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The Fight for the Forests:

the takeover of Australian forests for pines, wood chips, and intensive forestry

Third edition

R. and V. Routley

DEPARTMENT OF FORESTRY LIBRARY
AUSTRALIAN NATIONAL UNIVERSITY

Research School of Social Sciences
Australian National University
Canberra, 1975

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ISBN 0 7081 0646 3

Printed by Falcon Press. 8, Fyshwick Square, Kembla St., Fyshwick, A.C.T. Phone: 95-9278.

ACKNOWLEDGEMENTS

We owe special thanks to Jean Norman who collected, sifted and organised for us a welter of factual information, who managed to unearth some of the large amount of factual material on forestry projects that is not freely available, and who played a major part in the final production of the book. David Dumaresq also helped substantially.

We are indebted for information or critical comments or both, to very many people, but especially to John Logan, Malcolm Rennie, Peter Sheehan, Owen Stanely and Hugh Tyndale-Biscoe. John Turnbull and Geoff Parr contributed photographs of the woodchip areas in NSW and Tasmania. We are very grateful as well (particularly for many of the photographs) to several others who thought it wiser to remain anoymous. We are also indebted for information to a number of conservationists working on the woodchip industry, with whom we exchanged data – Paul Scobie, Milo Dunphy, Sam Lake, Judity Judith Wright, Dick Thompson, Jim Somerville, and Arthur Conacher. Finally we are indebted to the South Coast Committee, who originally undertook to publish the book, before it grew too long, and especially to its former secretary, John Hill who urged us to completion.

Several people in the Research School of Social Sciences and ANU Press helped with the production, and Hans Gunther of the Research School of Pacific Studies drew the maps.

It will of course be objected that in dealing with much of the material in this book we have gone outside our area of competence. Our reply is that no single discipline or person would be likely to be competent in all the areas necessary for an adequate treatment of the topic, most of which are clearly also outside the ambit of the professional forester. An acquaintance with logic and methodology of science, probability and decision theory, appears to us as adequate a background for dealing with such an area as an acquaintance with the botanical features of *Pinus radiata* – the latter being conventionally assumed to confer expertise in any aspect of the area.

Conventional subject classifications are often employed to block much needed work and stifle criticism, particularly where, as in this case, the conventionally relevant studies have been closely tied to a particular ideology. We believe that it is often essential to step outside these classifications, if necessary at the expense of academic respectability, in order to cover important areas which would otherwise be neglected. But we have followed a recognised convention for such work in that where we have dealt with specialised matters we have, as far as possible, provided supporting references to specialised published work in the area, so that the reader is not in general asked to rely on our authority. This procedure has however led to an exceptionally heavy reference and footnote burden, which many readers will no doubt find very irritating, but for which there was no alternative. We suggest that those who do find it irritating mentally blot out references and footnotes.

It will also be objected that the presentation is not 'balanced'. We have made no attempt to disguise our commitments – we believe that much of what is being destroyed or is about to be destroyed is of great value. But the clear adoption of a value system is no barrier to worthwhile work, and the belief that it is is typically a fallacy of workers outside the area of the social sciences. 'Balance' is not achieved by a pretence of objectivity, i.e. of having *no* value presuppositions – or by what it usually comes down to , an attempt to hide the value system presupposed. Balance, insofar as it is worthwhile, is achieved by the presentation of diverse views based on different value systems. But almost all the work so far produced in this area has been based, either explicitly or in a more hidden way, on the value system we have gone on to attack as 'the wood production ideology'. (Of course this has been so internalised by many workers in the area that they no longer see it as a value system at all.) We hope therefore that a treatment of some of the area from a different value standpoint will do something to restore the balance which ahs been so much lacking in the body of work on this area.

October 1, 1975

CONTENTS

INTRODUCTION TO THE THIRD EDITION 1
Population and the Borrie Report 1
The new forestry planning basis: the revised Forwood estimates 1
The failure to take account of recent demographic trends 1
Forwood's new consumption forecasts 4
Sawnwood 4
Panel products 5
Paper and paperboard 7
Total consumption figures 9
The wooden empire 11
The House of Representatives Inquiry 12
The Working Party Report on woodchipping 15
The Report is favourable because its assumptions are unrealistic 16
The appraisal basis and the criteria adopted 17
The inadequacy of the criteria assumed 17
Actually applying the criteria assumed 19
The real public profitability of Australian woodchip ventures 22
The Working Party at Manjimup 23
The Working Party in Tasmania 24
The Working Party at Eden 27
Regeneration and regrowth rates at Eden 28
New Eden royalties, underestimated costs, and the accumulated forestry deficit 29
The environmental aspects and constraints according to the Working Party 32
The Scott Report and the Eden woodchip project 33
The Report of the Australian Museum 34
Changes to the Eden project 37
Reserves in the Eden region are inadequate 38
Soil erosion at Eden: fact and forestry fiction 39
The economic impact of Harris-Daishowa's Eden operation according to Scott & Co. 41
'The sociological aspects in detail' 43
The political assumptions of the Scott Report 44
The Tasmanian woodchip scene 45
Extensions of established projects and newly proposed projects 48
The expansion of total logging operations in the surrounding region 51
The outlook 51
Additional references 55
Charts
Augmented chart 6: Forest products: per capita apparent consumption 10
Augmented chart 7: Forwood's per capita sawnwood domestic consumption projections 6
Augmented chart 9: Paper products: per capita apparent consumption 8
Chart 10: Panel products: per capita apparent consumption 8
Chart 11: Sawnwood: per capita apparent consumption 6
Tables
Newer population projections for Australia 2
Minimum surpluses of sawnwood from existing plantations 11
Recent losses of the WA Forests Department 23
Representative rates of erosion from various land uses 39

Chapter 1.	**The wood production ideology**	1
	Production forestry — cheap wood for private industry	5
	The conflict of values	10
	Underlying ideological commitments	17
Chapter 2.	**Pine planting for self-sufficiency**	21
	The 'import burden'	22
	The virtues of self-sufficiency	24
Chapter 3.	**The likely future population of Australia**	29
	Projections for 2000	30
	Projections for 2040	34
	The range of likely outcomes	35
Chapter 4.	**'Predicting' consumption levels**	38
	Sawnwood consumption	41
	Pulp and paper consumption	42
	Prediction or promotion?	44
	Setting reasonable consumption levels	46
Chapter 5.	**Overestimation, instead of rational decision-making**	49
Chapter 6.	**Likely future requirements and plantation areas**	54
	Acreages of coniferous plantations	61
Chapter 7.	**The environmental costs of Australian pine planting**	64
	The effects on flora and fauna	67
	Other environmental penalties	70
Chapter 8.	**Arguments from profitability and economic desirability**	76
	A cost-benefit analysis	81
	The best strategy under the decision theory model	88
Chapter 9.	**Woodchipping for export**	91
	Large-scale woodchip plans	92
	How woodchip projects affect pine planting schemes	96
	Information and choice	98
Chapter 10.	**The environmental costs of intensive pulpwood production**	99
	The costs at Eden	100
	The costs elsewhere	106
	Further environmental risks	113
Chapter 11.	**Forestry economics of woodchipping**	120
	Sorts of woodchip operations	120
	The year-to-year accounting picture	123
	Switching to the continuing picture	128
Chapter 12.	**Routes to commercial viability?**	131
	Reducing costs?	131
	Less interest or better prices?	133
	Adding value by processing?	135
Chapter 13.	**Wider economic considerations**	140
	The taxation argument	140
	Indirect benefits?	145

	Adding the indirect costs	149
	The upshot	152
Chapter 14.	**The Manjimup scheme in Western Australia**	154
Chapter 15.	**Parallel problems in USA and in New Zealand**	168
	NZ woodchip export scheme	196
Chapter 16.	**Alternative forestry**	204
	National parks — an impractical dream?	208
	Changing the ideological commitments	218
	Multiple values, partial use, and restrained yields	222
	Environmental pricing and decision-making	236
Appendix 1.	**The economic framework and underlying economic issues**	248
	Environmental economics	248
	Reasonable requirements versus future demand	253
	The thesis that demand should be unconstrained	255
	The doctrine of consumer sovereignty	257
	The 'problem' of value judgements	259
	Restricting market operations	260
	GNP, range of choices, and alternative measures of economic growth	262
Appendix 2.	**The pressures of growth and development on the environment**	265
Appendix 3.	**The alternative of planting pines on cleared agricultural land**	269
Appendix 4.	**Further details of the Eden woodchip project**	273
	Forestry revenue	273
	Forestry expenditure	276
	Technical paper no. 22	278
	The planned expansion of Harris-Daishowa's operation	285
Appendix 5.	**The 'objective' assessment of non wood-production values**	286
	The proposed reductions of values to uses	287
	Values through visitors, and recreational forestry	288
	Values through willingness of users to pay	292
	An 'opportunity cost' argument against forest reservation	296
Appendix 6.	**Unifying economic and environmental objectives through optimisation and decision modellings**	298
	Alston's forest model	298
	Synthesizing the economic and decision models	299
	General systems, and goals and best choice in economic systems	302
	The goals of an economy	303
	Bringing out underlying evaluations through rival optimisation models	306
Forwood — A case study of the industrial lobby at work		309
	The underlying ideology and the sociological picture	311
	Free enterprise at work: more public money for forestry	318
	Forwood's treatment of non wood-production matters. I. Industrial ecology	322
	Forwood's treatment of non wood-production matters. II. Multiple use	328

Development-oriented economics 339
The 'case' for subsidisation 341
The matter of profitability and commercial desirability of production forestry 349
The question of royalties 350
Forwood's estimates of market 'requirements' and demand 354
Understating the likely yields 368
Self-sufficiency – and export ambitions 372
The environmental justification 376

References 379

Maps

1. A broad classification of Australian forests 3
2. Montane forest and other forest types in NSW 68a
3. Tasmania: woodchip concessions and forest remaining outside woodchip concessions 107
4. The Eden district: land slopes for the Towamba and Genoa River Valleys 275

Charts

1. Per capita forest product consumption, 1950-1970, together with linear projections 1970-2000 40
2. Per capita consumption of pulp and paper products, 1955-2010 (according to NAFTA [1]) 43
3. Range of requirements for total wood products (excluding fuelwood) at 2000, with probabilities indicated 57
4. Range of requirements for total wood products (excluding fuelwood) at 2040, with conjectured probabilities indicated 58
5. Extrapolation of discounted revenues and expenditures for NSW [12]'s 'Eden project' 284
6. Per capita apparent consumption of forest products with various projections to 2010 355
7. Forwood's per capita sawnwood domestic consumption projections 360
8. Forwood's aggregate domestic sawnwood consumption projections 360
9. Per capita apparent consumption of paper products with various projections to 2010 365

Tables

1. Forest areas and percentage of forest land for selected countries 4
2. Relative losses for three state forest services 6
3. Volumes and values of forest product imports for selected countries, 1966 27
4. Population of Australia at year 2000 under various migration rates and various growth rates 36
5. Population of Australia at 2040 under various assumptions as to population at 2000 and various growth rates 36
6. Acreages of coniferous plantations under various requirements hypotheses, with and without imports 60
7. Comparison, as investment opportunities, of low-yielding, naturally regenerating euclaypt forest with a radiata pine forest 82
8. Cost-benefit analysis of conversion of native eucalypt plantations to radiata pine plantations 84a

9.	Cost-benefit analysis of planned conversion of *further* native eucalypt forests to radiata pine plantations	90
10.	Estimated production of broadleaved pulpwood	93
11.	Estimates of areas to be woodchipped annually and over a full rotation	94
12.	Estimated forestry revenue and expenditure on the Eden woodchip project, for an average annual 10,000 acre cut	127
13.	Estimates of regeneration costs for future pulpwood yields in Tasmania	129
14.	Employment of timber getters and other forestry workers in South Coast shires of NSW	148
15.	Estimates of capital costs and annual running costs for the Manjimup project	157
16.	Minimum direct commercial losses for the Manjimup project	158
17.	Multiple-uses in US forestry	179
18.	Relative losses for the New Zealand Forest Service	198
19.	The cost of national parks in four states	226
20.	Financial returns for the Eden project	282
21.	Commodity and indirect taxes for various agricultural and forestry enterprises	343

Photographs

(Photos a. and b. follow page *57*; numbers 1 to 10 follow page 80; 11 to 18 follow page 148; 19 to 28 follow page 204; 29 to 37 follow page 307.)

a.	Rock-bottom erosion at Eden.
b.	Sawlogs ready for loading to the chip mill.
1.	Clearing for pine program, Bondo State Forest, NSW.
2.	Bulldozing a fine Mountain Gum, Bondo State Forest.
3.	Conservation activity, Bondo State Forest.
4.	Grove of *Eucryphia moorei,* Monga State Forest, NSW.
5.	High quality eucalypt forest cleared for pines, Tallaganda State Forest, NSW.
6.	Eucryphia gully, Monga State Forest.
7.	Area bulldozed and partly windrowed, Tallaganda State Forest.
8.	Area of Messmate (*E. obliqua)* soon to be bulldozed, Tallaganda State Forest.
9.	An aerial view of clearing for pines, Tallaganda State Forest.
10.	The NSWFC's treatment of a stream in Tallaganda State Forest.
11.	Log dump in a stream bed, Tallaganda State Forest.
12.	Fern gully in montane forest.
13.	The sort of treatment excused by the 'renewable resource' claim.
14.	Results of pine planting by machine.
15.	Part of the large Bombala complex of forests to be woodchipped and planted to pine.
16.	Private land prepared for pine planting.
17.(a)	Millionth acre of pines in the Hampton State Forest.
17.(b)	Forest on the Boyd Plateau, scheduled to form part of the Oberon project.
18.	'Decadent', 'degenerate' trees of *E. obliqua,* Tallaganda State Forest.
19.	The Greater Glider (*Schoinobates volans).*
21.	A view of the Eden woodchip project.
22.	Destruction of native eucalypt forest by *P. cinnamomi.*

23. The Eden area has one of the highest run-off percentages in NSW'.
24. 'Unimproved' area, Eden.
25. Eden soils are shallow podzolics.
26. A fine 'degenerate' Mountain Grey Gum, Eden.
27. Dense roading involved in a woodchip project provides a permanent source of erosion and aesthetic affront.
28. Areas subjected to intensive forestry treatment are greatly and perhaps permanently impoverished.
29. Woodchipped area, Tasmania.
30. Woodchipped area near Buckland, Tasmania.
31. Part of TPFH concession area, Tasmania.
32. Nearly a third of Tasmania's forest is privately owned.
33. 'Multiple use' in operation in Kioloa State Forest, NSW.
34. A more recent view of part of the Eden project cut some time ago.
35. Forestry protection of flora and fauna.
36. Woodchipping at Eden.
37. A view of the Eden chip mill.

INTRODUCTION TO THE THIRD EDITION

The main text of the book – reproduced in its second edition form below – was written during 1972 and early 1973. In this Introduction we attempt to indicate the main ways in which the material in the book requires revision, and discuss some of the more important developments not covered. But though many details of the second edition need updating, none of the themes elaborated requires essential modification.

Both the new developments and the changes of detail are very conveniently considered, by way of examination of the relevant parts of a series of recent reports.

Population and the Borrie Report. One of the more important changes concerns the population data presented in Chapter 3. The recent and well-publicised Borrie Report [1] has now indicated population projections very much lower than those used in past or present forestry planning. A marked (and in 1972 largely unsuspected) decline in the natural growth rate – now well below the 1.1% level cited in Chapter 3 and expected to reach replacement level by 1976 – together with a lower immigration program, now suggest maximum levels of population close to the minimum levels suggested in Chapter 3. (Similar projections are also available from other sources, e.g. Spencer [1].) This fact has important implications, most conspicuously for the pine program, but also to a lesser extent for woodchip programs, insofar as these are designed eventually to meet Australia's future pulp and paper "requirements". These issues come to a head in the revised Forwood planning.

The new forestry planning basis: the revised Forwood estimates.[1] Both population and per capita consumption estimates of the original Forwood production forestry plan (set out in Survey [2], and criticised below in the Forwood Supplement) were revised in the new Forwood plans (New Survey [2]). These new plans were presented, and approved, at the reconvened Forwood Conference held on November 28-9, 1974.

The failure to take account of recent demographic trends. The revised Forwood softwood planting program of more than 2.8 million acres total area is quite excessive in the light of more recent population forecasts. The program should be drastically revised downwards to take account of the likely range of future population and the lower population projections and recommendations of the National Population Inquiry.

With the appearance of authoritative studies (such as Australia's Population [1]) showing that the population assumptions of the original Forwood plans were substantial overestimations – studies subsequently corroborated by the Borrie Report [1] – Forwood was forced to modify its population projections and was unable to avoid making some reduction in its pine planting program at the reconvened Conference. Forwood's revised population figures up to the year 2000 are a *high* selection from those presented in Australia's Submission to the World Population Conference (Australia's Population [1]), namely those obtained by assuming a net immigration of 60,000 annually. While the new Forwood figures are undoubtedly a substantial improvement on the completely out-of-date estimates the original Forwood planning adopted, they fail to take account of significant demographic trends already conspicuous by mid-1974 and before Forwood revision was undertaken, namely, reduced net immigration levels and a declining fertility rate.

The revised Forwood population projections are based upon Australia's Population [1], which was published in April 1974. This report assumes a higher natural growth rate than the National Population Inquiry Report, Borrie [1], which reduced the projected natural growth rate on the basis of more complete data and lower figures. When the natural growth rate is adjusted downwards in the light of the later report, it becomes evident that the Forwood projection of 19.1 million at 2000 is equivalent to the assumption of an immigration rate of almost 100,000 per annum (see the previous table). This level of immigration is however, as the Borrie Report argues, both unlikely and difficult

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1 The critique of the revised Forwood planning which follows is an adapted and condensed version of Routley [5].

NEWER POPULATION PROJECTIONS FOR AUSTRALIA

Year / Source	1970	1980-1	1990-1	2000-1	2010
Original Forwood, March, 1974.	12.4	15.1	18.2	21.5	25.2
Revised Forwood, November, 1974	12.4	14.7	16.9	19.1	21.5
Australia's Population [1], April, 1974					
i) with net immigration 40,000 annually.		14.5	16.5	18.3	
ii) with net immigration 20,000 annually.		14.4	16.1	17.6	
Public Service Planning Directive [1], December, 1974 (with 40,000 immigration).		14.3	[15.9]		
Cities Commission, July, 1974 Report.				17.98	
Borrie Report [1], p. 725,					
i) with no immigration		14	15	15.9	
ii) with net immigration 50,000 p.a.		14.4	16.1	17.6	
iii) with net immigration 75,000 p.a.		14.6	16.6	18.5	
iv) with net immigration 100,000 p.a.		14.8	17.1	19.3	

to achieve, and against the current climate of opinion in Australia (Borrie Report [1] pp.732-3)[1].

---

1 The Borrie Report however takes the view that these high levels will not produce 'serious environmental deterioration' (p. 714), and believes that it would be manageable in terms of both environment and resources' (p. 732). As argued in Birrell [1], the Borrie Report virtually ignores the environmental costs of these sorts of growth levels, and indeed claims that within limits, population growth is not an important factor in environmental deterioration (p. 714). A similar claim appears in Neutze [1].

However, as argued in Appendix 2, total impact on the environment is (necessarily) a function of numbers of people together with each person's impact. Hence unless individual impact somehow reduces as population grows — a fairly implausible assumption — increasing numbers must be an important factor. The argument presented in Neutze [1], and apparently bought by the National Population Inquiry, is confused. For it argues for population growth not being an important factor on the ground that 'environmental deterioration is not closely related to population density' (p. 40). But it does not follow, because environmental deterioration is not a simple function of numbers, or because population growth is not itself *sufficient* for environmental deterioration, that numbers are not an *important* factor; or, because there are measures (mostly reducing living standards, and unlikely to be taken) which could reduce the impact of each individual on the natural environment, that numbers are *irrelevant*.

It is apparently on the basis of such fallacious methodological assumptions that the Borrie Report has proceeded to discount the causal role of continued immigration in generating environmental costs. Some of these very real likely costs included are outlined in Birrell [1], and include not only the pine program, but adverse impacts on the cities, adjoining areas important for recreation such as the Dandenongs, Blue Mountains, and coast, and increased pressure on national parks and remaining natural areas. One does not know whether these impacts and those costs outlined in Birrell would be considered 'serious' by those who wrote the Report, or indeed what mere 'quality of life' deterioration would count as 'serious' in their eyes. But they should certainly have been considered as likely costs of continuing the program, especially in view of the absence of demonstrable benefits (except to industry).

An even more implausible Forwood assumption is that after 2000 the population will grow at the rate of 1% annually. Since a zero natural growth rate is now anticipated long before that date, the assumption amounts to supposing an immigration rate of about 200,000 people annually. On present information this is exceedingly improbable, particularly in the light of declining growth rates in countries which have been the traditional sources of migrants. Thus Forwood's population estimates for 2010 appear to have overestimated the likely population by many millions of people.

Although it is claimed that the revised Forwood figures are completely up to date (Lewis [1]), this is not so. The new planning in fact exhibits, in a perhaps less spectacular form, exactly the same defects as the old — the retention of out-of-date figures,[1] the failure to allow for a suitable *range* of assumptions in planning, and the continued use of improbable estimates at the highest end of the scale.

The findings of the Borrie Report are not uncontroversial. However similar tentative projections are now available from other sources, for example the Bureau of Census and Statistics (see Spencer [1]). The Cities Commission, in its second Annual Report (July, 1974), had projected a population of 17.98 million at 2001. In its more recent Darwin paper 'Long-term policy issues: Implications for national settlement policy',

> it suggested 18 million as a maximum figure, with 16 million as a minimum. Cities Commission officers, however, seem to incline more towards the lower number, and would be surprised if the population at the end of the century was more than 17 million (Juddery [1]).

And a directive distributed to public service departments in December, 1974, with population projections intended for use in preparation by departments and instrumentalities of forward estimates of Australian Government outlays up to 1978, incorporates net migration figures of 40,000 each year[2] — leading to population totals much lower than those considered by Forwood planners.

The outcome of a reassessment of Forwood planning using more probable population estimates is not difficult to ascertain. No more pine planting is required — even giving in all the quite unwarranted assumptions Forwood adopts in order to maximise the extent of its pine planting program, e.g. exorbitant per capita consumption estimates, lower than average recovery rates from plantation sawlogs, low yields from native forests, below average growth rates of pines, no imports. Consider, to take one critical case, sawnwood requirements and availability at 2000 according to Survey [2]: availability at 2000 is about 5.6 million cu.m. sawn volume (see Survey [2], tables XIV and XI), whereas requirements for a maximum population of 18 million are only 4.6 million cu. m. (see Survey [2], table VI), while for an expected population of 16 million "requirements" are 4.1 million cu. m. Thus on more realistic assumptions than Forwood there are going to be many million cubic metres surplus at 2000 and 2010 without any further pine planting.

The point can be highlighted in this way. At 2000 the population is not likely to be more than 30% higher than the present Australian population of approximately 13 million. Yet Forwood's revised estimates (New Survey [2]) assume that it will be essential to increase the output of the forests by 150% (from 11.3 million cu. m. in 1970-1 to 28.3 million cu. m. at 2010: see New Survey [2], table V).

There will also be some dramatic changes in the age structure of the Australian population in the coming 40 years, and these will have an extremely important bearing on the demand for sawnwood. These changes, which we discuss under consumption, have been completely neglected in the revised Forwood planning.

---

1 It was known in April 1974 that the figures of the National Population Inquiry would be lower than those of Australia's Population. Yet Forwood made no allowance for this.

2 The net migrant intake for 1974-5 was in fact about 43 thousand.

Forwood's new consumption forecasts. In view of their reduced population estimates Forwood planners were unable to avoid some reduction of the pine program as presented at the April Forwood meeting. The planners however attempted to compensate for this reduction by substantially increasing the estimates for per capita consumption. Yet per capita consumption estimates of the initial Forwood conference had already been implicitly criticised by several forest economists (e.g. Westoby [1], Ferguson and Parkes [1]) as overestimates. Whereas the proper result of the lowered population estimates would be to lower the per capita estimates, the response of Forwood planners was to greatly raise these per capita consumption estimates.

According to Forwood (New Survey [2], p. 19) the increase in estimates was made 'after consideration of comments received since April'. However the decision to raise the April per capita consumption estimates ignored both the opinions of the only (industry and forest service independent) economists (Ferguson and Parkes) on the Forwood Marketing Panel, that some of the April estimates themselves were too high, and the considerable doubts expressed by conservation groups about the desirability of catering for and encouraging such high consumption levels. The remaining members of the Marketing Panel were drawn almost entirely from the forest services and industries and it was evidently the opinions of industry which were given weight in the decision to raise consumption estimates, despite the fact that many sectors of industry clearly have a vested interest in maintaining the pine program at a high level regardless of its real justification.

The April Forwood estimates have already been criticised as lacking detailed publicly available and assessable bases (see p. 354 ff.). The refusal to provide a detailed basis for estimates is of course one way — a favourite forestry way — of ensuring that they are not open to assessment and correction. The revised estimates go even further than those of April in this direction. No details whatever of the planning basis are given, and the revised estimates appear to be plucked out of the air. The few meagre remarks made in support of the increase are evidentially worthless.

In the case of components of each of the three major end uses — (1) sawnwood, (2) panel products, (3) pulp and paperboard — it is said 'these estimates are slightly larger than earlier figures' (i.e. those of April). This is a considerable understatement, since the new per capita figures show an increase of about 15% over the April figures. No explanation is offered of why the estimates have been so expanded.

(1) Sawnwood — Of sawnwood it is said 'Recent trends have so far given no indication of the drop in per capita consumption by 1980, that was forecast in March 1973' (New Survey [2], p. 21). Thus the estimates were enlarged more than 15% on the basis of a further six months' data for sawnwood, obtained during a period of exceptionally high building activity. This is a thoroughly unsound procedure, since it is well known that building activity (the main user of sawnwood) fluctuates very greatly. Extrapolation for a 40 year period must be based on averaging over an appropriate period, not based on a temporary boom.

Moreover there is presently a large amount of deferred demand for housing (continuing at approximately 100,000 houses) so that higher consumption figures for the last year or so continuing into the near future would have little relevance to the forecast of decline beyond 1980. In fact the reduction in immigrant intake in the last years would already have produced a noticeable reduction in demand for housing were it not for the large amount of deferred demand in the housing and associated areas. The predictions also completely ignore new developments in house framing (such as the lighter framing techniques) which are thought likely to reduce sawnwood use in housing substantially, and the likely trend to smaller houses.

The New Survey explanation goes on to claim that 'the revised figures take cognisance of the current steady trend', which is clearly false, as the linear best fit graphs, shown below, indicate. It notes in justification of its increase that New Zealand is forecasting a considerably higher per capita consumption of sawn timber. However New Zealand has had for a very long time almost the highest sawn timber consumption in the world (FAO [1], [2]), due largely to the very large number of timber houses. This is not a trend

which is at all likely to develop in Australia, and the citing of the New Zealand figures is extremely misleading.

Sawnwood is the most inflated item in the revised Forwood figures; the reason is not hard to find. The case for continuing the pine planting program depends on a supposed deficit of sawnwood, pulpwood being a much less critical matter. If, as we argue, the case for the pine program cannot be made out on the basis of sawnwood shortages it cannot be made out at all. The reduced population figures used in the revised Forwood planning had a most damaging effect on the sawnwood case, and only by a substantial, and scarcely warranted, hike in the sawnwood estimates can much of the program be salvaged.

The increase is not justified. The initial Forwood figures were already overestimated (see pp. 359 ff.): there can be no case for the revised Forwood estimates depicted in Augmented Chart 7.

As well both Forwood's and the Ferguson- Parkes' estimates followed the quite unsound procedure of simply transferring the original per capita sawnwood estimates from and devised for a period of high population growth (approaching 2% over the last 15 years) to a period when it is expected that population growth will be much lower. That is, the Forwood sawnwood estimates have completely ignored the differential effect of lowered population increase, the crucial factors of age structure and family size, which are extremely important in estimating demand for sawnwood in housing (and elsewhere, such as furniture), and dramatic changes are now expected to occur in the age structure and pattern of the population of the coming 35 years. The result of these changes must be a considerable decline in per capita demand for *new* housing (and hence sawnwood), the early stages of which can be expected to appear in the 1990's, when the pine from the big program is beginning to come on stream. In fact all new planting will be producing sawlogs for the period beyond 2003 long after replacement levels have been reached and when demand for new housing will accordingly be very low. If proper account had been taken of declining population growth, then sawnwood consumption estimates would have been *lowered* over the initial estimates, not substantially raised as in the revised estimates.

(2) Panel Products — Some of the April estimates, notably those for particleboard, were criticised by Ferguson and Parkes ([1], p. 493) as 'far too optimistic'. In the revised Forwood estimates, the aggregate figures for particleboard were somewhat reduced, but those for remaining categories of panel products (plywood, hardboard and softboard) were increased, though without notice being given or any reason provided (compare the respective figures in New Survey [2] and Survey [2], table VII, both allegedly derived from the tables of Forwood [6]). The notes accompanying Table VI, New Survey [2], p. 21, are supposed to 'explain changes from previous FORWOOD estimates of per capita consumption . . . where changes have been made'. But *no explanation* at all is provided of the changes in estimated per capita consumption of particleboard, plywood and hardboard, though the revised per capita consumption estimates for panel products are now higher by nearly 20%. Only in the case of softboard — along with round and hewn timbers — is it said:

> Despite changes in the population forecasts the gross consumption estimate has not been varied because use of these products is not closely related to population increases. Per capita estimates are therefore slightly higher than earlier figures.

However it is evidently false that consumption of softboard is not closely related to the number of consumers (and hence to population increase) especially as so much of this end use goes into housing and furniture. The procedure of leaving the aggregate consumption unaltered despite the reduced population figures means in effect that the reduced population estimates have *not* been taken into account at all, and indicates — what is evident from elsewhere — a desire to maintain the program regardless of its real justification.

There is even less reason, then, for relying on the revised Forwood panelboard figures than on the earlier lower estimates, which Ferguson and Parkes had rightly criticised ([1], p. 497)

> The trends in Forwood forecasts for hardboard and softboard are not readily explicable. The Working Party concerned apparently did not supply these forecasts and their basis is unknown.

AUGMENTED CHART 7

FORWOOD'S PER CAPITA SAWNWOOD DOMESTIC CONSUMPTION PROJECTIONS

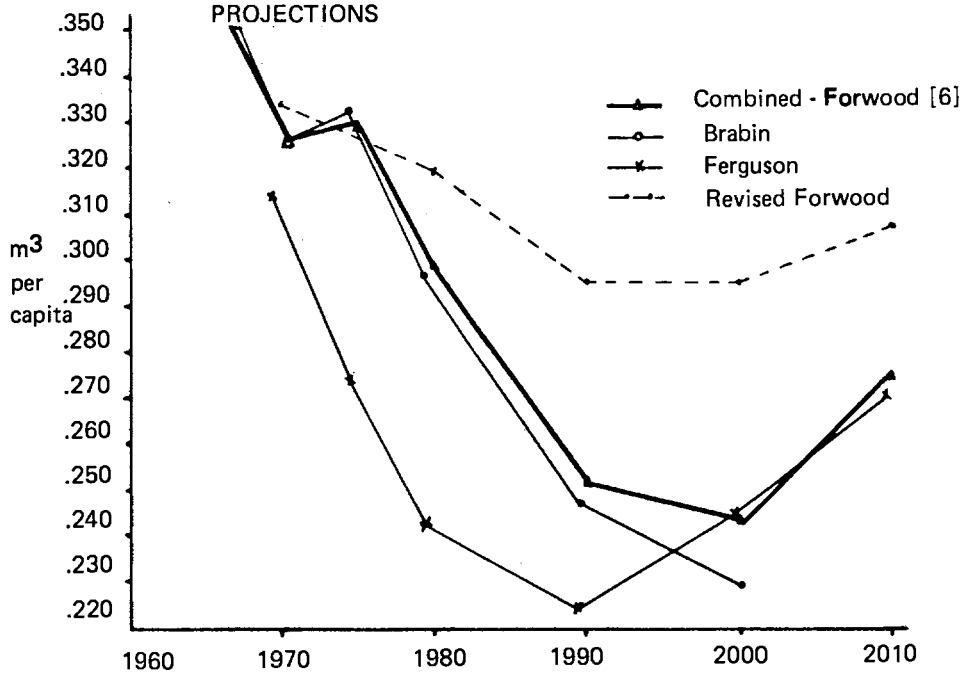
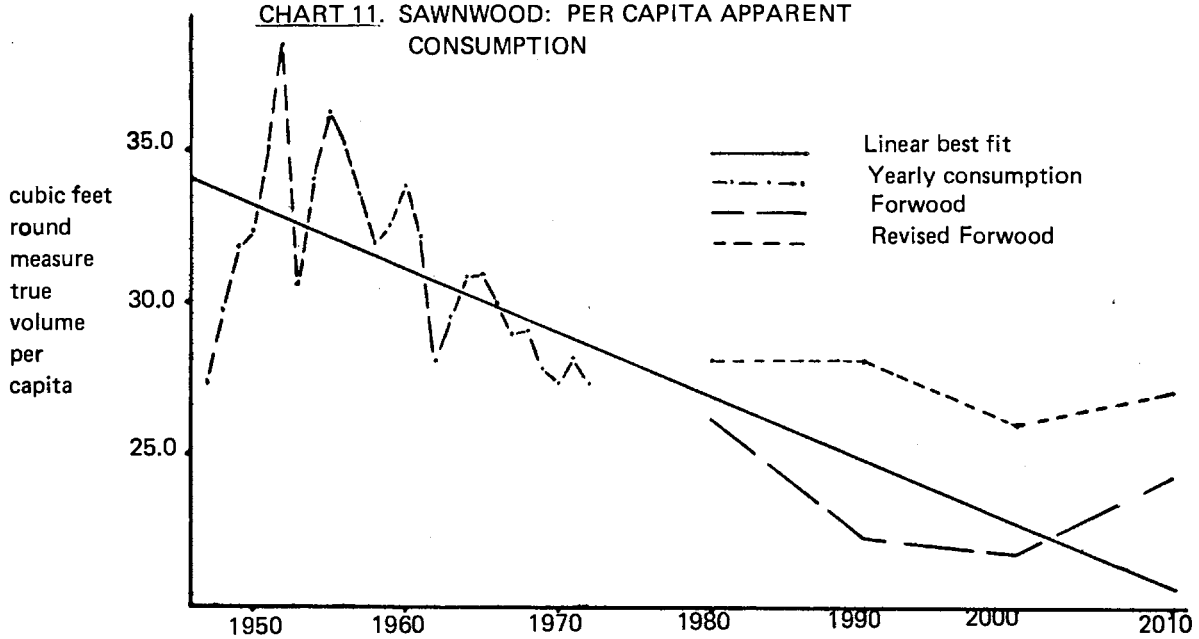


CHART 11. SAWNWOOD: PER CAPITA APPARENT CONSUMPTION



Sources: Forwood [6]; FTB[3], Table 123. 1968-1972 figures supplied by FTB. Population figures used in deriving per capita consumption figures were supplied by the Bureau of Census and Statistics; all but that for 1970 are to be found in Forwood [6], p.2 and p.40. Revised Forwood figures are from New Survey [2].

Notes: (1) The figures in cubic metres used are in terms of log volume by sawmill output. To obtain figures (likewise in cubic metres gross roundwood volume) by forest removal, the figures cited have to be multiplied by a factor of 2.5 (see the discussion of the defect allowance, Survey [2], p.21). Sawnwood figures given in chapter 4 are uniformly in cubic feet gross roundwood volume by forest removal. Thus to convert the figures in the above graph to a comparable form a factor of 2.5 x 35.315 has to be applied (since 1 cubic metre = 35.315 cubic feet, to three decimal places).

(2) The best fit linear projection was obtained by the method of least squares with a modified 'LINEFIT' Program on UNIVAC 1108, ANU Computer Centre.

Not only is the basis supplied for the panel products estimates unknown or else unsatisfactory; worse the projections made obviously lack any good basis, as chart 10 indicates. For projections should not substantially exceed the best fit line, because trends for those panel products which have 'caught on' relatively recently should level off, while trends for older-established products such as plywood should not exceed their recent per capita pattern of almost linear increase. What Ferguson and Parkes say of particleboard applies to some extent also to hardboard and softboard, namely

> Particleboard production had only just started in 1960 and there was a rapid increase in local supply in the ensuing decade as new plants were established. By 1971-72 there was surplus capacity and over-production until the subsequent building boom eased the situation.

They go on to argue in effect that (whether or not the real prices of particleboard fall substantially, thus discouraging investment in expansion) the rate of increase of per capita production will decline. This is the sort of pattern to be expected in the case of recently established commodities, the expected pattern being an S-shaped curve, i.e. extrapolations which are linear or exceed linear extrapolations are theoretically wrong (see the discussion on p. 366 below). In many cases indeed where the gradient is positive a linear projection will considerably overstate likely consumption (e.g. relatively recently established commodities such as particleboard and sanitary tissues), since with many products there is a damping off effect after the novelty of a product has worn off or the product stabilizes – a feature likely to apply not just in the case of panelboard products but also in the case of paper and paperboard products.

In sum, there is no theoretical basis for per capita panelwood product projections such as those of Forwood which substantially exceed the best fit line on significant data, and there is no case for basing planning upon such estimates.

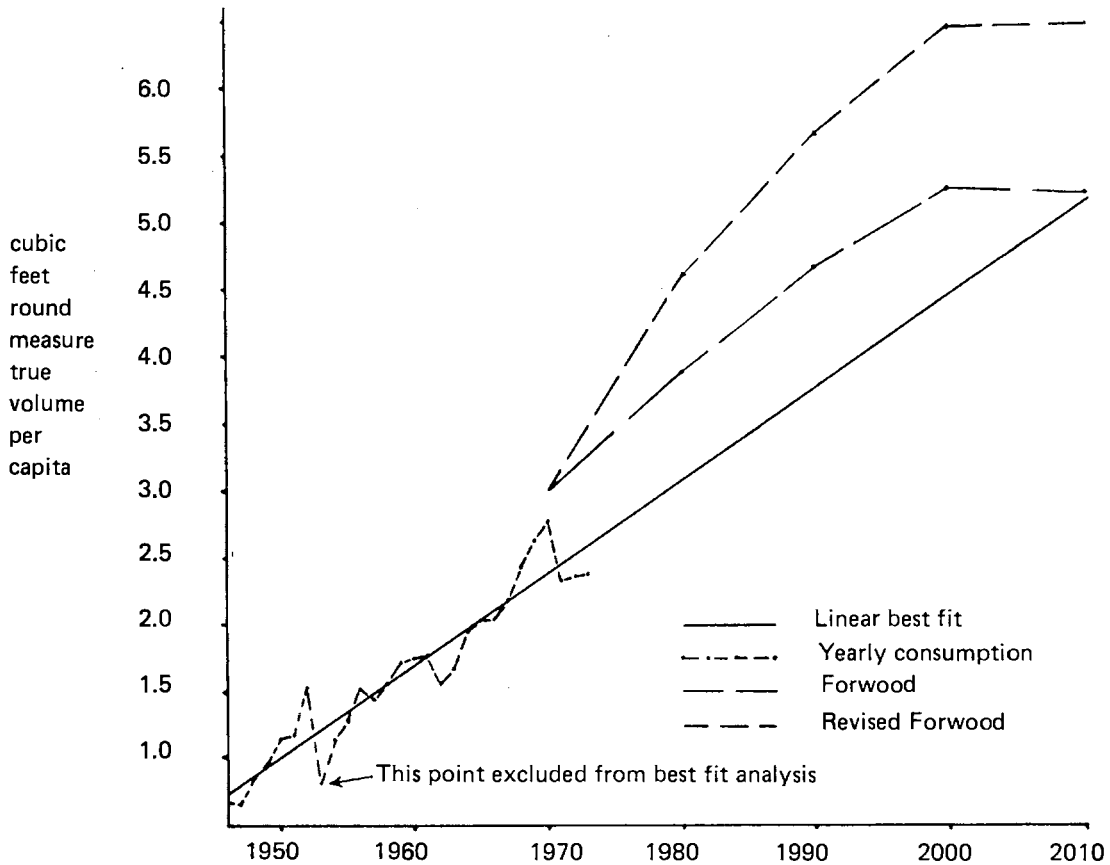
(3) Paper and Paperboard — The revised per capita estimates, again claimed to be 'slightly larger than earlier figures' (New Survey [2], p. 21) are in fact almost 9% larger than the April Forwood figures, as chart 9 indicates. The claim that the increase is 'based upon more recent statistics' – presumably a further six months' consumption figures and confirmation of provisional figures – is puzzling in view of the fact that more recent per capita statistics show no dramatic increase. How a 9% increase in the estimates at 2010 could be reliably based on a further six months' data is not explained.

The original Forwood per capita estimates for paper and paperboard are criticised below (pp. 364-8) as far too high. There is even less case for the revised estimates. The Forwood trends – in excess of a linear increase – are neither to be expected – unless paper products become much cheaper – nor are they desirable. Much of the end product, which can fairly be counted as junk paper, will consist of packaging material, containers and advertising paper which is used once and thrown away: very, very little of it in comparison goes into books or fine writing material. According to the revised Forwood figures consumption of paper and paperboard will exceed 30 cu.ft. a person at 2010, almost *three times* recent levels of consumption of about 11 cu.ft. per person. More than two-thirds of the consumption of paper (and one-third of total per capita consumption) that Forwood envisages at 2010 will, on our estimation, be of junk paper. Such material is already substantially subsidized, through

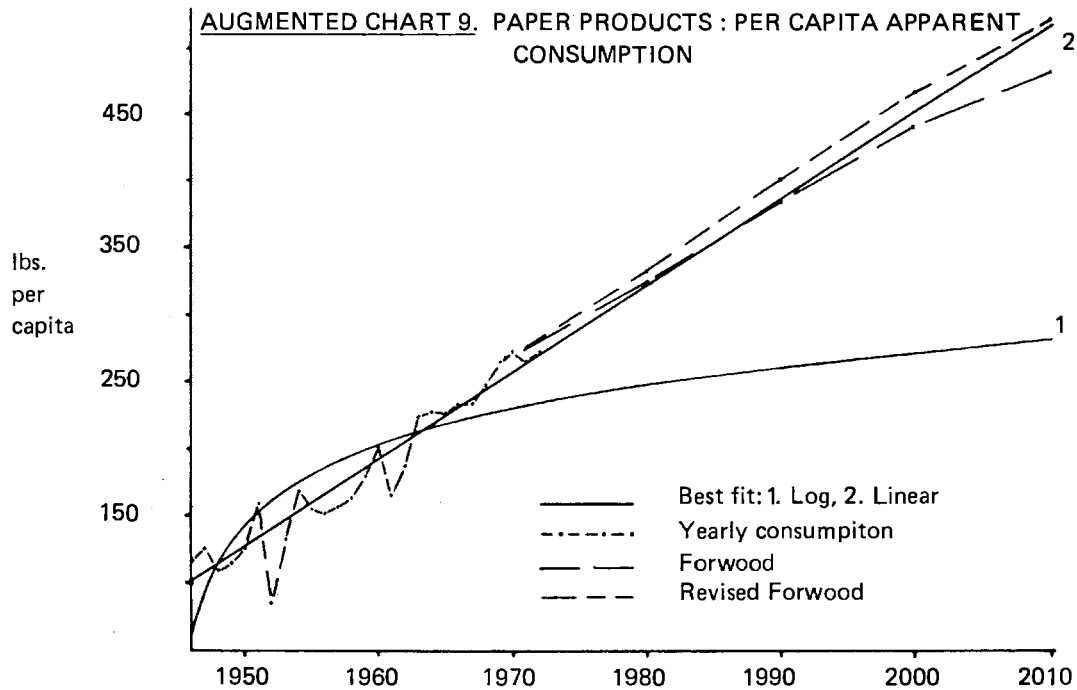
(i) extraordinarily low royalties for pulpwood, which do not even cover the costs of production, and accordingly do nothing to meet the environmental costs incurred in pulpwood production;
(ii) subsidization of paper-makers by way of cheap water supplies, electricity, and minimal pollution control; and
(iii) public shouldering of disposal costs.

A detailed discussion of the subsidization, and encouragement, of junk paper products may be found below (p. 236 ff.) and recommendations for changing the pricing structure to eliminate this unwarranted subsidization are also set out there (pp. 243-5). In essence our proposal is that *the consumer should be charged the full price of the paper products including commercial and environmental costs of production and processing and disposal costs.*

CHART 10. PANEL PRODUCTS : PER CAPITA APPARENT CONSUMPTION



AUGMENTED CHART 9. PAPER PRODUCTS : PER CAPITA APPARENT CONSUMPTION



Source: FTB [3]. 1968-1972 figures supplied by FTB.

Note: The best fit curves were obtained by the method of least squares with a modified 'LINEFIT' program on UNIVAC 1108, ANU Computer Centre. The 1952 figure was excluded from the best fit analysis.

Very high levels of paper and paperboard consumption of the sort Forwood envisages can hardly be achieved without increases in the subsidization of consumption, resulting in lower real prices, and further curtailment of consumer choice (so, e.g. that he can only purchase a range of commodities, such as milk, packaged in paperboard). There is no good case for such subsidization of these commodities or of such constraints on purchaser choice. Because these factors already operate it cannot be assumed that demand represents consumer preference: the market at best represents consumer preference for commercial goods when it is not subject to such distortions, and of course it does not reveal preferences for non-wood values of forests directly at all. In brief, demand for junk paper products does not accurately reflect the extent to which the products are desired: naturally it shows little about the extent to which they are desirable.

(4) Total consumption figures — It can be seen from the Augmented Chart 6 that the revised Forwood estimates are only slightly below the old high estimates of NAFTA, the last major forestry planning exercise before Forwood. The revised Forwood estimates far exceed per capita estimates of other forestry planners, e.g. Jacobs [3], Parkes [2]. The original estimates of future consumption prepared for NAFTA were widely rejected as gross overestimates, *even by industry* (see NAFTA [1]), and new more realistic estimates had to be prepared (these are shown on the graph as the NAFTA alternative). Yet now Forwood expects us to accept estimates which are nearly as high as the original estimates. There has been nothing in the interval for revision (four years) to justify such a large predicted rise and much to weigh against it.

The picture that emerges is one of gross overestimation of consumption to maintain a cherished program. This picture is the one that we have seen is supported by an analysis of main classes of end uses. Unless a better evidential basis can be provided than has so far been indicated, the revised Forwood figures will have to be regarded as baseless, and as quite unreliable for use in future planning. As the graph helps indicate the revised Forwood figures are improbable.

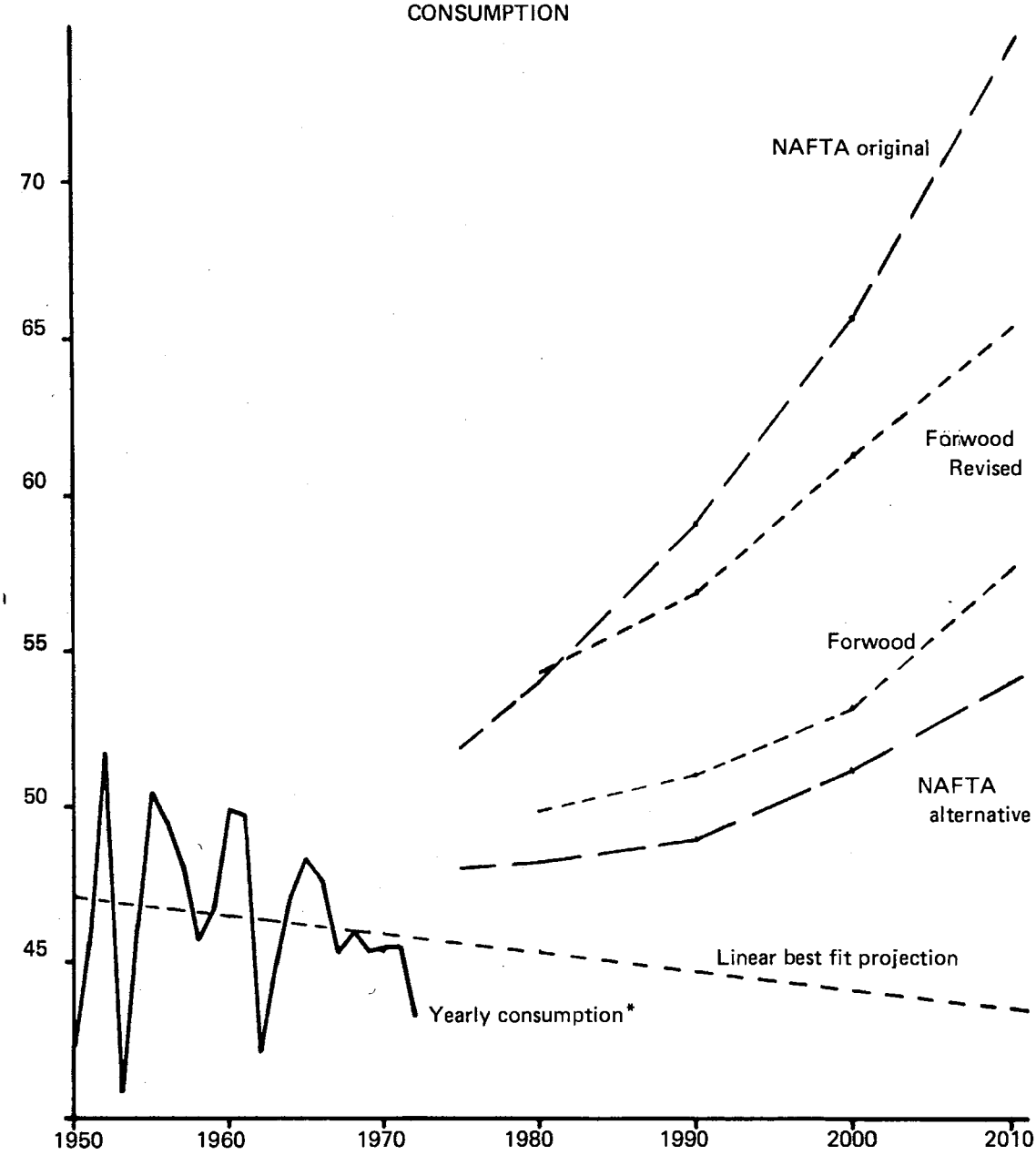
Therefore the aggregate Forwood consumption estimates on which the case for the pine planting program is based should not be accepted. New independent estimates should be prepared (by sources with no vested interest in maintaining the program), which use realistic per capita consumption figures and which take full account of the population trends (including age, structure and family size) discerned by the National Population Inquiry. The principal outcome of such a study would not be difficult to surmise, that the pine planting program should be wound down. That this is the logical outcome can be shown on the basis of the work of Ferguson and Parkes [1], even though their population estimates err liberally on the over-generous side, and their per capita consumption estimates (based on those of NAFTA alternative and the original Forwood figures) remain far too high.[1]

It is enough to examine the critical case, that of sawnwood (cf. Ferguson and Parkes: 'In considering the future planting program, most emphasis must be placed on the future requirements and availability of sawlogs'). For even on the revised Forwood estimates there will be a substantial surplus of pulpwood, especially about the year 2000 (see New Survey [2], table XVI). But it is a simple outcome of the work of Ferguson and Parkes [1] that already established pine plantations will provide a surplus of sawnwood from shortly after 1980 onwards (see the table). Yet Ferguson and Parkes [1] only vary Forwood's original estimates in minor ways that are hard to dispute, namely (i) as in New Survey [2] the population estimates of Australia's Population [1] are adopted; (ii) a small allowance for imports is included, essentially that of Forwood for specialist sawnwood; (iii) a sawn recovery of 45% for plantation sawlogs is assumed as against Forwood's figure of 40%. Ferguson and Parkes have a good case for this assumption ([1], p. 505):

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1 This very considerable tolerance enables us to escape the objections Ferguson and Parkes make to advocating changes in the planting program on the basis of their demonstration of surplus of availability of sawlogs over requirements ([1], p. 509); for none of the issues they mention affect the outcome, but only the way in which the softwood planting program should be rationalised to minimise economic and environmental losses from the excessive planting that has already occurred.

AUGMENTED CHART 6. FOREST PRODUCTS : PER CAPITA APPARENT CONSUMPTION



*Source: FTB [3]. 1968-1972 figures supplied by FTB.
The linear best fit projection was obtained by the method of least squares with a modified LINEFIT program on UNIVAC 1108, ANU Computer Centre.

Note that the historical data presented in this sort of graph does *not* represent new material consumption only, but exactly what it claims to present, namely per capita apparent consumption – contrary to the NSW Forestry Commission's recent attempt in its submission to the Softwood Inquiry (NSW [14]) to confuse the issue, especially the question of the reasonableness of Forwood's projections.

TABLE. MINIMUM SURPLUSES OF SAWNWOOD FROM EXISTING PLANTATIONS

(All figures in thousand cu.m. sawn volume. Table based on Ferguson-Parkes [1], table 6).

Detail \ Year	1980	1990	2000	2010
1. Ferguson-Parkes future requirements of sawlogs (based on net migration of 40,000/year)	3769	3724	4163	5249
2. Forwood native forest sawlog supply (incorporating the Sawlog robbery; see below)	2637	2164	1830	1774
3=1-2. (Ferguson-Parkes required supply of plantation sawlogs)	1132	1560	2333	3475
4. Supply of sawlogs from already established pine plantations	1040	2163	4269	~4500
5=4-3. Minimum surpluses	-92	603	1936	1025

> The sawn recovery for the coniferous species (Wilson 1969) over the last decade has averaged about 45%. In the Development Plan (Forwood 1974a), the low recovery for plantations is attributed to the fact that smaller logs give a lower recovery. Yet the mixture of log sizes seems unlikely to differ markedly from that of South Australia where sawn recovery for plantations has averaged nearly 47% over the last decade (Wilson 1969).

Overseas information reveals that, with modern sawmill equipment, a still higher recovery rate, exceeding 50%, can be achieved.

Ferguson and Parkes make no objection however to – what is equally objectionable – (iv) Forwood's per capita sawnwood figures; (v) the yield figures Forwood adopts for pine plantations (MAI of 16 m^3/h./a.) which are noticeably below average yields so far obtained (17 m^3: see Forwood [7], and the criticism p. 369), and below those claimed elsewhere in Forwood and now common in forestry sources (e.g. Florence and Shepherd [1] cite yields of 14-30 m^3/h./a). Forwood claims that the MAI of 16 is the average for all species planted to date. However planting is now concentrating on higher yielding species, especially *Pinus radiata,* and is occurring on better sites. Hence this figure is likely to considerably underestimate first rotation yields. As well it is almost certainly inconsistent with the benefit-cost ratio claims for pine plantations. Since detailed yield projections must have been available for these benefit-cost studies, these yield projections rather than the past average for the species planted should have been used.

Ferguson and Parkes' estimates provide a generous *upper bound* then, on future requirements. But, as the table shows these requirements can be met without further extension of already established plantations. It follows that *there is no general planning case* at all *for extending the pine program.* Australia is already growing too many pines, even allowing for self-sufficiency and generous estimates of consumption.[1] Nor is there a case for the program on financial, social benefit, or environmental grounds.

The wooden empire — There is ample evidence that forest services and planning organisations such as the Australian Forestry Council and the Forestry and Timber Bureau are very strongly attached to the pine program, and the Forwood procedure of raising consumption

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1 This has now been recognised in South Australia, where a governmental enquiry is finding that the state pine program will deliver big surpluses.

levels to compensate for lowered population levels provides clear evidence that they are determined to maintain it regardless of its real justification. The program of three million acres was originally set up for a population of 23 million at 2000, but now that the population is expected to be only about 17 million at 2000, we find that the pine program has been reduced by only about .1 million acres.[1] It is difficult to know under what circumstances forest services would be prepared to relinquish this program or what would convince them of its inessential nature.

Basically the pine program and other cherished forestry enterprises have not received sufficient critical scrutiny within forestry circles. Australian forestry literature can boast very few papers substantially critical of policies or giving a critical examination of cherished programs (perhaps Parkes [1] and Ferguson and Parkes [1] are exceptions; both however are quite mild critiques by most standards). Much effort however is put into defending and justifying prized programs. The structure of forest services is monolithic and authoritarian and there is strong pressure for conformity and against criticism (cf. Rattray [1]). These factors work strongly against proper critical assessment of forestry programs from within and encourage clinging to cherished programs such as the pine program regardless of their real benefit to the community.

These factors, together with the rapidly changing prediction base for forestry planning, mean that it is important to ensure frequent independent and critical scrutiny of the bases of forest programs such as the pine program. Hopefully this will eventually be provided by foresters themselves, but until this stage is reached it is important that public discussion and independent scrutiny continue.

The Forwood and Australian Forestry Council proposal to extend the Softwood Forestry Agreements Act for a ten year period instead of for the present five years would work against such scrutiny and review of the program. The Forwood procedures and subsequent events[2] have shown that the Australian Forestry Council cannot be relied upon to revise the program in the light of changing data showing a case for substantial reduction. No convincing reasons are furnished for a ten year period being necessary for planning. It is significant that the proposal was introduced after the defeat of the Softwood Forestry Agreements Act at its first reading in 1972, and growing opposition to the program on the part of conservation groups. The motivation for the proposal is that of avoiding adequate reassessment and public scrutiny; it is made in anticipation of growing public opposition to the program as it progresses and its destructive effects in many regions become clearer to many people who are now unaware of what is planned for these areas. Given another ten years to run the program will be virtually unstoppable.

The House of Representatives Inquiry. The Forwood planning basis was among other inputs considered at length by the House of Representatives Standing Committee on Environment and Conservation Softwood Inquiry. This thorough enquiry, Jenkins [1], which was set up to recommend on the continuation of the pine program and place conditions on new Softwood Forestry Agreements Acts, lasted nearly nine months and considered 74 witnesses in 12 public hearings. It amassed a large amount of important data in submissions and hearings, much of which is available nowhere else, and, in the words of its chairman,

> has enabled the whole range of people interested in a piece of future legislation to make their views known to the Parliament (Jenkins [2], p. 3026).

The findings of the committee are again most forcefully summed up in the statement of its chairman in presenting the Report.

> The planting program which was drawn up for the 1967 Act and which has been reviewed several times since, is aimed at Australia being self-sufficient in

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1 The NSW Forestry Commission did however reveal in its submission to the Softwood Inquiry [1] contingency plans which would mean a much bigger reduction in the size of the program.

2 Most conspicuously, the attempts to bypass the Jenkins Report and to obtain a further extension of the present Softwood Forestry Agreements Act until 1977 when, so it is no doubt anticipated, the Government will have changed and the Council will receive an even more sympathetic hearing.

timber, or at least being able to reach a net trade balance in timber, by the year 2010.

The Committee in its report questions this goal, as well as other considerations upon which the legislation is based. The Committee believes that the planting rate is excessive and that because of the environmental disadvantages associated with the program it ought to be reduced.

The main reasons for the Committee recommending a reduction in the planting rate are: (a) Future demand may not be as great as forecast due to a lower rate of population growth and lower consumption rates than those predicted; (b) Future supplies may not be as scarce as expected due to the availability of long-term supplies from New Zealand with whom we have a free trade agreement; (c) the planting program has continued with little heed for environmental values especially where the clearfelling of areas of native forest is involved; (d) the financial returns and balance of costs/benefits may not be sufficient for the continuation of the commitment of public funds over such a long period.

. . . Emerging from the Committee's examination of this legislation have been some serious environmental shortcomings which the Committee believes require most urgent attention. Primarily, these concern tragic dearth of knowledge of the effects of clear-felling large areas of Australia's native forests upon the flora and fauna they contain, and upon soil and water quality. The Committee is convinced that until much more is known about these factors, further clearing should not take place. The Committee was appalled to see the blatant disregard with which prime quality forests in some States are being bulldozed. In some cases not the slightest concession is made to environmental values, the only considerations being ease of planting and ease of harvesting.

Mr Deputy Speaker, this leads me to three major recommendations of this report which cannot be stressed too strongly. The first is that more funds ought to be made available for biological surveys and wildlife surveys for the whole Australian continent. The great tragedy of softwood planting is that of the native forest being destroyed, so little is known about its flora and fauna content or its relative value. The second is for greater research to be conducted into the side effects of softwood forestry upon all the environmental issues raised in the report. The third – this is a very important factor – is for more funds to be allocated for the purchase of marginal or derelict rural land which has been cleared for its timber and which would be suited to forestry. All three are vital matters and I urge that serious consideration be given to them.

Three recommendations of the Committee in particular, would, if followed up properly, virtually eliminate the program (as was argued above) namely

(1) That the new population projections of the Borrie Report should be used in planning the new program. These are considerably lower than those used in even the later Forwood planning (p. 14).

(2) That the per capita consumption estimates used in past planning are excessive and that reduced per capita estimates should be used in planning (p. 15).

(3) The aim of self-sufficiency should be abandoned and allowance should be made for imported material, which the Committee believed NZ was willing to supply and could supply under the NAFTA agreement more cheaply than Australia.

Other important recommendations too numerous to summarise would reduce the environmental costs[1] of what planting remained. There are detailed specifications of 'good forestry practice' to be followed, for inclusion in any new act, e.g. that slopes over 20° should not be cleared, that windrowing be parallel to the contours instead of across them as is the practice in NSW (see photographs 3, 7, 9), that only soils capable of growing timber on a sustained yield basis be used, and so on. The Committee was highly critical of

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1 An updated account of the environmental costs of the pine planting program may be found in Routley [5].

the NSW Forestry Commission:

> While the Forestry Commission of New South Wales accepts some responsibility for water catchment protection, it was evident from its submission and from evidence given, that flora and fauna values are given little consideration.
>
> During the flight over the State's mountainous area the Committee saw little evidence of forestry management techniques employed to protect the environment. . . . clearfelling and windrowing had been carried out with only two aims, the ease of planting and the ease of harvesting. Windrows were seen to lie in straight lines regardless of contours and dry watercourses and gullies were filled with debris. Only the more permanent streams were protected by any border of natural forest. Plantations were large and no concessions had been made to wildlife by providing natural corridors between adjacent natural areas along which it could move.
>
> The Forestry Commission emphasised its concern for thorough long term planning, but the Committee regrets that so little of this effort is being devoted to environmental matters. Surveys of flora and fauna are not carried out before clearfelling takes place and as far as the Committee has been able to determine the only research undertaken is that done at the University of New England where some projects are given financial assistance. Apart from foresters the Commission employs no-one with specialised qualifications in the environmental sciences.

The Committee also recommended that

> money should not be loaned to the States for the planting of softwoods in areas where native forest is to be clearfelled, except where a thorough and stringently supervised independent research program has been conducted into the flora and fauna of that area, as well as its soil quality, and where the planting plan allows for their protection.

Other provisions included an independent and thorough assessment of the program every three years ('to ensure that the area being planted does not exceed the needs of the nation') and an economic study taking account both of strict financial grounds and on 'the broadest possible cost/benefit grounds' (p. 36).

Unfortunately, despite the fact that the Committee's findings are, in the main, very unfavourable to this destructive pine program, it seems all too probable that the program will continue very much as before. The subsequent meeting of the Australian Forestry Council (of August 29th) adopted an approach which (in effect) attempts to bypass the Committee's findings. Official minutes of the meeting are unavailable. However the press release, AFC [1], indicates that neither the environmental, planning, nor decision-making aspects of the program are to be modified. For example, with respect to the Committee's numerous environmental recommendations, it is said

> Council noted that the recommendations for future forestry management procedure were almost identical in intent with practices currently adopted.

This is not true with respect to most of the recommendations as the Committee's report itself notes (e.g. it remarks that no surveys are carried out prior to clearing in New South Wales). In fact nearly all of the more specific forestry management directions on p. 52 of the Jenkins Committee's report are regularly violated in at least one state — New South Wales. However, the AFC claim clearly indicates that it is not intended to make any changes.

There is no indication of any intention to take account of the Committee's recommendations concerning reduction in size of the program, and of replanning to take account of lower consumption and population figures, and to allow for New Zealand imports. Taking account of these factors, as recommended in the Committee's report, would require major replanning and reduction in the Forwood planting targets. However according to the press release AFC [1]

> Council acknowledged that an indicative forestry development plan contained in the Report (of the Forwood Conference) provides a basis of planning until the end of the century.

Hence it seems that there is no intention to revise Forwood targets and that in this crucial respect also the Committee's report is to be bypassed.

Finally, it seems that the economic recommendations are to suffer a similar fate. The Committee recommended that the *broadest possible* study be carried out to determine the economic satisfactoriness of the program. The Forestry Council however has authorised only the narrowest sort of financial analysis, a quite inadequate basis for decision-making. The analysis is to be conducted by the Bureau of Agricultural Economics; but an organisation which, in the case of the woodchip study, found it too difficult to take account even of infrastructure costs, for which there is a standard procedure, is hardly likely to be able to take account of the broad factors the Committee has mentioned as necessary to take into account. It may also be doubted, in the light of the Bureau's woodchip analysis discussed below, whether the Bureau will carefully or critically scrutinize the data or studies provided by forest services, make proper allowance for environmental factors or multiple use factors, or take proper account of risks (very important in the case of pines) and opportunity costs on the investment of public capital. It is singularly unfortunate that the fate of millions of acres of mountain forest should be in the hands of an organisation whose attitude to the development of natural areas seems well summed up in the words (of old boy R. Patterson, quoted on p. 152, fn): if you've got a resource, develop it. The Industries Assistance Commission – which has so far shown much less of an ideological commitment to development and protection of the forest industries at least, and more to the assessment of public benefits, and whose finding that the forest industries receive considerable protection (see its recent Annual Report) already makes an instructive contrast with the Bureau's attempt to paint the industry as deprived of public assistance (see p. 341 below) – would have been a somewhat more suitable body to carry out the study, and perhaps to carry out a more sweeping study of the forestry industries and Forwood proposals.

It seems, then, that the prospect is for the continuation of the unnecessary and destructive pine program, which will continue to destroy mountain forests and have a serious impact on many regions, such as the Southern Tablelands.[1] The first part of the book, unfortunately then, remains relevant.

The Working Party Report on woodchipping. This Report, Cromer [4] is, as one might have anticipated from its main contributors, largely a justificatory exercise (thus, e.g., pp. 26-7) concerned with justifying the continuation of woodchip programs which are already approved. It would have been reasonable to expect, however, in view of the controversial nature of the woodchip industry, the polarisation of opinion, and the degree of public concern, that there would be considerable advantages in appointing as 'Independent Working Party' a set of clearly independent investigators, whose report might then stand some chance of general acceptance. But the then Ministers who appointed the 'Independent Working Party' (M. Cass and K. Wriedt), chose as Convenor a person (D.A.N. Cromer, then Director-General of the Forestry and Timber Bureau) who was already on record as very strongly committed to intensive forestry programs and woodchip operations in particular and whose belief in the justifiability of almost everything forest services chose to do could not unreasonably be described as passionate

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1 The NSW Forestry Commission's claims (in its submission to the Softwood Inquiry [1]) that only 120,000 acres of further mountain forest will be bulldozed is extremely difficult to credit. The area of native forest to go for the Tumut and Oberon projects alone will exceed that, even if the area of Tallaganda (120,000 acres on previous planting targets), Bombala, and northern tablelands projects is ignored.

(see Cromer [5] and [3]).[1] The Party comprised as well as Cromer, A.G. McArthur (then of the Forest Research Institute, a leading exponent of broad-acre control-burning of forests) two members of the Bureau of Agricultural Economics (one of them in part responsible for the development-oriented economics of Forwood, criticised below, p. 339 ff.), who played a very prominent part in production of the Report, and two members of the department of Environment and Conservation (both foresters, one of them previously involved in the environmental clearance of the Manjimup woodchip scheme, see p. 154). It is difficult to believe that the commitments of senior members of the working party did not influence the report. Thus the outcome certainly cannot be accepted as the independent or critical assessment of the impact of the industry or its public benefits it was represented as being. In particular, the Forestry and Timber Bureau which played a major role in obtaining approval for these projects could not easily turn-about and admit that some of these projects should be discontinued.

The Report is favourable because its assumptions are unrealistic. There are several reasons, apart from the composition of the Party, for doubting that the scenarios sketched are at all realistic. A first is the fact that these scenarios, designed primarily to convince us that all is well, were prepared after, in some cases years after, prices were set. In this event not only does the Report become essentially a post hoc justificatory exercise, but net profitability of operations turns out to be largely fortuitous. It might be said: How can this be? Surely forestry services would know their operating costs in advance? Nothing could be further from the facts. The Report reveals clearly that many infrastructure costs for woodchip projects are not known or else are not available even to the Commonwealth, and that the Tasmanian Forestry Commission, in particular, does not have any accurate assessments of what it has cost to operate the specific woodchip programs in which it is involved. It is known that the same point applies in the case of NSW and Western Australian projects. These projects were entered into without any very accurate idea of costs, and several important costs remain largely conjectural.

In fact the Working Party was prepared to reach economic conclusions apparently without undertaking a detailed financial assessment at all. Thus in the case of proposed woodchip projects in southern Queensland, northern New South Wales and eastern Victoria

> it would suggest that these three areas are considered to be commercially viable woodchip areas (p. 38).

This reflects the developmental fervour of the Party.

Other reasons for doubting that the scenarios are at all realistic will emerge in the course of an examination of the assumptions made in the commercial analysis of the projects examined (insofar as these assumptions can be extracted from the sketchy and aggregated data presented in the Report). For example, according to one scenario, sawlogs grow in 50 years or even less in Western Australia, but in fact this takes rather more than 80 years; according to the scenarios pulpwood forests only require commercial thinnings, but in fact regeneration where it is adequate is generally excessive and thinning will commonly be required; according to the scenarios woodchip operations are largely risk-free, but again the facts are different; and so on.

The Report itself occasionally realised that there were serious shortcomings in the scope of its study (e.g. p. 7), and that the study had failed to fulfil its economic objectives (p. 4 and p. 7).

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1 It has been contended by numerous forestry critics that the presentation of information of this sort about the commitments of public servants constitutes a disgraceful personal attack upon defenceless public servants (cf. Richardson [1]). It should hardly need stating (but apparently does), that the relevant political and evaluative commitments of senior public servants involved in deciding the future of public forests is a matter of public interest and importance and must be distinguished from irrelevant attacks upon personal character. To require that such relevant facts not be mentioned is a transparent attempt to protect the forestry area from the sort of comment generally accepted as fair in other areas.

The appraisal basis and criteria adopted — According to the Report the three criteria to be used in evaluating woodchip operations are these (see Part III and p. 47):

(a) Revenue derived from the relevant State forest service operations associated with each woodchip project should at least compensate for the costs of providing these services. [*Break-even test on forestry operations*]

(b) Returns to the public sector from the provision of infrastructure capital such as road, railway and port facilities should cover the costs of providing these facilities. [*Break-even test on infrastructure*]

(c) Environmental standards, once determined, should be maintained at least cost. [*Least-cost test for environmental maintenance*]

It is claimed (p. 47) that

> the results of applying these criteria to existing operations are presented and discussed.

But they are not; and the Report immediately begins to hedge its claims (p. 47). Firstly

> it was not possible to fully determine the returns to publicly provided infrastructure in all cases, nor to determine least cost methods of achieving natural environmental protection.

In fact in no case are the *full* costs of publicly provided infrastructure examined or estimated, or the break-even test on infrastructure properly applied. Nor is the least-cost test applied. It would require for its application an amalgamation of costs and benefits derived under headings (a) and (b), a matter that ought to have been undertaken in a proper assessment, but was not. Nor could the least cost test be applied. For requisite environmental standards on woodchip operations are nowhere adduced in the Report. There can be no minimization of costs in meeting these standards unless the standards (e.g. slope limitations on operations, better supervision requirements) are exactly specified. The Report abandons (c) entirely and considers instead the opportunity costs – as regards (a) and taking no account of other important factors – of two rather unsatisfactory variations in forestry operations.

Nor, despite claims, were the break-even tests applied to existing projects (p. 47):

> Insufficient data were available to estimate the profitability of forest service operations in Wesley Vale (Tas.), and, since publicly owned forests are not involved in the operations of Northern Woodchips Pty. Ltd., no analysis of this project was possible.

We are sceptical of these claims, and believe that an examination of the Wesley Vale operations, which involve APPM, was not undertaken because the outcome would have been unfavourable (even given the loaded methods that the Report has applied). One reason for this suspicion is that the royalties paid by APPM for its pulpwood have been consistently lower[1] than those paid by TPFH (for details see Routley [3]), and the Triabunna project, operated by TPFH, only scrapes home financially in the Report. Furthermore the fact that Northern Woodchips operates on private lands does not mean that an analysis of publicly supplied infrastructure and other public costs is impossible. And there is a further reason for public interest in the costing of Northern Woodchips operations, namely the 48% ownership of the company by the publicly-controlled Australian Industry Development Corporation (AIDC).

The inadequacy of the criteria assumed. It is simply not good enough that the public should merely break even on forestry operations and infrastructure costs incurred in operations on public forests. This just assumes a standard developmental orientation[2] –

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1 This corrects a conjecture made in the text, p. 141 below.

2 Optimising growth not of net value but of commercial values. Commercial development of this sort is subject to the same criticism as that made below (p. 262 ff) to the simple objectives of increasing GNP or, in the private case, profit.

that exploitation of public forests should proceed provided no public financial losses are incurred – which is no longer acceptable (see pp. 339-41). It is not just that there are opportunity costs on public finance which these minimal break-even criteria ignore: there is the whole question of multiple-value management of the public forests, a matter entirely ignored in the Report.

The approach adopted assumes in effect that environmental constraints are a secondary consideration. Essentially, commercial development should proceed, the underlying assumption being that such development as measured through the going system is a good thing and measures which ameliorate (uncertain and unestimable) environmental costs should be taken – insofar as they are admitted and can be afforded – at the least cost (see pp. 43-4):

> The [following] criteria are based on the proposition that if the sum of the monetary costs and benefits associated with government involvement in the industry is positive, it may be reasonable to suggest that scope exists for an improvement in the allowances made for environmental type objectives which may be potentially beneficial to society.

It is evident from the discussion of criteria that the basic presumption is in favour of an operation if it meets the break-even tests. The least-cost test for environmental amenity is only applied afterwards in more favourable cases (e.g. not Tasmania).

> The third criterion refers to the requirement that what adjustments in existing environmental protection measures are deemed necessary (i.e. are considered desirable), they should be achieved with as little disturbance to existing levels of monetary and non-monetary benefits as possible.

Environmental considerations are really a sort of luxury which should make minimum disturbance to operations already established on narrow commercial grounds which meet break-even criteria. Not even news that public money is being badly spent, because, e.g. there are serious opportunity costs, should close down on operation which meets the criteria (p. 45):

> . . . while this method of evaluation is suitable for examining existing or committed projects, a wider set of criteria would need to be applied in the assessment of new projects. In examining new projects, it would be preferable to show that a woodchip project will, from society's viewpoint, be an investment superior to all other feasible land-use alternatives in the same location.

But what applies to new projects also applies to the extension of committed projects into new forests especially when contracts are being considered for renewal or extension. This reveals that the method of evaluation proposed is not so suitable. And indeed the whole method of evaluation proposed is unsuitable for reasons we explain (especially in chapter 16 and also pp. 199-203). Multiple-value planning and assessment of projects requires that social and environmental factors be taken as an *integral* part of assessments, not as a luxury that perhaps gets some minimal consideration after the main costing and evaluation has been done.

> Hence the criteria adopted do not provide, as suggested in the Report (p. 44), a balanced approach to forests resource policy.

but noticeably furnish a quite loaded approach. It is bad enough that the Report adopts narrow developmental criteria which overrate commercial factors and underrate environmental ones; harder still to bear is the fiction that the value system assumed, with its developmentally-loaded criteria, is objective. The criteria are very far from providing, as claimed (p. 40),

> a set of guidelines . . . to take account of both sets of values simultaneously and objectively.

The idea that the loaded criteria proposed are objective is a thorough illusion. Guidelines which ignore factors which haven't been researched and which neglect uncertainty can hardly claim objectivity. Claims to impeccable objectivity are most often advanced by those who fail to see their fundamental (though usually conventional) value assumptions

and fail to see that there are alternatives to them.

Similar criticisms can be levelled at typical (and more naive) resource allocation models into the framework of which the guidelines proposed are supposed to fit (pp. 8-9). The models are not objective, being biassed in favour of narrow developmental objectives. For example, in the woodchip case

> the term 'resources' is taken to mean all the goods and services under the control of governments and which are associated with the development of the export woodchip industry (p. 41)[1].

Thus the resources assessed exclude important factors that a multiple value assessment would aim to take into account.

A proper resource allocation model would require optimisation of resource allocation. It would be quite unsatisfactory if it merely incorporated the extraordinarily weak break-even criteria that the Report concedes itself. And occasionally the Report seems to dimly recognise that the break-even criteria are inadequate and that net public benefits should be *substantially* greater than zero (cf. p. 16). Really net public benefits should be optimized subject to recognised constraints under resource allocation. Just once (p. 41) the Report virtually recognises this central point: that 'resources . . . should be invested . . . to achieve the best possible returns to society' (p. 41) — though this is quite inconsistent with the break-even criteria the Report applies.

The familiar reply, which the Report makes, to the criticism that environmental factors should have been considered as an integral part of assessment along proper multiple value lines, rather than shoved aside from the main assessment, is that

> many of the impacts attributed to the woodchip industry are difficult to quantify and, in many cases, reflect subjective valuations.(p. 41)

This theme is repeated throughout, e.g. one of the main conclusions (on p. 51) is that

> the available evidence concerned with environmental risk and uncertainty is largely subjective.

Unfortunately for the Report the same complaint applies with at least equal force to commercial matters, to commercial risk and uncertainty. For example, distant future pulpwood prices are far more uncertain than is the virtual elimination of forest-dependent animals after clearfelling operations. There are severe commercial risks in long-term pulpwood production, e.g. because prices may fall owing to the appearance of substitutes or a decline in demand for the products, or because the crop may fail for one environmental reason or another. The Report nas adopted an old, but unsuccessful, strategy to meet this objection, that of simply assuming that future prices, say, will be such and such; in fact it adopts a constant price and cost assumption (see pp. 47-8). But similar environmental assumptions, in lieu of uncertainty, could just as easily be adopted, e.g. that erosion will proceed at such and such a rate, and, if one likes, at such and such an annual cost (determined, e.g., in terms of an estimated value of land eventually rendered unproductive or incapable of carrying forest of a given type). It seems at least as certain that a good deal of environmental damage of specificable kinds and costs will occur under woodchipping operations as that output and prices paid for chipwood will remain constant or undergo escalation in the long-term. Future commercial data is frequently no harder than future environmental data.

Actually applying the criteria assumed. The criteria assumed are never really applied. There is no serious attempt to fully estimate net infrastructure costs or to combine the break-even tests on forestry operations with those on infrastructure. Very likely the combination was not attempted because the outcome would have been unfavourable. Most conspicuously in the case of the Manjimup project, the estimated net present value (discounted at 8%) of the project of $8.293 million (p. 48) is exceeded by the cost of port facilities, now estimated to be more than $8 million, and rail facilities. That is, the combined break-even test delivers a *negative* result. The Report avoided reaching this

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1 More comprehensive resource allocation models which do count as resources such matters as wildlife and scenery still sometimes fall down through presupposing total use doctrines.

conclusion because it was unable to estimate, even roughly the cost of port facilities at Bunbury for the woodchip industry (p. 48) and because it was unable to ascertain from the Railways Department the order of the rail subsidy (p. 49). In fact the Report goes out of its way to avoid evident conclusions as to the subsidization of the Tasmanian woodchip operations; for example,

> . . . it is clear that rail revenues from the woodchip companies will not cover the cost of construction of the rail link to Bell Bay. However since plans for the construction of this railway pre-date the woodchip operation by some decades, and the State Government intends that other regional industries will be established and use the railway, *it is not possible to say* at this stage *whether the railway will eventually represent a subsidy to the woodchip industry!* (p. 49; our italics and exclamation mark)

The feebleness of this explanation (borrowed from APPM who deploy it repeatedly) has already been amusingly exposed in the Jenkins Report [1], p. 675. The earlier plans for the Bell Bay line had been shelved, and the construction would not have proceeded without the woodchip industry, which now places practically all the freight on the line. Thus the operation of the line represents a substantial current subsidy to the woodchip industry.

It should have been by no means impossible for the Group – with the resources of Federal bureaucracy at its disposal – to have obtained bounds on the cost of the port facilities for the Manjimup scheme, or to find out the cost the West Australian government will contribute to freighting a ton of woodchips from Manjimup to Bunbury. (Does the Report really mean to claim that with their resources they could not determine actual rail freight costs for woodchips and subtract from these charges W.A. Chip and Pulp Co. is to pay?) The total costs of the new inner harbour at Bunbury are now expected to exceed **$20** million (cf. p. 82). Initially three berths were planned, one specialised for the woodchip industry, one for Alcoa, and one (for Alwest) designated for general purpose, but at present only the first two berths are being constructed. On the assumption that the woodchip berth is for an exclusive use, a minimum cost for the port facilities for the Manjimup project would be in the order of $7 million. Projected costs for the port facilities at Iluka, NSW (where dredging appears much more straightforward) lead to an estimate of a similar magnitude. It is now confirmed, however, by reliable sources, that Alcoa is to pay more than **$8** million for a practically identical berth to the woodchip one at Bunbury. Nor are the rail freight rates indeterminate. The 1973 rates for woodchips were to be $2.50 a tonne, but average freight rates on the line were considerably higher. It appears that estimates of subsidies of the order of $1.50 a tonne are very conservative. Thus a lower bound on rail facility subsidies is in the order of $1 million. The Manjimup project no longer looks so good, then, even under the weak assessment criteria of the Report, when *some* of the infrastructure costs are taken into assessment. And when some realism is injected into the forestry costing, the severe public costs of the project stand revealed.

The Party was not able (or, at least, willing) to assess infrastructure costs in Tasmania either (p. 48) where the costs of publicly supplied infrastructure are extraordinarily high. A recent striking, but by no means isolated, example is provided by the rural arterial road program, by which

> Funds were also provided for the improvement of roads subject to heavy log and woodchip traffic. Road works involved in this category included the reconstruction of a section of the Frankford Main Road at a cost of $199,000 and two sections of the Tasman Highway at a cost of $300,000 (Jones [2]).

But what about Eden?

> There, at any rate, there is no subsidy to the company . . . (p. 49).

Scott and Co., in their more thorough investigation of public expenditure related to the Harris-Daishowa project, present a very different picture. Consider, first, roads in the Eden region:-

> The repair of roads in the area is a big cost item to the local Shire Council. Although the main Princes Highway is the responsibility of the D.M.R., there

> are many miles of road where repair and maintenance is the responsibility of the shire. The Harris-Daishowa operation has involved the movement of much heavy transport through the area . . . . This heavy transport equipment does a considerable amount of damage to the road surfaces (Scott [1], p. 54).

With highway use assessed in terms of axle loading, it appears that the forest industries provide the main use of the expensive, new, publicly-financed Princes Highway south of Eden. The highway is also an essential facility for all pulpwood freighted from Victoria to Eden. These are the first of a set of subsidies – which can be expected to run into many millions of dollars over the life of project – for roads used primarily or extensively by the forest industries.

In the hearings of the Federal Grants Commission Councillor Stuart of the Mumbulla Shire Council complained that

> the Shire did not receive rates from the Forestry Commission, yet it was expected to provide roads for the haulage of logs. The Commission did not contribute towards the cost of maintaining these roads.(*Bega District News,* April 15, 1975, p. 14).

The Imlay Shire Council's engineer, J.C. Sutherland attested that

> the impact of heavy traffic, particularly the chip mill billet trucks, were concentrated on areas near State forests and nearby lands and seriously affected roads which were adjacent and abutting non-rateable land.
>
> The need to provide a pavement for heavy laden trucks was a demand on the council's resources beyond its expectations or ability to meet. (*Bega District News,* April 15, 1975, p. 12).

In a similar vein the Imlay Shire Ratepayers Association complained

> that the NSW Forestry Commission did not contribute to the cost of maintenance to shire roads.
>
> An example was Mt Darragh Road which forestry activity continually destroyed yet Imlay Shire Council was forced to maintain it in a trafficable condition (*Imlay Magnet,* May 8, 1975, p. 4).

It has now been announced (*Bega District News, Imlay Magnet,* September 4 and 5, 1975) that

> Imlay Shire Council is likely to receive a grant of $112,000 for construction work on the Mt Darragh trunk road,

a road linking the coastal area with Tantawanglo State Forest at the edge of the tablelands. It has also been announced that Imlay Shire Council is to receive an untagged grant of $150,000 from the Federal Grants Commission. Some of this will presumably be spent on repairing roads damaged by heavy traffic (with much of the remainder contributing to meeting other growth costs induced by growth of the forest industries, as we shall see shortly). It can be expected too that adjacent shires, such as Mumbulla, will be spending substantial parts of their grants on repairing road damage induced by forest transports.

Public expenditure on behalf of the woodchip industry by no means ends, as Cromer [4] implicitly assumes, with expenditure on rail, road and port facilities. The range and order of these costs has been highlighted by proposed Papua New Guinea projects where it is properly assumed that all infrastructure and induced service costs should be borne by the developer. The public expenditure includes that for water supply (see p. 138 below), electricity supply (consider, e.g., recent electricity works costing $800,000 'primarily to supply the expanding chipping operation carried out by Harris-Daishowa') research, technical training, fire control (with costs channelled through Bushfire Associations).[1] These are the more direct costs. Just as important but still harder to assess accurately – though not rendered thereby neglectable or negligible – are growth and change costs, for example those affecting publicly supplied services in local centres. Scott [1] considers briefly some of the induced public costs at Eden, namely those of sewerage, garbage dis-

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1 Some of these costs in the case of Tasmanian projects are documented in Routley [3].

posal, caravan parks (which accommodate many forestry workers) and public administration.

The Scott Report, though eager to claim the benefits it finds in Eden's growth for Harris-Daishowa (e.g. p. 34) –

> Growth . . . in the town of Eden has been particularly dramatic since 1971. Much of this development in both demographic and financial terms, can be attributed to the advent of the Harris-Daishowa operation—

is reluctant to accredit any specific costs for this growth to Harris-Daishowa. It cannot have it both ways; and it is evident that any proper assessment would attribute some of the increased public costs to the regional forestry industries. Nor are the costs listed complete. There are educational costs. There are costs from the uneconomic Edrom prison, the initial costs and public maintenance of which (by a different State Department) has served the Forestry Commission through its provision of a cheap work force. Hence the Commission's concern at the news that Edrom is to be closed down:

> The Forestry Commission is known to the very concerned at the prison's proposed closure as the prisoners are planting out seedlings in log dump areas in the forest. Some 80,000 seedlings have been raised and are ready for planting out and if the prisoners are not available for the work at this stage no provision has been made for an alternative work force (*Imlay Magnet,* July 17, 1975, p.1).

At least, for a fair costing of the Eden project, the difference between the market value of work undertaken by prisoners and the actual costs incurred by the Forestry Commission in employing prisoners should be debited against the Commission's returns.

The aim of the exercise should be to determine total costs and benefits to the public for the exercise, including total financial costs and benefits. It is certainly not to determine whether a forest service can show a profit on its books if sufficiently many costs are neglected in the accounting or passed on to other statutory authorities (e.g. housing, public works, correction authorities) or the public (via subsidies for infrastructure). The latter question can almost certainly be answered in the affirmative by suitable hidden accounting, but the fact shows virtually nothing about the desirability of the project, or whether there is an adequate return on public funds.

The real public profitability of Australian woodchip ventures. It is noteworthy that none of the financial assessment or cost-benefit analyses relied upon were carried out at the time when programs were planned and royalties set, so that it would appear to be a remarkable coincidence indeed if the ventures were to turn out to be satisfactory public investments (especially in the light of forest services' well-established track record as loss-making institutions). Faced with the need to justify programs already under way,[1] the forest services were indeed able to produce economic scenarios which showed that they would break even, and in some cases better. These the Bureau of Agricultural Economics (BAE) has accepted, and lent its credibility to: it does not appear to have asked itself whether the scenarios bear any relation to any probable reality. As we shall argue they do not. For they make obviously optimistic and sometimes quite unwarranted assumptions about yields, ignore costs, entirely discount risks, etc.

To estimate real profitability it will not do to rely on imaginary or merely optimistic growth rates, it will not do to neglect likely costs or risks, it will not do to exaggerate prices. It will not do, in short, to make unreal assumptions, to move into an ideal forestry world far removed from the actual situation of failures, losses, costs and risks. Nothing is easier than to design scenarios which bring out combined woodchip-sawlog ventures as having a net present value considerably greater than zero. This can be achieved in several ways, e.g. by inflating yields, by neglecting costs. Thus it is important that the economic models used adopt realistic assumptions. The simple NPV (net present value) models of Cromer [4] adopt, however, some most unrealistic assumptions. For instance, as remarked, the Manjimup scenario the Report sketches is of a fairy-tale world where forests are perfectly stocked after

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1 In Tasmania an economist was specifically appointed several years after the projects were started to show that they were indeed economic.

rough-as-guts regeneration methods and where eucalypts grow to valuable sawlogs in only 50 years.

What appears to have happened is this:- State forest services have designed such scenarios and released them to the Working Group, and sadly the Working Group has uncritically accepted these scenarios, without adequately cross-checking their empirical bases. What is even worse is that the Working Group has tampered with scenarios so as to make them appear in a still more favourable light. Take the Manjimup case (p. 69, ff.) where the mechanism is a little more exposed than in the other cases (Eden and Triabunna) examined.

The Working Party at Manjimup.

> The data used in the analysis of the Manjimup project were obtained from the Forests Department of Western Australia. Much of the data was given in the Environmental Impact Statement,

(i.e. WA [1], criticised in detail in chapter 14). The already suspect estimates in WA [1] are further doctored in Cromer [4]. Consider the matter of capital requirements for the project. According to WA [1] the capital costs, which are incurred only over the first three years of the project, amount to $605,000; but the Working Group manages to reduce these to a mere $93,000. This is achieved by the simple expedient of deleting all costs for vehicles ($32,000) and housing ($480,000) given in WA [1]. The Report tries to justify its deletion of $480,000 in capital works for housing by claiming that

> the costs will be largely recouped through rentals and the capital may be supplied by other bodies at least to some extent, e.g. State Housing Commission (p.71).

But it is *no less* a public cost of the project when funds are channelled through some other government agency. Nor are the costs likely to be recouped, since housing is provided on a substantially subsidized basis to forestry employees; and, in any case explicit accounting would show these rentals in the annual accounts and appropriately discount them.

In fact the Report expects us to believe that the total capital costs of the Manjimup project, apart from office and workshop extensions costing $80,000, amount to $13,000! Further

> it is assumed ... that no additional capital costs will be incurred after 1976 (p.71).

It is hardly surprising that the Report managed to turn in a paper profit for the Manjimup project, with such blatant underestimations of capital costs. Nor should the original estimates of WA [1] have been relied on: a forest service, which shows an annual loss of more than $2 million, but which can obtain 10 utility vehicles at $2000 and four trucks at $3000 each, which, maintained by one mechanic, last 100 years, is obviously in the wrong business. The reality is rather different, as can be surmised from the fact that the WA Forests Department in 1973-4 spent $270,460 on plant and vehicles and employed a workshop staff of 65 to maintain its equipment (WA [2]).

The same dodge, which we will shortly expose, is employed in the annual or running costs assumed for the Manjimup project in Cromer [4]. The Report assumes, with little further explanation, annual costs after 1976 of $740,700, whereas WA [1] allows running costs of $546,150. (The discrepancy can be accounted for, more or less, through further much needed allowances for research and hydrological research). Yet, as the table below indicates, the Forests Department's expenditure now exceeds $8 million and its running costs are in the order of $8 million:

RECENT LOSSES OF THE W.A. FORESTS DEPARTMENT

Year	1971-2	1972-3	1973-4
Revenue	5.033	5.050	6.001
Expenditure	6.474	7.114	8.406

(Figures are in millions of dollars.)

but the forests of the Manjimup project comprise about one-quarter of its empire. Thus running costs in the order of $2 million – before new research is counted in – would be expected. This can probably be confirmed by examination of the distribution of regional expenditure: thus in 1973 almost exactly one quarter of regional expenditure ($1.7 million of $6.8 million) was spent at Divisional Offices

in the area of the Manjimup scheme. Annual running costs of the Manjimup project can thus be expected to exceed $2 million. The upshot is (when table B.IV, p.72 is reworked) that the Manjimup Project has an NPV of large *negative* dimensions.

The Bureau of Agricultural Economics has made the colossal blunder, in its estimates of annual costs for the project, of considering as total costs, what are only *extra* costs. A careful reading of WA [1] makes this evident:

> A completely accurate appraisal of *extra costs* ... requires at least a year's detailed planning ... . A realistic appraisal of *these costs* ... is as follows:
>
> Total annual running costs – $546,150
>
> Capital costs – $605,000. (p.8, our italics).

The BAE estimates returns from all forestry operations, both sawlogs and pulpwood, in the region, but debits only extra costs for the production of pulpwood – a completely unsatisfactory procedure. (Nor would matters much be improved financially, as we explain later, by separating sawlog and pulpwood returns and expenditures.)

The costs, then, of the Manjimup project have been very seriously understated in the analysis of Cromer [4]. The returns have also been overestimated. Most striking is the assumption that the project will yield sawlogs of millable standard after only 50 years, despite only one commercial thinning at year 27 (see p.70). For it is assumed that

> the total standing forest available for harvesting will be completely harvested within approximately 42 years,

and also that jarrah and karri sawlogs will come on stream in quantity again after only 50 years. This is inconsistent not just with WA [1] which envisages a rotation for karri of 100 years (Attachment 7, p.25) but with the Report itself. For according to Heyligers ([1], p.22)

> for the jarrah forests a rotation of 120 years is envisaged for sawlog production. In wet sclerophyll forest a rotation of 80 to 100 years is planned for production of sawlogs with pulpwood as a "by-product".

Absolutely perfect stocking – of a type to be anticipated from plantation technique rather than the drastic methods proposed at Manjimup – and growth without a hitch thereafter on favourable sites, would be required to produce sawlogs in 50 years. Without thinnings this could not be achieved.

> Early thinning [of] ... the jarrah-marri forest ... is essential because these eucalypt species do not readily establish dominance unless released from competing neighbours. (Heyligers [1], p.22)

Likewise

> existing evidence shows that in even-age Karri regrowth selected crop trees benefit from thinning (WA [1], Attachment 7, p.31).

But the costs of such thinnings and stand improvement have not been budgeted for in Cromer [4]. Nor, more importantly, have net present values been estimated using the more realistic assumption that sawlogs take 80 years or more to grow: the reason why not is by now obvious.

The Working Party in Tasmania. The West Australian woodchip project appears in a bad light because the Forests Department has, quite properly, revealed its estimates of capital and operating costs – something the Tasmanian Commission has avoided since the disclosures of Gilbert and Cunningham (see p.120 below), and something the NSW Forestry Commission has been careful never to do.

In the case of the 'East Coast Tasmania' Project at Triabunna quite inadequate details are presented in the supposedly detailed assessment of Cromer [4]. Worst of all, the Tasmanian Forestry Commission could not provide, and the BAE *was not able to determine,* the Commission's expenditure on the East Coast project (p.75). That is, the present costs and future likely costs[1] of the project are not really known! On the

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1 Nor could accurate information on the marketing supervision costs be obtained (p.74).

basis of very conservative and out-of-date estimates of expenditure (the figures are based on expenses from 1970 onwards, as table B.V will reveal), the Report was only able to arrive at the weak conclusion:

> The results *suggest that* ... the Tasmanian Forestry Commission *should not make a loss out of the East Coast* project (p.75; our italics).

This is hardly reassuring support for the commercial viability of the project. But it is more reassuring than it should be. For the Commission's expenditure on regeneration, research and management is seriously lagging, and it is likely that more than the estimated 20% of the 'Commission's total expenditure (excluding expenditure on field works and supervision[1])' is attributable to the East Coast project. For the project includes rather more than 25% of the Crown forest for which the Commission is responsible, it includes a higher still proportion of the forest for the regeneration of which the Commission is responsible, and it is the Tasmanian exhibit project on which most expenditure has been lavished. However increasing the allocation of overheads to 25% reduces net returns (as given in table B.VI, p.75) by more than $1 million, e.g. the returns at 10% discount amount to less than half a million dollars – scarcely enough for insurance for risk over 100 years, let alone to compensate for the extensive environmental damage done.

And that is to assume that new necessary expenditure, e.g. for thinnings, for research and for environmental improvements, are allowed for: these assumptions do not hold up under examination. It is known that the Tasmanian Commission cannot afford adequate environmental protection practices and supervision on its East Coast project, and certainly it makes little allowance for either.

A net present value of a million dollars or less, on optimistic assumptions as to regrowth and cost-price relativities, for a project of 100 years duration allows very little margin for error, and practically none for the recommended research (p.4). And that margin is once again eliminated by a more realistic assessment of costs. In particular, certain costs have been ignored, and while returns have been increased to *current* levels, costs have not. Thus, for instance, while royalties used in the study are set at late 1974 levels, which represent a substantial increase on earlier levels, regeneration costs are based on averages obtained by using much older figures going back to 1970 (compare e.g. table B.V of Cromer [4], p.74, with table 13 below). That is, the study, despite its fixed prices and costs assumption has made quite insufficient allowance for inflation in determining its base costs. How many unprofitable firms could be made to appear profitable by using in effect 1974 prices and 1972 costs?

With the Tasmanian projects, as elsewhere, claims as to the future profitability of operations are by no means presaged by present, continued and continuing forest service losses. In the Report it is supposed that

> prices and costs used in the analyses have been based on 1974 levels (p.66);

yet on these figures, without some new and unexplained changes, 1974 Tasmanian losses would be expected to continue. Indeed there are grounds for supposing the Commission's financial position will deteriorate rather than improve. For there are significant regeneration and post-regeneration costs, not included in the BAE study, which will have to be met. Most importantly, costs of producing sawlogs have been neglected. These include, firstly, the costs of thinning densely regenerated stands, and secondly initial regeneration costs for sawlogs.

It is well known that the Tasmanian Forestry Commission has a very considerable backlog of cut-over forest which it lacks the funds to regenerate.[2] Extensive areas of such high-quality unregenerated forest lie within pulpwood concession areas. Eventually the regenerated forest will supply sawlogs and pulpwood for the projects, and accordingly the costs of regeneration and management should be included among the costs of the projects

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1 Why these are excluded is not explained.

2 For instance, in Tas [7] the Commission appeals for Commonwealth assistance to allow its regeneration program to be expanded by 4000 acres a year.

so long as the logs grown are counted among the benefits of the project.

Another critical assumption on which positive NPVs of Cromer [3] depend, particularly in Tasmania, is that woodchip profits be combined with sawlog operations. Without this amalgamation woodchip projects are a serious public liability (for reasons given in the text, chapter 10 and following, and also in Routley [3]). There are, however, environmentally important reasons for obtaining separate assessments of sawlogs and pulpwood operations. Since environmental criticisms of woodchip projects seldom extend to careful selective sawlog operations, why not then make separate assessments? The only defence the Report seems able to manage is the rather pathetic:

> it would not be realistic to attempt to separate the costs of one type of output from those of the other (p.67).

On the Tasmanian Forestry Commission's showing it is not realistic to separate costs of one project from those of another! But the BAE has made a crude attempt to separate these costs. It is likewise perfectly realistic to separate sawlog and pulpwood projects, and with an adequate data base respective costs could be estimated. There is no doubt that unprofitable and environmentally damaging enterprises such as Tasmanian woodchip projects can be propped up by being combined with other profitable enterprises (with which they may share some infrastructure). It appears that sawlog extraction in Tasmania is not at present able to offer this financial support, but under the more ideal conditions foresters regularly envisage it could. Then the question of whether a separate assessment of sawlog and pulpwood operations can or should be made would become important. There is a strong case for a separate evaluations of sawlog and pulpwood projects. (This is set out below on p.278, and, in improved form, in Routley [3].) For not only can the environmental inputs of the schemes be strikingly different, the forestry routines, schedulings, and economics are significantly different. For example, eucalypt sawlogs cannot be produced in 40-year pulpwood cycles, and the continuing provision of sawlogs is going to require operations outside and separate from the pulpwood operations. In Tasmania, as Felton and Cunningham [1] say, meeting the supply of sawlogs

> may be difficult in the second rotation, for its length of 40 years, though suitable for pulpwood production, is too short for sawlogs. Thus *special arrangements will be made to maintain sawlog supplies* (our italics).

Since sawlogs are not going to be regenerated in pulpwood coupes, they can obviously – and quite correctly – be separately assessed. When they are separately assessed it becomes evident that while sawlog operations in eucalypt forests are commonly commercially viable, woodchip projects are not, and that sawlog operations are commercially carrying and subsidizing woodchip operations.

In the case of the other two Tasmanian projects the Working Group could not, it appears, obtain the sort of data they sought. Yet

> from the economic analyses conducted ... they could find no firm basis on which to conclude that the woodchip industry should be discontinued (p.16).

Thereby is the incredible underlying law of inertia exposed: operating projects should continue unless there is a firm basis for change. That is solid conservatism: what is is right unless there is a firm basis for adjustment. It follows, on the Working Group's logic, that there is not such a basis in the case of APPM's Wesley Vale project, even though

> the past time-span of operations in the concession area complicates the situation to such an extent that an analysis of present and planned activities ... would not provide a meaningful result (p.76).

Part of the problem – deliberately unrevealed – is again that the Tasmanian Commission is far behind on its regeneration procedures for cut-over areas and has repeatedly appealed to the Federal government for extensive grants to meet its reforestation commitments. Taking such grants into account would have a quite adverse bearing on the project. The result of an analysis would not have been meaningless, but unfavourable, and so would have upset the overall assessment of the Working Party.

The Working Party at Eden. Such was the independence of the Working Group that in the case of the Eden project they simply reproduced – after some adjustments to eliminate more blatant defects – the economic analysis of one of the main proponents of the Eden project, the NSW Forestry Commission. Thus the Working Party's analysis of the Eden project is completely unoriginal. It is simply a repeat of Technical Paper #22, NSW [12], with practically no new work and with few appropriate cross-checks. In this respect the Scott Report is even worse; it did not even correct some of the more conspicuous gaffes in NSW [12],[1] but simply reiterates in exaggerated form the overstated claims of NSW [12] (these claims are criticised in Appendix 4). So despite appearances of new reports, there is no new commercial analysis of the Eden project. All government-industry assessments of the project go back to that of the NSW Forestry Commission – an organisation which is hardly placed to provide a suitably independent study of the project. And the Commission would scarcely release an unfavourable report on one of its pet projects. Certainly the Working Party, with its slightly adjusted copy of NSW [12], does not provide the independent assessment of the Eden project that the Party was set up to provide.

The Working Party's analysis is not only derivative, it is also sloppy. It copies NSW [12], which gives all its estimates in 1972 figures: yet it asserts that

> prices and costs used in the analyses have been based on 1974 levels (p.66).

The Working Group amends the Forestry Commission analysis only in disallowing credits from subsequent pine planting in the Bombala sub-projects, and in correcting the discount rates of NSW [12] (apparently – though how exactly is not explained – along the lines indicated below, p.282). Unfortunately there are at least as many difficulties in the way of assessing the satisfactoriness of the Report's evaluation of the Eden sawlog-woodchip operation as there are of assessing the original Technical Paper #22. The requisite data is not there, in either case. Analyses of this sort, which are not released (even on request in the case of Technical Paper #22) are suspect, cannot be relied upon, and should not be generally accepted. It is all too easy to omit or underestimate crucial costs – as we suspect, and can in some cases confirm, NSW [12] has done – to use outdated costs but recent prices, to channel costs through other organisations, and so on. We agree entirely with the Scott Report's recommendations ([1], p.62, our italics) that

> the Forestry Commission should be encouraged to produce up-to-date statistics regarding the Eden Hardwood Project. Again a strong case exists for further studies to be made of the Project, and *all results made available to the general public*

and that

> separate accounting systems ... annual cash flow statements, and capital account valuations, should be made freely available for each separate project.

We doubt, however, that such accounting systems would

> do much to allay criticisms directed at the Forestry Commission by conservation groups that certain individual projects are not economically viable (p.62);

on the contrary, the information would probably fuel criticism. Similar points hold for the new commercial accounting procedures adopted in NSW:

> This financial year, for the first time, the Forestry Commission of NSW has adopted commercial accounting to find out whether its forests are "losing money or making money" (Norman [1]).

The sceptical will reserve judgment as to adequacy of accounting to come. But as to the unreliability of past accounting and predictions, including that in NSW [12] which was

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1 See Appendix 4. Also the Scott Report ([1], p.68) manages to get the already mistaken formula for NDR of NSW [12] into hopeless shape. And that no doubt reflects the carefulness with which NSW [12] was assessed. The Scott Report does however indicate that the requisite data for a new study was not obtainable from the Forestry Commission.

supplied to the Working Group, there seems little room for doubt, even though the details of the analyses have not been publicly released, as they should have been, for independent assessment.

The Eden project is atypical in that a considerable portion of the region (sub-projects 3-6) is to be clearcut on a once-only basis (see p.120 ff below), and — in a separate project[1] — to be regenerated with pines. The studies are premissed on the — once again optimistic — assumption that a part of the first rotation region will deliver the full second rotation. This is doubtful. The analyses are also premissed on the assumption that the native forests remaining for the second rotation will be turned over entirely to pulpwood production. Even Scott & Co. finds that

> on available evidence however, the current policy appears to only provide for a pulpwood rotation crop (Scott [1], p.6).

Careful examination of NSW [12] makes it plain that the second rotation will consist entirely of pulpwood. So much for the promised 'better forests for the future' (NSW [1]): the character of the forests will be drastically changed, and the new forests will be better at most for pulpwood.[2] Thus the picture so commonly painted by foresters of superior forests they are producing — with everything now there only more so — are completely misleading. The forests will contain no mature trees, no sawlog trees even. One part of the Eden project will disappear, where it succeeds, under dense-growing pulpwood stands, the remainder under pines.

Nor is it so transparent that the new forests will be better for pulpwood production. A non-negligible proportion of the formerly forested area has been lost to forest, having given way to roads, snig tracks and log dumps; other parts have failed to regenerate adequately or have regenerated with non-commercial species such as casuarina; and finally much of the cut-over forest has regenerated so densely that the stands will stagnate without proper silvicultural treatment. Dense stagnant stands are common in formerly cut-over forests in the Eden region. A better pulpwood forest for the future will probably not result without expensive silvicultural operations, such as non-commercial thinnings to "release stagnant stands". Nor has it been shown, but is simply assumed, that the silviculturally-treated new pulpwood forests will deliver appropriately higher pulpwood yields.

Regeneration and regrowth rates at Eden. Though the commercial success of second and subsequent rotations at Eden depends heavily on forest yields, there is no discussion of second rotation yields in Cromer [4] or, for that matter, in its source, NSW [12]. This is especially strange since assumed higher yields per acre are said to be the reason for the higher royalties expected for regrowth pulpwood (NSW [12], p.18).

But though the NSW Forestry Commission is obviously banking on substantially higher yields in the second rotation, there is no evidence available which sets the likelihood of adequate future yields beyond doubt. In fact, though the Eden project has been operating several years and regrowth rates are a sensitive economic issue, there is no published data on the matter, and experiments are only said to be beginning. It is tempting to conjecture (what there is by now a good inductive basis for) that the data once again is not available because it is not so favourable. In any case, the standard forestry claim that 'foresters are producing better forests for the future', by which they mean 'better pulpwood production units', at least in the case of Eden, lacks a proper empirical basis, and is, strictly, speculative.

What evidence is available points rather to unsatisfactory and patchy regeneration and

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1 It is noteworthy that this forestry operation, with a shared infrastructure, can be separated, though sawlogging cannot realistically be separated, so it is said.

2 Accordingly for a proper assessment of the Eden woodchip project, sawlogs should be omitted entirely, not merely because sawlog extraction is a separable and far less environmentally damaging activity, but because the project is ultimately a purely pulpwood production operation.

slow regrowth.[1] Regeneration of eucalypt is not usually normally distributed, tending to be either excessive or too sparse: such a principle certainly seems to apply at Eden. Thus, on the one hand, there are areas of failed regeneration, dominated, when burnt, by casuarina or wattle species. On the other hand there are areas with excessive regeneration of eucalypts with more than 5000 stems an acre. These are the areas that will have to be non-commercially thinned if regrowth is not to stagnate at early pole stage. There is already enough evidence, both from fire damaged areas and previously logged areas, that densely regenerated areas stagnate – of areas logged or burnt 25 years or more ago which now consist of a tangle of slender poles.[2]

Nor will matters be entirely rectified by thinning in areas of excessive regeneration. Plainly areas of poor regeneration will not be assisted by thinning; and there is no allowance in Cromer [4] and NSW [12] for silvicultural treatment of inadequately regenerated areas. Moreover growth rates in the Eden district appear to be poor, and are probably at best in the order of 2–3 feet annually. It was not for nothing that F. Moulds, Victorian Commissioner, said that growth rates at Eden were 25% less than those that would be acceptable to the Victorian Forests Commission.

Whether the poorness of the regrowth is due to soil factors such as soil nutrient deficiencies or to the widespread occurrence of soil pathogens such as phytophthora which inhibit growth is apparently not so far known, though the matter is in principle empirically decidable. If root rot – which is widespread in the Eden district, though the matter doesn't merit serious mention in Cromer [4] – is the cause of slowness then serious losses may be expected in the event of a long dry summer, and the fragile economics will be upset. If soil deficiencies are the cause, then intensive forestry practices will aggravate the problem, and successive rotations will see accelerating declines in site productivity – *not* the anticipated increases – and rectification of the problem, if it can be achieved, will require heavy fertilization, which has not been budgeted for, so again the economics will be upset. Probably both factors are at work.

There will be difficulty in obtaining assumed higher yields, and more likely serious declines in later rotations and serious sustainability problems. As a result there will be pressure to switch – as already planned in Gippsland – to blue gum or other eucalypt monocultures. The Eden region is probably marginal from the point of view of the forestry operations being carried on (cf. Scott [1], p.80); so forestry ambitions will only be realised given a progressive change to monocultural style tree-farms sown with favoured root-rot resistant species.

New Eden royalties, underestimated costs, and the accumulated forestry deficit. The Working Party Report on the Eden economics was out-of-date before it appeared,[3] owing to a restructuring of royalties, which considerably alters the public accounting picture – though not, it is suspected, for the better:

> NSW's latest move on royalties suggests that the 1930's depression mentality lingers on – i.e. that royalties should not be pitched at a level to inhibit jobs. ...

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1 These deficiencies must be well-known to forestry administrators and publicists, but they receive no proper public airing. The only relevant published research work appears to be that of APM foresters on the rather similar forests of East Gippsland, and that work is old (dating back to the 1950's) and generally preliminary.

2 Similarly in East Gippsland:

> Early slashings and costly thinnings may have to be undertaken (in restocked forests) as white stringybark regenerates profusely and tends to stagnate (Alexander [1], p.78; also p.84).

3 According to Norman [1], NSW [12] was out-of-date when it appeared 'because of high interest rates and inflation'.

> The latest mistake of the Forestry Commission of NSW dates from January 1, this year. With the opportunity to recast royalties from that date, it still opted for a rate per tonne instead of a rate per dollar of turnover, as if the traditional "stumpage" was still the thing and inflation never heard of.

For the new royalties

> will stand for five years. Then there is provision for further five-yearly revisions. Not many lessors of real estate, for example, would fancy that these days (Norman [1]).

The old system of royalties, which expired at the end of 1974, is explained in Appendix 4.

> Under the new system, the top rate is $3.38 a tonne within 50 km by road from the chip mill. Outside that the rate is reduced by 3¢ a tonne per kilometer until it reaches a minimum of 60¢ a tonne (Norman [1]).

Thus while maximum royalties are increased by 50% on 1970 prices, minumum royalties are diminished by about 270% on the old 1970 royalties. Overall, then, royalties will rise by less than 50%; but in the same period, 1970–75, the average adult male wage went up by approximately 90%. Since many of the Forestry Commission's costs depend on labour, it is evident that costs have increased more rapidly than prices. The long-term effect of these price and cost changes is evident: relative profitability will decline.

The Forestry Commission has a net accumulated deficit of approximately half a million dollars on its Eden hardwood project (Scott [1], p.48). Only in one year of operation (1973–4) has revenue exceeded expenditure and then by an amount much smaller than the margin of error in the estimates (since a flat 100% figure on direct costs is used to determine administrative overheads). The information – only recently released – that the Forestry Commission has been operating at a loss on its Eden project, even when sawlogs are thrown in, confirms a conservationist thesis (see p.126) to this effect, and refutes repeated forestry claims as to the profitability of the Eden project, including statements by the NSW Commissioner such as:

> Mr. Henry said that the woodchip industry contributed very significantly to the Forestry Commission's revenue. The operation would make up about 8 per cent of the Commission's total income this financial year, while the expenditure would be less than 3 per cent of the Commission's outgoings. (*Sydney Morning Herald,* January 3, 1973, p.3).

The statement was deliberately deceptive as a reply to criticisms of paltry profitability.

Despite the disclaimers of Scott and Co. ([1], p.47), a sizeable accumulated deficit after seven years of operation does cast doubts on the economic viability of the project, and on the optimistic forecasts of the Working Party. Scott [1] makes the conventional reply that a deficit is to be expected in the initial span of a project. But not only is the initial period becoming protracted, the new royalty system will render improvement unlikely and various postponed silvicultural costs and new supervision and research costs will have to be met. Both Harris–Daishowa and the Forestry Commission have been trying to be on their best behaviour, with a view to obtaining further concessions, export license renewals and extensions, and new pulpwood schemes. The Forestry Commission's best behaviour has included a determined effort to make it appear that its Eden project is not a net public financial liability; for, if it were, Eden would hardly provide much of a model for other proposed projects. The matter is one of major importance for proposed projects on the North Coast of NSW and in southern Queensland, where the vexed question of royalties has mostly been avoided.

Scott & Co. ([1], p.48) attribute the continuing increase in the deficit (it increased each year until 1973–4) primarily to rising costs as against a constant level of royalties and to 'high current capital expenditure, e.g. Imlay Road'. Though the case of Imlay Road indicates the effect of rising costs matched against a fixed income well enough, the facts of the matter are that the contract for the first stage of the road was only let in early 1974 and construction did not begin until after the 1973–4 year.[1] Thus the very heavy costs for the construction of the

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1 See *Imlay Magnet*, March 21, 1974, p.11, on the letting of the contract and cost of the first stage, and October 10, 1974, p.7, on the commencement of work.

Mt. Imlay Road, which are to be spread over three years (according to NSW [12], p.12), insofar as they are to be met by the Forestry Commission, will not appear in the Commission's accounts until future years. The accumulated deficit can therefore be expected to increase substantially again over the next three years or so as the Commission's costs, of more than $2 million, for the Imlay Road are met, and as postponed silvicultural costs are met. It is hard to see how, with a heavy deficit over the first 10 years of project life, the Working Party (Cromer [4], p.52) can engineer an NPV of $5.3 million for a single rotation at Eden when later years are discounted at 10% – without having gone in for a serious under-estimation of costs.[1] The Imlay Road case (conveniently) illustrates that just this has been done. The first stage of the Imlay Road was estimated to cost $700,000 (NSW [12], p.12) but it now appears that it will cost $800,000. Actually a great many commercial costs appear to have been underestimated, even from a 1972 perspective, not just road maintenance and fire protection costs (see p.281 below), but maintenance and silvicultural expenses and research expenses – for which a direct allowance of a mere $1000 annually has been made – as compared with $169,000 annually for access roading. And there is no cost margin for failures.

The hard historical fact is then that the Forestry Commission has been making a loss on the Eden hardwood project; and it looks very much as if it is going to go on making a loss. The reassuring results of NSW [12] and Cromer [4] – the details of which remain unavailable, even to sympathetic groups, and independently unassessable – are pie-in-the-sky. Emanating, as they do from the Forestry Commission, the results are hardly to be trusted, given the Commission's record for deviousness.

It is worth elaborating these points. Because of the absence of data and details of the model in NSW [12], it does not constitute a clear or rational demonstration of its claims (and Cromer [4] which relies on it is even more methodologically defective). Acceptance of the conclusions of the paper is little better than an act of faith, that the Forestry Commission of NSW has fully, honestly and accurately presented its costs, risks, realistically estimated yields, returns, margins for error, and so forth. But this is an act of faith for which there is little rational basis, beginning with the sketchiness of NSW [12] itself, but by no means confined to this. The Forestry Commission is an organisation which (much like the Tasmanian Hydro-electricity authority) has shown a deep, indeed overwhelming commitment to its own programs, and to defending, justifying and continuing with them whatever their financial and environmental costs (consider, e.g. the Boyd Plateau case). It has simultaneously shown a considerable hostility to and intolerance of criticism. The carrying through of its cherished wood-production programs appears indeed to be its overwhelming objective, and it plainly does not intend to allow these programs to be stopped by public protest (as the case of the Boyd Plateau again demonstrates) or public inquiries (as its reception of the House of Representatives Softwood Inquiry findings indicates). It has consistently misled the public and the press on the true situation, financially and silviculturally at Eden, and elsewhere. Technical Paper #22 is among the publications the Commission has relied upon, in accomplishing this and in its public relations campaign. It is not a rational, impartial demonstration of the commercial satisfactoriness of the Eden project to the Commission, but yet another, less glossy, more technical and sophisticated, justificatory exercise.

It would be rash to deny, however, that there may be technological innovations which may eventually make the Eden project profitable to the Forestry Commission, e.g. the advent of mobile chip-harvesters and bark pulpers which enable the use of small material and which, combined with 15–20 year rotations, make thinning and debarking unnecessary.[2] The NSW

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1 It is not uncommon for road costs alone to outweigh Forestry Commission royalties, e.g. the roading planned in order to log the environmentally significant Levers Plateau rainforest on the NSW-Queensland border.

2 Such profits would, as so often, be won at the cost of biological capital: the effect on the natural environment, and on soils, of such highly intensive operations would be drastic. That is, the increased commercial attractiveness would largely be obtained by increasing environmental costs – for example through the short rotations, the damage done by machinery especially in the many marginal areas, and the impetus to plantations and tree farming in place of natural forests.

Forestry Commission is obviously hoping for technological advances, and postponing costs accordingly (cf. Krilov and Ironside [1], and NSW [12], p.17, on thinning costs). The much criticized failure of the Commission to release a management plan for the Eden region (cf. Scott [1], p.24), may well be due in part to the fact that the Commission is gambling on future solutions to its management and cost problems somehow turning up, whereas a specific management plan would tend to foreclose management options. But even if new technology should succeed in turning Eden from a public liability into a profitable venture, it would still not be proven to be a good public investment; for (as explained below, e.g. pp.90 a-c) there remain better, less environmentally costly, alternative investments.

The environmental aspects and constraints according to the Working Party. It is not impossible then – we do not say that it is likely – that there will be technological and other changes which make woodchip projects far more economically attractive as public investments than they are at present. If this does happen, it is greatly to be hoped that a more discriminating set of criteria for acceptability of projects will be adopted than those adopted by the Working Party, which appears to operate on the assumption that provided there is no actual public loss, and provided a tiny fraction of the area has been reserved from cutting and the exploitation is carried out by Australian owned companies, the risk of considerable impoverishment of and damage to woodchip project areas is acceptable.

A notable feature of the Working Party report then is the failure to recommend the adoption of any significant environmental constraints on the industry, despite the fact that the terms of reference specifically allowed for, indeed invited, such recommendations. There is the suggestion for more research, it is true, but no word as to who should pay for it. The undertaking of vital research (necessitated by the introduction of the industry), but funded by the public, is hardly a constraint on the industry. More importantly, there is no suggestion that the expansion of the industry be halted or even slowed down while this crucial research, which the Working Party admits is sadly lacking and which is long term, is being done. It is hardly necessary to elaborate the irresponsibility of decision-making which advocates proceeding blind, in the absence of requisite research (cf. chapter 5). For the benefits the projects are supposed to deliver are scarcely large enough to outweigh the probable costs proper research may well disclose or confirm. In the failure to suggest significant constraints on the industry or even on specific projects, the Working Party report contrasts sharply with that of the Australian Museum (in Scott [1]) on Eden.

Unsatisfactory and limited as the economic investigations of Cromer [4] are, then, they are substantial compared with the slight and shabby treatment environmental matters are given. The recommendations emerging (p.17) are very general and very weak, calling for no changes in practice but merely for further investigations. The main environmental discussion occurs in the section where the Working Group attempts (pp.28-31)

> to identify the *major* reasons why the export woodchip industry has created a great deal on controversy in Australia (p.28).

The markedly defective diagnosis which follows begins with the familiar false contrast between intensive forestry practices on forests on the one side and minimum disturbance of the forest in the other. Most nature conservationists are prepared, however, to see much forest managed for wood production. In rather characteristic forestry fashion it is assumed (p.29) – what is very far from evident – that net public benefits flow from intensive forestry practices and that these benefits increase with the extent and intensity of these practices. While (p.29, pp.30-1) the net commercial benefits are supposed to be readily identifiable, quantifiable in monetary terms, controllable and certain – we have already seen the very considerable extent to which they are not – environmental costs are taken to be none of these things – again we have seen the extent to which this is false.

The industrial forestry bias of the discussion indicates that the Department of Environment and Conservation has failed in its role of environmental advocate in the Working Party – as it has failed generally to date in the Australian forestry controversy. Furthermore the failure to suggest serious environmental constraints on an industry which is already affecting 5 million acres (5%) of the forests and is likely to affect much more, must raise serious doubts about the capacity of the Department of Environment and Conservation to

act as an environmental advocate on forestry issues, perhaps because of the number and influence of foresters within the Department. Material for such doubts is provided by the Department's endorsement (criticised in Chapter 14) of the Manjimup woodchip scheme – where national park needs had not been assessed, where inadequate provision has been made for national parks, and where as now appears, the project will prevent the establishment of the important Shannon River reserve proposed to preserve magnificent virgin karri forest. It is also suggested by the verbal submission of the Department to the Softwood Inquiry, where the senior spokesman for the Department in fact acted more as an industrial advocate than as an environmental advocate (see Softwood Inquiry [1]). A previous Minister for Environment and Conservation was accustomed to refer to the Department's role on woodchipping as a "watchdog" one. If the performance on the Working Party and other forestry issues is a guide, one would have to conclude that as far as the protection of forests is concerned it is the sort of watchdog which has no bark, no bite and is on excessively friendly terms with the intruder.

The Scott Report and the Eden woodchip project. There has been, just as with the New Zealand Beech scheme (see Searle [2]), an attempt to bury the planning disasters which are current woodchip schemes under a pile of approving reports from bureaucratic sympathisers or private consulting firms. The Scott Report on the Eden woodchip project is such a report. This environmental impact report was commissioned by Harris-Daishowa, with the objectives of investigating and reporting on 'all important present and future ramifications of Harris-Daishowa's operations in South-east Australia', reporting all findings as 'objectively as possible', and making 'recommendations regarding future management provisions' (Scott [1], p. 3).

A major motivation for the commissioning of the study appears to be that of supporting Harris-Daishowa's hoped for expansion in NSW and across the border into the adjoining million acres of Victorian forest, a good deal of which is virgin forest. There are ominous signs that much of this forest, if given over to woodchipping, would be converted to a monoculture of blue gum, which produces much more satisfactory growth rates than the main native species.

The Scott study arrived at conclusions favourable to the Harris-Daishowa operation, drawing the general conclusion that the project is sound and giving qualified support to expansion plans. It drew the general conclusion that the project was economically viable and was a social success, that reports of damage to streams and from erosion were exaggerated and that no species was likely to be eliminated. However very few of these favourable conclusions are actually warranted on the basis of the hard data presented in the Report. Much of the hard data in fact confirms the claims made in later chapters that the Forestry Commission has in fact made a loss at Eden, and that considerable environmental damage is occurring. In short one may accept much of the hard data in the Report and reject the favourable conclusions it arrives at. These conclusions appear to depend upon an unstated set of political and evaluative assumptions, especially assumptions concerning the relative weight to be given to the various factors in a multiple use context.

Since both Harris-Daishowa and the Report itself make a great deal of the Report's supposed objectivity and independence, the issue is worth examining. With the exception of the Australian Museum all consultants were organisations which depend largely for their livelihood upon undertaking paid assignments for various special interest groups, usually private enterprise. The overall conclusion and the main report was the work of Scott and Co., management consultants who also selected the other consultants.

In fact the market system – together with the fact that the overwhelming majority of such reports, and particularly environmental impact statements, are compiled by such private consultants and paid for and organised by private enterprise or others with a clearly preferred set of conclusions – effectively ensures that such reports are not independent and objective, but are in effect advocacy or casemaking, more or less sophisticated, for the client's interest. Consulting firms, like lawyers, depend upon building up and maintaining a clientele. And a private firm generally no more wants to hire a consultant who regularly reports unfavourably to his client's interest, than an accused person will want to hire a lawyer who regularly stands up and tells the judge what he really thinks to be the truth,

that his client is a liar and a rogue and should be sent to gaol for five years. Reports by such private consultants who depend on such clientele for their livelihood will generally no more be objective than the advocate's address to the judge, and should not be represented as such. These factors do a great deal to explain the character of most environmental impact statements, of more, or less, sophisticated advocacy for the projects under consideration. The moral is that such an EIS process, like the legal process, is essentially an *adversary* process, and that public hearings which enable it to function as real adversary process are not, as the bureaucracy is inclined to believe, an unnecessary and timewasting frill best removed as soon as possible, but a crucial part of any effective process. The other moral is that the EIS process, again like the legal process, is likely to produce reasonable results only so long as the adversaries are fairly equally equipped with respect to time, enthusiasm, energy, resources and interest. At present there is little doubt which way the balance lies.

Most private consulting firms have, then, an indirect but nevertheless powerful interest in providing a service satisfactory to the client – in this case that is the justification and defence of the Eden project and its desired expansion into the adjoining million acres of Victorian forest.[1] The same sort of criticism does not of course apply so directly to organisations such as the Australian Museum which do not depend upon maintaining a clientele, and the Museum has, in the case in hand, in fact produced the only non-promotional report. Nonetheless organisations such as the Museum may be interested in continued private sponsorship, e.g. of their research,[2] and this may explain why it is that the Museum has allowed its report to be used to industrial advantage in the summary for journalists (the Overall Picture, p. 22 ff.) in ways which its findings do not support.

The Report of the Australian Museum. One of the more disgraceful aspects of the Eden situation is that independent biological surveys and studies such as that commissioned from the Museum have been undertaken only on the initiative of the company and in the hope of expansion, some seven years after the project commenced, and that studies aimed at lessening the damage done by the project were not obtained by the NSW Forestry Commission many years ago, and certainly before now. That the assessment of the impact of a project which will affect nearly a million acres of public forest (and possibly two million) had to come in this way, despite the fact that the care of the forest is supposedly the responsibility of the Commission, is itself a crushing indictment of how the Commission sees and carries out its responsibilities. In fact it has still not recognised the need for such studies.

It is appalling that after six years of operation no similar studies or even rough surveys have been done at all for Tasmania, despite the fact that Tasmanian woodchip fran-

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1 In the case, however, of the silvicultural consultant, Margules, whose report is a significant part of the document, a more obvious and direct interest in promoting the Eden project exists. R. Margules is a trained forester, who had already several years ago publicly expressed strong support for forest services as against their critics on the pine planting issue. More importantly however, R. Margules is closely associated with Kapunda Development Co. Pty. Ltd., an afforestation company which has extensive pine planting areas in the Bombala district, and which purchased extensive holdings in the Towamba Valley in 1967, conveniently located to Eden, for forestry purposes. This company therefore has a direct financial interest in the continuation and expansion of the Eden project. Silvicultural and environmental protection practices of private firms planting in the Bombala district leave a great deal to be desired and serious soil erosion has already occurred there, and are hardly a good model against which to judge the adequacy of forest practices at Eden, upon which the consultant has pronounced judgement. At least one consultant then, would appear to be singularly ill-equipped to satisfy Harris-Daishowa's claimed aim of providing a totally objective, independent and disinterested study.

2 Harris-Daishowa has continued to fund research of H. Recher, principal author of the Museum's report, in the Eden region.

chises cover such a large proportion of Tasmanian forest and the best national parks and reserves are notoriously inadequate.

The Australian Museum's report on ecological aspects of south-eastern woodchip projects (those which will operate within 160 kilometers of Eden) confirms several of the claims made in the text (in Chapter 9). The Museum's own studies were

> preliminary and designed to provide a rapid assessment of the situation. In the time available, it has not been possible to conduct a strictly quantitative study nor has it been possible to investigate more than a few groups of animals (p. 115).

As in the case of other woodchip areas

> A thorough survey of the biological resources of this region has never been attempted (p. 114).

The theme is virtually the same for every facet of the ecology of the region: that it is little known. Thus (p. 118):

> Little detailed information exists about the flora of the area.

Though the main eucalypt associations are known

> less information exists on the forest understorey of South East New South Wales.

A number of the plant species

> are considered rare for Australia by the National Herbarium, Sydney. . . . It must be emphasized that little or nothing is known about the requirements of these species in the Eden woodchip area. Such information would need to be obtained before an adequate assessment of the likely impact of the woodchip operation on these species could be made (p. 119).

It is known, however, that in woodchipping operations

> the density of the standing timber is substantially reduced, the canopy greatly opened and the species composition of the understorey possibly impoverished (p. 127) . . . . with the current logging practices in New South Wales, the impact on wet gully vegetation and associated fauna is severe.

Though

> South Eastern Australia has a rich terrestrial fauna . . . relatively little information is available on the fauna and most of this is confined to the more conspicuous terrestrial vertebrates . . . . no data for invertebrates are available [for NSW] (p. 119).
>
> . . . some birds and mammals are known to be rare and are potentially endangered by the accelerating development of forest resources in Australia. (p. 120: however in a passage on p. 124, that appears to be mistaken, the claim as regards birds is contradicted).

The effects of standard forest operations in woodchipping projects are severe.

> In a clear-felling operation, arboreal mammals are eliminated from the cut area (p. 127) . . . .
>
> One might think that the logging operations associated with clear-felling for chip production leave sufficient timber that arboreal mammals might survive. This does not appear to be true. The density of standing trees on clear felled areas is only a fraction of the mature forest and many trees are small. Also the trees most suited to woodchip production are those favoured by arboreal mammals as food trees. Thus, a relatively large proportion of the trees standing after chip logging are unsuited as food trees. During our observations in March and April we recorded large numbers of Greater Glider and Yellow-bellied Glider (Table VII), but always in association with mature forest and *large* trees. They were absent from clear felled areas.
>
> . . . it is significant, that in the 40 to 45 year cutting cycle suggested for woodchip production in South Eastern New South Wales, the forest will not approach maturity (p. 128) . . .

> The greatest effect of clear-cutting will be on the fauna of mature or climax forest and particularly of wet sclerophyll and rainforest species. Within these habitats, arboreal mammals (e.g. Greater Glider) will be eliminated and unlikely to survive in small uncut patches or in buffer strips along streams. It is also likely that some ground dwelling animals will be eliminated. For example, we would not expect to find Swainson's Antechinus or Potoroo in recently cleared forest (p. 128). . . . [Also] some birds may be affected because there are no longer suitable nest sites (p. 129).

Moreover

> the impact on wildlife will intensify with each cutting cycle (p. 135).

There are, then, no grounds for complacency.

> The area affected by the existing woodchip operation is large and without doubt contains many undescribed species. . . . Of equal concern are species which remain abundant and widely distributed, but which seem particularly sensitive to changes in their habitat (p. 132).

For example, the Greater Glider:

> In considering the impact of the woodchip industry on the Greater Glider and similarly affected plants and animals, we must also consider the impact of development elsewhere in its range. Throughout Eastern Australia, forests are being logged more intensively, cleared for plantations, burnt more frequently and subdivided for holiday or recreation purposes. Each of these developments affects the survival of the Greater Glider and it is necessary, therefore, to minimise the impact throughout the animal's range. The survival of the Greater Glider is *not* assured by virtue of its current wide distribution and abundance (p. 132).

The picture is similar in the case of freshwater ecology.

> The distribution and abundance of freshwater organisms is poorly known for most of Eastern Australia (p. 125).

On the basis of their sampling program the Museum concluded that

> The Australian Smelt . . . and particularly the Australian Grayling . . . have only been collected from silt and pollution free rivers . . .
> The Bass and Perch can be considered as relatively rare and patchy in distribution, but a scientifically interesting and virtually unexploited population of Bass occurs in Nadgee River. The Grayling is considered endangered and previous to the Museum's survey had only been recorded once in New South Wales in the past 40 years (p. 130).

There is serious cause for concern, then, at the silt and nutrient levels of streams resulting from woodchipping operations (see, e.g. p. 130). The recent construction of forestry roads into the upper Nadgee River catchment and across the river is likely to be the precursor of considerable ecological damage not only to the unusual freshwater life of the river but also to the rare trees and plants that remain in the hitherto undisturbed catchment.

It is evident from the Museum's report then that there is real cause for concern and that, whatever the silvicultural value of the Eden program, there are substantial and mainly adverse effects on other values of the forest. Thus it is puzzling that the Museum should have appeared to endorse the general conclusion of the Scott Report, that the project is sound. Such a conclusion is not supported by the detailed contents of the Museum's report, which reveal ecological unsoundness.

The Museum has, it is true, made a number of useful suggestions for improvement to the project (which however it recognises as inadequate to eliminate adverse effects). However not only is there no guarantee that such measures are to be taken, but it has not been shown that they are compatible with continued economic 'soundness' of the project, or would enable the meeting of contractual commitments to Harris-Daishowa. There has, for example, been no assessment in the study of the effect of meeting the Museum's requirements on the economics of Harris-Daishowa's operation or on the inadequately supervised Forestry Commission operation. But both the requirements that the amount of area in national park and otherwise exempt from cutting be greatly increased, that the area grown

to maturity be increased, and the important condition that 18° slope limits be imposed for machinery operation, would be likely to have substantial effects on the economics and on volumes available. Slope limits are particularly important environmentally (see photo a); but in an area of steep average slopes, such slope limits are likely to remove large areas from cutting by the methods currently in operation. Yet as the Scott Report indicates available volumes are heavily committed, and even larger ones are being sought. Thus it has not been shown that the project is 'sound' in the sense that necessary improvements can be effected.

The other argument advanced in support of the claim that the project is sound (p. 24) is entirely unconvincing. This is that the present regeneration policy of regrowing the native eucalypts of the district for pulpwood is 'in the best interests of conservation', because things would be worse if the area were converted to pine or eucalypt monoculture. But the argument that things could be *worse* under some different management policies hardly establishes the soundness of the present policy, especially when a number of alternative strategies which would appear to be better for conservation have been ignored in the comparison, e.g. placing a much larger area in national park and managing and regenerating a small area of the present woodchip franchise for continued sawlog production by selective logging or group selection. The argument does nothing to show that the project is sound.

Since the Museum's report does not support the Scott conclusions, it is unfortunate that it should have failed to dissociate itself from the favourable conclusions; for failure to dissociate has already been represented by the Company and by those sections of the press who have apparently read only the general conclusions, as endorsement for the project and its expansion into another million acres of forest in East Gippsland. The Museum has, despite its findings and emphasis on multiple use, been led into accepting the general political and value judgements on the Report, in particular, that adverse effects on non-wood values are of little moment if wood production benefits, and the political judgement that a project which impoverishes a million acres of public forest (or two million acres if expansion plans go forward) can correctly be described as 'sound' provided a small (and as we shall see exceedingly optimistic) profit is made for the forestry commission and private forest industries and some local people and contractors do well out of the venture. The Museum's judgement on these political and evaluative matters cannot of course be taken as authoritative. The political assumptions are open to rejection and should, we believe, be rejected.

Changes to the Eden project. At Eden — unlike other Australian woodchip projects — a number of significant changes in project management have been made. (There have also been important changes in royalties paid at Eden.)

> Initially quite large areas were cleared (4,000 ha) and buffered by uncut forest strips of up to 1.2 km in width, but under present management 200 ha is the maximum sized area cleared (Victoria 65 ha) and cut areas will alternate with uncut on a projected 40 year cutting cycle. Except along main roads areas previously reserved as buffer strips have been largely abandoned and the forest incorporated within cutting coupes (Scott [1], p. 113).

Further control measures have recently been ordered by the new Minister for Lands and Forests (J. Mason), namely:

1. Greater protection of streams including removal of log crossings after logging.
2. Better location and drainage of roads, bulldozer tracks and log dumps.
3. Greater supervision of logging operations by contractors.
4. Prohibition of downhill bulldozer extraction of logs where possible.
5. Stricter enforcement of 'filter strips', unlogged areas along rivers and major creeks.
6. More care with road construction works. (*Imlay Magnet,* July 31, 1975, p. 1).

Unfortunately the new measures entirely lack appropriate specificity, and in some respects the newly adopted management plans make matters worse. For instance,

> the elimination of most of the [buffer] strips in the current management plan is unfortunate and certainly increases the impact of the logging operations on the fauna (Scott [1], p. 132).

According to the Australian Museum,

> to best protect the ecology of the woodchip forests, we believe that a buffer strip of undisturbed vegetation should be left along all streams, temporary **and** permanent, and that the vegetation of wet gullies should be minimally disturbed. . . .
>
> With current logging practices in NSW, many buffer strips along streams are highly disturbed and broken by the removal of trees and the crossing of streams by vehicles. Any wildlife value that they might have is, therefore, reduced (Scott [1], p. 131).

In fact the ecologically retrograde step of reducing buffer strips has been in train for some time:

> change in management procedures between 1969 and 1975 have eliminated most of the buffers between cut areas in Naghi State Forest (Scott [1], p. 131).

The adequacy of the new management practices (both those reducing coupe size and alternating coupes, and those announced by Mason) should not be taken for granted. To understate the matter rather drastically:

> The stated management policies of Forestry authorities are not always followed in forest operations (Scott [1], p. 113).

Even if the prescriptions were followed and operations were properly supervised, the new practices are (for reasons set out in chapter 9 and elsewhere) ecologically inadequate. The Australian Museum reached the same conclusion: thus it recognised, for example, that *the size of clearfelled areas should be reduced and the duration of the cutting cycle extended* (p. 138).

> For environmental reasons, we believe the smaller sized the area cut, the better and that even 200 ha will prove too large. By cutting small areas, the diversity of the forest is maximised and the chances of the wildlife recolonizing the regenerating forest greatly increased (Scott [1], p. 129).
>
> . . . We suggest that consideration be given to cutting smaller coupes (preferably under 40 ha) and . . . to diversify the cutting cycle so that a percentage of the coupes are cut on a larger cycle than the proposed 40-45 year rotation (Scott [1], p. 135; the points reappear in strengthened form on p. 138).

The new practices ordered by Mason go little distance towards meeting the Museum's recommendations or to ensuring proper environmental protection. Not only are no quantitative restrictions such as specific slope limitations on operations included; none of the measures are independently assessible, for they are all of the vague form 'greater protection', 'better location', 'stricter enforcement' and 'more care', which *can* sound fine but mean little. There are no prohibitions **on** downhill extractions of logs, no precise requirements on road, track or dump location and construction, and so on.

Reserves in the Eden region are inadequate. The elimination of buffer strips means – given the shortness of rotations and that 'the impact on wildlife will intensify with each cutting cycle' (p. 135) – a greater need for parks, reserves and wilderness areas. As it is the system of parks at Eden 'leaves much to be desired':

> None of these conditions [for a viable parks system, e.g. large, inter-connected and with a minimum edge to area ratio] are met by the system of parks established in NSW west of the Princes Highway and we conclude that they will prove inadequate for the conservation of fauna (Scott [1], p. 135).

In the projected woodchip areas in East Gippsland, Victoria, the situation is even worse:

> None of the inland and higher elevation forests are represented in the parks and reserves system (p. 134).

The previous niggardly allocation of parks in Victorian forested regions encourages warranted scepticism that reserves promised in forested areas of East Gippsland will be at all satisfactory.

The Australian Museum sketches out, in a valuable way, reasons why the parks established in NSW in the Eden region leave so much to be desired: they are too small and can

easily be destroyed by fire or old age, they do not carry representative forest (making re-colonisation unlikely) and they do not incorporate ecologically significant areas such as the upper Nadgee catchment. The Museum also rightly emphasizes the importance of trying to retain what limited forest wilderness remains in Australia:

> Forest wilderness areas in Australia are extremely limited and we strongly recommend that any wilderness areas in the Eden district be reserved from logging and the intrusion of logging sights and sounds (Scott [1], p. 138).

There is a strong case for much additional research, and especially for the monitoring of the impact of the woodchip industry on terrestial and aquatic ecosystems. Such is the thesis of the Australian Museum (p. 137), who recommend detailed research on an inventory of biota of the south-eastern region, on the size, distribution and management of reserves, on the size and features of buffer strips, and on the impact of forestry operations on terrestial and aquatic ecosystems, and on soils.

Soil erosion at Eden: fact and forestry fiction. It is commonly thought that even if soil erosion does occur in forestry, it is no worse than that occurring in agriculture, and the Scott Report predictably makes heavy, if indirect, use of this argument in claiming that (p. 24)

> there is evidence of soil erosion but not erosion unique to the woodchip project.[1]

But that there is more than one case of erosion in forestry does nothing to establish the acceptability of the practice. The non-uniqueness and no-worse-than-agriculture arguments excusing erosion amount to a virtual abandonment of standards. But one bad practice does not excuse another. To compare forestry with agriculture is to compare it with a practice which has degraded a considerable proportion of the earth's surface and has only succeeded in a long-term basis under the most favourable conditions. The fact is that soil erosion resulting from agriculture has ruined a considerable proportion of the earth's surface (as Lowdermilk [1] has grimly portrayed). In the comparatively short agricultural history of Australia soil erosion has exacted a considerable toll, and erosion continues apace at present. Agriculture provides at best a bad model for forestry practices on public lands.[2] Where agriculture has succeeded on a long-term basis it is in regions with special conditions, e.g. with deep and favourable soils, gentle slopes at most, and naturally light or distributed rainfall. Generally remaining forest areas in Australia have none of these special features; they are

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1 The extent and comparative severity of erosion in standard forestry harvesting is revealed in the following table.

REPRESENTATIVE RATES OF EROSION FROM VARIOUS LAND USES
(from UN [1])

	Metric Tons/ sq km/year	Tons/ sq mile/year	Relative to Forest = 1
Forest	8.5	24	1
Grassland	85	240	10
Abandoned Surface Mines	850	2,400	100
Cropland	1,700	4,800	200
Harvested Forest	4,250	12,000	500
Active Surface Mines	17,000	48,000	2,000
Construction	17,000	48,000	2,000

2 There are other reasons why the agricultural analogies so popular with forest industries and tree-farming foresters (see e.g. Cromer [3])are not valid. Unlike agriculture most forestry in Australia operates not on private but on public land, which theoretically should be subject more readily to constraints deriving from sustained yield and multiple use considerations — which are unfortunately difficult to apply under current private property systems. 'Tree-farming' methods pursued on the agricultural analogy ignore this fact, and the related fact of the importance of remaining forest land for conservation purposes.

As well, there is also a prevailing climate of over-confidence about silviculture, in which the comparatively shaky empirical basis for current practice is obscured. Silvicultural techniques are, in comparison to many agricultural ones, at an extremely tentative and experimental stage. Most have not even been tested sufficiently widely or

steeper lands with thin soils in places subject to heavy rainstorms. In short the forests commonly occur in places that sensible agricultural practices would avoid, and certainly would not totally clear.

There is already severe erosion, as a result of woodchipping activities, in the Eden region, and even worse erosion is to be anticipated when the forests growing on the steep, highly erodible, granitic soils of the Eden hinterland are exploited. The Scott Report, however, advances the thesis that where erosion occurs it is mostly due to inadequate supervision and violation of regulations by contractors ([1], p. 81, 90, also 130). The main conclusions of the Scott Report admit that

> there is some erosion from logging and roading operations in the district

but contend that

> there are adequate regulations for erosion prevention, though these regulations should be enforced strongly ([1], p. 24).

The facts of the matter are quite otherwise, as the Report itself explains ([1], p. 130):

> Erosion on snigging tracks is particularly obvious and coupled with soil compaction results in the growth of a different vegetation from that on cleared, but less disturbed ground. In general, diversion ditches on tracks and roads are too few and usually placed at right angles to the tracks rather than along the contour. The result is a fine 'frog puddle', but does not divert water and silt onto vegetated ground. Though this does reduce the amount of silt reaching streams, the number is too few and discolouration of streams is obvious during rain. However, without assessing runoff and siltation on logged areas or measuring the amount of silt reaching streams, the total impact on aquatic systems is unknown.

On steeper slopes there is erosion down to bedrock, several feet of soil sometimes having been removed (see photo a), and there are *no* regulations to prevent snigging which causes such erosion from occurring. On such sites regulation cross-drains, where installed, have been filled with silt and washed out and considerable downslope gullying has resulted.

It is not just slope limitations and cross-drain regulations that are inadequate: buffer strips are inadequate, there is no protection of temporary streams.

> The definition of a permanent stream is vague and the vegetation along many streams which obviously carry large amounts of water during the year has been cut. Also in many places, we observed where logging debris have been pushed into stream courses or wet gullies. . . . (Scott [1], p. 130).

On the tablelands behind Eden, where woodchipping is a once-only operation to make way for pine plantations, erosion has also been severe, with both gully and sheet erosion. For example in Coolangubra State Forest there is substantial evidence of damaging sheet erosion.

In short, there is extensive erosion, directly attributable to intensive forestry operations, which occurred though the regulations were observed. The regulations are quite inadequate to prevent extensive erosion — for example, there are no slope limits on operations other than bulldozer drivers' estimates of safety, and high-lead logging is contemplated to extract timber from slopes too steep for crawler machinery (Scott [1], p. 78, also Carter [3]) in order to mazimize on short-term pulpwood production from the Eden region.

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2 (continued from the previous page)

even over a *single* rotation (the equivalent, in terms of agricultural crops of a single season). No one familiar with the large background of research and experimentation which has gone into modern agriculture and the problems it faces, could reputably advocate turning huge areas of forest over to 'cropping' methods which have in most cases not even had the equivalent of a single season's trial, and where those trials which have been carried out indicate serious problems (as in the case of second rotations of *Pinus radiata*). Despite the extravagant and overconfident claims about the 'reliability' of agricultural-type methods in forestry (see e.g. Gilbert [2]) that is the real situation in most forestry today.

The actual techniques used in the Scott Report investigations for studying hydrology and measuring erosion appear patently inadequate. For example, a survey of major catchment areas, where logging had or was being carried out, by a few traverses (as described on p. 189) is quite unsatisfactory. Control data, preferably on these catchments *before* logging occurred, would have been desirable, and the data obtained thereby should have been compared with appropriate data after heavy rains on the catchments. It is hardly surprising, given the inadequacy of his study, that the hydrologist Scott and Co. employed should have found no indication of recent or abnormal accretion or of significant erosion except along road formations (p. 190). He could not have been looking for such evidence.

The extensive erosion that nas already occurred in the Eden region is not the only problem. Many of the major access roads have been poorly designed and engineered from a soil erosion viewpoint (the Merrica Road providing a recent example).

> The roads have large cut and fill areas, which are a major source of silt. Water run off from roads increases the erosion damage in the neighbouring forest. Soil landslides have developed on some of the large road cuttings. The land slides fill the drains on the road edges, and after rain the flowing waters in the drains have a very high silt load (Ecology Action [1], p. 4).

Not surprisingly, siltation is a major problem, which has already, in the few years of the Eden project's life, had a significant effect on aquatic life, e.g. more sensitive fish are vanishing from affected catchments.

Moreover, many parts of the cut-over areas now have a high susceptibility to erosion, owing to substantial disturbance by heavy machinery. This applies particularly to snig tracks, which are generally poorly vegetated at best, and then with short-lived fire-regenerated scrubs.[1] Vegetation failure is even more conspicuous on log dumps, where the soil is heavily compacted and a long-term source and cause of erosion. Attempts to seed these dumps have usually failed (cf. Scott [1], p. 85), and so seedlings have been raised in pots, the idea being that dumps be replanted using prison labour. Unfortunately for forestry accounting the prison has been closed, and labour for planting will have to be hired at prevailing market rates.

The economic impact of Harris-Daishowa's Eden operation according to Scott & Co. The main economic thesis of Scott [1] is, none too surprisingly, that the impact of the Harris-Daishowa operation on the Eden region is largely beneficial (see e.g. p.31, 37, 51). The thesis is supported, insofar as it can be, by the now familiar method of benefit analyses, with associated costs neglected or minimised. The first section of the Report is, in the main, a progressive and enthusiastic elaboration of these benefits (see e.g. pp.31, 36, 53).

> By no means all the acclaimed "benefits" are uncontroversially beneficial, e.g. a change in land use pattern, as previously under-utilized forest resources are developed (p.31).

This undisguised "use and growth are good" assumption sets the tone for much of the eulogy on behalf of the client, Harris-Daishowa, that follows. Some of the benefits were subsidized by public funding, e.g. the NSW Department of Decentralisation made a considerable grant for Harris-Daishowa company housing in Eden township (a point unmentioned in Scott [1]). Many of the indirect benefits are exaggerated (as explained in chapter 13).

The fact is that the benefits Harris-Daishowa provides – in exchange for drastically altering the face of hundreds of thousands of acres of Australia's forests – are piddling. As Norman remarks ([1], p.12)

> admittedly, Harris-Daishowa is keeping more people on at Eden than it needs in the present circumstances, and is stockpiling billets rather than standing down employees and contractors

in contrast to the situation in Tasmania (see below). Admittedly too, Harris-Daishowa is generating income in the district with the construction of its second chipmill,

> but, without getting down to council rates and minor local payouts, that is all the company can apparently demonstrate Australia gets.

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1 For example, the acclaimed 'Regrowth on an old snig track' of Scott [1], p. 94, consists simply of goodenia.

It is just such minor matters as Imlay Shire rates that the Scott Report is forced to get down to:

> thus the Company is providing a considerable amount of revenue to Imlay Shire Council (p.53);

in fact $15,955 or 1.38% of total rates.

Scott [1] has two further conventional arguments to offer for the beneficial effect of Harris-Daishowa's contribution to the regional economy, namely the multiplier effect of its local spending, and the Company's effects on the growth of Eden. Though the regional multiplier of 1.27 is more reasonable than those multipliers guessed by the Forwood Conference (see pp.345-6), the unreliability of the estimation of the multiplier is not indicated, as it should have been (pp.37-8). As remarked in the discussion of economic base models from which the multiplier equation is drawn (McColl and Throsby [1], p.210):

> the fact remains that there are many theoretical objections and limitations to the economic base model,

especially when what is essentially a static equational model is applied in a dynamic situation. And even if the multiplier were reliable, there is a serious mistake in its use, which results in grossly exaggerated estimates of both the multiplier effect and the number of people that could thereby be employed at average wages. Instead of the estimated multiplier of 1.27, an unlikely multiplier of 2.7 is applied to Harris-Daishowa's annual expenditure of $11.61 million (item 2, p.37) to obtain, as a result of the multiplier effect, an additional $3.13 million and approximately 390 jobs. This more than doubles the multiplier effect, overestimating finance generated by about $1.66 million and jobs by more than 200.

The underlying assumption, that growth is good, especially as featured in such commercial parameters as expenditure generated and employment opportunities afforded, appears in a more blatant form in Scott [1]'s enthusiasm about the growth of Eden. This enthusiasm touches its most bizarre level in the amazing Postal Services table (on p.211), which documents the first acclaimed example 'of a raised living standard for the townspeople of Eden', namely the 'marked increase in the use of postal/telephone services'. If, however, the percentage changes of the table had been correctly calculated — the changes shown are practically all wildly erroneous — it could have been seen that the postal increases are only of the order of Eden's population growth. The increase in no way indicates a raised standard of living, even in terms of narrow conventional measures of living standards. The table does however highlight the desperately justificatory and unscientific nature of the Scott & Co. investigation.

Scott [1] would like to attribute the growth of Eden and the benefits thereby inferred primarily to Harris-Daishowa (see e.g. p.34) without however attributing the costs of the growth to Harris-Daishowa (see e.g. p.54). This is impossible: Harris-Daishowa cannot generate the applauded growth without thereby assuming, to that extent, responsibility for the costs of this growth. Some of the costs are mentioned (on pp.54-5), e.g. the damage to roads, traffic congestion in the town, quite inadequate sewerage and garbage disposal facilities, local administration problems, and a serious shortage of housing, with the result that

> much of the labour attracted to Eden by the Harris-Daishowa operation and accompanying development in the town, is still living in 'temporary' accommodation in caravan parks (p.55).[1]

There are other costs that are not mentioned. In the last half-dozen years Eden has turned from a small pleasant fishing town to a largely unplanned and ill-regulated hotch-potch. Many of the newer areas lack services, not just sewerage but lighting and paved footpaths (cf. *Bega District News,* April 15, 1975, p.12).

Scott [1] makes little of Harris-Daishowa's contribution to the national economy, as distinct from the regional economy, for the good reason that that there is little to make anything of. No company tax is paid.

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1 The *Imlay Magnet,* August 15, 1974, reported (on p.1) that 100 families were living in caravans in Eden.

> The accumulated losses of Harris-Daishowa (Australia) Pty Ltd. are just under $5 million, and trading losses were still running at just over $500,000 in the year to December 31, 1972, the latest filed (Norman [1], p. 12).

Not too surprisingly then, Scott [1] tries to play down the issue of Harris-Daishowa's commercial viability or national contribution:

> The economic viability of the HDA operation *in itself* is of little relevance to this study – it is the *effects* of that operation on which must be considered, in terms of the economic impact that the development has had, and will continue to have, on the Eden area (p.49).

An honest report would have brought to light Harris-Daishowa's negligible contribution to the national economy, and also that it is unlikely to contribute much in the future. For the memoranda and articles of association of Harris-Daishowa – which cannot be varied without Daishowa's consent – give

> Daishowa Paper an on-the-spot veto over any woodchip pricing or sales it does not like. (Norman [1]).

The long-term policy is apparently to operate Harris-Daishowa on a cost-plus basis, an arrangement that would no doubt suit Daishowa Paper's finances splendidly, but would mean that no company tax is paid in Australia. And that is a more accurate reflection of the extent to which Australia is benefitting from the Harris-Daishowa operation at Eden than the trifling regional benefits Scott [1] is so pressed to locate.

"The sociological aspects in detail". The Scott Report concluded that the Eden project was a social success on the basis of a survey showing 91% support for the project in the town. The argument, however, clearly makes the assumption that the social community which counts from the point of view of estimating the social success of any particular piece of forest management is the local community. This assumption should be rejected. The forest is an important public asset, and should certainly not be regarded as simply to be disposed of to the liking of or for the enrichment of the local community. The procedure adopted would give the interests of .02% of the *present* Australian population a decisive influence on the present and future fate of 2% of Australia's forest. The social community whose interest is to be considered clearly extends well beyond the local community, and it often has interests quite different from, and often in conflict with that of the local community (for example in many cases there is a clear conflict between a local community's bread and butter interest and urban or regional recreational and conservation interest, e.g. Fraser Island). There is no attempt to consider whether the social interests of this wider community (which includes future people), is being served by the impoverishment and damage to so much forest for an export industry. The Scott Report's assertions on this point then are based on a fallacious assumption of what is the relevant community.

To consider the social benefits in terms of the local community in this way is also subtly to load the (multiple-use) criteria in favour of bread and butter aspects, that is, generally, in favour of wood production aspects. Employment is an overwhelmingly favourable factor in the local context, and it would indeed have been surprising if in a town where woodchipping provided a major source of employment there was not a strong local body of opinion in favour of the project. Indeed the indiscriminatory nature of local opinion is rather given away in the Scott Report, which remarks (on p.204):

> The situation at Eden at the moment seems to be that any potential source of employment is regarded favourably.

Since virtually any such project, however undesirable or destructive, would be locally approved, strong local approval cannot be used to establish that the project is "a social success" or is desirable from the point of view of the local community or long term interests, in the way the Scott Report assumes.

However in the Eden case there are in fact additional important factors operating, which have certainly played an important role in shaping favourable opinion in the local community. These are entirely unmentioned in the Scott Report. Local sources of

communication have been highly favourable to the project. The local newspaper, *The Imlay Magnet*, has for some years conducted a strong campaign in favour of the project, ridiculing critics and printing articles overwhelmingly favourable to the project. Thus during the period 1972–75 the newspaper printed some 37 articles, many very lengthy, in favour of the project and only 3 or 4 unfavourable to it (most of these being very brief reports of the views of local critics). There is no local conservation group and there is no doubt that the local presentation of the issue has been extremely one-sided.

In addition there are strong pressures against what local critics of the project there are. Local critics of the project are subject to considerable public pressure, sometimes amounting to harassment, and even ridicule in the local newspaper, usually without their views even being presented (see for example *Imlay Magnet* early 1973 and *Imlay Magnet* July 24, 1975). The atmosphere of pressure and conformity has become so strong as to be objectionable even to some local supporters of the project (see for example *Imlay Magnet*, August 28 and August 21, 1975). Thus a forester's wife wrote:

> I have for some time now had the impression that it is unacceptable in this town to even question the effect of forestry activities let alone be opposed to them (which I am not).

This sort of situation can hardly be regarded as desirable or indicative of a "social success".

Given all these facts it is surprising that even 9% of Eden people disapprove of the project. In other areas outside the town where these pressures have been less effective there is considerably more criticism and objection, to the point where an adjoining shire council, that of Mumbulla, has officially objected to chipping within the shire because of adverse effects on roads, scenery, etc. (see *Bega District News,* August 26, 1975).

The Report claims that there are no adverse effects on the fishing and tourist industries at Eden. This claim is made on the basis of interviews with representatives of the deep-sea fishing and large tourist industries at Eden. However the local fishing industry, being a deep-sea industry, has not yet been affected by the siltation of streams and estuaries, and although it may well eventually be affected by pollution from the planned pulp and paper mill, the industry representatives evidently prefer to take the short view. The tourist and fishing areas affected so far consist primarily of the small, non-group, unorganised tourist recreational, fishing and holiday area, which comprises probably the major recreational and tourist industry on the South Coast of NSW. Local people involved in this industry have claimed publicly that it is being adversely affected, and it is surprising that the Scott team was unable to find and interview those people.

To sum up: the data presented in the Scott Report which is alleged to show that the project is a "social success" would justify most socially and environmentally damaging projects and is quite compatible with the project's destroying an asset of value to present and future Australians. The methodology of the argument for the project's positive social benefit is invalid and the conclusion is not warranted on the basis of the evidence presented.

The political assumptions of the Scott Report. In order to get from the specific data presented in the Scott Report to the general conclusion that the Eden project is sound (and should be expanded) one has to supply a number of political, evaluative and methodological premises. These are however unacceptable, since precisely the same assumptions – that a project that has undeniable environmental and social costs (some of which grudgingly are admitted and others of which are played down in the Scott Report) is sound if it provides employment, stimulates regional growth, and finds favour in the eyes of the local community – would justify virtually every environmentally and socially destructive project from sandmining to nuclear weapons proliferation and beyond. For there are many forms of employment which stimulate regional growth which are destructive of valuable items and destructive of the amenity and even livelihood of many present and future people. Therefore, since the latter are undesirable, one cannot argue, as the Scott Report does, for the desirability of a project, on the basis of employment and regional growth. In short as is well known (and expanded on pp.145 ff. below) employment and regional growth arguments do not establish economic desirability: the arguments are simply invalid.

The Tasmanian woodchip scene. At Eden there have been some improvements in present management practices, most notably a reduction in coupe size and a scattering of coupes. Coupes have been reduced to a maximum size of 500 acres 'and these must be adjacent to grown areas' (Scott [1], p.86).

In Tasmania, however, there have been no improvements in environmental practices. Yet the evidence is that these projects are a good deal more damaging than the Eden project (see p.106 ff. below), in part because much of the forest cut is not regenerated, and in part because of the severe methods of regeneration which involve extensive and sometimes hazardous burning. As the Australian Museum's discussion indicates, regenerative burns are not only likely to affect flora and fauna but also greatly increase the risk and severity of soil erosion and deterioration and stream pollution in clearcut areas (Scott [1], p.138). For example, woodchipping activity may be the cause of discolouration in the Macquarie River, the source of the Ross water supply (*The Mercury,* August 20, 1975, p.17). Needless to say, the hydrological effects of the extensive Tasmanian woodchip operations – like most other environmental effects of the operations – have not been investigated.

The Eden operation can be expected to be a good deal less damaging, then, than other Australian woodchip operations where burning is or will be conducted in accompaniment with clearcutting (e.g. all Tasmanian operations and Manjimup). Despite the enthusiasm engendered by journalistic junkets for Tasmanian operations, Tasmanian operations are in many respects worse than the Eden operation – not just because of the hot burns which accompany the largely experimental regeneration practices, but also because not even those minor environmental safeguards presently observed at Eden apply in Tasmania, e.g. in Tasmania there are no buffer strips along streams or roads, coupe size has not been reduced, supervision has not been extended but remains minimal, and few, if any, of the promised and necessary flora reserves have been gazetted.

Even more ecologically damaging than the ruthless regeneration practices, is the failure to regenerate the large clear cut areas. The Tasmanian forests are literally vanishing, because private cut-over forests are not being regenerated and the regeneration of Crown forests is lagging far behind cutting.

> Over the period 1965-66 to 1972-73, the Forestry Commission prepared and burnt (i.e. "regenerated") less than 1200 hectares of eucalypts each year. ... Since 1972-73 the areas treated for regenerated have been markedly increased, but still average less than 4,000 hectares per year with adverse weather conditions sometimes delaying the burning of slash and necessitating firing under more risky conditions. *In contrast, cutting and clearfelling currently exceeds 20,000 hectares per year and may go even higher, hence the regeneration program lags disastrously behind.* (Jones [1], p.79; cf. also p.viii, p.26).

A main reason for the lag is, as we have seen, that the Commission cannot afford to regenerate all that is cut. Moreover,

> no decision has been made that royalties *should* cover production costs, though forestry officers accept that royalties must rise substantially if this were to become a policy objective (Jones [1], p.36).

Of the 12,000 to 16,000 ha of privately owned forests cut-over in Tasmania each year,

> the Tasmanian Forestry Commission estimates that only about 5% of this cut-over area is being systematically regenerated at present (Cromer [4], p.13). Natural regeneration will restore some of these forests; some farmers are forming companies to undertake reforestation; but present indications are that most of this extensive area of private forest will disappear ... (Jones [1], p.27).

Once again a main reason why private forests are not being regenerated is that

> royalties of between 20–40 ¢ per tonne are not adequate for the owners of private forests to undertake regeneration programs. A royalty of around $2 per tonne or more would be required to make forestry on private land

of economic proportions[1] (Jones [1], p.27).

Higher royalties still would be required to ensure improvements in environmental practices:

> it would appear that assistance of a large magnitude would be required if environmental protection objectives are to be attained through reliance on private landholders' production and investment decisions (Cromer [4], p.50).

A worthwhile adjunct (discussed in Jones [1]) would be to introduce legislation to require more satisfactory practices. At present

> There is little legislation designed to ensure the maintenance of environmental standards on privately owned forest land *in any State* (Cromer [4], p.13; our italics).

There is none in Tasmania and, what is worse, there is no effective legislation to require observation of environmental standards on public forest. The forest industries even have a moratorium under the Tasmanian Environmental Protection Act until 1977.[2] New forestry legislation and legislation controlling pulpwood operations are urgently needed in several Australian states, and nowhere more than Tasmania. For drastic Tasmanian forestry practices are proceeding apace – far more rapidly than sustained yield would permit – though there is

(i) virtually no data on the natural ecosystems being cropped;
(ii) no inventory of plants and animals is available, let alone knowledge of the effects on wildlife of particular cropping methods;
(iii) no measurements of substance are being taken on soil erosion, run off, nutrient loss or water quality (Jones [1], p.89).

There is, furthermore, a quite inadequate system of parks and forest reserves. A number of important areas proposed as national parks, in particular the proposed South West Tasmania National Park, Norfolk Range National Park, and Central Plateau National Park, lie partly within pulpwood concession areas.

The unregulated and unsatisfactory nature of the Tasmanian operations is especially alarming because of their extensiveness.

> Pressure on resources has reached the stage that previously inviolate reserves, e.g. the Picton Valley area, are now about to be exploited. There is even some discussion of alienating a portion of the Hartz Mountains National Park for forestry purposes. Tasmania faces the dismal prospect of a carve-up of its scenic south-west by hydro-electricity [mining] and forestry agencies ... (Jones [1], p.80).

The Tasmanian National Parks and Wildlife Service, supposedly a "conservation body",

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1 Similarly T. Walduck, who is assisting A.G. Webster and Woolgrowers with their plans to amalgamate the management and marketing of pulpwood from private forests, suggests (in [1]) that royalties of $2 – 2.50 a ton are required for proper regeneration of private lands. Walduck also complains that while Japanese prices rose by 67–94% in recent years and 91% in the Pacific Basin, they increased by only 29% in the same period in Tasmania.

In contrast to Jones [1] and Walduck [1] and others, the Working Party claims, however, that

> insufficient information was available to determine whether the royalties received for private timber supplies are adequate (Cromer [4], pp.14-5).

The Working Party characteristically failed to find unfavourable information. Moreover the Working Party subsequently went on to present information inconsistent with their initial claims (see especially p.35; also p.50).

2 A set of simple and modest legislative changes, which would result in much overdue changes in Tasmanian practices, are proposed in Jones [1], pp.92–9.

proposed, to the consternation of Tasmanian conservationists, that

> an area of approximately 2,300 hectares of forested land in the Hartz Mountains National Park ... be revoked and made available for forestry purposes (Southwest National Park [1]).

The effect of the pulp and paper recession. The world recession in paper demand escapes mention by the Working Party, though it has had – through closure of one project and quantity reductions in others – severe local economic consequences in Tasmania. Even at Eden,

> production levels are currently (early 1975) being held at lower levels than provided for in expansion plans, because of the present world recession in demand for paper (Scott [1], p.40).

More recent evidence reveals that production levels will be further reduced:

> The world wide pulp and paper market continues to be in a somewhat depressed situation and buyers of timber resources in Japan and other parts of the world are accordingly temporarily restricting their purchases ... Under these circumstances Harris-Daishowa has to play its part in the form of some reduction in export from Eden of its hardwood woodchips as against the earlier figures which had been budgeted (Harris-Daishowa press release reported in the *Imlay Magnet*, September 18, 1975).

Not only are production levels to be cut at Eden and elsewhere, suppliers are being asked to reduce prices – a matter which will accelerate the economic impact of the present recession –

> Due to the downturn in the Japanese paper and pulp industry all major Japanese pulp and paper manufacturers are asking their suppliers to reduce production by a minimum of 30%, also to reduce prices. This applies particularly to Daishowa and Sanyo Koksuku. Daishowa's president has currently made a visit to the United States to ask their USA suppliers to reduce in the same way as Australia has been asked to reduce production/prices (Kelly [1]).

In Tasmania, where one woodchip operation has been closed down and others have severely reduced their chip intakes, matters are worse. Many employees have been thrown out of work, and many logging contractors are going bankrupt or else are saved from doing so only by federal assistance through the Regional Employment Development scheme – further social costs[1] which reflect the high level of instability in a booming woodchip industry.

> The 'boom' that the woodchip industry brought to Tasmania has turned into an extravagant 'bust' – a financial dilemma that is coming to light as the unemployed, the over-committed and the already bankrupt get together to sort out their plight. ...
>
> Twenty-eight log hauliers who have lost their contracts because of the slump, say that they have a combined debt of almost $1.75 million on machinery, equipment and other commitments, and they suggest that the State's log haulier could owe as much as $10 million (Devonport *Advocate,* March, 1975).

Similarly,

> Woodchip log contractors are facing an early prospect of bankruptcy, while Tasmanian sawmills are choked with sawlogs for which they have no outlet (Hobart *Mercury,* March 12, 1975).

1 There have been increasing social costs from the woodchip industry in many other respects as well. Another set of these costs also concerns log hauliers. Several sessions in a symposium on management of road maintenance held in Launceston in 1974 drew attention to the heavy impact of chipwood trucks on Tasmanian roads and to the other social impacts of log and chip cartage (e.g. traffic hazards and congestion, noise and heavy axle loadings on surburban streets when carters return and leave home, damage to nature strips, road debris, flying debris).

Both in Tasmania and Victoria, APPM has huge quantities of unsold papers in its warehouses, and order books substantially down on 1974.

In Japan, paper and board factories were operating at 40–60% of capacity early in 1975 (*Australian Financial Review,* Februarv 11, 1975) and the situation has since deteriorated. The recession has also affected the Manjimup project. The Japanese have asked for the first shipment of woodchips to be delayed from March to May 1976, and apparently want to renegotiate the contract to permit reduced annual tonnages (SW Forests Defence [1]).

The recession does not however mean a curtailing of plans for further and expanded projects, only some postponements. In the words of a spokesman for the Japan Paper Manufacturers' Association:

> We will surely need more materials when the domestic business in general recovers.

Hence the many further proposals for woodchip schemes both in Australian and in neighbouring Pacific countries.

Extensions of established projects and newly proposed projects. Harris-Daishowa's eagerness to extend its Eden operations is one reason why the Company commissioned the Scott Report, and the virtues of extensions of the Company's operations are correspondingly extolled in Scott ([1], e.g. p.25):

> The most likely additional resource to be utilized is in Victoria. ... Economic benefits of scale to the project could be expected.

A more pressing reason for the commissioning of the Scott Report is linked with this desire for Company expansion, namely that the Company's export permits expire at the end of 1976, and that extension of the permits is conditional, among other matters (such as a satisfactory export price), on the establishment of a pulp mill, should this prove feasible.

> If the Company established a pulp mill, it forecasts a need for a total of 1.3 million tonnes per annum of woodchips. 700,000 tonnes will be used for the pulp mill and 600,000 tonnes to be sold as chips (Scott [1], p.225).

In fact the Company does not need the extra 600,000 tonnes of chips for such a pulp mill, but its parent, Daishowa Paper, wants raw chips, and probably would not proceed with the pulp mill without such a guaranteed supply. With its second mill, Harris-Daishowa now has the capacity to process the whole, enormous, 1.3 million tonnes annually, and has planned to expand export production to 850,000 tonnes by 1978.

According to the Minister for Environment, however,

> The Company has been clearly informed that the second chipper-line's establishment has no implications whatsoever in the Australian Government's attitude in any future applications for increases or renewals of export approvals. ... Any application for renewal of the current approvals would be subject to the provisions of the Environment Protection (Impact of Proposals) Act 1974-5 (Berinson [1]).

The Scott Report will, no doubt, in due course provide the required Environmental Impact Statement which Harris-Daishowa must submit. Though the procedures of the environmental protection legislation will be complied with, it would be rash to assume that the outcome is not determined. The costly duplication of the Harris-Daishowa chip mill was not undertaken simply with the hope that its full use might gain approval:[1] In fact the

1 Nor was it undertaken, as Berinson [1] understands, to

> merely increase the productive capacity of the mill so that the Company can achieve production levels more closely in line with their current export approvals.

A second mill would not have been warranted for such a purpose, especially in present recessionary times. The Minister cannot have reflected on Harris-Daishowa's expansion plans (graphically displayed in Scott [1], p.39).

Company evidently believes that official approval for expanded operations had been granted before construction of the second mill proceeded (see pp.285-6 below). The environmental impact assessment will, one rather suspects, be a carefully staged affair which delivers the already determined approval (not that the legislation requires, as it should, that recommendations of properly constituted environmental enquiries are followed). There are also further grounds for this suspicion. On the one hand, the NSW Minister for Lands and Forests, J. Mason, has intimated that nothing, short of revolution, could stop the Eden woodchip industry (*Imlay Magnet,* July 31, 1975, p.1), and subsequently that the State government is strongly in favour of the project. On the other, the Federal government has stated that it will accept environmental impact assessments carried out by, or in conjunction with, State agencies. The suspicion is that, should the Federal government stick to its ruling,[1] the Federal government may well accept a NSW assessment which finds in favour of an expanded Eden project.

Since in NSW 'the land within 160 kilometres of Eden appears to be committed' (Scott [1], p.227), the obvious source of the additional pulpwood supplies is Victoria, but 'the Victorian Forestry Commission has not let an agreement to supply pulpwood to the Company ' ([1], p.225). Should Harris-Daishowa fail to win long-term access to Victorian forests, and perhaps in any case, it is likely to go further afield in New South Wales.

> Other machinery such as the mobile chipper and [technological] improvements ... could also bring into account other forests now beyond economic range (e.g. Bateman's Bay and Tumut). These areas are however limited by the possible allocation of this resource to other forest industrial undertakings (Scott [1], p.78).

Harris-Daishowa is not alone in aspiring to extensive pulpwood concessions in East Gippsland. A group of sawmillers from the Victorian Sawmillers' Association[2] has formed a company, the Gippsland Paper Pulp, with the object of establishing a Kraft pulpmill at Orbost, Victoria (*Weekly Times,* August 27, 1975). Further pulpwood operations in the East Gippsland forests are frozen until the Land Conservation Council of Victoria makes its recommendations, later this year. In the light of its past recommendations it can be expected that the Council will not object to substantial parts of the almost two million acres of State and Crown forests in the region being committed to sawlog-pulpwood extraction provided certain environmental safeguards are observed. The Victorian Forests Commission has indicated that a project like the Eden operation would not be permitted in Victoria as the coupes are far too large (a maximum size of 65 ha is planned in Victoria) and regeneration would need to be at least 25% better to satisfy the Commission. However the Commission is evidently keen to expand integrated sawlog-pulpwood operations in East Gippsland. To meet the problem of root rot, which is widespread in the region and will be dispersed by woodchip operations, the Commission plans to "salvage" heavily infested areas by clearfelling and, after fertilization, to replant with phytophthora-resistant species such as blue gums (*E. globulus* or *E. stjohnii*), which have grown rapidly in

1 There are now statements from the most recent Minister, J. Berinson, indicating that it may not.

2 An association in which Harris-Daishowa's former rival APM is well-represented through subsidiaries, and has much influence. Victorian Sawmillers and APM are apparently investing $24,000 in a joint socio-economic study of the Gippsland area. But according to some sources APM itself does not want to harvest pulpwood from East Gippsland because of the higher cartage costs involved and higher royalties — twice those that APM is presently paying for pulpwood for its Maryvale plant.

The very cushioned ride that APM has in Victoria, both through a cheap and guaranteed source of fibre from public forests and through lax pollution requirements, is documented in Rawlinson [1].

experimental stands in the area. Similarly, hill forests which the Commission considers to have been badly degraded (from a wood production standpoint) by fire or insect or fungus attack will be clearfelled and then aerially reseeded with preferred species. Thus under Commission planning the forests of East Gippsland which remain under forestry control will be gradually converted to pulpwood monocultures, and the diverse natural forests and many of their inhabitants eliminated.

Nor is Harris-Daishowa alone in considering woodchipping centered on the Bateman's Bay region. Allen Taylor and Co. have recently acquired most of the sawmills in the immediate area, and many of the early signs of a woodchip project can be discerned in the region.

The other Australian woodchip project proposals under active consideration at present are four proposals which together span northern NSW and southernmost Queensland, from Sydney north to Brisbane. Three companies have submitted environmental impact assessments to the State Pollution Control Commission (NSW), as follows:—

(1) Allen Taylor and Co. Ltd. (a subsidiary of the Blue Metal Industries group), in partnership with C. Itoh and Co. of Japan (already well-entrenched in NSW woodchip operations through the company Daishowa Paper), plans to export more than 350,000 tonnes of woodchips annually through the port of Coffs Harbour. It is planned to haul material from as far as 150 miles radius from Coffs Harbour (see Taylor [1]).

(2) Toyomenka (Australia) Ltd., acting on behalf of itself, Toyo Menka Koisha Ltd., Tokyo and the Nippon Pulp Industry Ltd., Tokyo, in the most specific of its many alternatives, plans to export 240,000 tonnes annually through Newcastle and a minimum of 300,000 tonnes annually through a new port to be constructed at Iluka.

(3) A joint venture (of the Standard Sawmilling Co. of Murwillumbah and Carter Consolidated of Auckland NZ) aims to export a minimum of 300,000 tonnes of chips a year through the port of Brisbane. This project (see Standard [1]) would draw supplies of chip and billet wood from southern Queensland and from northern NSW, especially from the Casino forestry district (Forest Region 11).

The environmental impact statements submitted by the three groups bear a striking resemblance to one another; they all represent their operations as waste wood removal; they are all competing for material; they all cite major benefits that would accrue from their proposals but find only minor or trivial costs; they all avoid important specific details which should have been supplied, such as the minimum royalties to be paid, and quantitative data as to the effects of their operations; they all assume that various sorts of socially and environmentally damaging industries are perfectly admissible if the exploitation is Australian; and so on. As a result there is an emergent resemblance: none is at all satisfactory.[1]

The proposals try to make much of the contention that, in contrast to the project at Eden, their projects would rely on waste wood. Thus

> the proposal is basically a waste removal operation. ... The proposed venture is different from any other woodchips operation in Australia, in that it does not require large-scale clear felling of forests to provide pulpwood for chipping (Taylor [1], p.12 and p.1).

Similarly Toyomenka ([1], e.g. p.S1) and Standard ([1], e.g. p.1, p.6). The proposals are, however, by no means the only woodchip projects to be *mis*represented as waste removal operations. According to Harris-Daishowa directors [1] commenting on their NSW South Coast operation:

> Harris-Daishowa (Australia) Pty. Ltd., is a manufacturer producing woodchips from waste material.

And the same has been claimed of other Australian woodchip proposals and operations, e.g. East-Gippsland and even Tasmania. What is not said, but follows (e.g. from Taylor [1]), is that wood waste comprises *much of the forest* that is economically chippable that does not wind up as sawn timber. In short, the proposals apply a high redefinition of 'waste',

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1 A much more detailed critique of these proposals may be found in Routley [6].

so that what in the forest does not or will not supply sawn timber is "waste".

The new proposals for the North Coast do not differ in kind, but only in emphasis, from other Australian woodchip proposals and operations. The East-Gippsland proposal and the Eden operation have *the same ingredients* as the allegedly different North Coast ventures: removal of sawmill waste; removal of most or all the remainder of the forest, in effect "timber stand improvement" or in the limit clearfelling, after sawlog extraction (now thinly disguised as one sort of 'forest residues'); removal, again by clearfelling, of forest on private land ('agricultural residues'); and future extraction of plantation thinnings ('silvicultural residues'). Despite the new attire, the North Coast projects, should they eventuate, will be more of the same, and in the longer run result in just as much environmental damage as other Australian woodchip projects. They will have similar social costs, and they will exact for their operation similar substantial public subsidies. They will have a similar severe effect on private forests,[1] and will lead to increasing dependence and pressure on Crown forests.

The expansion of total logging operations in the surrounding region. There are few parts of the surrounding Pacific with even moderate forest regions which have escaped consideration for integrated or pulpwood forestry operations. The cutting out of the rich Indonesian and Malaysian rainforests continues apace. Now the forests of Melanesia are under threat (see Routley [4]). In New Zealand the pine planting program has been vastly expanded with the result that its implementation will involve the clearing of many patches of the now poorly represented North Island rainforests, and of many regenerating hillsides, as well as the harvesting of much exceedingly steep and erodible country. The proposed South Island Beech scheme (discussed below p.196ff.) encountered a great deal of opposition from conservationists (for reasons well explained in Searle [1] and [2]) and also some resistance from the NZ Institute of Foresters, who claimed that the resource was not adequate for the projects planned. Because of the political sensitivity of the issue the NZ Government has decided to shelve decision-making on the Beech scheme at least until after the forth-coming elections (in November 1975).

The outlook. The planned expansion of Australia's forest industries continues to develop according to the master plan developed at the Forwood Conference; the plan (as pointed out below) is essentially that of turning the native forests to woodchip production and producing sawlogs from pine plantations. There has, however – despite the enormous importance of these native forests for conservation and the future quality of life in Australia, and despite the fact that the expansionary plans which are likely to affect these features so adversely have been drawn up by (and in the interest of) the forest industries themselves – been no proper federal attempt at an independant overall assessment of the likely benefits and costs to Australians of this expansionary program. As Bannister [1] has argued, the undertaking of such an inquiry is a matter of considerable public importance.

Despite the House of Representatives' Softwood Inquiry, there has been no winding down of the pine planting program (except as induced by the pecuniary state of forest services). And the program of woodchip export expansion, discussed in chapters 9-13, though temporarily decelerated by the present slump in the pulp and paper industries, nevertheless proceeds, with many more woodchip projects planned. Should these plans come to fruition most of the forests of south-eastern continental Australia will be committed to pulpwood production. APM expansion and the East Gippsland scheme will absorb most of the Victorian forests east of Melbourne which are not already committed to heavy sawlog production. Projects centered on Eden and Bateman's Bay will utilize most of the South Coast forests, while North Coast projects, probably exporting out of Newcastle and Brisbane, will commit forests from Sydney to Bundaberg. Nor have plans for more northerly projects in Queensland and in Northern Territory been abandoned.

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1 The dismal prospects for private forests sketched for Tasmania apply also at Eden (cf. Scott [1], pp.76-7 and p.51, and also Cromer [4], p. 35 and p.50). The bleak outlook is not confined to Australia: in the Pacific Northwest of USA private forests 'are being liquidated much faster than they are growing back, where they do' (*Sierra Club Bulletin,* August-September 1975, p.24).

In the meantime the Federal Government has itself become a part of the forest industry. By the date of writing the AIDC has purchased an 11% share of the W.A. Chip and Pulp Co. which holds the Manjimup concession, and of which a director of the AIDC is also a director, and a 49% share of Northern Woodchips (an increase from a holding of 20% at February 1972). Northern Woodchips is a Tasmania company which, prior to its reduction of exports in 1975, obtained its material from the clearing of forest on private land. The Tasmanian Forestry Commission has estimated that only 5% of this land is reforested. The AIDC is rumoured to be strongly interested in the development of woodchip projects elsewhere, particularly North Coast schemes.

Since the AIDC invests public funds at a rate of return which last year averaged 2%, this represents yet another public subsidy to this industry. More importantly, the purchase represents an attempt to encourage and develop an industry which, at least in the case of Northern Woodchips, is directly engaged in the destruction of scarce and valuable Australian forests and to develop, with virtually no environmental controls, and industry which will have a major adverse impact on the environment. Thus the Federal government, which with its right hand establishes to date rather ineffective semi-bureaucratic organisations such as the National Heritage Commission designed to preserve the Australian Heritage, is with its left encouraging the development of an industry which is very effective in destroying one of the most important parts of that heritage. The point underlines again the fact that some forms of "socialism" simply involve replacing privately controlled and directed destruction of the environment by state controlled and directed destruction.

It has been suggested that one of our major theses, that forest services operate with a growth and development ideology which gives overwhelming emphasis to wood production and industrial interests at the expense of other values, is no longer relevant, and that substantial improvements, in both ideology and practice have occurred which have gone a long way towards rectifying the situation described in the main text. There have been, it is true, some victories, notably on the Boyd Plateau, and some improvements in practice, for example, reduction in coupe size at Eden (to 500 acres), scattering of coupes and the appointment of a wildlife officer to advise on modifying forestry operations (the latter at the expense of the underfunded National Parks and Wildlife Service of NSW). However the improvements in practice are quite minor, while the basic impoverishment continues and other major abuses continue; and in virtually all these cases improvements have not been initiated by forest services, despite their fondness for describing themselves as "professional conservationists", but as a result of public concern and pressure. In some cases, for example, the Boyd Plateau, improvements have been achieved in the face of strong resistance from the forestry service concerned.

There seems, in fact, to have been little basic improvement in outlook or decision making. It is, it is true, becoming difficult to pick up a survey article by a forester which does not contain an encomium to multiple use, normally taken to be in practice on our public forests. However the concept is still largely employed as a public relations task and is still not properly understood by most of those who pay lip service to it, who too often identify it with the making of a few inadequate concessions and the retention of a tiny fraction of the forest as reserved areas (for example, the .25% of NSW forest under reservation as flora reserve in the Forwood model state, NSW). In the meantime there is no real improvement in practice. For example forest services persist in an apparently inflexible commitment to large-scale clearcutting (where possible to be followed by burning, see Mount [1]), despite the existence of alternative methods of managing the forests, such as selection or group selection or small patch cutting, which are much less damaging to non-wood production values of the forests.[1] Yet large-scale clearcutting is rapidly becoming a standard method of managing eucalypt forests. Critics of present forestry practices

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1 Quite often the advocacy of this practice is based on a simple confusion between necessary and sufficient conditions. A good example is provided in Mount [1] where clearfelling is described as "the key" to forest regeneration and hence to a sound and healthy forest which will maximise all values. The argument depends upon an ambiguous reading of "key", ambiguous between necessary and sufficient conditions. If it is being claimed that clearcutting (as opposed to alternative methods for obtaining regeneration of shade-

are customarily denigrated as "extremists" (see, for example Australian Forestry Editorial [1]); however given the inflexible commitment to methods of harvesting which sacrifice non-wood values to such a heavy extent, it is fairly clear who are the real extremists.

Despite the emphasis on multiple use in public relations, it does not really play a part in decision making, as evidenced by the failure to devise or use multiple-use decision models or even to take account of other values in an informal way in decision making (see for example, the Working Party Report, Cromer [4]). Nor does multiple use feature properly in the antiquated legislation which directs our forest services. Not a single forest service, despite the alleged liberalisation of outlook, has thought it necessary to recommend or properly support changing forestry legislation to specify a less wood-production oriented set of goals. It is probable that most would resist such changes.

Sustained yield of wood production is another ideal which is frequently invoked by foresters (see for example Cromer [3]), but which is neither embodied in forest legislation nor, in general, applied in practice. Despite all the talk of "renewable resources" there is good reason to believe that Australian forests continue to be overcut. This situation is now officially confirmed for at least one state, Western Australia, where it is now admitted by both the relevant state minister and the WA Conservator of Forests that WA's public forests are being overcut to a considerable extent – at a rate approximately 1.5 times the rate of natural increment (see, e.g. Softwood Inquiry [1], p.2083).[1]

Overcutting is also occurring on private land in all states, but especially Tasmania. Similar but undisclosed overcutting is no doubt continuing in other states – the evidence for this is to be found, not merely in the claim that *past* overcutting has "run the forests down", thus necessitating large scale clearfelling, but in the Forwood figures for projected yields for hardwood sawlogs, especially in Tasmania and in NSW, and in the impossibility of obtaining clear working plans showing that cutting operates on sustained yield. The passing of satisfactory multiple-use sustained-yield legislation (for example, along the lines of the American Act) is a crucial first step in redirecting the activity of forest services and improving the management of public forests. It should be a condition of continued federal aid for state forestry.

In other respects also there have been only minor improvements. The research effort, especially on non-wood values, has increased only slightly (for example the Eden project now employs a hydrologist), but it is apparently felt that the continued repetition of the same (largely discredited) a priori arguments for the soundness of turning the forests over to large scale clearcuts or intensive integrated operations is an adequate substitute for empirical research (see, for example, such articles as those of Gilbert and Richards in 'Forest View' Campaign [1], where the old, empirically-defective arguments designed to convince us of the ecological soundness of intensive industrial forestry are wheeled out yet again). In most states the position on public participation and the availability of information has not

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1 (continued from the previous page)

intolerant species such as those discussed on pp.231-5) is *necessary* to obtain regeneration, that is simply not true (as argued on p.327). It is obvious that one does not need to clear areas of 1000, 500 or even 40 acres in order to provide light and adequately reduce competition for young trees, and there is considerable empirical evidence for quite small cuts being adequate, some of which appears in Gilbert [1]. This shows that clearcutting is not *necessary*. And while clearcutting together with other conditions (presence of seed, etc.) may be sufficient in the *short term* for adequate regeneration, it by no means follows that it is the best means to achieve renewal of the forests when all values are considered. In fact it clearly is not.

1 The excuse for this overcutting (which may well have a bearing on many of the serious ecological problems affecting WA's forests) has been that it is required to provide employment in the "economically depressed" south-West. However at the same time the Australian government has been engaged in a special drive for migrants prepared to go to the area to fill an alleged shortage of workers in the timber industry!

improved noticeably.[1] Forest services do not seem to have reacted to the widespread public criticism of their activities and objectives by reassessing their priorities and improving their programs and by becoming more responsive to areas of public concern, but by hardening their line, stepping up the public relations campaign designed to justify on-going activities, and by denigrating their critics (see again, 'Forest View' Campaign [1]).

The overall position, then, is that things forestry have changed largely for the worse. There is no less cause for vigilance, nor can the management of forests now be left to enlightened foresters. Despite the claims by university foresters (e.g. Florence [7], Ferguson and Reilly [1]), forestry ideology appears to have shifted little – at best we are offered a thin conservation veneer in Victoria and not even that is supplied in Tasmania. The forestry way of meeting criticism has changed little also: instead of changing practices in the direction of environmental and economic soundness, extensive and expensive publicity campaigns – which attempt to vindicate industrial practices with the same old inadequate arguments (criticised, e.g. in chapter 1 below) – have been initiated and political lobbying intensified. At the same time, quite moderate views advocating a better balance between forestry exploitation and environmental conservation, such as those of the Australian Conservation Foundation and the Nature Conservation Council of NSW, and also those of the present authors, have been branded extremist (e.g. Australian Forestry Editorial [1], Florence [7], Richardson [1]).

Finally we see no reason to revise our central thesis that the forests are a public resource run at considerable public cost in the interests of the forest industries. Indeed evidence for this thesis continues to mount. The number of senior foresters who, on retirement or resignation from forest services, can switch to representing the views of industry with scarcely a change of tone or pause for breath, continues to grow. Indeed as Toyonenka ([1], p. 56), and many other sources demonstrate, the forest industries and services engage in mutual admiration and support. (It would be surprising indeed if industry was so enthusiastic about a body which was really placing serious constraints on its activities.) The views of forest services and industry continue, in most respects, to coincide at each inquiry, hearing and conference. Individual foresters in some areas (e.g. the ACT) are closely associated with industrial pressure organisations such as the Hoo-Hoo club, an organisation whose political aims include preventing the reservation of further forest land in national parks (see VNPA [1], and also p. 209 below). Nothing could more clearly indicate the industrial orientation of those in charge of our public forests than the determination of the Australian Forestry Council to ignore the report and recommendations of a parliamentary inquiry to which all with an interest in the forests were able to and *did* contribute, in favour of the report of a heavily industrially biassed conference – Forwood – at which a strong effort was made to exclude meaningful participation of those thought likely to oppose the dominance of industrial interests and suchlike. The only respect in which we would amend the central thesis is that we now see the feature of matters being run in the interests of industry as pervasive in current social organisation.

We have therefore left the main text intact.[2] We believe that it is still relevant, and that there is just as much need as before to fight for the forests.

1 October, 1975

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1 For example after more than nine months correspondence the authors are unable to obtain from the relevant minister an answer to the question as to whether the New South Wales Forestry Commission intends to reduce its pine planting program in line with the revised Forwood figures and which areas it now intends to plant.

2 (footnote on next page)

2 Including typographical errors and including the passage, which – apart from our refusal to observe the jarring and affected anachronism of employing 'data' as a plural noun – has apparently raised more ire than any other, viz. the quote from Watt on p. 76 (see, e.g. letters in the *Institute of Foresters Newsletter*, vol. 15, December, 1974, and the *Australasian Beekeeper*, 1975, and NSW [14]). It is our belief that the statement quoted is, as we claimed in the text, *implied* by the full passage we quoted from in the preprint of the paper. Watt has in effect asserted the implication that *if* such an opportunity cost rate is accepted and *if* forestry earns what it appears to earn, most forestry would not be economic. He may *also* wish to reject the conclusion, in which case he is, if he is to be consistent, also committed to rejecting the premisses. It appears that he does wish to reject one of the premisses. The premisses seem to us to be reasonable however, and there is independent evidence for them, as we argued. The selective statement which we quoted however, does not entail that Watt accepts the conclusion (or the premisses), and his assumption that it does is a logical fallacy known as affirming the consequent.

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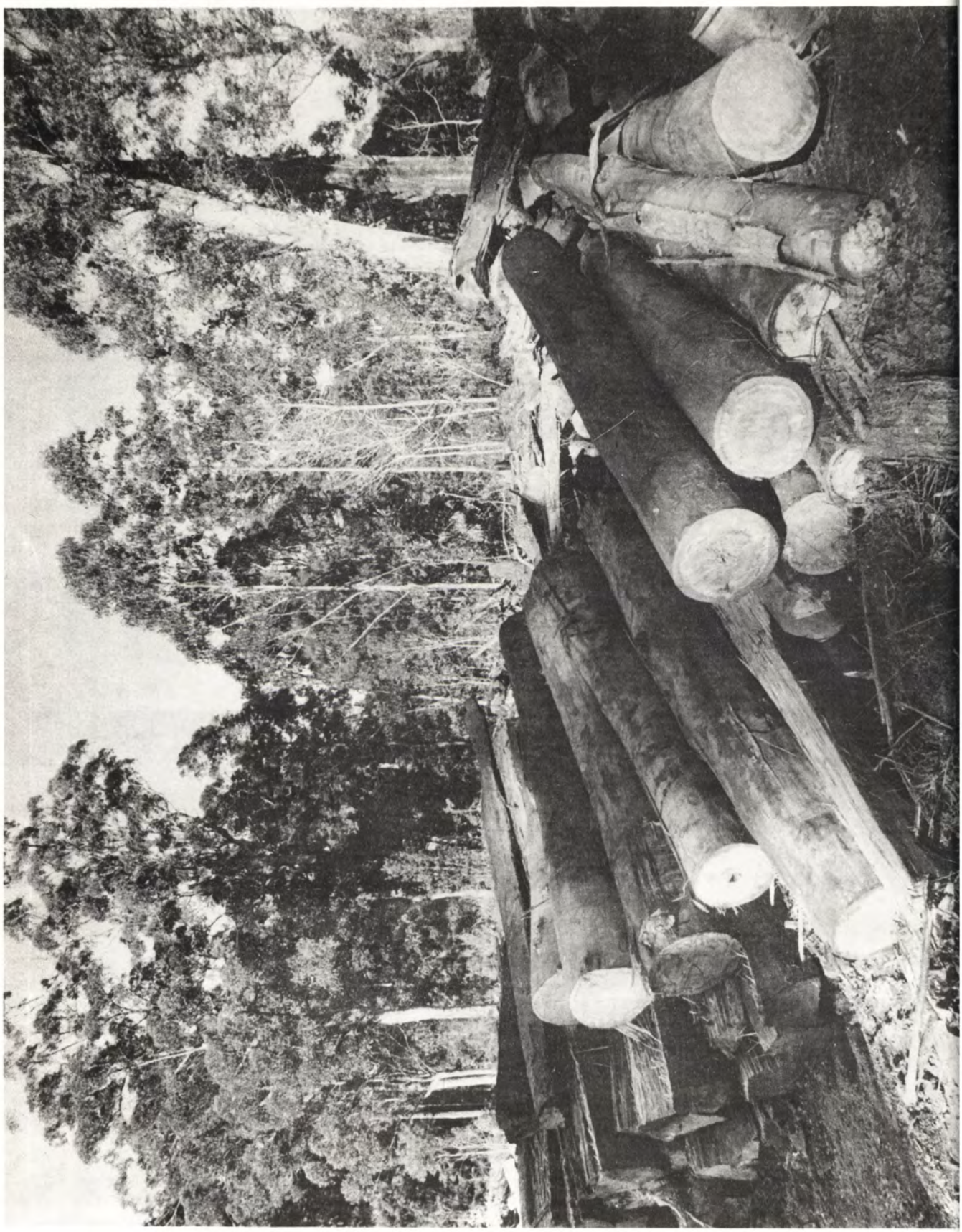
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Rock-bottom forestry. Figure shows extent of erosion of this arbitrarily selected recent snig track on a steep slope at Eden. Cross drains have been constructed but have washed out. All soil horizons to a depth of 4' have been lost. No slope limits are enforced at Eden and none are contemplated.



Saw logs ready for loading to the chip mill. Visitors to the project look in vain for defects in many of the logs being cut up for chip billets. Many potential sawlogs also go to the mill. A projected future shortage of sawlogs in Australia is claimed to be a serious problem and is the main rationale for the destructive pine program.

'Nor is there much satisfaction in contemplating the world with nothing left to the spontaneous activity of nature; with every rood of land brought into cultivation, which is capable of growing food for human beings, every flowery waste or natural pasture ploughed up, all quadrupeds or birds which are not domesticated for man's use exterminated as his rivals for food, every hedgerow or superfluous tree rooted out, and scarcely a place left where a wild shrub or flower could grow without being eradicated as a weed in the name of improved agriculture.'

John Stuart Mill, *Principles of Political Economy*

CHAPTER 1

THE WOOD PRODUCTION IDEOLOGY

Even if the survival-threatening disaster predicted to result from unchecked population and consumption growth, pollution and runaway technology should be averted, what does seem inevitable is that these factors will all too soon produce a world stripped of much that is valuable and beautiful, and in particular that they will put great, perhaps, irresistible pressure on the remaining natural areas.[1] It ought not to need emphasizing that a world from which what is natural has been largely eliminated, degraded, or reduced to tiny pieces of museum status, will be greatly impoverished, and human opportunity in such a place would be similarly impoverished. In fact a world from which natural areas have been permanently eliminated would be impoverished in a more significant way than one which has exhausted the commercially important nonrenewable resources about which so much concern is exhibited. It is reasonable to expect that as pressures from population growth and other factors grow conflicts over the elimination of natural areas will increase (hence those who see conflict and confrontation as exceptional and easily avoided by such simple devices as impact statements and land-use committees, and who see destruction, such as that of rainforest and of Lake Pedder, as a hangover from a barbarous and unenlightened past, are not facing the facts of future scarcity and competing demand). Pressures on remaining natural areas from these factors and others are certain to increase – exponentially.

We are concerned here with one of these pressures, that from intensive forestry. For now the greatest threat to remaining natural forest areas in developed countries comes less from expansion of agricultural clearing than from intensive forestry. Australian forest services, despite their self-proclaimed reputation as conservationists, will in the next few decades replace agricultural interests as the main destroyers of remaining natural forest areas (in fact with the virtual cessation of agricultural clearing perhaps they already have) and they have in some states already replaced agricultural interests as the main obstacle to the creation of a satisfactory national park system. In part this increased pressure on forests is not their fault, for some increased forestry pressure on forested lands is the inevitable result of population and consumption growth, leading to increased demand for forest products; however for the most part it is, as subsequent discussion will show, not dictated by these factors outside forestry control but is largely avoidable. The availability of new methods for wood production closely resembling those of modern agriculture has produced dissatisfaction with the normally low-yielding natural forests, and the upshot is the intensive 'tree farm' treatment of the pine plantation and woodchip franchises. The attraction to foresters of these methods is their improved yields per acre and the increased efficiency of the forest as a wood production unit leading ultimately to the ideal of total use of the forest crop for wood production; the attraction is not profitability, for that intensively managed forests yield a better return on the whole is far from clear. However these new methods generally have a bad, and at times disastrous, effect on forest values other than wood production, and their ability to sustain even long-term intensive wood production is suspect.[2]

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1 The pressures of growth on the environment are sketched in Appendix 2.

2 As is explained in later chapters.

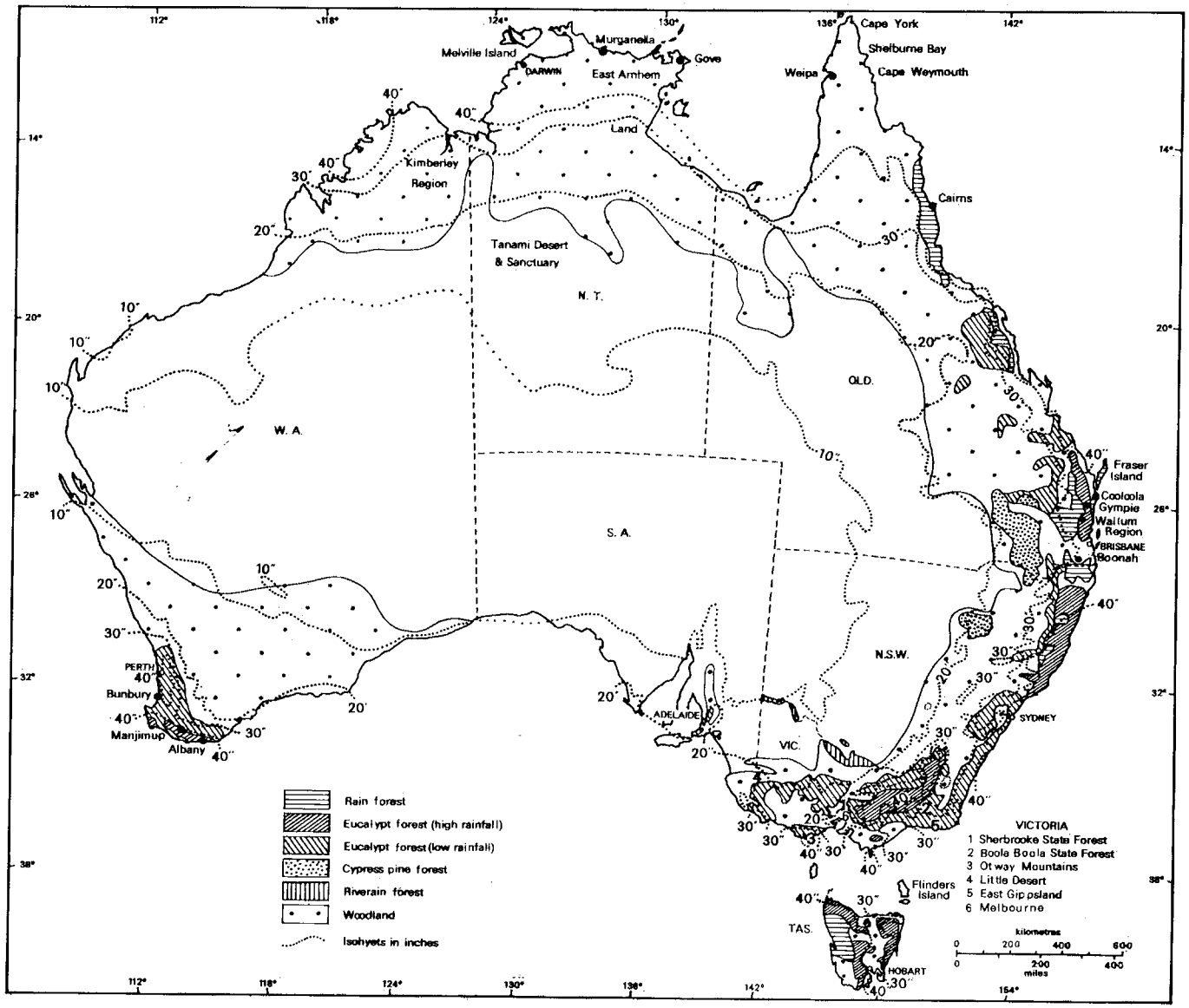
The fight against intensive forestry and the inroads it is making on the natural environment is not confined to Australia; it is underway in other countries, such as USA, Canada and New Zealand. Nevertheless the conflict created by intensive forestry between wood production and other values is particularly severe in Australia, despite the small present population, because Australia has only 87 million acres of real forest[1] (compared with other countries an exceptionally small proportion of its land area), and a rapidly growing population which will be concentrated on the wetter coastal regions where most of the forests – before European settlement about 15% of the continental area, but now occupying only about 4.5% of the continent – lie. The comparison with other representative countries, tabled below, is illuminating.

Plainly Australia is not well endowed with forest areas. Moreover the small area of Australian forest, which contains some of the most beautiful and interesting forests in the world, must serve a great variety of purposes. In short forests are scarce and valuable. Very little of this forested area (only about 3 million acres[2]) is reserved in national parks, most of the remainder being either directly (as state forests, etc.) or indirectly (as Crown lands, over which forestry exercises timber extraction rights) under forestry control. Contrast continental USA, with a comparable land area, which has 38 million acres of parks, much of it forest.

Despite this extremely small area of natural forest and forest reserves the powers that control our forestry services have decreed not only that Australia should become the *only* trading nation in the world which is *self-sufficient* in forest products (FAO [6]), but also that it will become a large exporter of forest products mainly in the form of hardwood chips but possibly also of softwood logs. The aim of self-sufficiency and of creating an export industry in hardwood pulp is to be achieved from this small area of natural forest by 'expanded wood-production management', by a much greater degree of control, manipulation and use (ideally total use) of forest areas for wood production, i.e. by intensive forestry; this will replace the present predominant non-intensive use of forest areas. It is clear that these results will not be achieved without substantial cost to the environment and a reduction in quality of life for Australians. It would place great strain on natural forest areas and inevitably involve the elimination of many of them in favour of plantations of species favoured for wood production. Nevertheless not only have Australians not been consulted about these grandiose plans which will have such an effect on the future Australian environment, but they are for the most part secret.

1 Comm [1], Food and Agricultural Organization (FAO) [7]. Larger figures frequently cited, particularly by those who are anxious to make out that Australia is quite well off for forests and does not need to treat them with particular care, include extensive areas of woodland in addition to real forest areas and hence cannot be used in obtaining a comparison with real forest areas of other countries. The following description (Hall et al [1], p.4), while not risking a definition of 'forest', outlines the difference: 'As conditions become more favourable woodlands give way to forest. Improvements in soil features accompanied by greater humidity (very roughly above 25 to 30 inches of rainfall annually) aid the development of denser tree and scrub layers until the tree canopy is more or less continuous and a forest is formed'. According to the more adequate characterisation in Beadle and Costin [1] a *forest* is 'a closed community dominated by meso- or mega-phanerophytes, characterised by flat-topped crowns which usually form an interlacing canopy, and by boles of which the length is greater than the depth of the crowns'.

2 On the assumption that a number of currently proposed parks such as Deua-Tuross-Brogo and in the ACT are dedicated.



Map 1. A broad classification of Australian forests. Primary source: Hall et al [1].

However, as we shall argue, neither the plan to make Australia self-sufficient in, nor that to make it a net exporter of forest products, has any good economic justification, and the individual projects involved in this grand scheme mostly have a poor or doubtful economic justification also. Even if forestry decision makers do not bear responsibility for those stresses on natural forest areas which grow from increased demands for forest products due to domestic population and consumption growth, for the destruction due to the ill-conceived, ill-planned and unnecessary development and export projects they must

TABLE 1

FOREST AREAS AND PERCENTAGE OF FOREST LAND FOR SELECTED COUNTRIES

	Australia	Alaska	Argentina	Brazil	Canada
Total area	769	152	277	851	997
Forest land	35	54	63	518	443
Commercial forest	26	18	55	129	151
Percentage of forest land	5	36	25	57	44

	China	India	Iran	Japan	Papua New Guinea	NZ	USA	Conti-nental USA
Total area	956	327	164	37	46	27	936	766
Forest land	77	62(+)	18	25	36	6	308	243
Commercial forest	39	?	?	18	6	2	215	197
Percentage of forest land	9	22	11	68	78	22	33	32

Figures are in millions of hectares to the nearest million. (2.47 acres = 1 hectare.) Continental USA excludes Alaska.
Primary Sources: FAO [7], Haden-Guest et al [1].
Figures are subject to the same qualifications as in FAO [7], viz. different countries may apply different definitions of 'forest', forest inventories are sometimes incomplete, and figures are for different years and may include cleared land which will be re-forested in the foreseeable future.

bear direct responsibility.

Many intensive forestry export projects seem to be due to an outdated development ideology which is undiscriminating with respect to the sort of economic growth and industrial activity it welcomes, to empire building (an increase in the number of foresters and the volume of forestry activity is often cited as an advantage of the schemes), and to bad economic arguments such as excessive emphasis on accruing balance of payment surpluses. Another factor is the desire to employ the new technology because it is available, and its uncritical acceptance as a desirable improvement simply because it increases yields, regardless both of economic reality and wider welfare and environmental considerations. The persistent clinging to and advancement of projects which decrease the amenity, aesthetic and conservation value of forests, and which have poor economic and other justification, can only be explained on the assumption that those who control forestry planning and management usually set a low value on the natural environment and do not have a proper appreciation of the role of their forests in providing benefits other than wood production. The situation is made worse by the fact that so little of our forest area, and virtually no sizeable areas of first class uncut forest, is permanently reserved in national parks (which seem in fact largely to have been set up on land not useful for other purposes). Because so much of our forested land is controlled by forest services, their attitudes are crucial to the preservation of the natural environment in Australia; if these attitudes are, as the behavioural evidence indicates, unduly oriented towards wood production, the prospects are grim.

Production forestry — cheap wood for private industry

Although it can hardly be claimed that there is strong pressure on forest services to show large profits, the attitude and behaviour of forestry decision makers towards the natural areas they control resembles that one has come to expect from entrepreneurial activity involving the exploitation of the natural environment for profit making. Here however one encounters a paradox. Production forestry is not a very profitable activity. There are few parts of production forestry (excluding processing) which can be justified simply as profitable business ventures producing a satisfactory return on capital invested as compared to other attractive possible investments. Forest services usually make thumping losses: for example the revenues and expenditures of three state forest services on the following table show that expenditure always substantially exceeds revenue, and that in real terms, given by the ratios, the losses are increasing.

The loss pattern is similar in other states where losses are not partly offset by revenue from government sawmills. For example in 1971-2 (1970-1) the Queensland Department of Forestry (which is also responsible for the administration of state parks) received a revenue of $7 million ($5.9 million) but incurred an expenditure of $17.1 million ($15.1 million). Furthermore the ratios of expenditure to revenue have not improved greatly with increased volumes of production; in general as the scale of forestry activity has increased so have the losses. The Tasmanian Forestry Commission, for example, had a better ratio in 1948 than in 1970, despite a 600% increase in expenditure. This remarkable growth (described by the former Chief Commissioner as 'exhilarating and inspiring', Crane [2], p. 43) has then largely been a growth in losses. It is unlikely that intensive forestry will change the situation markedly.

The relatively unprofitable nature of production forestry is generally acknowledged by foresters: for example what D. Cromer, Director-General of the Forestry and Timber Bureau,[1] has said of plantation forestry with pines holds of forestry activity more generally, namely

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1 The administrative structure of Australian forestry and state and territory forest services is sketched in Comm [11], which also explains the statutory functions, composition and objectives of the Forestry and Timber Bureau and of the Australian Forestry Council (on the latter see also Brown and Hall [1], pp.34-5).

TABLE 2

RELATIVE LOSSES FOR THREE STATE FOREST SERVICES

STATE	YEAR	55-56	60-61	65-66	66-67
NSW	Expenditure (E)	5.2	7.2	9.5	10.6
	Revenue (R)	4.2	5.4	5.7	5.5
	E/R Ratio	1.24	1.33	1.67	1.93
Tasmania	Expenditure (E)	1.2	1.78	2.8	3.1
	Revenue (R)	.76	1.08	1.5	1.6
	E/R Ratio	1.68	1.65	1.87	1.94
Victoria	Expenditure (E)	2.9	3.2	7.6	8.3
	Revenue (R)	2.3	2.4	5.8	5.9
	E/R Ratio	1.26	1.33	1.31	1.41

	YEAR	67-68	68-69	69-70	70-71	71-72
NSW	Expenditure (E)	12.0	13.7	14.7	15.8	17.8
	Revenue (R)	6.5	6.4	6.7	6.9	7.9
	E/R Ratio	1.85	2.14	2.19	2.29	2.25
Tasmania	Expenditure (E)	3.3	3.5	3.7	4.2	4.6
	Revenue (R)	1.6	1.6	1.7	1.8	2.1
	E/R Ratio	2.1	2.19	2.18	2.33	2.19
Victoria	Expenditure (E)	8.7	9.0	9.9	10.7	11.7
	Revenue (R)	5.7	5.6	6.0	6.5	7.2
	E/R Ratio	1.53	1.65	1.65	1.65	1.63

Note:

(i) The E/R ratio gives the relative losses in *real* terms.

(ii) Expenditure and revenue figures are in millions of dollars.

(iii) Victorian figures are assisted by revenues from state sawmills.

Sources:

Annual Reports NSW [3], Tas. [2], Vic. [2] and NSW [8].

> . . . the profitability . . . lies not in the forests per se but in the combination of forest ownership *and* manufacturing operations which modify a marginal cost/benefit ratio to a very positive one. This conforms also to the situation with private forest ownership on the European and North American scenes. (Cromer, [1])[1]

Different activities have different cost structures but even where an apparent small profit is made this frequently either depends upon a disguised subsidy, e.g. long-term low interest government loans or ignoring administrative overheads, or the profit itself is so low that it can only be regarded as acceptable at a social discount rate of 6% or less. Intensive forestry is sometimes more profitable than the non-intensive variety, but the advantage is by no means clear-cut in all cases (e.g. Leslie [2]).

We emphasize the comparatively unprofitable nature of most production forestry not in order to argue that it should be made more profitable (for on the contrary there is good reason to think that, unless prices for products are increased, production forestry can only be made more profitable at the expense of the environment and its quality, and that an economy of this sort is indeed false economy), but in order to emphasize the point that production forestry cannot usually be justified as a purely commercial activity and that the exploitative attitudes of the sort encountered in purely commercial activity have even less justification in such a case.

Why then continue with or even plan to expand, beyond basic necessity, an activity so unappealing from a commercial viewpoint? Doing so would be justifiable only if it could be argued either that present forest management provided benefits *other* than wood production, which although not possessing a precise market value, were nevertheless important and valuable, or alternatively that it was desirable to provide a subsidy for forest production and consumption because this was something one wished to encourage. We will begin by considering the first of these alternatives.

The unprofitable nature of present forestry management would be understandable and justifiable if forests were managed along the lines of multiple use, e.g. to provide in addition to wood production benefits such as wildlife and flora conservation, recreation and other less tangible needs, watershed protection, etc. (a range of benefits well outlined in Dasmann [1]). There would then be many cases (not just the occasional flora reserve or forest park) where wood production would take a back seat, because some other value was considered more important. In fact there is a good case for considering that if multiple use were *really* to be practised in Australia where there is such a small area of forest, wood production should normally come *last* rather than first, since forest products can be imported from wetter areas of the world relatively cheaply and more cheaply than they can be produced locally whereas adequate recreational areas for future population, areas for watersheds and wildlife preservation, cannot be imported. It is important to realise that true multiple use does not consist simply of managing forests primarily for wood production and *hoping* that other values will not suffer unduly; it does not consist for example simply in making allowance for public access to wood production areas. Genuine multiple use would have to take account of these in decision-making and planning by allowing suitable values for these along with profitability from a wood production viewpoint. The upshot could be frequent occurrences of cases where maximum wood production was foregone. However when multiple use is defined in this way it can't be claimed that our forests are or have been managed, except rarely, along

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1 It is of course extraordinary that a cost/benefit analysis could so ignore the difference in benefits for private and public interests, and the crucial question: for *whom* is the cost/benefit ratio positive?

the lines of multiple use.[1] Rather they are managed with dominant use as wood production, with other values to be tolerated or promoted only insofar as they do not affect wood production adversely. This widespread practice which has been recognised as policy for more than 90 years in the South Australian Act (SA [1])[2] has recently been legitimised in NSW in amendments to the Forestry Act passed in late 1972 recognising timber production as the dominant use. Both Queensland and Tasmania have similar legislation. Nor is this practice simply a reflection of government policy; it is also a reflection of the training and inclination of most professional foresters in Australia. Although foresters are portrayed (e.g. by the NSW Forestry Commissioner) as forest ecologists, a survey of articles published in the journal of the Institute of Foresters, *Australian Forestry,* the only Australian forestry journal which is not primarily a trade magazine, reveals that over the last 16 years (1956-1971 inclusive) more than 80% of the articles have been solely concerned with wood production or associated matters and less than 2% of the articles were on aspects of forest ecology not directly affecting wood production. Failure of forestry training courses to provide broader training has recently been the subject of protests by Australian National University forestry students (cf. also the editorial of their magazine, *The Forestry Log,* 1970). This narrow orientation is also reflected in the normal absence of research on matters other than those having a fairly direct bearing on wood production, and sometimes in the positive discouragement of other organisations from undertaking such other research. Nor would a genuine education in forest ecology be so strongly oriented to the justification of the activities of state forest services.[3] One obvious conclusion is that in view of the narrowness of their aims and interests forest services in Australia exercise control over an unjustifiably large area of forest (much of which was obtained or retained on the pretext of management for multiple use). However the main conclusion we want to draw from all this is that since multiple use is not practised in Australia in any real sense and there are few cases where wood production or profitability is deliberately and substantially modified in the interests of providing other benefits, it can't be argued that the reason and justification for the poor profitability of forests is management for multiple use.

This production of forest products from public forests at substantial public loss must then be seen as a very substantial public subsidy for wood product consumption and production, including that of paper products. The losses show that the true cost of production of forest products is not being charged to those who use them. If this situation were remedied however, and the price of raw material greatly increased in order to allow a reasonably profitable rate of return, there is no doubt that the consumption of many types of forest products would drop dramatically. Many would give way to substitutes or suffer greatly reduced use. Although it can be argued that in some cases, where the substitute is of an environmentally undesirable kind, this would be a bad thing, the view that forest product consumption of all kinds, including excessive packaging materials, should be

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1 An elaborate definition of 'multiple use' is given in the US Multiple-Use Sustained-Yield Act of 1960, section 531. This Act, while not adequate, is a substantial improvement on Australian forestry legislation.

2 The forest service is 'to endeavour to continually improve the productivity and usage of this plantation resource towards maximum yield of wood as a primary aim, within a context of such multiple use as may be consistent therewith'.

3 While this narrowness and bias of forestry education persists the offloading of excess forestry graduates as park rangers and 'conservation advisers' is a most alarming development.

encouraged, can no longer be sustained. It is easy to see why, when forestry was directed largely, as in the past, to the production of essential materials such as timber for building, forestry was regarded as worth encouragement and subsidy in the public interest. But it is not so easy to see why we should now publicly subsidize production of paper for disposable items and packaging, or why such consumption should be considered either essential or desirable or to be encouraged, through subsidy, in the public interest. Yet this is not only an important part of the end use of present wood production, and the main growth area, but since prices paid for pulp wood are very low, it is also the least profitable use for the end product from the wood production viewpoint, so that the subsidy for this purpose is correspondingly greater than for sawnwood. Even if some forest production is worth subsidy (e.g. that for basic housing), a large part of present forestry production, particularly export production, cannot prove even as worthy of a social discount rate of 6% or so, let alone the rather lower, or negative returns frequently encountered. It cannot be justifiably claimed, then, in defence of low or negative forestry returns that losses are incurred because it is in the public interest to encourage, by a subsidy, the consumption, both domestic and foreign, of forest products of all sorts.

Losses on the production side of forestry, where they cannot be socially justified, have to be seen as substantial and unwarranted subsidies and favoured treatment for the private industries engaged in production, processing and marketing. Forestry losses in this event can only be explained on the hypothesis that forest services are prepared to treat the forests not as a public resource, to be exploited with restraint for total public benefit, but as a cheap or even loss-making source of raw material for private industry. As D. Cromer's statement revealed, forest services generously agree to shoulder the unprofitable and risky portion of the venture, raw wood production, leaving private industry to take up the profitable manufacturing part. Thus the main role of public forest services in Australia would appear to be less that of running public forests in long-term broadly-conceived public interest than that of assisting private industry by the new sham socialist method of *socialising losses,* while leaving the profitable part of production firmly in private hands. (Galbraith [2] has pointed out the obnoxious features of this new sham socialism.) To criticise this situation is not of course to suggest that the demands and interests of industry should be completely neglected (nor necessarily to suggest that the processing part of the enterprise should be nationalised) but merely that the demands and interests of industry (say, for example, for increased, reliable and cheap wood production) should be heeded only as *one* among many different demands and interests which should be taken account of, and certainly not as the major or sole ones. The suspicion that the interests of industry are indeed paramount is deepened by such statements of influential forestry planners as the following:

> Australian forests . . . have a capital value of hundreds of millions. If the environmentalists tie up these forests there will not be any logs to support the producers investing millions (Jacobs [9]).

The vast emphasis placed on wood production in Australian forestry is in part at least a reflection of the management of the forests largely in the interests of industry. The swing to intensive forestry represents an intensification of this tendency to manage forests primarily in the interests of industry. If one looks at the results of intensive forestry — namely high rates of production of large reliably pre-determined volumes of standardized raw material from the cellulose factory, which are not accompanied by marked rises in profitability and possibly in some cases even by a decrease in profitability, but which *are* accompanied by a marked decrease in amenity and aesthetic values and other benefits from forests which would have accrued to the public — it is evident who is really gaining from the widespread adoption of these methods, namely industry. Moreover these gains are made at the expense of public interests even where some small increase in profitability results.

The role of forest services as primarily the servants of industry emerges not only through the yearly losses of most services but also in the tender regard shown for the requirements, and not necessarily legitimate requirements, of industry in planning, and particularly in planning for the pine program. The attempt for forestry planners to allow for extremely, indeed undesirably, high levels of consumption of paper products for example, and to promote and encourage such consumption is part of the same story.

The sensitivity of forest services towards the views and needs of industry contrasts strikingly with the usual indifference to those of other members of the community; the secrecy surrounding most forestry ventures, and particularly future plans, shows a disregard for public wishes and rights in decision making and is a way of avoiding accountability to the public.

In fact the connections between forest services and industry are very close; they exchange staff, they share research facilities, journals, and conferences; and forestry commissioners and other high-level public servants have a habit of later becoming directors of, or advisers to, private industry. F. Moulds (the Victorian Commissioner of Forests) even refers to public forest services as 'the forest sector of the industry' ([1] p. 56). That the identity of interest is strongly felt is indicated by the calls for a united front by private industry and 'public' forest services[1] against demands of conservationist members of the public for more attention to values other than wood production, better conservation and more restrained exploitation of public forests:

> Let us here and now unite as an industry and as a profession and vocally dispel the catchcry that 'forests are too valuable to be entrusted to the care of foresters' . . . (Cromer [1], at the 1972 Appita conference)

and

> I hope it will not not need a crisis to unite the various timber industries and the building industries. In the U.S., ecology has precipitated this unity. It is a sad commentary that something like this was required to unite the industry. [O'Neill [1], of Weyerhaeuser (USA) at the 8th All Australia Timber Congress, 1972. The 'timber industry' is plainly taken to include public forest services].

It is interesting perhaps that no objection to these extraordinary views is recorded, and that forest services are prepared to accept without demur the proposition that the interests they serve and those of industry are identical. While forest services and professional foresters remain so closely identified with the timber and paper industries, the view they resent so strongly, that forests are too valuable to be entrusted to foresters, is surely correct.

The conflict of values

It is obvious enough that what is good for the timber industry, for sawmilling and paper companies, is not necessarily what is good for Australia and particularly specific groups of Australians. However the surprising absence of questioning and dispute about what the aims of forest services should be, and whose interests they should serve, is explained, in part at least, by the widespread assumption that there is no conflict between intensive wood production and other forest values. Hence, it is thought, there is no need to manage forests in ways other than those best suited for wood production. Management for maximum wood production is then multiple use.

Given this view that there is really no conflict, public dissatisfaction and disquiet about intensive forestry and its results must be a consequence of misunderstanding and ignorance of forestry operations and forestry expertise, and can be dispelled by a proper

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1 See too Clennett [1], Edgerley [1], and Moulds [3] and the discussion of Mould's paper, loc. cit.

education campaign designed to secure public acceptance of the results of forestry activity. Such a campaign, designed, in its more exaggerated forms, to justify practically any activity forestry managers choose to undertake and to present foresters as unquestioned experts on every aspect of forestry management, is now called for in forestry literature (e.g. Moulds [1], p. 56; Grose [1]; Huddleston [2]; Clennett [1]). Meadows and Saul isolate the problem ([1], p.2):

> Many of the problems arising (from Australian woodchip developments) are due to the basic lack of understanding of forest industries by the general public,

and Unwin presents the standard forestry solution:

> We must improve our public relations and explain to the public, who are also deeply concerned, what we are doing, why we are doing it . . . ! [We must] recognise public concern and public misunderstanding and overcome it by properly informing the public of our methods and the reasons behind our planning ([1], p. 439).

In a similar vein Florence

> calls for initiatives by the forest services and industries to ensure greater public understanding and acceptance of expanded timber production management within the native forests. [The public relations exercise will include] provision for public notices on clear cut sites explaining procedures, regeneration methods and likely duration of apparent devastation ([2], p.9).

Thus the former attitude of indifference to public opinion has undergone a transformation now that foresters are worried by the prospect of loss of complete control of public forests and of their power to 'make and implement management decisions on public forested lands' (Florence [2], p. 1), and now that it is perceived that sufficiently aroused opinion can in fact succeed, as it threatens to or has[1] in USA, in placing restraints, legal or governmental, on forestry activity and management of forests. The new sensitivity to public opinion does not, however, take the form of a sensitivity to the actual wishes of the concerned public, nor of an attempt to change activities to produce a less disturbing result, but rather of an attempt to change the image of foresters and forestry activities; that is, it is not an attempt to adjust to public opinion and values, but rather an attempt to adjust these values and opinions to actual forestry practices. No non-trivial changes in practices appear to be contemplated. Instead persuasive attempts are made to sway public attitudes; a practice well illustrated by recent forestry attempts, in articles designed for popular consumption (e.g. NSW [5] and [6]), to influence aesthetic values so that people come to prefer the young dense even-aged stands of trees of but a few favoured species that foresters prefer for pulpwood production to the majestic and richer older forests that pulpwood stands too frequently replace. But it is not the business of public forestry services to attempt to change values in favour of wood production values or to run 'education' or propaganda campaigns in its favour.

What the education argument fails to realise, and where the propaganda campaign gets unstuck, is that there is a conflict between values, and hence genuine disagreement over values. And intensive forestry greatly increases the conflict, as recent research on the effects of intensive forestry management on wildlife and soils particularly has demonstrated beyond doubt. However the conflict between wood production and other values

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1 The exact effects of the National Environmental Policy Act of 1969 (Public Law 90-190, 1 January 1970) are not yet clear.

has received insufficient recognition in forestry literature, and indeed it is fashionable to deny that there is a conflict. Instead of modifying practices to suit environmental realities, much effort is devoted to more 'education', particularly to presenting and elaborating a set of arguments designed to show that the conflict does not exist or can be neglected, that by a coincidence which would be extraordinarily fortuitous if correct, what is good for wood production is what is good for wildlife, soils, watershed protection, aesthetic values and everything else. It is in fact of crucial importance to the devotee of intensive forestry to deny that there is any serious conflict of values — because in this way, and *only* in this way, can he present himself as an expert in the relevant areas.

It is not claimed that Australian foresters have invented this ingenious set of arguments — rather they seem to have borrowed most of them, along with the methods that necessitate their use, from their American colleagues[1] (see USA [1]). It is worth classifying and examining this set of arguments, which play such an important role in the 'educative' process, in some detail.

An important part of the education process is that of presenting forestry activities and foresters in a good light. Thus according to Florence ([2], p. 6), if the worst features of the US experience (which threatens to limit forestry activities) are to be avoided in Australia, then 'the lines of communication between forestry management and the public must be strengthened, and a better image of professional competence projected.' It helps greatly in improving the public image of foresters to present forestry activity as quite essential, as meeting basic day-to-day human needs such as shelter. The strategy of grouping forestry activity under the shelter industry umbrella is to invest all forestry activity, whether for domestic building purposes or for export and whether of sawlogs or of inessential packaging materials, with the image of timber used for home building, for essential shelter. The following is a fair example, presented in suitable tiny-tot style, of the forestry attempt to project the shelter industry image:

> Wood-chips are a product of the forest, as are railway sleepers, poles and posts, the lumber produced from sawlogs, and many other materials essential to our every day life (NSW [4], p. 1);

and the author might have added: as are paper tissues, cardboard boxes, wrappings and many other items which are undesirable, inessential and produced at such substantial environmental costs. It is to this latter class that the products of our export woodchip industry chiefly contribute; nevertheless the attempt to justify woodchipping in terms of the hypothesized desirability of wood products as building materials is widespread..

The image-promoting stratagems are typically reinforced by a set of pseudo-ecological arguments,[2] all of which have in common the feature that they are designed to smooth over the conflict of values and to direct attention away from the crucial issue as to whether the changes being wrought by expanded wood production management are damaging to the environment or to an important set of forest values other than wood production.

A common argument designed to present any sort of forest exploitation which allows for a continued supply of trees as environmentally admirable and beyond criticism, is the Renewable Resource Argument. The forest, it is said, is a renewable

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1 Likewise such methods as ringbarking and control burning have been imported from USA. But we may have excelled Americans in our applications of some of these techniques.

2 It is interesting that many of these arguments bear a striking resemblance to the sceptical arguments, well-known to philosophers, in epistemology.

resource and nothing can be lost by its use; hence its exploitation must be environmentally sound, even admirable since its products satisfy so many needs. The argument is far too simplistic: the renewable/non-renewable resource distinction, although a valuable one for many purposes, must be treated with a good deal of care. For, first, renewability is relative to the method of exploitation. From the fact that a given biological resource is indefinitely renewable under a restrained method of exploitation, it does not follow that it is not being run down or that it is renewable in the long term under more severe methods such as clear cutting. Obvious examples of forest deterioration even where a continuing supply of material is aimed at, are cases where severe erosion, topsoil and nutrient loss or disease are induced by forestry operations. It cannot be automatically assumed then, that even forestry activity which aims at a continuing supply of wood is benign, and there is mounting evidence that intensive forestry may not enable long-term renewal. Also highly intensive forestry such as frequent coppicing for pulpwood runs into immediate conflict with the conservation laws since a great deal of mass and energy is taken out of the partly closed system which is not returned or compensated for. The question in such cases is then not so much whether run-down occurs, for undoubtedly it does, but rather how quickly it does (cf. Commoner [1]).

Secondly, renewability is relative to the properties preserved under exploitation, *which* features are renewed under use. Renewing something is not producing something identical with it, but presumably it is necessary at least that features taken to be important are reproduced or preserved under use if it is to be true that nothing is lost. Something, e.g. the forest, may be renewable in one respect, but not in another which is equally important. For example, the wood producing capacity of a forest may be renewed if it is replaced by a monoculture of a different species, but other valued properties may be destroyed or irreversibly damaged, so it is not true that nothing is lost. The obvious example is conversion of a biologically rich eucalypt forest to pines. Renewability does not enable avoidance of the question of whether a given set of methods involves serious or irreversible losses in certain respects. Finally, the argument insofar as it fails to consider the impact of use on important values other than wood production values, and attempts to persuade us that as long as the wood producing capacity of a forest is retained nothing is lost, is simply a subtle way of imposing the notion that the only real value of a forest is for wood production and the view of the forest as a cellulose factory.

Another general argument that figures prominently is the Argument from Change, according to which those who attempt to oppose any destruction or degrading environmental activity are condemned as uninformed preservationists who fail to realise that Nature, what's natural, is not static but is continually changing. Because Nature is dynamic, it is futile to attempt to retain forests for example, in an unchanging state; so the changes forestry activity makes may as well be accepted (cf. Holloway [1], p. 332). The argument fails basically because it rests in a false dichotomy[1] between either

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1 The classical false dichotomy is a favoured weapon much employed against conservationists. A typical example is the move to force the conservationist into agreeing that either every natural area has to be completely preserved or anything in the way of destructive activity must be accepted. But of course the conservationist does not usually insist that every natural area should be completely preserved — though no doubt he will wish to retain more and more of what is left with increasing scarcity of natural areas, since these areas thereby become more valuable. A related move is the attempt to make out that the conservationist is some sort of primitivist who would have all back in a state of nature or even in Carboniferous times. But obviously the position that present natural areas are valuable and should be preserved does not imply primitivism, although its adherents adopt a discriminating attitude to technological changes, to industrial and agricultural development and commercial progress, realising that by no means all of these are always desirable.

accepting any sort of forest degradation or allowing no changes whatsoever. A forest may evolve under natural processes, in which case it changes, but not in the undesirable ways forestry activities may demand. The Argument from Change attempts to persuade us then that because some changes, even natural changes, are inevitable any changes are acceptable.

According to the Nothing's Really Natural Argument those who want to retain 'natural areas' (the argument regularly sneer brackets 'natural') have simply been misled by an inapplicable, or even meaningless, concept; for it is impossible to draw any clear distinction between what is natural and what is not, and belief in such a distinction is little more than a superstition. What superstitious conservationists regard as natural forests are not really 'natural' at all, for they have virtually all suffered human interference; and it is even said that what the unenlightened amateur does not realise is that remaining forests are all virtually man-made (cf. Pryor [1]). As there are no 'natural areas' to retain, forestry management can proceed. In part the argument employs a low redefinition of 'man-made' so that even an area from which isolated trees have been removed counts as man-made, and a high redefinition[1] of 'natural', so that even forests which have suffered a very low degree of human interference are not natural; without these illicit redefinitions the argument begins to founder.

A *natural* area may be roughly characterised as one which has been only or largely subjected to natural processes, i.e. those not under human control or set off or up for human purposes or ends. That is, natural areas are those subject at most to a low level of human interference or control.[2] What is important, then, in deciding whether an area or forest is natural is the *degree* of interference. But certainly some degree of interference can occur without destroying what is natural; and this is why the high redefinition of 'natural', according to which absolutely no degree of human interference can occur in absolutely natural forests, should be resisted. Since there are few absolutely natural forests, there would be but few, maybe no, natural forests given the redefinitions, just as there would be no doctors under the high redefinition of 'doctor' according to which a real doctor is one who can cure any disease in a few minutes. But only a high redefinition makes the notion of natural forest inapplicable, for on the ordinary notion a highly selectively logged or lightly grazed but regenerated forest is still natural (and certainly not 'man-made') though it has suffered some interference.

Nor does it follow that the notion of a natural forest is unusable because it is not easy (or necessary) to draw a sharp boundary line between natural and artificial states, just as it does not follow because there is vagueness in the notion of baldness that the notion is worthless.[3] There are clear cases of natural forests including many forests threatened with wood-chipping or conversion to pines, and there are likewise clear cases

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1 A 'low' redefinition of a term is one which enlarges the class attributed the relevant property by adopting particularly and unjustifiably lax criteria for having it, whereas a 'high' redefinition reduces the class by adopting specially and unjustifiably stringent conditions for having it.

2 Notoriously the term 'natural' has several other senses, but these are not relevant for our discussion of natural forests and natural areas.

3 Compare too the useful distinction between natural and improved pastures.

of forests which are ruled out as natural under the rough characterisation given, e.g. Australian pine plantations, eucalypt monocultures, and forest arboreta. The familiar slide (or Bald Man) argument – for example, if removing one tree from a natural forest leaves a natural forest, does removing two?, or three?, . . . or every tree? – can be defeated in the usual way, by admitting a class of borderline or grey cases (which mostly don't need resolving) between the clear black and white cases. The fact is that the difference in the degree and type of interference involved in setting up and maintaining artifical forest stands is quite sufficient to justify the ordinary distinction in kind between these and natural forests.

Even if we were wrongly persuaded to give up the ordinary and useful notion of a natural area, it would not follow that any sort of forest management of areas formerly described as 'natural' is acceptable. There is always the question of whether the forestry interference is desirable. Thus the objection to much intensive forestry is not at all an objection to some interference or to some human control and utilization – an objection that would be appropriate in the case of wilderness areas though not generally for state forests – but to the degree of these things involved in the new management of the forests, and their use in pursuit of a narrow and often undesirable set of ends.

But so far from naturalness or less intensive usage being specially virtuous, interference, or management, is, according to another forestry argument, essential to maintain the forests and indeed improves them both from aesthetic and other viewpoints. According to this argument, the Interference Improves the Forests Argument, old forests are 'decadent and damaged' (Crane [1]), even 'stagnant' (Clennett [1], Jacobs [10]), and the disturbing activities of foresters are essential to maintain them in health and vigour and stop them becoming 'cemeteries' (Jacobs [10], p. 83). Similarly old or unlogged forests are commonly claimed to be full of ugly defective old trees, and it is implied that foresters are doing a great service to aesthetics by replacing these 100 foot plus horrors by dense stands of 15 foot saplings. Thus forestry activities improve forests. (It is hard to know how forests got along without foresters!) For example Florence, who was prepared to argue that 'occasional conservative logging and silvicultural manipulation of saw log quality forest within "complete preservation" areas is desirable', contends that 'it may be only through the periodic stimulation of forest use, that the forest is maintained in a dynamic and healthy state' ([4], p. 39). Jacobs is quite certain:

> a forest must be interfered with by something, either fire, storms, or man, if it is going to be regenerated properly. I can forecast . . . that within a generation, the parks that are now being dedicated to naturalness and untouchability as far as the forest stand itself is concerned will be being treated for regeneration; and I hope by forest services. . . . a forest . ... is a living organism and you have either got to treat it sooner or later in some way, or it is going to become just a standing cemetery, and one very dead ([10], pp. 82-3).

Unfortunately the Interference Argument collides head-on with another forestry argument much favoured in justifying intensive forestry operations, the Degenerate Forests Argument, that selectively logged forests, from which the best trees have been repeatedly creamed leaving a preponderance of old or defective trees, and fire-ravaged forests, are badly run-down, and might as well (or ought to) be replaced. For example NSW [1], [5] and [6] harp on 'the generally derelict nature of the native forests' in the Eden region, the dereliction being attributed to interference by repeated fires and logging.

But the forests can't both be run-down and improved by the *same* sorts of silvicultural activities (logging) and interference (fires, storms). In fact neither argument amounts to much more than a roughly disguised way of imposing wood-production values as ultimate aesthetic values and as biologically-dictated. Neither argument will be very convincing to those who have admired the great shaft-like trunks of mature trees and

magnificent ferngully and rainforest understoreys in the few tiny remnants of prime virgin forests, such as Sherbrooke Forest and parts of the Otways, which forest activities have left us, particularly if they have compared such 'unimproved' areas with adjoining cut-over forests. It will not impress either, the admirers of majestic mature trees in the disappearing restrainedly logged forests, and it squares rather badly with the preference of a large range of wildlife for such decadent forests.

The only sound point behind the Interference Argument is that non-climax forests (which are frequently preferred for wood production) need disturbance if they are not to revert eventually to the often more impressive and self-maintaining climax forms. The Argument tries to persuade us that because some disturbance is sometimes desirable to maintain a preferred state in biotic succession, any degree of disturbance, no matter how bad its effect on non-wood-production values, is acceptable and biologically sound. Furthermore the description of old trees and climax forests in these terms is simply an attempt to have us adjust our aesthetic judgements and even our biology to fit wood-production values (cf. the description of undisturbed forests as unhealthy). Anyone who looks beneath the verbiage, will see that he is usually being sold an inferior and impoverished forest environment from most points of view other than wood production under the production forestry label 'young, vigorous, healthy new forest'.

The second argument – that intensive forestry improves the forests or is unavoidable, because the forests are degenerate having been run-down by years of fires or forestry activities – is just as unconvincing. Although it is of course true that some forests which have been severely burnt or savagely logged are run-down, many others, including several destined for drastic modification by pine or woodchip programs, are not degenerate. Some forests included in the woodchip program have never been logged or seriously damaged by fire, e.g. the previously inaccessible escarpment west of Eden. (Indeed only a small part of the total franchise of about 800,000 acres of forest near Eden is in a derelict condition, although much is made of these derelict areas in the PR program as in NSW [5] and [6], and they are the areas which visitors to the projects are shown). Some of the forests scheduled for elimination in favour of pines, such as Tallaganda State Forest east of Canberra, are by no means worthless, but are supplying good sawlogs and are regenerating well with high-quality forest, in addition to supplying other less tangible benefits not supplied nearly so satisfactorily by their replacements. Usually, then, it is only a small proportion of the extensive areas destined for woodchip or pine projects, which have been seriously fire damaged or logged out. This underlines a further alarming feature of such projects, that because of the necessitated extensiveness and spread, that they frequently include areas that are selected in terms of proximity rather than appropriateness. There are moreover other ways of upgrading silviculturally degenerate forests than such drastic methods as clearfelling, e.g. by culling some of the overmature and defective trees to restructure age classes and improve wood quality. There remains the obvious but crucial point that the new forests may be improved for wood production but impoverished for everything else. The 'better forests for the future' that forest services claim to be producing (cf. Hanson [5], p.41), are not better for aesthetics, recreation or wildlife or conservation purposes, and it is not so clear that they are better for wood production – though that's the idea – not if they have to grow on worse soils, are subject to dieback from root-rot and to insect attack, and have not regenerated satisfactorily, i.e. neither excessively nor too sparsely.

Another favourite general argument for justifying bad effects on the environment from exploitation of natural areas is the Natural Disaster Argument, according to which any damage which may occur is no worse than, or only a simulation of, damage from various comparable natural disasters which might possibly occur. Hence no objection can be raised to these effects. The Natural Disaster Argument has been used to justify a wide range of noxious activities ranging from air pollution to atomic fallout, e.g. Maddox [1] compares these with dust from Krakatoa. But the effects are mostly quite different, for

example no volcanic fallout produces strontium 90 or hydrocarbons. However (while we admit that intensive forestry is something of a disaster) the argument is open to objection at a number of points, even in those cases (if any) where the effects are in fact comparable. Not every natural occurrence is desirable; a natural disaster is nonetheless a disaster even though natural; and it scarcely seems sensible to simulate with an avoidable occurrence, something whose effects are recognised to be undesirable. Nor does it seem sensible to deliberately bring on a merely possible disaster. And only where it could be claimed that the occurrence to be justified replaces or circumvents a certain or highly probable disaster would the argument have any force – otherwise one simply has multiple disasters or deliberately created ones in place of merely possible ones.

The Natural Disaster Argument is easily adapted according to taste and local conditions, and a special case enjoying some popularity in Australian forestry is the Great Bushfire Argument,[1] according to which clearfelling activities only simulate what happens in a bushfire; similarly soil deterioration and erosion in pine plantations simply replaces what would have otherwise occurred in bushfires. In chapter 10 we explain why the effects of clearfelling cannot properly be compared to and are from many points of view worse than those of a bushfire. In any case the argument is open to the objections listed above, namely it is not true that the activities in question replace otherwise inevitable bushfires. It is not clear, for example, that woodchipping will enable the avoidance of bushfires, and what effective protective measures are pursued could have been undertaken in any case if the area were not so intensively managed.

Underlying ideological commitments

The very real conflict between intensive wood production and other forest values, and the resulting conflict between intensive forestry and conservation, cannot be smoothed over by such persuasive arguments. This conflict is certain to increase as more and more forested areas are taken over for intensive forestry. The dispute between forestry and conservation interests is not just a dispute about whether the new methods will involve damage to natural areas and to values other than short-term wood production, though it is partly this; nor is it just a dispute about the relative importance of wood production and other values, though this is also an important part of the picture: at bottom lies a difference in attitude to unused forests and above all about the extent of utilization of forests for wood production. Intensive forestry involves a very high degree of control and manipulation ('management') and of utilization of the forest crop for wood production – ideally from the wood production view-point its total use. The objection is not merely to this increased degree of control and manipulation with the resultant increased elimination from our forest areas of everything not considered to be of fairly direct use, although this could be considered objectionable enough in itself. The problem is also that the increased control is to be directed towards a very narrow set of purposes and goals, namely increased wood production, and that the changes resulting from increased degree of control and use for wood production are unlikely to be at all desirable from other points of view. In the past multiple use of forests was to some extent guaranteed because the use of forests and control exercised over them *was* so incomplete, so that attractiveness and conservation values of forests could frequently persist despite management for wood production. But now that the degree of control and use is to be so greatly increased, the orientation of forest services to these narrow goals is a matter for much greater concern.

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1 In east coast USA where bushfires are uncommon, a Great Hurricane Argument enjoys some vogue as an ecological justification for clearfelling.

A forestry policy of almost complete utilization of the forest crop involves an inevitable conflict with conservation, first because of the habitat requirements of a large range of Australian wildlife (as explained later) and also because of the effects on soils and aesthetic values. To the extent that forestry is committed to principles of total utilization and production of maximum quantities of wood, it is on an inevitable collision course with conservation and with other forest values, and therefore also with multiple use[1] properly conceived. However forest services and forestry planners are already heavily committed to the principles of total utilization of the forest crop and maximum wood production from forests. For example P.T. Unwin (Chief Commissioner of Tasmanian Forestry) calls for 'a policy full utilization of the forest crop' and sees 'the need to harvest the highest possible volume of usable wood from each acre of the present crop' ([1], p. 439).[2] Similarly A.C. Harris (former Conservator of Forests in Western Australia and President of the Australian Institute of Foresters) says of the woodchip industry that 'through the medium of this industry we can see ourselves realising the dream of all foresters — complete utilization' ([1], p. 37).

A related evaluation is that consumption of wood products should be maximized, along with production. But despite the common opinion of professional foresters in Australia that this is their prime concern and that the prime concern of Australian forestry should continue to be the expansion of wood production, and despite the legal reinforcement of such attitudes and goals in forestry legislation designed to entrench them, it is very doubtful that it is the role of foresters to maximise wood production and consumption, especially where this conflicts with other goals. Some European foresters have properly abandoned this role though American foresters still generally have not (since forest production goals are still largely those of the 1947 Reappraisal Report: 'to provide as much timber as a prosperous people might use if the supply were sufficient to keep forest products available at reasonable prices'; in short, to maximize consumption without account of other factors). Yet many professional foresters in Australia are employed either by universities, the public service, or public utilities. It is certainly not the role of foresters employed by universities or the public service to promote such production and consumption goals, and it should not be the business of public utilities such as forestry services to endeavour to maximize either consumption or profits or the size of their forests at the expense of other goals.

A narrow legalistic reply is sometimes given to such criticism of forest services. For example J. Henry, the NSW Commissioner, has observed (in [1]) that the NSW Forestry Commission is obliged under the Forestry Act that constitutes it to put wood production first, as the dominant use of forests, and to promote the consumption of wood products. But this piece of regressive legislation was only introduced, as an

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1 Someone who rejects the assumption that all forest should be *used* can, as far as the empirical facts go, be catered for within a multiple use scheme; for areas used for complete preservation are, looked at differently, unused. What remains is a difference in attitudes to such areas, a use exponent seeing such areas as used for human purposes, while an opponent of the use-ethic regards it as reserved from use. But the difference in attitudes makes no difference to the results.

2 It also follows from what Henry asserts ([1], p.3) that he believes that dominant use for wood production is the best and highest use of forests, and that this is also the view of the NSW parliament.

amendment to the Act, in late 1972, presumably at the instigation of the Commission itself, with a view to resolving conflict and blocking conservation criticism on a simple (-minded) law-and-order basis. Similarly Moulds has explained to conservationists that 'the Victorian Forests Commission has a responsibility to plant a defined acreage of pines each year. This is its task as a government instrumentality under the State-Commonwealth agreement' ([2], p. 5). But the Victorian Forests Commission, as represented in the Australian Forestry Council, pleaded for the very Commonwealth legislation enjoining the responsibility[1]. In any case forestry legislation is not immutable, and unsatisfactory or regressive legislation should not be immune from severe criticism.

The ideals of complete utilization and maximum wood production — together with the empire building aspirations of forestry organisations and the pressures (already remarked) emanating from associated private industries — explain the otherwise puzzling fact that forestry services are eager to persist with uneconomic projects which degrade the environment. Forest services seem to have internalised the private industry ethic of maximizing production and consumption, throughput, of their main product, wood, and to have absorbed the prevailing growth and developmental ideals of business, but in cases where these are completely inappropriate. Forestry administrators are backed up and reinforced in these (inappropriate) developmental and utilization ideals[2] by the government officials and politicians with whom they co-operate since, by and large, these people share their ideological commitments.[3] It is, however, very difficult to see any objective justification for these ideals, especially where the main product, often converted to commodities of doubtful value, is produced either at a loss or with quite inadequate returns, with heavy environmental costs, and at the expense of more important roles for Australia's scarce forests.

These forestry ideals and goals inevitably lead to a clash with other values. The ensuing disagreement is ultimately a disagreement as to values, as to whether utilization for wood production or some other forest value should rank more highly; it is not just a dispute as to the facts. Because the underlying conflict is a conflict of values, not as to facts about forests, foresters' claims to expertise are undermined. For while foresters may be experts on some aspects of forest management, almost exclusively wood production

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1 Compare Henry [6]: '...It is inevitable that conflicts arise over land use. The only satisfactory solution is for the Government, not the Forestry Commission, to state quite firmly that it is Government policy to establish at least one million acres of exotic conifers and that suitable land is required for this purpose'.

2 The development syndrome has been sketched out, in a way adequate for present purposes, in Reich [1] and Galbraith [1]. An integral part of the developmental syndrome is the desire for growth in the size and power of the organisation, in this case the forest services. Both pine and woodchip operations provide considerable scope for such growth, both in manpower (e.g. at Eden, from 1 professional officer in 1968 to 40 in 1972), in increased capital and equipment, and in influence in the districts affected.

3 Among politicians see, e.g., Swartz [1] (who looks forward to many more woodchip projects), Meagher [1] (who calls upon forest services to become more market oriented), Reece [1] (according to whom 'chipping promotes the correct use of a resource with no value'), and many of those who engaged in the debate on the softwood forestry legislation, Hansard [1].

aspects, they are not experts on values. Although foresters may be profitably consulted as technical experts in their given areas for factual information and know-how. decisions as to how forests are to be zoned and managed should not be left to them. They do not have the right to decide, it is not their role to decide, which forest values should dominate and what the objectives of forest management should be. Decisions on these matters display all the hallmarks of political decisions; for instance they depend on the values and preferences of groups of people, and they affect interests of competing groups. As with similar political decision-making, in a large democracy, the decision-making is typically delegated to elected or appointed representatives. It is important that these representatives are sensitive to the rival cases openly presented to them, and also that the bases on which they make their decisions and the information they assemble should be freely available to all interested people. Current forestry planning exhibits none of these desirable features.

CHAPTER 2

PINE PLANTING FOR SELF-SUFFICIENCY

It is becoming difficult to travel in the mountainous areas of south-eastern Australia without encountering pine plantations or large areas of bulldozed native forest being prepared for pine planting. Soon it will be the same in coastal Queensland and in south-western Western Australia. By the year 2000 pine plantations will stretch from Cape York to Tasmania, and in the south will span the continent. More than a million acres of pines have already been planted, and forest services in Australia plan to plant at least 3 million acres of conifers by the year 2000, almost all of it *Pinus radiata* at higher altitudes or in winter rainfall regions, or *Pinus elliottii* or *Pinus caribaea* in summer rainfall coastal regions, and most of it at the expense of native forest. These services attempt to persuade us that, at a time when the natural areas of the world are disappearing at an unprecedented rate, the destruction of much cool, moist mountain forest is 'a positive contribution to man's search for a better environment' (e.g. NSW [1], p. 10; NSW [2], p. 17.)

The motivation and arguments for the pine planting program are well worth examining, not only because of the enormously destructive effects of the program, especially on mountain forest, but also because of the light cast on the attitudes of forest services towards conservation, and towards the enormous areas of native forest which are under their control. The main argument for the program has not been the familiar argument put forward for the destruction of natural areas, that large profits are to be made thereby, but rather the argument that the plantation program is essential in meeting future domestic requirements. Indeed if the program is to be justified it has to be justified in this way rather than as a profitable business venture, since investment in forestry, once the various indirect subsidies and concessions are peeled away, gives a poor return for the long-term investment involved compared with other possible safer investments. Softwood plantation foresty, despite its higher productivity,[1] is no exception, and the long-term low interest loans provided by the Commonwealth, which are necessary to ensure even modest returns, must be regarded as among the effective subsidies. The low rate at which finance for the pine program is charged presupposes that the activity is of a type which one wishes to encourage, despite its low profitability, because it is somehow necessary or desirable.

The argument for the program then is that it is essential to meet future domestic requirements of wood products over the next 80 years. We shall argue however that most of the arguments which are supposed to establish the high national priority of the program are unsatisfactory, and that the strategy of these arguments has been to pass off the entire program as essential on the basis of a much smaller proportion of it that has some justification; that a large proportion of the program does not have the status that would justify the environmently costly methods that are currently being used to implement it. We shall

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1 Admittedly under current management pine plantations are generally more productive than eucalypt forest; but, unfortunately for forestry economics, productivity is not profitability, and a productive forest may be very unprofitable if the establishment costs are of any size and are properly discounted; see chapter 8.

also claim that so mesmerised have the planners of the pine program been by the charms of population growth and of expansion, that they have failed to take proper account of the effect of a reduction in the rate of population growth. We shall contend that the desire to maintain and promote the consumption of wood products has heavily biassed the 'predictions' of future demand, and that no adequate account has been taken of the environmental cost of the program. In sum, we shall argue that a large part of the program, far from being so desirable as to warrant encouragement by public subsidies, is a positive public disservice.

The 'import burden'

Because, it is argued, Australian forests are naturally deficient in softwood species, it is necessary to import softwoods, and softwood products account for most of the Australian forest product import bill of more than 200 million dollars annually. But, it is claimed, most of this material could be grown satisfactorily here, thus ridding us of an import burden which is restricting normal development of the continent (Jacobs [4], NSW [2]).

Australian forests consist primarily (90-95%) of hardwood species; but it does not follow that the continent is *deficient* in softwoods (as asserted, e.g., in Jacobs [4] and [7]) without rather questionable assumptions as to what woods are required and whether those that are wanted have to be grown in Australia. According to Jacobs ([8], p. 16), Australia has long endeavoured 'to make the Australian forest resource better suited to a European civilization. European type industries need at least 50% of coniferous wood.' The argument seems to be that Australia has a European civilization with European values, and accordingly needs European-type forests, and industries. The argument is decidedly unsatisfactory. Australia already has several non-European-type industries, such as arid land grazing and irrigated tropical farming, and forest product industries appear to be among them. The Australian building industry has shown how eucalypts can very satisfactorily replace softwoods for most building and construction purposes, and Japanese technology has shown how short fibred woods can replace long fibred conifers for very many pulp uses – in other words, how, with some imports, a 'European civilization' can manage very well without large coniferous forests. In any case, European countries like France have predominantly (70%) hardwood forests and rely on imports of softwood pulp. And while softwoods can be imported the values being destroyed with native forests cannot. The pine program is regularly presented as if its main benefit will be the *saving* of the amount currently paid out to import softwoods. But this is quite misleading. First, not all the imports would cease; for a number, such as Douglas fir (Oregon pine), would still have to be imported despite the scheme. Second, it may well cost Australia more to grow softwoods than it does to import them, and they are certainly not going to cost *nothing* to produce locally. In fact the investment involved is very heavy, especially since the real initial costs have to be compounded over a long growing period; and the establishment of plantations is dependent on Commonwealth assistance under the Softwood Forestry Agreements Act 1967 and 1972. Not even the most ardent proponent of the pine planting scheme has attempted to argue that the material in question can be produced more *cheaply* here. The only thing that would clearly be saved is foreign exchange. Although once this is noticed the economic benefits of the scheme are by no means so self-evident, no attempt has been made to argue that growing the material locally is better economically than importing it. Instead vague but apparently persuasive nationalistic considerations about the importance of self-sufficiency have been put forward, or it is argued that it is essential to save foreign exchange.

The standard (1971) figure of $200 million for imports may in isolation appear crippling. But in the context of total Australian imports, which in 1971 totalled $4,137 million, it is not a significant figure. A sense of urgency is conveyed by the often

repeated claim that forest products make up 'one of the largest single items on Australia's import bill' (NSW [1], p. 2; Jacobs [4], p. 30; Brown and Hall [1], pp. 12-13). But what is counted as a *single* item in import lists is decidedly arbitrary. On the one hand forest products break up into a number of diverse items with diverse cost structures and import bills such as toolhandles, industrial paper, etc., but not furniture, magazines, etc. On the other hand, it is easy to obtain other 'single items' of greater cost than wood products by adding together other commodities, separately listed for rather arbitrary reasons, which fall under a single rubric such as machinery other than electrical ($708 million), petroleum products ($254 million), textile articles ($287 million). In fact the Official Yearbook (Comm [1]) does not give a separate figure for imports of forest products, but the list of items it provides sums to less than $60 million since it does not in fact include paper products among forest products or timber products. The point of considering singularity, then, seems to be largely persuasive.

Moreover, the blanket figure of $200 million for wood product imports conceals an important fact – that almost three-quarters of the value of the imports consists of pulp and paper, which can be produced from a disproportionately small acreage of plantation. For although pulp and paper products comprise approximately 44% of the monetary value of all forest products consumed in Australia they require less than 23% of the (log equivalent) volume. In contrast sawn timber which accounts for only 39% of the monetary value uses 63% of the total log volume consumed (Parkes [2], p.6C.5). Hence a comparatively small plantation area directed towards the production of pulp and paper rather than sawnwood could dramatically reduce the import bill. In this way one could make a substantial difference to the cost of imports without going in for more than a *small* proportion of the planting required for self-sufficiency in both pulp and paper and sawnwood. Thus producing our own sawnwood in place of imports would require a comparatively greater area of planation, and hence greater destruction of Australian forests, but do comparatively little to reduce the import bill (in 1968-69 imports of sawnwood cost less than 50 million dollars, and imports of radiata pine sawnwood cost only 2.1 million dollars (Comm [1])). If the cost of imports *were* to become an important factor, the bill could be very substantially reduced with a fraction of the planned planting program, were this oriented largely to the production and manufacture of long fibred pulp and of paper.

Furthermore, even if it were important or became important to save foreign exchange, it would not follow that investment in pine planting projects is the best way of making the saving (Parkes [1], p. 169). In fact such investment would not even be an efficient way of reducing expenditure on imports because of the inflexibility of forestry due to the long production period and because plantation forestry would only give a low saving of foreign exchange per dollar invested in comparison with other ways of saving exchange such as investment in petroleum production.

However the elimination of wood product imports is continually presented by program planners as a matter of great national urgency justifying disregard both of economic costs and environmental consequences. Yet Australia's balance of trade situation is now recognised as very healthy, and is expected to remain so (the figure for exports in 1971 totalled $4,610 million, leaving a trade surplus of $473 million, and exports have risen sharply between 1971 and 1973 leaving a still larger trade surplus). Hence there is no need for overriding priority to be given to eliminating imports. In this situation economists have questioned the wisdom of continuing to regard the elimination of imports per se as either necessary or beneficial, and it is now recognised that a balance of trade leaving too much in the direction of an export surplus may also be harmful, for example, it may curtail trade with a country from which little is imported, and it may interfere with improvements in the standard of living by preventing worthwhile reductions in the price of some consumer goods. The fallacy is that of assuming that, because in a certain situ-

ation (e.g. where there is a trade deficit) the reduction of imports and/or the increase of exports is important, it is *always* a good thing, and that one can never have too much of it.[1] Probably the best that could be said in the current economic context of the attempt to eliminate such a quantity of imports is that it is pointless. If, as there is reason to suppose, much of the home-grown product produced at such environmental expense will require *protection* in order to compete against more economically produced imports resulting in higher prices for the relevant goods unless they are further subsidized, such a program would be positively harmful economically. Despite these facts it is commonplace for forestry texts to describe the case of imports in scare terms, e.g. as 'at a dangerously high level' (Brown and Hall [1], p. 13) and to claim that it would be 'dangerous' (even 'a national tragedy') for Australia to rely on or increase timber imports.

The virtues of self-sufficiency

But the most that can be argued with any cogency is that it would be unsafe for Australia to rely upon continuing to import softwood products because it is uncertain that reliable cheap supplies will continue to be available. M.R. Jacobs, formerly Director-General of the Forestry and Timber Bureau (FTB) and one of the prime movers of the program, argued in just this way: 'The fourth and perhaps most important implication of the gross annual debit for forest products is that future resources of adequate supplies cannot be relied upon' (Jacobs [4], p. 30), and 'It would be unsafe, however, for Australia to rely upon obtaining imports at a reasonable price in the distant future' (Jacobs [2], p. 3). Even if this appeared to be the position in 1963-1968, it is no longer the position. In 1969 the New Zealand Forest Service announced a greatly increased planting program (NZ [1]) from which the anticipated yield available for export is 260 million cubic feet in 2000 rising to 300 million cubic feet (roundwood equivalent) by the year 2010, and presumably continuing to rise thereafter.[2] This would provide more than half the anticipated yield at the same time (2000-2010) from Australia's (target) coniferous plantations of 3 million acres, and, depending on population growth would, projecting present levels of wood consumption, meet roughly half of local softwood requirements. Furthermore there are a number of reasons for the supposition that, just as in the case of other high rainfall agricultural crops, NZ can produce the product more reliably and more cheaply than Australia. It is not easy to obtain comparative figures for forestry in different countries, partly due to the many hidden production costs; and since the final market price may not reflect the actual production costs we cannot extrapolate just from the fact that NZ products are underselling Australian products on the current NSW market. However the higher yields per acre, the more suitable soils, the shorter rotation periods, the reduced fire incidence, the easier topography and location close to ports, of the main NZ plantations must substantially reduce the relative costs of NZ production. It is worth noting that the main NZ plantations are not competing with the NZ forest but are being planted on areas which were originally treeless, or formerly cleared for agriculture; so that use of the NZ product would reduce the destruction of natural forest areas in the region.

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1 It is also significant that the case for the planting program won approval at a time, the early and middle sixties, when the dogma 'Exports good, imports bad' was unchallenged policy in certain government departments. It is no longer unchallenged: see, e.g., Comm. [4], p. 41.

2 And the estimate for export volumes after 2000 given in NZ [1], which was made in 1969, does not depend on yields from the chipping of beech forests in the proposed South Island Beech Schemes.

There are other reasons for buying NZ's product apart from the fact that it will probably be cheaper. NZ has a very unfavourable trade balance with Australia; in 1970-1 NZ imports from Australia amounted to $225.5 million but exports to Australia to only $97 million, and if the present trade pattern is maintained this gap could be expected to widen as the volume of trade increases. Given Australia's trade surplus it can scarcely be claimed that not increasing our imports from NZ has the status of an urgent national necessity. Plainly a very large volume of timber could be purchased from that source without doing anything more than rectifying the imbalance of trade. The purchase of substantial quantities of timber products from NZ would bring many of the advantages put forward in favour of greater trans-Tasman trade and cooperation; advantages which trade policies less inclined towards hard bargaining, and less open to sectional influence, would long ago have appreciated, viz. the best and most efficient use of resources in the region, thereby increasing the standard of living in and economically strengthening the entire region. Past attitudes of protectionism directed toward NZ products have largely had as their excuse the need to protect an already operating body of local producers, but this excuse is conspicuously lacking in the case of softwood products. An improvement in the balance of payments with NZ could be expected to produce a number of benefits for Australia in the form of increased Australian exports to NZ, since as is well known, the volume of trans-Tasman trade has been held back by this imbalance. This could go some substantial way towards offsetting some of the development benefits such as increased regional employment, often claimed for the pine planting program. For the industries whose exports are likely to increase, such as automotive and manufacturing industries, are far more labour-intensive than forestry. Any danger that NZ might sell its forest products elsewhere could be eliminated by an appropriate trade agreement.

NZ is not the only source of imports. Among other likely sources are Indonesia (FAO [1]), Fiji (which has recently announced a large plantation program) and Canada and United States (both important sources of present supplies). It is expected that North America will have an exportable surplus of 6 (American) billion cubic feet of wood products at 2000 (Carter [1]), and this estimate is probably conservative because no allowance has been made for recent reductions in the population growth rate in USA. USSR, which has already shown interest in penetrating the Australian timber market (FAO [1]) has huge coniferous resources and may well have large surpluses available for export from Pacific ports over the next 40 years (FAO [1], p. 124-5). Furthermore, several other countries have embarked on extensive coniferous planting programs, e.g. Chile, South Africa. Such data cast doubt on the prediction that there will be world-wide shortages of timber products at the turn of the century and the idea that even if imports are available they will be expensive (Brown and Hall [1] p. 13; Jacobs [1], p. 8). It is worth pointing out that in a number of similar cases where production shortages and consequent high costs have been widely forecast the fact that several suppliers have independently taken measures to avert the predicted shortfall has resulted in substantial oversupply (Macrae [1], p. v).[1] Just such a situation appears to be occurring in world forestry, and oversupply appears more likely than shortage in the Pacific Basin around 2000. Arguments for the need for an inexhaustible supply of wood based on the population explosion and greatly increased per capita consumption, together with the argument that what is available from producers like Canada will be hotly competed for by Asian countries, ignore the fact that most of this population growth will occur in the 'developing' countries which cannot even afford to consume their own cheap timber

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1 The classic hog cycle in USA provides a textbook economic example.

products much less buy those from Western countries in any quantity (FAO [2]; e.g. Malaysia and Philippines are both timber exporting countries, but per capita domestic consumption is very low and timber will presumably remain a luxury in these countries). It has for example been argued that we will be unable to buy timber from Asian countries from which we are currently importing because (it is hoped) their standard of living will rise and they will want to consume their supplies themselves (Jacobs [2], p. 3); and it has been argued on similar grounds that export markets will be available in Asia in the event of local oversupply (Jacobs [1], p. 8). But there is no evidence that standard of living and wood consumption levels are generally increasing; on the contrary, when account is taken of the *distribution* of income rather than mere GNP there is evidence that the standard of living in many Asian countries is declining (International Labour Organisation (ILO) [1]) — and it is the distribution of suitable income which counts in raising consumption of items like sawnwood.

But even if future supplies can be ensured at reasonable prices Australia's reliance on forest product imports is nonetheless excessive (cf. Jacobs [2] and [4]). Parkes ([1], pp. 171-4) has, however, demonstrated that from an international viewpoint the Australian wood products import bill is not excessive, on either a per capita or GNP basis, and that it is much lower on a GNP basis than that of several net importing countries. The detailed results, the relevant parts of which are displayed in Table 3, show that Australia with $7 worth of forest products per $1,000 of GNP, is some $0.3 above the group average, but $0.9 below the average of the six net importers. The table also reveals that the percentage of forest product imports to total imports for Australia is not only less than the average percentage, 6.5 % for the net importing countries shown, but also less than the average, 5% of the 9 countries tabulated (it is also less than that, 5.5% of the world as a whole); and that Australia's percentage of consumption of forest products from imports, 19 per cent in 1966, is over 8 percentage units less than the average of the countries tabulated and 18 percentage units less than the average of the 6 net importing countries. So, according to Parkes ([1], p.172):

> although 19 per cent may initially appear to be a high proportion of consumption to import, it is not excessive on international standards and is probably about the level necessary to obtain the benefits from production specialisation and international trade. These benefits can easily be lost if arguments for complete self-sufficiency are accepted without question.

A number of further considerations in favour of producing the material locally rather than importing it seem to have played a part in arguments for the program. For example, it is pointed out that Australia is a great exporter of wool and wheat and suggested that timber is not pulling its weight in comparison with such primary products, and that timber production is somehow letting the country down since imports greatly exceed exports (Brown and Hall [1], p. 12; Fairbairn [1]). But firstly, when the sorts of principles upon which these suggestions are based are brought into the open, namely that the production of each kind of produce should ideally be equal, and that one should import no more of each class of goods than one exports, they can be seen to be as arbitrary and unreasonable as they are damaging to trade. In fact textbook economic arguments for international trade may be applied against planning demands for self-sufficiency. The argument from comparative advantage, for instance, clearly applies to the Australia-New Zealand trade situation, in favour of increased imports of wood products from New Zealand.[1] Secondly, the suggestions are none too well-founded since only a portion of the wood products imports (little more than $4 million worth) are really primary products, the remainder being to some degree manufactured (Parkes [1], p.168). Thirdly such arguments appear to ignore a number of basic facts about Australian topography and climate,

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1 The argument is elaborated in Thompson [1], pp. 32-47.

TABLE 3

VOLUMES AND VALUES OF FOREST PRODUCT IMPORTS FOR SELECTED COUNTRIES, 1966

	Country	Volume		Values		Average Value
		cu.ft./ $1000 GNP	% of consumption	$/$1000 GNP	% of all imports	$/100 super ft.
Net importers	UK	13.5	92.3	13.9	8.9	10.75
	Japan	11.0	32.1	8.4	8.5	8.00
	West Germany	7.2	46.5	8.6	5.7	12.50
	Australia	6.3	18.9	7.0	4.7	11.67
	South Africa	4.7	16.1	6.8	3.2	15.17
	USA	3.3	16.8	2.9	7.8	9.17
Net exporters	New Zealand	2.8	7.1	5.4	2.7	20.33
	Canada	2.7	10.5	3.4	1.8	13.08
	Sweden	2.0	6.9	3.6	1.8	18.83
	Group average	5.9	27.4	6.7	5.0	13.28
	Net importer's average	7.7	37.1	7.9	6.5	11.21

Source:

Parkes [1]. To remove differences in population and levels of economic activity of the selected countries, Parkes uses both per capita and per $1,000 GNP comparisons; but he shows that GNP (deflated) values have a better statistical correlation with consumption and production than do population ones.

namely that Australia has large areas of land suitable for dry climate crops such as wool and wheat, but only very much smaller temperate areas suitable for wetter crops like timber, and that these must also provide for other, and possibly more important, uses.

It can of course be said in favour of self-sufficiency that it makes one more independent of wars, recessions and variations in international trade conditions (Jacobs [2], p. 1), but these sorts of advantages can always be cited for self-sufficiency in any item, and unless the item (unlike wood) is of strategic importance or otherwise essential must carry little weight; ultimately they lead to the economically primitive position that one should produce domestically everything one possibly can. The requirement of a cast iron long-term guarantee of future supplies applies standards of security that are not reasonable and are not required in the case of products of much greater comparative importance.

Moral arguments for self-sufficiency also play a part, and it is hinted that reliance on imports is not only dangerous but also somehow shameful and spineless – the import bill is referred to by Jacobs ([4]) as 'an annual debt'. Indeed, 'a claim that Australia should remain a large-scale importer of forest products indefinitely is equivalent to the view

expressed 170 years ago that the continent could not produce its own wool and wheat' (Jacobs [2], p. 1). Advocates of continuing imports, then, are 'knocking' Australia, a 'pioneering country' (NSW [2], p. 16). The program is projected as a national challenge (particularly to foresters); and appeals to a nationalistic, pioneer spirit and to the desire of Australian foresters to prove their excellence are more important than rational arguments. Thus Jacobs [2], p. 1: 'Australian foresters should plan to grow the national demand for forest products on Australian soils and to process them through Australian industries. . . '.

Bad as the arguments for Australian self-sufficiency are they look eminently reasonable compared with the extreme position, adopted by some forest services and foresters (NSW [1], p. 2; Henry [1]), that each state should be self-sufficient in wood products, and ideally no doubt each locality or local government region. It is claimed, however, that if we produce the material locally, we will consume more of it – 'The most important step in a program designed to stimulate the use of wood in any locality is to grow it in that locality' (Jacobs [2], p. 2, and also Hanson [1], p.39) – and for some reason (chiefly, we suspect, the discredited reason that consumption per se is a virtue) this is considered an excellent thing. It is even suggested as one of the benefits of the program that it will increase the number of foresters (although obviously not everyone will find this prospect so attractive).

Another argument commonly advanced (see e.g. Cotton, Comm [5], p.2343) is that the import bill will become intolerable by 2000. However imports currently account for about 20% of consumption, and if they were maintained at this level their value would increase in absolute dollar terms as consumption and population grow, but so correspondingly would total GNP and export earnings. Since forest product imports would retain their present position relative to other items, there would be no cause for concern and a moderate level of imports, of, say, 20% or so, could still reasonably be allowed for.

As well there is the usual battery of arguments which are routinely advanced to justify local activity which involves the destruction of natural areas for marginal short-term benefits, e.g. in agriculture and mining and particularly in sand mining: the creation of (rural) employment and decentralisation, the bringing into production of 'useless' (i.e. unexploited) areas, and many more aging favourites. Since a good deal of weight is placed on the first 'welfare' considerations by some proponents of the program, it is worth noting (we say much more later) that if the employment situation ever became, permanently, so serious as to warrant government expenditure and investment of the order involved in the program, in order to employ the people involved, the immigration program (on which the pine program relies heavily for potential customers) would clearly no longer be viable.

The case for self-sufficiency seems then to be a hotch-potch of bad arguments. There are good reasons, in view of the availability and probable cheapness of imports, for a proportionate reduction of the softwood program to take advantage of them. Certainly the availability of these imports removes the 'top-priority' classification from a corresponding portion of the program. The question of how much of the planting program is thereby rendered unnecessary we shall leave until we have looked at the issue of likely future requirements.

Despite the foregoing argument, the highest level of imports seriously considered in our final estimate (Table 6, p. 60) does not exceed the moderate level of 20% of requirements. *Our argument that the target of 3 million acres of conifers is an unnecessarily high allowance for future domestic requirements does not depend upon assuming the availability of imports,* or upon assuming that imports will continue to make even their present moderate proportional contribution to total requirements.

CHAPTER 3

THE LIKELY FUTURE POPULATION OF AUSTRALIA

Future requirements of wood products are a function of future population and of future per capita consumption. Moreover these parameters are not independent since per capita consumption depends on the rate of change of population. Thus estimates of future requirements depend on estimates of future population size and of population growth rates; and the pine program is a good deal more sensitive to both of these parameters than forestry planning papers have represented it as being. Moreover in estimates of population size and rate of change there is far more uncertainty and a much bigger spread of likely outcomes than program planning has allowed for, and forestry planners have set probable population levels far too high.

The main reasons for uncertainty are these:— Firstly, as the plantation rotation periods for pines are 40 years or more and plantations will not be completed until 2000, much of the program is oriented, not as is often claimed (NSW [1], Brown and Hall [1]), to the population of the year 2000 which is uncertain but to that of 2040, about which there is a great deal more uncertainty. This can be seen from the fact that a large part of the program, established with spaced aged groups to ensure a continuing supply of wood, will not even be beginning to yield thinnings by the end of the century, and also from the fact that even the maximum likely population of 2000, about 22 million, could be supplied at present rates of consumption by substantially less than two million acres of pine plantations or alternatively, if imports are admitted, by the one million acres of plantation already planted. Also the development of new projects such as those being started at Tallaganda and Bombala in NSW where planting will not be completed until about the end of the century at present planting rates, is largely oriented towards the populations of 2030 and 2040, since the economics of current planting in these areas presupposes the completion of the entire project. The development of new plantation areas must look, not forty, but eighty years ahead.

Secondly the period of time involved is such that one could not predict with any vast confidence the continuation of the present natural growth rate, much less that of a growth rate like Australia's which is artificially inflated by an immigration component which could be altered at any time. Over the last 20 years the immigration program has almost doubled the population growth rate; more precisely, over the years 1966-72 the immigration program has lifted the population growth rate from the natural increase of about 1.1% per annum to a figure of 1.9% or more (figures are obtained by averaging recorded components of increase at 31st December figures, given in Comm [2], for the relevant eight years). Because populations tend to grow exponentially the gap between populations growing at different rates increases rapidly with time; thus the difference between the population projected at the natural growth rate and that projected at the maximum rate produced by immigration is only 4 million by the year 2000 but reaches 20 million at 2040 (approximately 26 million versus 46 million). Therefore, cessation of immigration and reversion to natural growth rates, likely in the next 80 years, would greatly reduce population levels.

In the face of such uncertainty, it is essential to consider and plan on the basis of a range of possibilities, as decision theory makes plain. It is quite inadequate in planning over such a long period to do what some forestry planners do, namely to simply project recent population trends into the distant future. This would be rather like trying to predict family size in 1970 on the basis of trends between 1880 and 1890. That some tendency has appeared in the recent past does not give it any special priority over other

assumptions unless there is reason to believe that the conditions responsible for maintaining it will continue. And in this case there is evidence that they will not, that attitudes to human fertility and population growth are undergoing fundamental changes in Western societies. There is no basis then for a simple inductive procedure of extrapolating past trends — as the notorious unreliability of such demographic predictions shows. It is also quite inadequate methodologically to assume that planning must be based on something, and that past trends are the best data we have; really a theory which controls projections is needed. Nor is it methodologically sound to consider only the maximum or upper limits for population growth as forestry planning also does (in view of its adoption of systematic overestimation as methodological procedure; see Chapter 5). A rational procedure for planning must consider the likely range of outcomes and apply rational decision making methods in attempt to evolve the best strategy (as later explained). Not only is the forestry planning procedure of giving weight only to the upper population limits unsound; the estimates of the range itself are based on mistaken data and are set far too high. At both main reference points, viz. 2000 and 2040, there is a heavy concentration on improbably high points at the top end of the spectra, and failure to take proper account of the lower ends.

Projections for 2000

For the year 2000 a minimum population of 20 million is regularly assumed in program planning papers. Yet given the increasing questioning and growing unpopularity of the immigration program and the likelihood of its considerable reduction, a substantially lower population than this, in the order of 18 or 19 million, could easily eventuate (see table 4). Perhaps the failure to allow for lower figures is due to the use of the mistaken figure of 1.43% (usually rounded upwards to 1.5%) for the natural growth rate used consistently by Jacobs. This crucial error (which appears to have originated in Hanson [2]) has been systematically repeated or applied in a number of other forestry papers and texts. For example a minimum figure of 20 million at 2000, given by Brown and Hall [1], pp. 13-14, assumes a minimum growth rate of 1.5% or slightly more. In fact the natural growth rate has never attained such high average levels; it has averaged less than 1.3% over the last 30 years and only about 1.1% over the last 10 years (Comm [2]). But there does not seem to be any forestry source concerned with the program in which the natural growth rate has been correctly stated and population levels which would eventuate on cessation of the immigration program correctly estimated.

When it comes to setting an upper limit for the population of 2000, however, the great caution shown in setting the lower limits is thrown to the wind. The upper figure of 25 million mentioned by Brown and Hall [1] would demand a population growth rate well in excess of anything achieved in the past or likely to be achieved in the future. Even the figure mentioned by Jacobs and Hanson (e.g. Jacobs [2] and [3], Hanson [2]) as a conservative estimate — 22.4 million — would require an immigration intake in excess of anything that has been obtained except on isolated occasions and a higher average intake than has ever been obtained.[1] In fact this figure should be regarded as a decidedly high figure even with immigration, and a more likely *upper* figure, taking account of past and

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1 The average net immigration levels for the 12 years 1952-64 (before the Vernon Report [1], which recommended net immigration levels of about 100,000 a year) stood at about 75,000 which would lead to a population of about 21 million at 2000.
Although some recent forestry papers, e.g. Muncey [1], presumably following the New Zealand-Australia Free Trade Agreement (NAFTA) report [1], have given 21 million as the likely population at 2000, this must still be regarded as a high estimate although it is presented as a 'reasonably likely figure' and used as a unique basis for estimates.

likely future limits of achievable net immigration levels, is about 21 million by 2000. A more satisfactory range would be between 18 million and 22 million (significantly lower than the range considered even in recent program planning papers), for the following reasons:–

Even if there were no policy change it is doubtful that levels higher than 22 million at 2000 could easily be achieved. In order to obtain higher levels a consistently high level of migrant intake would have to be maintained. Some difficulty has recently been experienced in meeting quotas and these difficulties are likely to increase as the prosperity of the European community and other traditional sources increases and the birth-rate in Northern Europe declines. There are reasons to suppose the very high level cannot be consistently achieved at least without tapping 'unacceptable' sources and thereby increasing the prospects of the program's unpopularity and curtailment. Another reason for this is that targets are set each year in the light of the prevailing economic situation, employment levels, etc.; for example, targets were drastically reduced in late 1972 because of local unemployment. But the economic situation fluctuates here, and these fluctuations follow to a large extent international patterns. Hence when the Australian economic situation is buoyant it tends also to buoyant in the source countries and immigration quotas cannot be filled; conversely when the economic situation in the source countries is depressed so that large quotas could be filled quotas must be set below their annual level because of the similar economic situation here. Thus barring some European catastrophe, it seems improbable that the *net* immigration levels in excess of 100,000 persons a year, necessary for a population in excess of 22 million by 2000, would be achieved.

Policy has however changed. The Labor Government has already reduced the immigrant intake. The intake has so far dropped by 20% on the recent average level, leading to a population growth rate of about 1.7%. It has been stated[1] that government policy for the selection of assisted immigrants is to base the intake of assisted immigrants primarily on chain migration (sponsorship of the migrant by relatives or close connections) and otherwise on the intake of skilled migrants in areas where industry calls for skills. This much more selective policy, if implemented, would reduce the number of immigrants substantially since very many of the immigrants in recent years are unskilled and unrelated to earlier immigrants; and it is mathematically bound to lead to the reduction of immigration to a much lower level as ties are lost between descendants of migrant families and relatives in their country of origin.

There are also less direct reasons for thinking that the Labor Government will (be obliged to) reduce the immigration program, by making it very much more selective. One reason is the vexed question of 'non-European' (mostly coloured and Asian) immigration. It is Labor party policy that the immigration program be administered so as to avoid 'discrimination on any grounds of race or colour of skin or nationality' and also so as to avoid 'the difficult social and economic problems which may follow from an influx of people having different standards of living, traditions and culture' (Labor [1], p.30). To implement these policies, and to preserve the image the Labor Government is trying to present abroad, the immigration policy will have to be very selectively administered so that only limited numbers of 'non-Europeans' are admitted yet discrimination does not occur, and this means a much reduced intake.

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1 Announced in election speeches, and repeated by the Minister for Immigration, e.g. SMH, January 30, and Grassby [1] and [2], and the Prime Minister. According to the Prime Minister 'the emphasis has changed . . . we will not, as our predecessors were accustomed to do, sponsor migrants as a government' (Whitlam [1]).

As well unless the immigrant intake is heavily reduced many of the planned welfare programs in housing, education, urban conditions and social services will be very costly and may well founder. Part of this point was emphasized by two ministers in a joint press statement (Uren and Cass [1]) where they 'seriously questioned whether it will be possible to adequately improve the urban environment if the present rate of population increase continues'. And the party program explicitly recognizes that immigration may well have to be curtailed in the light of Australia's 'capacity to provide employment, housing, education and social services' and in the interests of the 'the welfare and integration of all its citizens' (Labor [1], p.30).

The possibility of a long-term decline in the natural growth rate also cannot be discounted; Australia has a natural growth rate which is high in comparison to that of other countries which are similar in the relevant respects, and there is now a noticeable tendency towards decline of natural growth rates in these countries. A reduction in rate of immigration leading to increased participation of women in the work force could also work indirectly to reduce the natural growth rate.

But although the immigration intake has been reduced, through a reduction in the number of assisted passages offered and through a tighter screening of prospective immigrants, and may be further reduced, and the natural growth rate may well decline, the general issues concerning Australia's future population growth are less clear. In part this is because the previous government had no properly worked out population policy, and the present government has yet to work out a policy. And even if it does, future population growth cannot be settled simply by reference to the population policy of the present government, since even the population of 2000 is plainly beyond the power of government to determine to more than a slight degree during its current term of office (unless, what is unlikely, the immigration program is entirely dismantled, for once dismantled it would, like Humpty Dumpty, not be easily put together again).

Long-term population policies are of course political decisions, but studies and enquiries presently under way should influence the outcome. It is difficult to see how any study which is concerned with *long-term* population policies and which is not excessively weighted towards business interests (as the Vernon Committee undoubtedly was) could recommend a long-term increase in the present rate of population growth, and reduction seems a more likely outcome. It is alarming, then, that virtually irreversible decisions affecting the future of much of the forests are apparently to be taken before these expected decisions on long-term population policy, crucial to forestry planning, are made.

It is plain then that the procedure adopted by forestry planners and others of attempting to estimate future population beyond 2000 by simply projecting current high rates of growth is unsound, since available evidence suggests that the factors responsible for these growth rates are unlikely to persist. And to a substantial extent the future population of Australia is a matter for decision rather than projection. Given the extent to which it is a matter for decision, the issue of future population levels becomes one not just of empirical fact but of value, for political argument – an issue where arguments for what is desirable play an important role. The arguments traditionally advanced to support high levels of population growth for Australia not only appear to have neglected a number of important value considerations but also to have relied on disguising the extent to which such policies are *political*, i.e. the extent to which they assist some groups and penalise others.

The main argument advanced for the high rates of population growth achieved through the immigration program is that economic growth and GNP are increased thereby increasing welfare. But even if one accepted the identification of increased GNP with increased welfare involved in the argument, and ignored the ambiguities involved

in the notion of economic growth which makes the claim that economic growth is increased question-begging, it has not been satisfactorily demonstrated that per capita GNP *is* increased by the immigration program. And even if an increase in per capita GNP could be demonstrated, this would have to be shown to outweigh the other evident disadvantages of reduced quality of life – of which the pine program itself and the increased strain on remaining forest areas are clear examples, but which is also evident in the increased size of cities, in great and already evident pressure on scarce recreational areas such as beaches and national parks adjacent to cities. It is also commonly suggested that serious disadvantages arise from the capital requirements mass immigration imposes, and from the strain increased numbers of people place upon often over-extended urban facilities and social and public services: that nowadays it means increased urban congestion and a reduction in the quality of life through overcrowding, inferior education, and excessive stress on and delays in social and public services, and that the resulting increased demand may contribute to the excessive land and building costs Australians are burdened with.

Many other arguments for the program are similarly unconvincing, and it would appear that many of the supposed benefits could be obtained with less cost in other ways, as in fact happens in other countries which do not depend on high rates of population growth for continued economic growth. For example, it is argued that the immigration program is necessary to obtain a supply of labour for less desired jobs such as assembly line work; however it would appear this might be achieved with less cost to the community by improved wages and conditions. The program is supposed to increase economic efficiency by increasing the mobility of labour; but it would appear the aim could be better achieved by a more efficient use of the existing labour force, for example through better planning, effective retraining schemes, etc., and by an attempt to attract a small number of skilled workers in specific needed categories. The increased market provided by immigration is supposed to bring economies of scale in production and thereby increase productivity; however, not only is appropriate quantitative evidence for this claim lacking, but it appears that in major cases such as automobile manufacture such economies could be better achieved by having the existing market split between fewer firms since the firms mostly produce similar products. The rapidly increasing market is supposed to bring new incentives for investment and entrepreneurial activity, but natural growth in population provides an expanding market and appears to give quite adequate incentives. The program is supposed to enable the filling up of empty spaces, the population of the inland and country areas, but it is now evident that almost all the increased population will add to the congestion of the coastal strip and, even with decentralisation, of the larger cities. Even if the inland areas could sustain the large populations this plan envisages (which is increasingly doubtful), there is no longer felt to be any urgent necessity or even good reason, for such a plan, which would obviously involve substantial financial incentives. Large-scale immigration is supposed to confer greater variety in the means of enjoying life, for example through cuisine, entertainment, arts and culture; but an influx of unskilled and sometimes semi-literate people is a blunt method hardly likely, other than fortuitously, to achieve such results, which would be better accomplished by a direct attempt to obtain quite limited numbers of skilled immigrants, restauranteurs, artists, academics, draft resisters, polynesians, eskimos, and so forth. But in fact people, and also a fair variety of people, are no longer in such short supply in Australia.

As well it is now realised that there may be severe limitations, much more stringent than was previously thought, placed on future population size by the scarcity of such resources as water; and in addition to the well-known problems raised by non-renewable resources, the dangers of building up population levels whose standard of living relies on non-renewable resources are now more widely appreciated, while it is also becoming more evident that in an era of resource and particularly energy scarcity the economic advantage may come to lie with those countries whose populations are small in relation to their resources, especially energy resources.

Finally, even if a good case could be made for increased welfare stemming from high population growth rates, good decision-making would tend to prefer lower population levels because of the simple decision theory point that the disadvantages of an undershoot are very much less than those of an overshoot; for having lower population levels than the maximum which might be sustained with a high standard of living would *at most* mean that some material wealth was temporarily foregone (which as we have argued would probably be more than compensated for in other ways), whereas excessive levels run the risk of severe long-term penalties, both economic and environmental.

Despite the foregoing considerations, our argument does *not* depend on assuming a great reduction in population growth rates before 2000; for it is plain that, though the population at 2000 is uncertain, standard forestry estimates are probably too high, and are inadequate because they fail to take account of the range of likely outcomes. To repeat the main point:— In view of the uncertainty it is necessary, in order to apply rational decision-making methods, to consider not just *maximum* possible or likely population levels, as forestry planners have tended to do, but a range of probable levels of populations.

Projections for 2040

An even more remarkable upward displacement of the spectrum has occurred in forestry population estimates for 2040 and 2050. The top levels considered are so improbable that no rational decision-making procedure really needs to consider them, while quite feasible lower limits are completely neglected. For example, Jacobs ([3] and [2]) contemplates a population of 39 million by 2040 as a lower limit: for a population of 22.4 million by the year 2000 is 'considered as conservative' (Jacobs [3] p.40) and 'the annual rate of increase should continue at least 1.5% after the year 2000' (Jacobs [2], p.1). No doubt the use of 1.5% as a minimum growth rate here is due once again to the mistaken use of 1.43% — 1.5% as an estimate of the natural growth rate. If the correct figure for the natural growth of 1.1% (approx.) is used the minimum population at 2040 can be seen to be very much lower (see table 5).

The upper population levels and growth rate of 1.87% contemplated by forestry planning (Jacobs [3] especially) assume that something like the present high rate of population growth will continue until 2040: that is, assuming that the natural growth rate fails to rise, that the immigration program will continue to make something like its present contribution to the rate of population increase, not just in the immediate future but right up until the year 2040. It now seems extraordinarily unlikely however that these population levels will be reached, for the following reasons:— The immigration program was introduced to achieve certain specific economic goals, e.g. minimal population levels for an industrial economy, and it will have achieved these goals well before 2000. Once these goals are achieved there would not only be little advantage, but very positive disadvantages, in continuing the program, as even its proponents realise. As it is, Australia has a very high growth rate for a modern industrial state. Thus we can reasonably expect that assisted immigration will have been practically halted by 2000. The second reason why growth at the rate of 1.87% leading to a population of around 46 million at 2040 is unlikely is that given such a growth rate it will be virtually impossible to avoid excessive population levels thereafter. For example, if population growth continued after 2000 at 2% Australia would have a population in excess of 150 million people by 2100 and population rather like the present population of India only fifty years later at 2150. Even if it were decided to revert to the natural growth rate after 2040 it would be very difficult to avoid excessive population levels within a short time, for example 100 million people by 2100 at a 1% growth rate; and the hypothesis that the population could grow at 2% until 2040 or 2050 and growth case suddenly thereafter can, of course, be discounted. It is hard to believe that rational people would go to the great expense and trouble involved in the immigration program in order deliberately to create a catastrophe.

Even if these sorts of population and growth levels *were* desired, they would be difficult to achieve. This is because the numbers contributed by immigration would not continue, as at present, at a flat rate, but would have to increase exponentially to maintain a constant population growth rate, of say 2% per annum. But this means that by 2040, for example, the migrant intake would have to be in excess of 600,000 people for the year (allowing for the usual percentage of departures), and by 2050 it would be necessary to import nearly three-quarters of a million people per year to maintain growth at 2%. It is very doubtful that these numbers could be maintained. The logistics and expense of finding, transporting and settling this many people each year are staggering – it would require the greatest sustained mass migration in the history of mankind. So too would Jacob's [3] 'moderate intake of migrants' with a growth rate of 1.87% per annum. Indeed when even targets of 200,000 immigrants a year were set in 1950 and 1951,[1] targets were nowhere near filled and there was a quite high departure level partly because of the number of marginally interested people attracted by advertising.

The same considerations which indicate that the hypothesis of growth at 2% to 2040 seriously considered by forestry program planners is, on present information anyway, so improbable as to be not worth considering, also indicate that an upper bound to population growth between 2000 and 2040 is probably about 1.4% per annum. For any more than this, 1.5% say, would involve at later stages a migration intake in excess of 200,000 people each year: but immigration programs of this size have not been long maintained anywhere, even by the populous and wealthy USA and they face obvious difficulties. Thus even the lowest levels considered by the program planners for the population of Australia (viz. 39.5 million resulting from growth at 'natural growth rates' of 1.43% from a basic population of 22.4 million at 2000) are above those that need to be considered as likely in decision making (see Table 4). More probably the immigration program will have ceased after 2000, and lower populations resulting from reversion to a reduced natural growth rate before 2000 should also be considered as not unlikely.

The range of likely outcomes

The range of possibilities for the reference dates are illustrated in tables 4 and 5, unlikely hypotheses lie outside the double lines.

Hopefully the chief defect of Table 5 is that it tends to err on the high side. For there is some reason to expect that Australia's natural growth rate may fall, after the pattern of the demographic transition in industrialised European states, from 1.1% to a growth rate more like the 0.4% presently characteristic for much of northern Europe. Allowance is made in Table 5 for a reduction in growth rate to 0.8%, the current growth rate for Europe (see Ehrlich [1], p. 45), but the much lower levels that may result before 2040, either through a change in social attitudes, or through an early demographic collapse of the world system (as modelled by Forrester [1] or Meadows et al [1]), have not been taken into account. In fact it will turn out not to matter, from the point of view of the pine planting program, that these lower levels at 2040 are not included. For given, as is argued later, that the best course of action is for the states to plant no more pines, reduced population figures would make no difference to planning policy.

Forestry program planners have however considered only a far smaller spread of probable outcomes than the spreads shown in Tables 4 and 5 for the probable ranges at 2000 and 2040. In this way they have managed to make their program look much less dependent on population factors than it is and much less open to uncertainty than it is.

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1 In those heydays of growth 'both the Chifley and Menzies governments envisaged population increasing at 3% a year'; (Vernon [1], p. 69), which would have required net immigration of about 200,000 people annually.

TABLE 4

POPULATION OF AUSTRALIA AT YEAR 2000 UNDER VARIOUS (MIGRATION RATES AND VARIOUS GROWTH RATES

	Average growth rate % per annum	Average Net Migration in persons per annum	Population in millions
	From either current natural growth rates, with perhaps a small inflow, or from a reduced future natural growth rate with a low level of immigration.		17.3 17.8
Probable range 18-22 million, with lower levels more likely	1.4	40,000	18.9
	1.63	60,000	20.3
	1.8	80,000	21.2
	1.9	100,000	22.0
	2.0	120.000	22.8
	2.15	140,000	23.7

Some figures are drawn from Comm [3]

Base population at 1970: 12,487 million.

TABLE 5

POPULATION OF AUSTRALIA AT 2040 UNDER VARIOUS ASSUMPTIONS AS TO POPULATION AT 2000 AND VARIOUS GROWTH RATES

	Population in millions at 2000	Hypothesis as to growth rate	Populations in millions at 2040
	17.3	1.1% from 1970	26.8
	17.8	1.2% from 1970	28.7
	18.9	0.8% from 2000	25.6
	18.9	1.0% from 2000	28.0
	18.9	1.1% from 2000	29.2
	18.9	1.2% from 2000	30.4
	20.0	1.1% from 2000	30.9
	20.0	1.2% from 2000	32.2
	21.0	1.1% from 2000	32.5
	21.0	1.2% from 2000	33.8
unlikely outcomes	21.0	1.4% from 2000	36.6
	22.0	1.5% from 2000	38.2
	22.0	1.7% from 2000	39.6
	22.4	1.87 from 2000	46.99

They have used their narrow and incorrect population spreads to justify the program's inflexibility and to counter the objection that the program fails to make satisfactory provision for the reduced planting rates in the event of lower population levels. The argument (put forward, e.g., by Jacobs [3]) for not giving weight to possible variations in population size, and for not worrying about the over-estimation of requirements, is that timber is a flexible crop which can be held over while population size expands or harvested earlier to take up variation in demand. The argument might be satisfactory if likely variations in population were comparatively small and rates of population growth as large as Jacobs supposes: but it loses cogency where spread of likely population outcomes is larger and rate of population growth relatively small — in such a case much of the plantation venture would become a serious economic liability since over-production could neither be absorbed by a rapidly increasing population nor profitably exported.

Not only the direct effects of a reduced population size at the main reference points have an important bearing on the pine planting program, when the derivative effects, operating through a reduced population growth rate, are also taken into account, the results of a reduced population growth rate can be seen to be even more spectacular than the population totals themselves suggest.

CHAPTER 4

'PREDICTING' CONSUMPTION LEVELS

Reduced population growth would not merely reduce population size, it would also operate indirectly to reduce consumption levels. For many durable goods demand is much less a function of absolute population numbers than of population growth. Sawn timber is such a commodity (given some degree of affluence as a necessary, but not sufficient condition, for moderate sawnwood consumption). Sawnwood consumption is approximately 63% of current total wood consumption in Australia, i.e. about 29 cu. ft. per head in 1960-65 out of the total of about 45 cu. ft. per head annually (FTB [2]). About three-quarters of the sawn timber consumed in Australia is used by building and construction industries and more than one-half of sawn timber used goes into new housing (see e.g. Turnbull [1]). Thus in Australia, taking a small allowance for wood panel products used in building and construction, about 23 cu. ft. per capita is used in building-construction. (Presumably something like this figure would still be correct if some quantities of sawnwood were replaced by wood panel products, as they may be). But the building-construction industry depends on rate of population growth. Thus for example if a population of 20 million stabilized at zero growth rate the building demand would, other things being equal, be almost entirely for building replacements and alterations; in such a situation a correct figure for sawnwood demand would not result by multiplying 20 million by a consumption figure for sawnwood evolved from a period of much higher population growth rate. Demand for commodities such as sawnwood is not, then, a linear function of population, as has been assumed by standard Australian forestry planning, but depends also on the rate of change of population. Indeed total sawnwood figures are not so much a matter of population increase as of increase of adult population; and since the immigration program increases the proportion of new adults it leads to higher sawnwood consumption figures even than an equivalent natural growth rate without immigration.[1] Thus, other things being equal,[2] reducing the growth rate by half, by terminating the immigration program with its heavy influx of new adults, would reduce the sawnwood consumption correspondingly, presumably almost by the order of a half, and by at least 10 cu. ft. per head. Likewise cutting the immigration program in half and thereby reducing population growth by about one quarter will presumably cut demand by about 5 cu. ft. per head within a short time interval. No allowance has been made for this factor in standard planning papers (e.g. papers of Jacobs and Hanson) or textbooks which have adopted the unsound procedure of multiplying population figures

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1 When population growth rates are changing rapidly the age structure of the population assumes importance in projections of consumption figures.

2 For demand for sawnwood, d(sn), is not just a function of p(opulation) and dp/dt; it also depends on i(ncome) and di/dt (and indeed, also on distribution of incomes), on the price and availability of substitute m(aterials), and on t(echnological changes). A variational argument, based on the equation $d(sm)/p = f(p, dp/dt, i, di/dt, m, t)/p$, can be used to show that per capita demand for sawnwood is likely to decline. In order to better support our (not unreasonable) hypothesis as to the extent to which per capita demand $d(sm)/p$ is likely to decline as dp/dt decreases, it would be advantageous to apply such techniques as regression analysis; but unfortunately the data for such an analysis is lacking. What can be done however, to support the hypotheses, is to use a cross-sectional analysis, as in NZ [2].

for population growing much more slowly than the current one by current or even higher per capita consumption figures (e.g. Brown and Hall [1], Muncey [1]). Perhaps one reason why overseas forestry planning has ignored this effect is that in countries growing at a relatively constant growth rate which could change only gradually, any effect obtained would be masked by the time lag and changed consumption patterns. In Australian conditions,however, where terminating the immigration program would cause a dramatic fall in the growth rate in a short time, the effects would soon be very significant. Furthermore one could allow for such a fall in consumption given an appropriate drop in population growth without assuming any reduction in the real standard of living, the availability and adequacy of housing, and the amount of sawnwood used in each building.

If at the year 2000 (to which the program is allegedly oriented) the population is around 20 million and growing at between 1% and 1.4%, and appropriate adjustments are made for the effect of reduced growth rate on consumption, it would appear then that softwood requirements at 2000 could be met (at wood product consumption figures of 35-40 cu. ft. per person) by the amount of pine already planted, slightly over one million acres (allowing the yield figure, discussed below, of 250 cu. ft. per acre per annum). For a total of 700-800 million cu. ft. — made up from 400 million cu. ft. from native forests (excluding woodchipping; figures from Jacobs and NAFTA [1]), 100 million cu. ft. from NZ (admitted under the NAFTA agreement), and with the remainder from pine plantations — would suffice; moreover there would be provision for some shortfall since private planting of pine alone will almost certainly carry the total area of coniferous plantation to 1½ million acres by 2000 without any further State Government forestry projects. Faced with this apparent discrepancy between what the program of 3 million acres will deliver and what would appear to be needed, the program planners usually manage to discover evidence for a remarkable rise in wood consumption figures by 2000, so that even with the total program a shortage of supplies at 2000 can still be claimed.

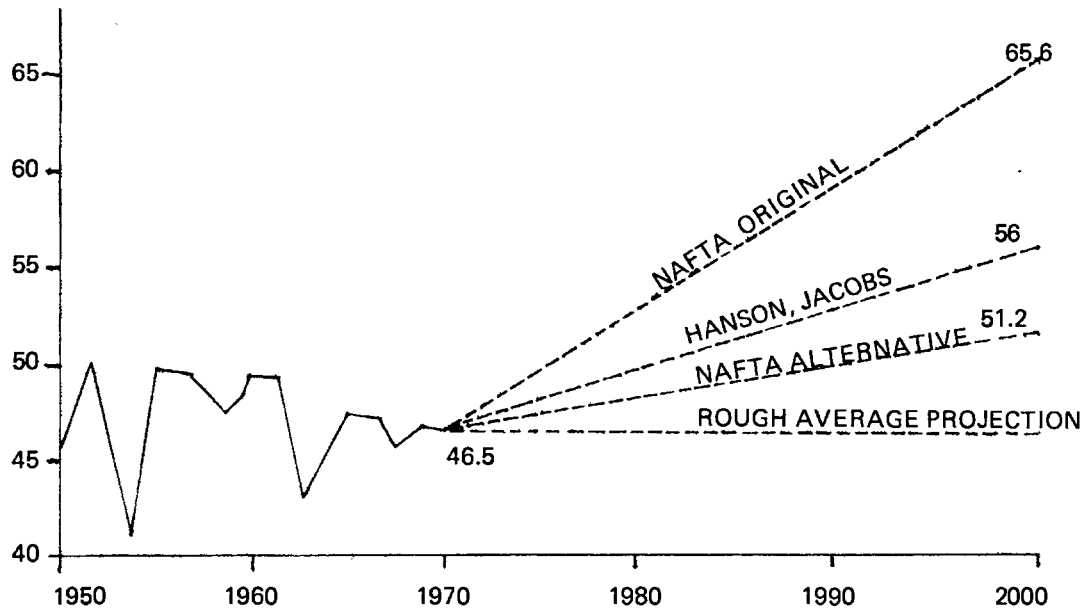
The assumption that consumption will rise dramatically in the next 30 years is made *despite* the fact that wood product consumption figures for Australia have remained relatively constant over the last 25 years at around 45 cu. ft. per head (Jacobs [6], p.190). However, much higher consumption figures are predicted in the following sources: Hanson [2], 56 cu. ft. per head; Jacobs [2], 56 cu. ft. per head; Muncey [1], 48 cu. ft. per head as a conservative estimate with a maximum figure of 58 cu. ft. per head; NAFTA [1], almost 60 cu. ft. per head ('with effective effort from industry' and presumably consumers too).

Not surprisingly the procedure of casting around for evidence to support an already determined conclusion — namely that the pine planting program or even more is justified — has produced some fine examples of unsound methodology, the main one being that of looking only for confirming instances and ignoring disconfirming ones (cf. Popper [1]). The prize for ingenuity however in finding reasons for lifting the consumption figures seems to go to Muncey ([1]), who hit on the brilliant strategy of counting our exports to Japan as part of our consumption so that our 'domestic requirements' for the year 2000 will include not only what *we* consume but also some of what the Japanese consume. But Muncey is closely challenged by Huddleston [1] who has discovered that the disappointing decline in NSW (and Australian) per capita consumption of sawnwood can be rectified by skilful extrapolation, not from per capita consumption figures, but from consumption figures divided by a population figure from 25 years earlier.

It is illuminating in considering these predictions of greatly increased wood product consumption (the *growth* hypothesis) to examine the graph for total consumption which would emerge over the fifty year period if these predictions were correct: the graph appears in chart 1. Inspection of the graph shows that per capita consumption has been relatively stable since about 1950, and has in fact been declining slightly in recent years; hence extrapolation of past trends lends no support to the growth hypothesis. Although

CHART 1

PER CAPITA FOREST PRODUCT CONSUMPTION, 1950-1970, TOGETHER WITH LINEAR PROJECTIONS 1970-2000



Sources: 1950-1970 Figures from FTB[2] and FTB[1]

2000 Figures from NAFTA [1], Jacobs[2],[1] Hanson[2].

Note:

The FAO consumption figures for Australia to 1960 are markedly lower than those cited above; for example the 1959 FAO figure for Australia (excluding as usual fuelwood) is only 38.6 cu. ft.: see FAO [2], FAO [5], and Jacobs [2]. The discrepancy in figures calls for explanation.

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1 In a more recent paper [1], Jacobs reduces his (expected) requirement figure to 50 cu. ft. per head.

extrapolation from past trends must be treated with care, extrapolation based on the last 15-20 years of relatively stable economic conditions is generally regarded as a fairly good base for prediction, because there is reason to believe that the same sorts of growth factors will continue to operate in the near future. In view of this it is incumbent on those who predict startling changes in wood consumption patterns to produce some evidence that new growth factors which will produce such a change will begin to operate. The case for the growth hypothesis must be assessed separately for each of the relatively independent factors which go to make up wood product consumption, sawnwood, pulp and paper, newsprint, etc. We will consider the more important of these factors, sawnwood, and pulp and paper, in turn.

Sawnwood consumption

The main arguments for the view that sawnwood consumption will rise have been developed by Hanson in a number of papers ([1]-[4]) from 1959 to 1969, and his arguments have been endorsed in influential papers by Jacobs (e.g. [2]). At the time when the pine planting program was instituted (1962-1966) Hanson and Jacobs predicted that per capita consumption of sawnwood would rise over the next forty years by about 4 cu. ft. per person. The reasons advanced for the predicted rise in sawnwood consumption was that sawnwood consumption rose as income rose (the *income* hypothesis), and that Australian incomes were expected to rise over the next forty years. In fact what happened in the next four years was that sawnwood consumption declined by about 5 cu. ft. per person (FTB [1] and [2]). It continues to decline – as substitution of concrete floors and metal frames and cladding for sawntimber commodities increases, and as multi-unit dwellings, which use less timber, increase proportionately. But despite this data the prediction that sawnwood consumption must rise, based on the income hypothesis, is reiterated in recent publications (Hanson [3] and [4]). And that the growth hypothesis for sawnwood has been by no means abandoned despite these recent trends is shown by the fact that it reappears in a disguised form in the NAFTA [1] figures. For not only have these figures assumed that sawnwood consumption will revert to earlier and higher levels of 30 cu. ft. per person instead of continuing to decline from the current figure of 25-26 cu. ft. per person; but also the NAFTA [1] figures have failed to make any compensating adjustment to the wood panel product figures, which are also assumed to increase substantially. There is, however, reason to suppose (see FAO [3], p.83) that sawnwood consumption and wood panel product consumption are by and large inversely correlated. For example if one examines the figures obtained by adding together wood panel products and sawnwood consumption figures one has a relatively constant (if slightly declining) figure though the relative proportions of each have altered. There are moreover reasons for believing that these components are not independent, but that one replaces the other for at least a number of uses, e.g. furniture, built-ins. If one looks then at a combined total for these components, wood panel products and sawnwood, NAFTA [1] assumes that this combined figure, which has been slightly declining from 30 cu. ft. per head over the last twenty years, will rise to 37.5 cu. ft. per head over the next 30 years. No evidence is advanced or cited to support this presumption, but it may well be that the income hypothesis is being applied.

The income hypothesis for sawnwood is the assumption that (for all levels of use) per capita volume of consumption of sawnwood is a monotonically increasing function of per capita (real) income, that is, that volume of consumption is a function of income such that as income increases so does sawnwood consumption, and presumably proportionately (e.g. Hanson [3]). The hypothesis is applied as if the function were approximately linear to predict increased sawnwood consumption in Australia in the next 30 years on the basis of the assumption that real income will rise. One obvious fact which ought to cast serious doubt on this basis for predicting rising consumption is that real

income has risen in Australia in the last 15 years (probably more sharply than it is likely to rise in the next 20-30 years) and yet sawnwood consumption has failed to conform to the pattern and has in fact shown a decline (Hanson [3], FTB [2]). Clearly under Australian conditions at least, the mere fact of a rise in income is not sufficient to produce a rise in sawnwood consumption. This highly relevant piece of data from local conditions has been discounted (Hanson [3]) on the assumption that Australia is at present a very special case because of the high level of hardwood component in sawnwood consumed. However the hardwood factor does not appear significant or Australia a special case, since similar falls in consumption despite rising income have occurred in most other countries with a similarly recent high level of consumption, e.g. Canada, New Zealand, USA (see Hanson [3], FAO [1], Commoner [1]). Nor can the drop in these countries be 'explained away' in terms of a fall in availability or through price increases. In fact what is suggested by trends in a number of countries in the last 15 years is that in countries where use was very high in 1955 sawnwood use was virtually at saturation. This view is supported by a NZ study (NZ [2]) of international trends which has shown that NZ consumption of sawnwood is at or near saturation level, and on the basis of which NZ forest services are allowing for a steady decline in sawnwood consumption in the future. In this respect sawnwood would merely seem to be following a pattern familiar from other consumer durables, namely that after a certain level of consumption and point of income is reached volume of consumption may no longer be a linear function of income but may become logarithmic or may even begin to damp off. To assume that the function is linear is to make an assumption as naive as the assumption that a man earning twice as much as his neighbour will own twice as many refrigerators or washing machines.

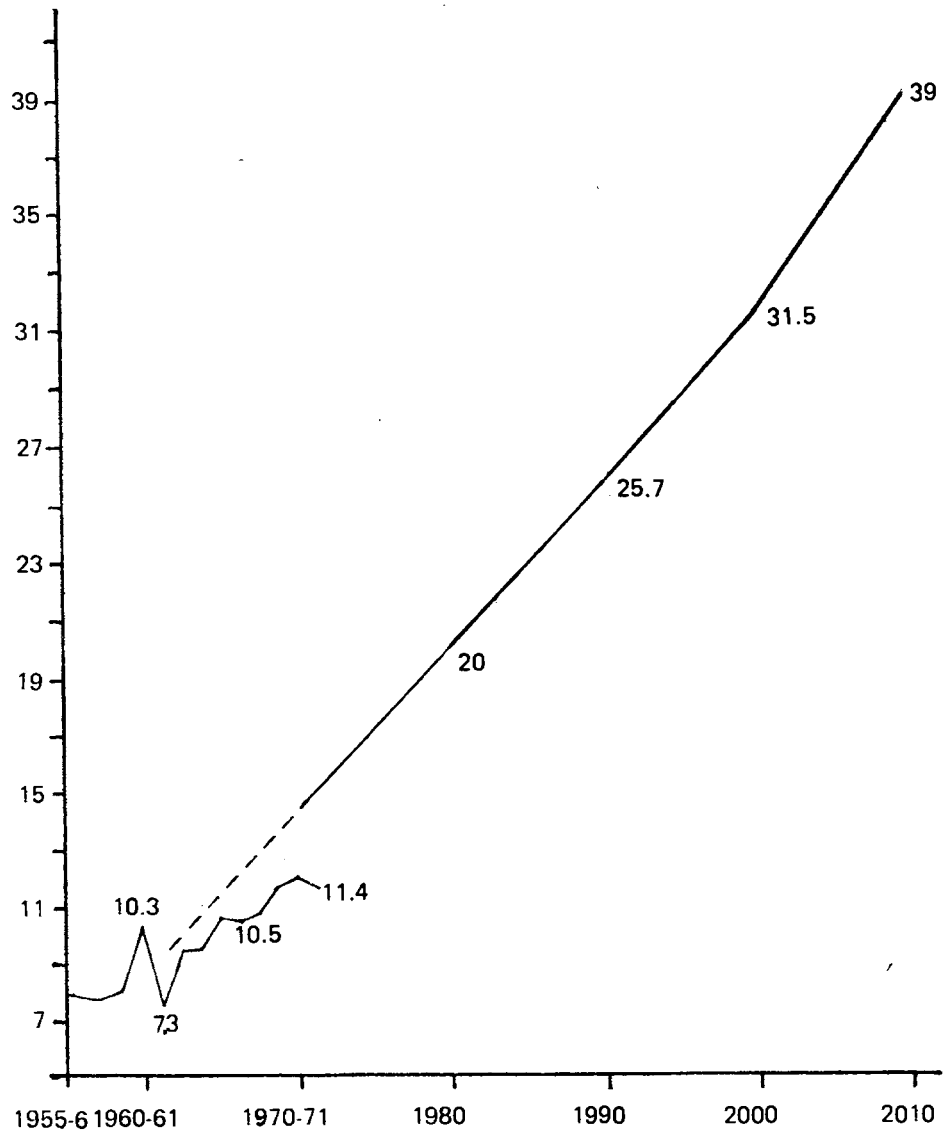
These highly relevant disconfirming examples have however been ignored by the proponents of an inflated wood consumption requirement estimate (e.g. Henry [1]). Instead reliance has been placed on a very rough correlation between GNP and consumption in a number of favourably selected countries (Jacobs [2] and [3], Hanson [3]). But the correlation is so rough and unreliable that it forms an inadequate basis for prediction of rises in sawnwood consumption due to increase in GNP. Furthermore, above a certain point the correlation disappears; for example if we examine just those half-dozen countries with a markedly high level of consumption in 1955 and again in 1966, there is no significant positive correlation between income and consumption. This suggests that such rough overall correlations cannot be used to predict consumption rises after a certain level of consumption has been reached.

In sum, for sawnwood the best assumption seems to be that consumption will continue to decline slightly, or alternatively, if one considers a combined total for sawnwood and wood panel products (allowing for sawnwood to lose ground to substitues), that this combined total will remain relatively constant at around 30 cu. ft. per head or slightly decline – *for a population growing at the current rate of approximately 2%.*

Pulp and Paper Consumption

Recently, since the prediction of a dramatic increase in sawnwood consumption has begun to seem less plausible, in the light of the decline which has actually taken place, the burden of justifying an enormous increase in estimated wood product consumption has increasingly fallen on the estimates for consumption of pulp and paper products; thus NAFTA [1] predicts a colossal rise in per capita consumption of pulp and paper. That NAFTA's predictions are not based on extrapolating recent local trends in consumption is obvious from Chart 2. (We have started the graph at 1955 because a number of significant pulp and paper uses were not established before that date). The graph for the last 15 years, when smoothed out and when allowance is made for the 1961 recession, conforms well to the pattern which is typical for pulp and papers uses, namely a log-normal function (cf. FAO [3] and [4]), with the graph beginning to flatten off.

CHART 2
PER CAPITA CONSUMPTION OF PULP AND PAPER PRODUCTS 1955-2010 (ACCORDING TO NAFTA [1])



1955-1967 figures are taken from FTB [3].
1967-1972 figures are from FTB [1].
Linear projection, 1970-2010, is from NAFTA [1].

Note: The trough at 1961-2 represents the 1961 recession.
The NAFTA graph *seems* to have been extrapolated from the period of return from recession!

According to NAFTA ([1], p.28) in the case of their original projections

> The method was based on the international cross-sectional relationship of consumption with income. The indicated level of per capita consumption at the value of Australian GNP per head projected for the year in question was multiplied by the corresponding expected population. For papers the relationship is excellent and was used directly, and in effect led to projected consumption levels similar to those experienced in U.S.A. at comparable income levels.

But both the trends of the preceding 15 years and the log-normal nature of consumption/GNP patterns are ignored in the NAFTA [1] projections. For the graph reveals, what the statement quoted hints at, that NAFTA [1] has made the elementary error of projecting the function as a linear function of income, taken as GNP. Since a linear extrapolation is used to project per capita GNP, which is taken in turn as providing per capita real income, and since the graph of the per capita consumption of pulp and paper is linear from 1970 to 2010, it follows that NAFTA has assumed that the consumption of pulp and paper products is a *linear* function of per capita real income. By its incredible linear assumption NAFTA manages to arrive at a vastly higher figure for consumption than would be achieved by applying the relevant log-normal function. In fact many of the same considerations which applied in the case of sawnwood consumption apply even more clearly to the treatment of pulp and paper consumption as a linear function of income; namely that both local and overseas trends of the last 15 years refute the hypothesis of a linear relationship. Furthermore there is a conflict with what is known generally of consumption trends in pulp and paper and similar commodities, that they tend to be log-normal, and generally fail to maintain a uniform rate of increase with increase of income.

A further argument has been advanced for allowing consumption levels vastly in excess of present ones, namely that Australia should allow for levels of consumption of the sort currently being experienced in the USA and Canada. This is suggested in the NAFTA report (see above quote) and is explicitly put forward by Jacobs ([6], p.190) and Hanson ([1], pp.38-39); in fact both in the case of pulp and paper consumption and also in the case of total wood product use. But this seems to present an excellent example of the ad hoc procedures of proponents of the growth hypothesis; for why should Australian consumption be assumed to parallel that of USA and Canada in the case of pulp and paper products when it is assumed to be completely different from these models in the case of sawnwood? And why should Australia follow North American patterns rather than the *much* lower European consumption patterns? Once again proponents of the growth hypothesis are prepared to count in as evidence what suits the growth case and dismiss what does not.

Prediction or Promotion?

But as in the area of planning by large corporations (discussed by Galbraith [1]), so in this area there is a thin line between planning and prescription. To plan for a level of consumption like the American one is probably to help create it. The difference between Australian consumption of pulp and paper and the higher North American consumption levels is mainly accounted for by the greatly increased use of such items in packaging and advertising in North America (FAO [1], p.25). To create increased use of pulp and paper products then is to create increased use of packaging, for example in excessive and multiple packaging of items, disposable paper items and food containers. (Likewise to bring Australian consumption figures for newsprint up to the North American levels commended in NAFTA (NAFTA [1]) is largely to create increased leaflet and newspaper advertising.) It is difficult to see however why we should deliberately plan to follow the US into a type and level of consumption which is widely recognised as both unnecessary and, in view of the environmental cost of production, environmentally damaging, and which makes only a very doubtful contribution to increasing the real standard of living.

It is also very difficult to see why consumption of this sort should be regarded as sharing the high priority that foresters have claimed for the softwood program. The fact is however that the planners are committed to the belief that it is their business to attempt to raise consumption of wood products. They are not interested merely in anticipating and supplying existing demands but also in creating demand and stimulating consumption. This is evident not only throughout mainstream forestry planning papers (e.g. papers by Jacobs, Hanson and Muncey – though there are occasional and largely neglected exceptions such as Turnbull [1]), but has recently been recognised in the act constituting the NSW Forestry Commission: for the object of the Commission is 'to encourage the use of timber derived from trees grown in the State' (Forestry Act of NSW as amended 1972, Section 8A(d); cf. again Chapter 1).

Once this point is grasped the peculiarity of the methods used to 'predict' high consumption levels makes sense; the high levels do not so much represent 'predictions' as *targets,* prescriptions disguised as predictions. They represent levels at which, it is thought, people could be persuaded to consume if the material were available cheaply and in quantity. The disguising of promotion as prediction is evident in NAFTA [1] with its hopeful references to 'effective effort' to reach the levels it predicts, and is also well illustrated in an article by Hanson ([3], p. 36), which initially purports to be an estimate of the likely future requirements of sawn timber, but soon turns to the more congenial task of exhorting greater efforts by industry to maintain and increase consumption of the product in the face of slipping consumption figures:–

> In the Bureau's forecasts we tend to assume that the Australian per capita consumption of sawn timber will gradually rise to 150 super feet per head from the 1969 level of 140 super feet. We recognise that this will not occur without strenuous efforts on the part of the sawn timber industry to improve their grading and presentation, to carry out a lot of product research and development and to at least hold their cost relative to competitive materials. If these efforts are not effective the Bureau would forecast that per capita consumption would decrease to about 100 super feet.

That the program is designed not merely to meet demand but also to stimulate and create it explains the otherwise puzzling way in which the plantation area 'required' has mushroomed since the late 1950's when pressure for the present program began. The demand climbed progressively from 1 million acres in 1960 (Slinn [1], Hanson [1]), to two million and preferably 2½ million acres in 1962 (Jacobs [1]), to 3 million acres by 1963 and later (Jacobs [2], [3], [4], [5]), and to more than 3 million acres as preferable (since 'this will allow future industry greater latitude particularly in the field of paper products', Jacobs [6], p.195) by 1968; some forestry sources now speak of an area of 4 or 5 million acres as being what is really necessary. This exponential growth in demand for plantation areas has occurred despite the fact that expected yields from native forests have greatly increased with the advent of new forestry techniques. But where 'demand levels' represent, not what is really required, but what may be promoted, the sky is the limit.

What is the point of disguising pushing as prediction? One of the benefits is suggested by one of the NSW Forestry Commission's propaganda efforts (NSW [2], p.4): 'Yet it is *people* who seek and use forest products – and who will be seeking much larger quantities by the end of the century'. The consumer, not the planners can then be handed responsibility for the excessive consumption levels the planners have deliberately created and the environmental damage it causes, despite the fact that he is offered no real choice in the matter (particularly in the case of paper used in packaging). Forest services and paper companies can be represented as innocent servants of community 'demands', and what is in fact decided by forestry planners can be conveniently disguised as chosen by

'the people'.[1] The NSW Commission's strategy and attitudes here bear a remarkable resemblance to those adopted by the automobile industry in the face of criticism on environmental and safety grounds (for which see Nader [1]).

The attempt to encourage and cater for high and undesirable levels of consumption illustrates a basic inconsistency in forestry attitudes. For, on the one hand, forest services expect to receive, and what profitability their activities have depends heavily upon receiving, a social discount rate for forestry of the sort which could only be justified if the activities for which the discount rate is applied are desirable or basically necessary. On the other hand they are prepared to encourage levels and types of consumption which are unnecessary, wasteful and harmful to the environment. They act like public corporations with respect to receiving funds but like private ones with respect to promoting consumption. This is to expect the advantages of a public body without the corresponding responsibility of ensuring that the activities fostered are desirable and in accord with wider goals. The promotion of a subsidised product which is of little benefit and whose production involves environmental destruction is the height of irresponsibility.

Setting reasonable consumption levels

What is correct about the planning procedure of prescribing consumption levels rather than predicting them is that in this area prediction is not really feasible, because it is not, on the basis of current information, really possible to predict distant prices (FAO, [3], pp.9-10). In such a situation, where the market model has limited applicability[2] it is not so much a question of predicting consumption levels as of deciding what they will be, of setting levels for consumption, and then determining supply (See Appendix 1). What is wrong in the planning procedure is the virtually universal assumption that such levels should be set to maximise consumption, even where the cost of producing the relevant items involves substantial damage to the environment. It is clear that a policy of this sort is in effect a disguised *political,* ideological, decision on the part of forestry planners, a decision about priorities of a type that is increasingly being questioned — that a satisfying and diverse environment is less important than more cardboard boxes, excessive packaging and throwaway paper products. Whether or not such priority judgements can be supported, they are not the sorts of judgements which should be covertly made by forestry planners and anonymous public servants and quietly passed off as 'estimates' or 'predictions' or 'forecasts' of future requirements. The alternatives and choices should be made clear and allowed for; it is not the job of forestry planners to promote *one* of these alternatives, excessive consumption levels , and to disguise the fact that there are other alternatives.

The fact is that one can decide what level of consumption to have, one is not the passive victim of some immutable and iron economic law which decrees that goods should be consumed at maximum levels. There is no reason why one should not adjust consumption levels to achieve environmentally satisfactory results or to take account of and reduce the environmental cost of production; and an environmentally responsible policy would do just that. Nor would such a policy inevitably involve a decrease in the standard

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1 In fact one of the main private companies planting pines in Australia, APM, Australian Paper Manufacturers Ltd., is now actively involved in packaging (including plastics) and in promoting packaging.

2 The market model is in any case, not properly applicable to forestry in Australia since (i) the situation is not a case of perfect competition because of local monopolies controlled by public utilities and protected by local tariffs, (ii) the long term nature of wood production limits response and early feedback of products to market trends, and (iii) intensive forestry has heavy external costs.

of living (contra Coombs [1])[1]; for a satisfactory index of *real* standard of living must take account of far more factors than per capita GNP or consumption of goods, including environmental factors (just as a satisfactory index of the worth of a house takes account of the attractiveness and desirability of its surroundings and not just the cost of the structure itself). Furthermore, if one makes proper allowance for *negative* environmental weightings, there will be cases where the consumption of certain goods, which have a high environmental cost of production, has an overall negative weighting (because the disadvantages of production and disposal outweigh the benefits of consumption); hence cases where consumption makes a negative contribution to the real standard of living. Reduction of consumption of such items would make a contribution to increasing and maintaining real standard of living, increase of consumption to reducing it. (In Weaver [1]'s terms this would be a case where more is not better, but worse.) Since excessive consumption of wood and paper products can be argued to be of just this negatively contributing kind, there is no clear objective justification in terms of increasing standard of living for the forestry policy of promoting and maximizing consumption of these products.

What is needed then is to determine plantation areas so as to allow for reasonable future requirements. For one is certainly entitled to require some limits on the consumption of items which are subsidized or whose production involves damage to the environment. It will be objected of course that allowing only for reasonable requirements involves making value judgements as to what is reasonable. However the notion that the present system of imposing no restraints on consumption whatever its cost or damage involves no value judgements is an illusion. It involves value judgements of a particularly insupportable kind – that one should take *no* account of environmental affects or other 'externalities', or even of the preferability of a fine forest to its equivalent in cardboard boxes.

The method of adjusting prices to keep demand for environmentally costly items down has been favoured by economists (e.g. Coombs [1]) as the way to achieve environmentally satisfactory results. In the case of forestry the length of growing time makes this sort of solution inapplicable, since once the areas have been planted and the native forest destroyed the main environmental cost is already incurred regardless of the eventual price or actual consumption of the material produced. The cost is incurred initially, through initiating the planting. Thus unless the price-mechanism can be somehow adjusted in *advance* of planting, i.e. at least 40 years ahead, so as to influence and limit planting it will not operate effectively. But in the absence of even minimal information of, and an adequate theory about, distant future prices the method is inapplicable. Therefore – whether or not prices are eventually adjusted, as they may be[2] in order to

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1 Coombs of course was mainly considering the case of scarce mineral resources, where there is a question of a decrease in present standard of living in order to allow a satisfactory one for future generations (the decrease need only be very slight: see Forrester [1]). However this case should be distinguished from the case where per capita GNP is abandoned as sole measure of standard of living and adequate attention given to the satisfactoriness of the environment, which need not decrease real standard of living and may in fact increase it. See too Appendix 1.

2 On present evidence such prices would only need to be increased slightly in order to reduce demand substantially; see, e.g. Ferguson [1], p. 2; Yoho [1], p.174.

have demand match supply – regulation must come by adjusting supply,[1] by refraining from planting more than will be needed to achieve desired levels of consumption. Thus an environmentally responsible policy would attempt, not to maximise demand willy-nilly, but to adjust supply and subsequently through prices, taxes and tariffs, to regulate demand.

The controls on supply must be supplemented by price and tax mechanisms to ensure that demand is limited in the relevant areas, i.e. for packaging and disposable paper items rather than for sawnwood. Several ways of curbing excess consumption of these items suggest themselves, e.g. the enforcement of strong anti-pollution measures against paper mills, which are heavy polluters, thereby, given an appropriate tariff adjustment, increasing the price of their products; the imposition of sales taxes on packaging and throwaway paper products to cover the cost of disposal; and the provision of choice for consumers as to packaging of purchases.

Given that the present environmentally costly methods of producing and processing wood products will continue, an environmentally responsible policy[2] would not allow for consumption levels greater than existing ones and should even attempt to reduce damaging consumption. Only if methods of production which minimised or removed the environmental cost of production were adopted in place of existing ones (e.g. methods such as planting the pine crop on suitable cleared farmland and processing the product through effluent-free mills) would it be permissible to allow for levels of consumption higher than the present ones within the confines of an environmentally responsible policy.

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1 The same points apply against the fashionable economic reply to the arguments of Forrester [1], Meadows et al [1], and others, that the present world system is headed for collapse, namely that the pricing system will operate to avoid collapse. It is simply an act of economic faith, and an ill-founded one at that, that price mechanisms will operate far enough in advance to have the relevant effects. Furthermore practically every main parameter in the world models presented will have to be adjusted if collapse is to be avoided, but a prices system on its own is hardly an effective means of regulating such parameters as population size and it cannot (though it may enlarge the portion of a resource that is worked) extend a strictly finite resource.

2 On the welfare picture talk of an environmentally responsible policy is cashed in for talk of a policy which caters (properly) for the welfare of present and future people.

CHAPTER 5

OVERESTIMATION, INSTEAD OF RATIONAL DECISION-MAKING

A standard forestry reply to criticisms of the kind we have been making, to the effect that they are vastly overestimating requirements, is that overestimating requirements is the best and safest decision procedure; and indeed that excessive estimation is not just a sound, but in this case the only sound, procedure. Thus according to Jacobs '. . . our estimates for future demands should be high rather than low' (Jacobs [2], p. 1); 'Australian forestry has usually set its target too low. Aiming high would be better because trees do not have to be cut at a precise date' (Jacobs [3], p.40). Jacobs' claims and arguments have been reiterated recently by Henry ([1], p. 4) 'in preparing the forecasts it was deliberately decided to err on the optimistic side . . .'.

Overestimation there has certainly been. In the past the (fallacious) method of overestimating requirements was a very widespread practice in forestry planning and permeates the figures used. It does not appear just in the matters of overestimating population, overestimating per capita consumption and underestimating yields, but it is a pervasive part of estimates everywhere. Thus figures are typically rounded upwards in order to increase requirements (or downwards so as to reduce production). A specially striking example is provided by recent official Australian forestry estimates (in NAFTA [1]). When the original consumption figures provided by the report were submitted to industry for comment they were widely rejected as substantial overestimates (as the report itself admits). Thus the report carries a set of alternative figures which revise the original estimates in the light of industry comment (the revised figures are still inflated). But the rejected figures closely resemble the figures used by Hanson (especially [2]) and largely followed by Jacobs and others in major planning papers on forestry in Australia. In brief, a check by forestry industries, hardly independent organisations, of standard forestry estimates of requirements reveals that they are substantial overestimates. That overestimation is the favoured method is not however hard to explain; it is an outcome of the fact that in forestry planning prediction has been biassed by promotion, and promotion of wood products along big business lines with the aim of maximizing their consumption. The overestimation method, applied in a developmental 'pioneering' ethos, helps, in its turn, to account for the environmentally irresponsible attitude of much standard forestry planning.

It is not merely that the procedure of deliberately planting more than is likely to be required is a remarkably greedy and irresponsible one in the light of the important alternative roles of the native forest to be destroyed by the program; as a method of dealing with uncertainty it is not even a sound decision-making procedure. The overestimation method would be satisfactory only if there were no penalty involved in providing the product or in providing excess material. As soon as the penalties are recognized, a rational decision-making method must take account of the probabilities of various alternative outcomes, and the best strategy according to decision theory takes account of both the likelihood of each outcome and the penalty attached to it. (The best strategy maximizes the products of probability and desirability of outcomes.) In fact what the application of decision theory principles reveals is that planning should concentrate on the low and intermediate population and consumption levels where probability is high and penalities low. The forestry method of overestimating requirements is then a remarkably bad strategy since it ensures that the heavy penalties resulting from a large population and high consumption levels are incurred despite their low probability.

Even so the overestimation method continues to have great appeal,[1] and too many people are tempted to think that, in the face of such uncertainty about future population and consumption levels, a planning procedure should allow for maximum population and consumption levels. The same temptation appears in other environmentally important cases of decision-making under uncertainty, e.g. in the acceptance of supersonic transport, in the planning of dams and electricity schemes, where more of each is once again naively taken to be better, and in the case of Australian defence options where too many people think that, in view of the lack of complete security guarantees, heavy defence spending to achieve military self-reliance is the best course of action. Military self-reliance (like wood production self-sufficiency) is not a good policy, for though the probable risks are small the costs are heavy in comparison with alternative policies: only if a neurotically high undesirability were assigned to the somewhat improbable contingency of an attack by a great power where no ones comes to our aid, would military self-reliance emerge as the best strategy (for an elaboration of these points, see Bull [1]).

The case of future forestry requirements is a typical one of decision-making under uncertainty, with population size and rate of increase the main variables contributing to uncertainty as to best dimensions for plantation area, but with other variables such as per capita consumption levels and price also contributing to the uncertainty to an extent that should not be neglected. Yet no attempt has been made to apply the methods, drawn from decision theory, designed to cope with just such cases. Indeed not even the more rudimentary methods of cost-benefit analysis have been widely applied. Instead forestry planning has relied upon the naive procedure of overestimating. But the method of automatically overestimating only gives the best strategy under the following very special conditions, which are *not* satisfied in the present case. These are:—

(1) That there is no penalty or only a slight one involved in the destruction of areas to be used for excess production. Given that there is a substantial penalty involved the method of overestimating simply ensures that such a penalty is incurred regardless of whether it is necessary.

(2) That a possible shortfall in wood products and a consequent drop in consumption is a matter of sufficient seriousness to warrant drastic measures and substantial risks of excessive production or other penalties in order to avoid it. Here it is perhaps worth remembering that Australian consumption is already very high by world standards and in fact a good deal higher than a number of European countries with comparable living standards, so that the prospect of reduced supply could not be claimed to be a matter of great seriousness (and a shortfall could in any case be met by imports or by restructuring consumption away from inessential uses).

A satisfactory procedure would not simply fasten on a gigantic (but improbable) population figure of, say, 56 million by 2050, as some forestry sources have done, and base estimates on that; this simply ensures that one incurs now some of the penalties of such a large population whether or not it eventuates. A satisfactory procedure would

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1 It also has strong historical roots: thus 'the attitude — born and nurtured in Central European schools of forestry — that wood was a necessity, together with the lengthy production period and the apparent disregard for the opportunity cost of resources devoted to forestry, combined to generate support for practices which maximized volumetric production' (Slinn [2], p.35).

consider a range of estimates likely on the basis of available information and then assess the best strategy in terms of these. The method of assessing best strategy for a range of alternative likely outcomes is determined by decision theory by the following rule (for maximizing expected utility): for each alternative outcome compute and assess the probability of that outcome multiplied by its desirability,[1] positive (benefits) or negative (costs) (conventionally ranging between 1 and -1). Then select the maximum of this set.[2]

To put the point another way, the best strategy is obtained by taking account of both the likelihood of each outcome and the penalty attached to it (where the penalty or disutility is the inverse of the desirability or utility).

In order to apply these decision theory methods to the pine plantation question one has to specify the range of outcomes, the probability of such outcomes, and the penalties attached to each outcome. In order to assess both probabilities and penalties we break the outcome up into direct outcomes, future consumption levels at each given reference point (2000, 2040), and derived outcomes, which can be represented most simply in terms of pine plantation areas and their features. We assume, for a discrete case, that only consumption levels and acreages that differ by significant amounts are considered. The derived outcomes will be determined by the total consumption levels, on the assumption of various yield levels from plantations and from native forests, together with import levels. Though derived outcomes are also affected by other factors such as availability, location, price and type of land, one can afford (especially in the face of characteristic forestry intransigence on these matters) to neglect these factors initially. The direct outcomes will, as already explained, be determined by the population and the per capita consumption levels. The per capita consumption levels will in turn depend on the rate of increase of population, on the price of wood commodities and substitutes and on income levels (both of which are taken as pre-determined), and on the amount of recycling of materials. By assigning probabilities to each of the relevant elements, one can, given dependence assumptions, obtain a probability for each outcome. On given assumptions as to the connections of direct and derived outcomes, such as standard yield and import figures, one could transfer probabilities from direct to derived outcomes. For the assessment of penalties we work in the opposite direction, and transfer penalties attached to the derived outcome, especially environmental penalties, back to the direct outcome. The penalty (or inversely, desirability) of a given direct outcome is then estimated by weighing both economic penalties and environmental penalties of that outcome including those penalties that accrue to it from its derived outcome. For the environmental penalties will depend, of course, on the destruction wrought in establishing and maintaining the plantation areas; for example, the environmental costs would be substantially reduced by planting on good rainfall, cleared agricultural land with appropriate soils, and at the same time economic costs such as those of clearing would be eliminated – though on the other hand economic benefits such as those of planting on land such as Crown land with presumably(?) a very

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1 One need not of course equate desirability or utility with money value, although some have criticised such applications of decision theory on the assumption that one must.

2 For detail and examples of this expected utility principle, see Jeffrey [1] or Schlaifer [1]. The expected utility principle is not the only rule that has been proposed for decision-making under uncertainty; but competing rules such as the dominance principle (discussed in Nozick [1]) will not give a divergent strategy in the forestry case in question.

low initial value would be reduced.[1] The fact that there are a good many intangibles involved in assigning penalties, and that different assessors will give different values to the same factors — as for instance mining representatives, as opposed to conservationists, characteristically give heavy weight to immediate economic advantages and zero weight to environmental costs — does not mean that the method cannot be applied fruitfully. For the same considerations underlie, if much less obviously, decisions reached by less satisfactory and revealing methods such as cost-benefit analysis; for example the forestry assumption that overestimation is the best policy covertly takes it for granted that environmental costs count for very little.

The application of a decision theory model quickly reveals that current forestry methods of reaching decisions on plantation sizes are based on extraordinarily poor strategies.[2] For the forestry methods select very improbable outcomes with high penalties. The outcomes are improbable because both the large populations anticipated (up to 56 million in 2050) and the high per capita consumption levels (in the order of 48-56 cu. ft. per person) are decidely improbable. Furthermore the derived outcome of more than three million acres of pine plantation, much of it at the expense of indigenous forest, involves penalties even from an economic point of view, and severe penalties when wider economic considerations concerning general desirability are taken into account. The economic penalties are these: that a heavy investment will have been made for an overproduced product, which will have to be protected or subsidized on the local market, and for which there is only a speculative export market in view; that is, that extensive moneys will have been poured into a commodity, which to be used will have to be used wastefully, and which may yield few or no returns, and certainly not the 7% annually confidently predicted by some foresters. Moreover one will have destroyed in this cause forests which are not economically valueless. For many of the forests to be destroyed have considerable economic value for wood, for water and genetic conservation, as reservoirs of fauna and flora, for recreation, and so forth.

But foresters usually neglect the economic penalties of their scheme and emphasize a benefit of the pine program, namely the place of plantation forestry in decentralization and rural employment. But this limited benefit is not a specific benefit of *pine* plantations as such; it is a benefit that would result equally from eucalypt plantations or from improving the management of native forests — both of which may turn out in the long run to be more profitable. In short, the benefit can be obtained in other ways that are not offset by all the penalties of the pine program.

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1 But not, it would appear, to the extent of offsetting the reduction of economic costs achieved by planting on cleared land which previously carried wet or intermediate sclerophyll forest, as NSW [1] tries to claim.

2 The decision theory model can be profitably applied in other cases of environmental importance, e.g. to the question of whether supersonic transport should be accepted and in the larger issue as to whether evasive action should be taken to avoid possibly impending collapse of the world system. Since a collapse outcome is highly undesirable, the optimism exhibited by Maddox [1], Kahn and others is irrational if, as it seems, the risk taken, the probability of the outcome, is not negligible.

The environmental consequences need much more emphasis, since they are characteristically neglected by planners and developers who are promoting pine plantations; and we devote the next chapter to these consequences. There we shall argue that, contrary to the standard forestry presumption that there is no penalty to over-estimating (which supposes that there is no real loss in the unnecessary destruction of replaced forests), 'undeveloped' and under-exploited indigenous forests are far from valueless.

Given that standard forestry decision-making is exceedingly poor – because it will ensure that the heavy penalties of a large population with high consumption levels are incurred, whether or not they occur, in a case when they are most unlikely to eventuate – how does one devise a better strategy and decision? There are two standard moves, familiar from decision theory, which here complement one another. Firstly one makes sufficiently many assumptions, in the light of available information, as to be able to apply decision theory methods to determine the best strategy (as done below). The fact that one has to make a good many assumptions in order to apply the method is not a damaging objection; more naive methods such as neglecting probabilities take many more things for granted, and make less adequate assumptions, than do applications of decision theory. Moreover it is enough that our assumptions are reasonably good; for in the application we want to make of the decision model we do not need to arrive at strategies which have any high degree of precision in order to make good our case. But, secondly, in order to obtain better results by decision methods one tries to reduce the assumptions and uncertainties. It is a standard methodological point (cf. Schlaifer [1]) that if the evaluation date of a decision can be postponed without loss then it is good policy to postpone making the decision, that is, to keep options open until a better decision can be made in the light of later and better information, fewer assumptions and less uncertainty.

This second move, of postponing the evaluation date, is especially relevant in the case of forestry planning. For it seems very likely that a substantial amount of light will be cast on future population and consumption trends in the next 10-15 years; and since the commencement of major new projects could be delayed for this period without undue penalties, and planting concentrated on existing advanced projects, it would be wise to postpone implementation of new or early projects, until further data becomes available, and to reassess the strategy and the need for further areas in the light of additional data.[1] This would result in a much more flexible decision-making policy than that currently adopted by forestry services: it would allow properly for revision of plantation targets in the likely event of reductions in population growth rate and per capita consumption levels.

In contrast the forestry planning programs close off options in an unnecessarily premature way by commencing, years before they are actually needed (if they are needed), projects such as those at Bombala and at Tallaganda (where planting was proceeding slowly, at a token rate of about 500 acres a year). From the point of view of reducing environmental costs it is important that no planting be carried out in project areas before it is clearly needed, especially since even a small investment in early planting, which would be largely wasted if the project did not proceed, tends to commit a forestry commission irreversibly to the rest of the project. It is this sort of procedure together with the inflexibility of official forestry policies which gives them the Juggernaut effect, sadly observed by many conservationists.

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[1] For this reason recently-exposed plans of the Australian Forestry Council AFC [1] – to push through the next Softwood Forestry Agreements Act two years in advance of its expected renewal date in 1976 and for a period of not 5 but 10 years – thereby closing options for the next 12 decisive years – are quite unsound and should be resisted.

CHAPTER 6

LIKELY FUTURE REQUIREMENTS AND PLANTATION AREAS

The area of softwood plantation that can be justified in planning for future requirements[1] may be estimated given likely population sizes and growth rates, per capita consumption levels, and anticipated yields from both native forests and coniferous plantations, together with allowances for imports.

To arrive at a range of likely per capita requirements at each reference point, 2000 and 2040, we extrapolate from recent trends (those graphed in FTB [2]), making allowances for reductions in per capita consumption of sawnwood and woodpanel products with declining population growth rate and for recycling in the production of pulp and paper products. The point of taking account of a range of requirements for each selected population level (18, 19, 20, 21, 22 million people at 2000, for example) is twofold; firstly any extrapolation should allow for a certain spread over time, and secondly there remain uncertainties, for example as to the rates of growth of population at each population size and as to the amounts of recycling that will take place. Certain assumptions already defended are taken over, namely that the per capita consumption levels for sawnwood combined with wood panel products will remain relatively constant (though with a tendency to decline) at a high population growth of about 1.9%, but that levels will fall with lower growth rates. In the absence of better data a linear reduction in per capita consumption levels with reducing growth rates is assumed. Thus at a population growth rate of 1% it is anticipated that combined per capita consumption levels for sawnwood and panel products would have declined to less than 20 cu. ft.. The widely accepted assumption that per capita use of poles, piles, props, posts and sleepers will continue to decline, as these items are replaced by more appealing substitutes, is adopted, and as is usual, per capita consumption of fuelwood is neglected (under Australian conditions it is unlikely that fuelwood will raise any special problems since much of it can be provided by branchwood or trees outside forests). Finally it is assumed that per capita consumption of pulp and paper products will follow a log normal distribution, increasing from the 1967 statistic of about 10 cu. ft. per head to level off (as logarithmic extrapolation from chart 2 suggests) in the vicinity of 13-15 cu. ft per head.

Thus a maximum consumption level appears to be in the order of 48 cu. ft. per head for a population growing at about 2%. But firstly it is expected that the population at 2000 will be increasing at a rate very much less than 2% per annum, and that at 2040 at less than 1.2%; and secondly allowance ought to be made for the re-use of materials before per capita consumption levels are multiplied by population numbers. Because of the first point, the maximum likely consumption figure can be reduced to 43 cu. ft. per head, upon allowing a reduction of 3 cu. ft. per head for sawnwood and wood panel product consumption (since it is improbable that population growth rate will then exceed 1.5%), and a reduction of 2 cu. ft. per head for recycling. As to the second point, very substantial reductions in pulp and paper consumption figures could be achieved by efficient recycling of materials.

Although an increased allowance for paper and paperboard recycling might appear unrealistic for the near future, the likelihood and desirability of such measures ought to be taken into account in planning for 2000 and beyond, although forestry planners have

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1 No apology is offered for writing of future requirements; the notion is defended against some objections in Appendix 1.

made no attempt to do so. Efficient and widely practised paper and paperboard recycling could realistically cut paper and paperboard consumption levels by two-thirds or more (Mohrer [1], p. 65), that is future pulp and paper consumption levels could be reduced to the order of 5-6 cu. ft. per head. Theoretically of course much greater reductions could be made. Extensive paper recycling may appear, at the moment, uneconomic or at least somewhat expensive.[1] But at least one reason for this is that the cost of disposal of paper waste is at present a public charge and is not included in the cost of the commodity, as it would be if sound environmental economics for commodities such as packaging were adopted (as suggested by Weaver [1] and Coombs [1]). If an appropriate tax or disposal charge were imposed, for example, on the disposal of paper waste the cost difference between recycling and using new materials would be eliminated. But in future, as both waste disposal and raw material costs increase and paper mill technology improves, such a tax will no doubt prove unnecessary. Paper and paperboard recycling, already feasible and practised to a modest extent (26% of total Australian consumption of paper and paperboard is provided by waste paper, as compared with 19% in USA and 41% in Holland: Australian Industries Development Association, AIDA [1], p.6) will then increase significantly.

Recycling of materials is not however an unqualified good, and should not be accepted as an at all adequate substitute for eliminating undesirable consumption (the line now pursued by several companies who wish, through their recycling activities, to appear to be making major concessions on environmental matters, without however in any way modifying their output or supporting reduced consumption of undesirable products they market). For recycling of many materials uses much larger amounts of energy and produces many more polluting by-products, than would processing of equivalent raw materials. While this claim does not hold for glass it does for wood pulp. There are problems about the removal of fillers, coatings, colours and ink from waste paper and paperboard, and waxed papers are not recycled at all in Australia. The removal of these additives is often expensive (de-inking machinery is so expensive that de-inking, an important part of full recycling, is unlikely to be undertaken in Australia for some considerable time); it is also energy-consuming and effluent-producing. For example, whereas the manufacture of original pulp in USA yields 20-200 lbs of solids in the effluent for each ton, the manufacture of de-inked wastepaper pulp yields 500-800 lbs per ton (Kneese et al [1], p. 36). Thus, unless technological improvements are effected, increased recycling will remain undesirable from a water quality standpoint, despite the importance of recycling for reducing solid refuse disposal problems.

Combining an allowance for recycling (about 5 cu. ft. per person) with the reduction in sawnwood and wood panel product consumption (about 10 cu. ft. per head) by a slowly growing population, it is evident that total wood product consumption could realistically fall to 30 cu. ft. per person for a population growing at the current natural rate (approximately 1%) and practising paper and paperboard recycling – ***without***

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1 In fact it is made feasible in Australia largely through free collections by charitable organisations, which thereby effectively subsidize private industry, by selling the waste at a price (about $10 a ton, as compared with hundreds of dollars a ton for manufactured paper) which does not cover true costs.

any reduction in the current per capita level of utilization of goods or any reduction in standard of living.[1]

Accordingly we have used, to determine estimated requirements, *adjusted* consumption figures which allow for a level of use which (under the stated hypotheses of reduced growth rate and recycling) is not less than current levels of use.[2] Consumption of raw material is of course lower (and so therefore is the adverse effect on the environment) but utilization levels and standard of living are not; that is, just as much wood product material is available to each individual consumer as at present. These adjusted consumption figures, adjusted for a population growing more slowly after 2000 and to allow for recycling, are the sorts of figures that an environmentally responsible forest service, maximizing quality of life rather than consumption of raw wood products, would work with: figures larger than these adjusted figures for a slowly growing population cannot be justified as reflecting real domestic requirements, or as having the sort of priority needed to vindicate current implementation of the pine program.

Adjusted consumption levels are displayed in charts 3 and 4, where likely requirements are estimated. The total consumption figures graph, for discrete population sizes, the direct outcomes of the decision theory model.

It is reasonable, in view of the evidence, to adopt the familiar statistical assumption that probabilities are distributed normally about the most likely regions. The easiest case is the expected population for 2000 where current demographic evidence suggests that the most likely population will range between 19.5 and 20 million; thus we assume a normal distribution, with maximum at 19.75 million, which effectively cuts off at limits of our expected range. The other cases are the population at 2040 and the expected per capita consumption levels to 2000 and 2040. In these cases, which are more arbitrary, we assume a normal distribution across the expected ranges. We have indicated the combined effects of these normal distributions by shading zones, in charts 3 and 4, where high regions of distributions overlap: these shaded zones show the most likely direct outcomes. The distribution reveals that, in the light of available evidence at least, we can reasonably neglect in decision-making both the high consumption estimations for high population levels and very low consumption estimations for low population levels.

On the face of it it might appear surprising that the same sorts of requirement figures emerge for 2040 as for 2000. However this is easily explained by the lower levels of consumption resulting from the expected decline in population growth rate, and by the increased efficiency of utilization, made possible by technological innovations, through less wastage and more recycling of materials: together these neutralize the increase in numbers which will occur between 2000 and 2040. Indeed this presents a striking example of the sort of decrease in environmental destruction one can expect to

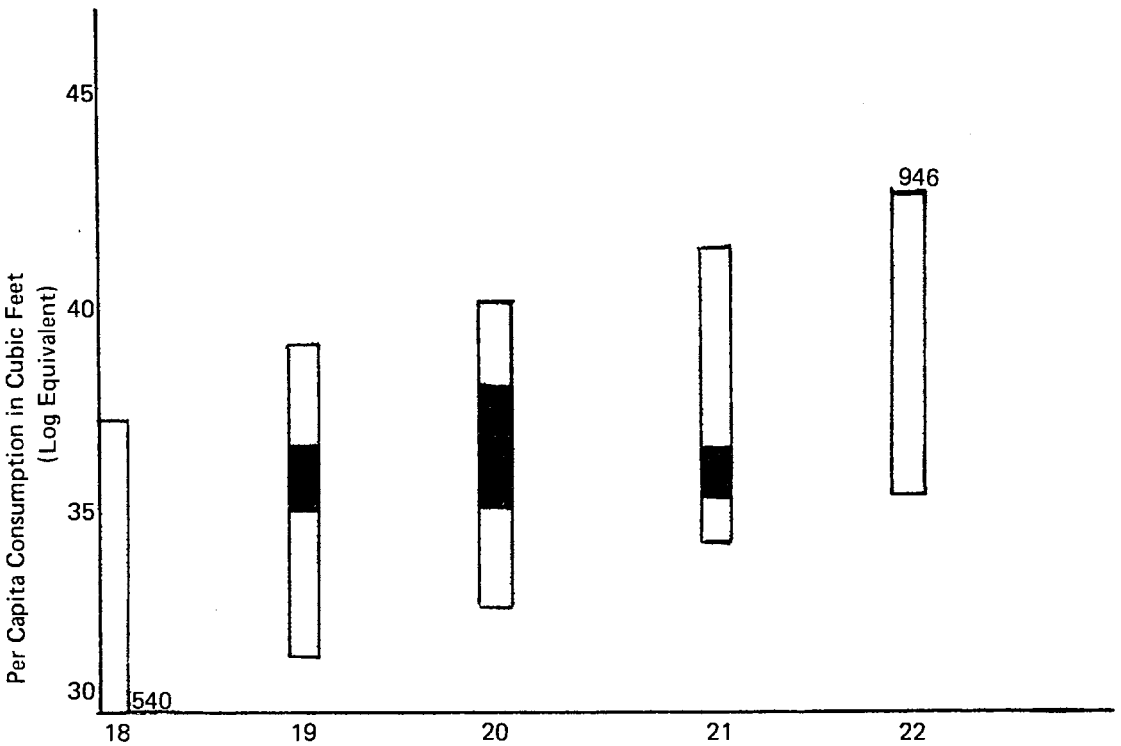
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1 But under the not implausible assumptions that population growth falls well below 1% annually (as it may well do, and hopefully it will, before 2040) and that extensive recycling is practised, consumption levels could easily fall as low as 20 cu. ft. per head, i.e. to the sort of levels common in many European countries with a high standard of living (see FAO [3]). At present more than a tenth of a ton of recoverable paper waste is disposed of per person annually in Australia, and, as in USA (where the figure is 40-55%; Myer [1]), a substantial proportion of municipal refuse volume consists of wood fibre products.

2 Although consumption figures of this order will no doubt appear ridiculous to persons persuaded by standard forestry planning, to assume consumption levels as high or higher than present ones for a population growing slowly and practising recycling is really to assume a very great and quite unwarranted increase in per capita utilization of forest products. (Utilization, assessed in terms of benefits derived from use of resources, contrasts of course with consumption, measured in terms of use of raw resources).

CHART 3

RANGE OF REQUIREMENTS FOR TOTAL WOOD PRODUCTS (EXCLUDING FUELWOOD) AT 2000, WITH PROBABILITIES INDICATED



Expected population range at 2000 (in millions).

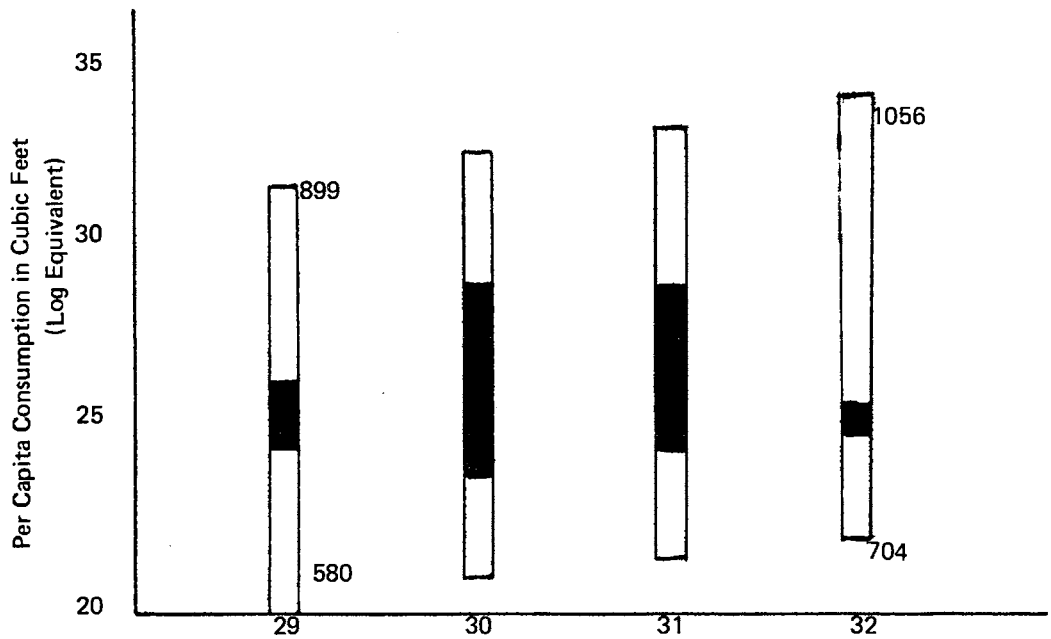
Key

Rectangles show (roughly) likely requirements, i.e. adjusted consumption totals, at each population interval.

The shaded areas display more probable outcomes, at the studied population levels. In fact the shaded areas consist of the intersection areas of the upper areas of a distribution for population figures with the upper regions of normal distribution curves over the expected per capita consumption ranges.

CHART 4

RANGE OF REQUIREMENTS FOR TOTAL WOOD PRODUCTS (EXCLUDING FUELWOOD) AT 2040, WITH CONJECTURED PROBABILITIES INDICATED



Expected population range at 2040 (in millions).

Key

Rectangles show (very roughly) likely requirements, i.e. adjusted consumption totals, at each population interval. The upper figures assume limited recycling of materials, allow for a decline in use of minor wood products, and take account of anticipated decrease in population growth rate.

The shaded areas display more probable outcomes at the studied population levels (as explained in chart 3).

find with decreased growth rates and more responsible consumption habits.

Acreages of coniferous plantations

To work out the resulting acreage of coniferous plantations needed at 2000 and 2040, estimates are made of the yields from native forests and from exotic plantations, and of the levels of imports admitted. The imports can be considered as a separate matter, and required import levels are displayed in a separate column in table 6.

Firstly, it is assumed that managed softwood plantations will yield 250 cubic feet per acre each year, i.e. a mean annual increment of 250 cu. ft./acre/year is assumed. Though this figure exceeds the average of 230 cu. ft./acre each year that has so far been achieved in Australian plantations, it should be pointed out that early plantations were frequently sited in unsuitable areas, e.g. *P. radiata* plantations were sited in summer rainfall areas on the coast or in marginal rainfall areas and included a number of well-buried failures. In any case the figure of 250 assumed is the lowest figure cited in NSW [1] [1] and is regarded as a conservative figure in such sources as Brown and Hall [1] and CSIRO [1]. Actually in view of the quality of sites that Forestry Commissions and private companies are now endeavouring to secure much better yields should be obtained initially. For example, almost all the forest land scheduled for conversion to pines in the Tallaganda-Badja area of NSW (over 120,000 acres) is class III forestry land or better (on the classification of Duffy, CSIRO [1], following McCormack [1]) with an estimated mean annual increment (MAI) of 330 cu. ft./acre/year or better, and much of it with an MAI of 370. Similar figures probably obtain for most other major plantations areas in NSW, Victoria and Tasmania, and almost all the plantation areas would be at least class IV forestry land, with an MAI of 290. Thus the assumed figure of 250 cu. ft./acre each year is a conservative one; with proper management the plantations in the new high quality site areas now favoured should, at least in early rotations, yield much higher returns.[2]

Native forests can eventually be expected to yield 500 million cubic feet each year. This conservative figure allows for no intensification of present selective logging methods (e.g. by clearfelling and woodchipping), but only for better fire protection and for some improvements in conversion factors and in the recovery of materials at present wasted. A conservative figure is deliberately adopted in order to show that the reduction in coniferous plantation areas argued for is not obtained at the expense of extensive or excessive exploitation of the native hardwood forests by clearfelling or clearcutting and woodchipping; for it would not be a good ecological bargain to trade a million acres of forest to be converted to pines for many millions of acres of regularly woodchipped forests. Recent production estimates by foresters, which allow for some intensification of forestry methods, are much higher. Jacobs [6] estimates a total hardwood yield of 698 million cu. ft., composed of 423 million cu. ft. of saw logs and 275 cu. ft. of pulpwood (obtained from woodchipping) for 2000. Parkes [2] estimates hardwood production at 676 million cu. ft. consisting of 209 million cu. ft. of logs and 467 million cu. ft. pulpwood; and NAFTA [1] which Parkes follows presents similar figures. FTB [2] estimates hardwood

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1 At least these yield levels ought to be achieved or bettered on the average over the first two rotations if forestry propaganda for the scheme is to stand up and if the grand project is to be worth the candle: but there are good reasons to doubt that these yield levels can be sustained in the longer run.

2 On very high quality sites not only *P. radiata* but also favoured forest eucalypts may yield in excess of 400 cu. ft./acre/year. See, e.g., Carter [2].

TABLE 6

ACREAGES OF CONIFEROUS PLANTATIONS UNDER VARIOUS REQUIREMENTS HYPOTHESES, WITH AND WITHOUT IMPORTS

Total Requirement (in Millions of Cubic ft	(i) No imports		(ii) Less available imports of 250 x 10^6ft.^{3}		(iii) Less available imports of 100 x 10^6ft.^{3}		Superimposed Probabilities
	Softwood (or Additional) Requirements (10^6 x ft.^{3})	Plantation area (in millions of acres)	Softwood Requirement	Plantation Area	Softwood Requirements	Plantation Area	
1000	500	2	250	1	400	1.6	Improbably High
900	400	1.6	150	.6	300	1.2	
800	300	1.2	50	.2	200	.8	Likely Range
700	200	.8	0	0	100	.4	
600	100	.4			0	0	
540	40	.16					Improbably Low At 2000

Assumptions (explained in the text).

(i) yield of 250 cu. ft./acre/year from softwood plantations.
(ii) yield of 500 million cu. ft./year from native forests.
(iii) imports of small quantities of specialised timbers etc. are neglected.

Explanatory notes

(i) The total requirements figures are drawn from charts 3 and 4: the one table suffices to cover ranges from both charts.
(ii) Probability assignments are transposed from charts 3 and 4.
(iii) The available import figure of 100 million cu. ft./year covers imports of the order that might be expected under the New Zealand Australia Free Trade Agreement (NAFTA).
(iv) The softwood (or additional) requirement could alternatively be met by eucalypt plantations, in which case the plantation areas would need to be adjusted (though less, since the advent of chipping methods, than many foresters are inclined to think: see Cremer [1]).

removals at 2000 at 578 million cu. ft.

Future production or yield estimates from native forests will not simply coincide with current figures but should take account of increases likely to result from the recovery of logging and industrial residues and from technological advances which improve conversion factors.[1] For, firstly, there is a very sizable quantity of wood waste presently discarded or burnt at logging, milling or manufacturing[2] stages which can be profitably used for pulping. Secondly there are likely to be technological advances which result in improved conversion factors, especially of those of fibre to pulp and paper products — which means effectively that the same amount of raw wood fibre will go further than at present. Although appropriate allowances should be made for both these factors, no explicit estimates as to allowances appear in recent forestry estimates as to yields, except for a conjectured figure of 193 million cu. ft. each year for waste allowance in Jacobs [2].

It seems that on the average at least a third of the wood volume (less bark) of each felled tree, at present lost in one way or another in processing (logging, milling etc.), could be recovered by chipping and pulping residues. Ovington ([1], p. 201) furnishes useful details in the case of softwood plantations.

> Almost without exception, utilization of forest production is extremely wasteful.[3] Taking softwood plantations as an example of what might be regarded as relatively intensive utilization, less than a third of the organic matter produced by the trees reaches industry. Even after this, further waste occurs, the approximate conversion factors for the wood based industries being for pulp processes 40-85 per cent, for hardboard and particle board production 80-90 per cent and for sawn timber 40-45 per cent.

Thus in the case of softwood sawntimber, only 12-15 per cent of the original biomatter is recovered. Yet sawntimber is still the main forest product in Australia. The recovery percentages for eucalypt forests are known to be much lower, though exact figures do not appear to be available. On the assumption, then, that something like a third of the present annual yield, now wasted, could be recovered, a further 120 million cubic feet will eventually become available annually, since current estimated production of hardwood is approximately 360 million cubic feet annually. Parkes [2] gives an estimate of 362 million cu. ft. for 1970; and a figure of 353 million cu. ft. for 1965-6 may be derived from FTB [2].[4] Given a very slight allowance for technological improvements, it follows that our estimates suppose no increase in number of trees removed over current levels of removal,[5]

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1 These can be allowed for either in consumption or in production figures, but the latter seems preferable.

2 Especially, in USA, in furniture manufacture. Wastage in the utilization of wood products tends to vary inversely with the size of the operation. There are also enormous tonnages of unrecovered wastes, often organic, in pulpwood manufacture; see Kneese et al [1], p. 35 ff.

3 This is not completely accurate; though material at the mill site is wasted, wood left on logging sites often contributes valuable organic material to the soils.

4 But a crucial chart used in the derivation, chart 2 in FTB [2], appears to be defective; for its estimated removals sum to only 321 million cu. ft. for 1965-6, whereas the estimated removals for that year in all other charts total 451 million cu. ft.

5 Though many run-down forests will have to be reforested or thinned in order to maintain yield levels.

levels which have in fact remained fairly static over the last 15 years. In short the estimate of 500 million cu. ft. annually from native forests allows for no intensification of present selective logging methods, but only for improvements in conversion factors and the recovery of material at present wasted. This accords with Ovington's recommendation ([1], p. 197): '. . . it might be more realistic to try to improve utilization of the available biological production rather than to try to increase biological productivity by more intensive forestry management.'

It is evident from table 6, column (1) and (3), that a coniferous plantation area of 1½ million acres would be quite a generous allowance for future domestic requirements under the assumptions outlined (given, for the higher range, a low level of imports, of the sort that probably should be admitted under the NAFTA agreement anyway). This level would be adequate to provide for likely future populations at utilization levels not less than those enjoyed by the present population. Moreover with this amount there is a substantial safety margin that could be drawn on either to lift the level of per capita utilization above the present level, or to cope with improbably larger populations, or to cover yield losses. The safety margin can be drawn upon

(a) by increased imports from NZ and elsewhere. As argued earlier, there is little or no penalty attached to this course and in fact it could be considered as a means of reducing plantation areas still further, as indicated in table 6, column (2). Indeed from the point of view of the earlier considerations, it would appear that we have already planted more softwoods than can be economically justified, on nonprotectionist grounds, for domestic requirements.

(b) by increased recycling of materials. There is scope for considerably more recycling than we have allowed for, since up to 80% of paper and paperboard volume is potentially recoverable and recyclable (Mohrer [1]). One likely effect of any shortfall, and one that would in many ways be advantageous, would be that of giving increased impetus to recycling and to less wasteful forms of consumption.

(c) by exploitation of the native forests by some carefully conducted woodchipping. Since woodchipping could, if carried out extensively, contribute an extra 150 million cu. ft. of wood or more annually,[1] it provides a very large backstop. There is of course plenty of scope for improved treatment, and also for more careful management, of native forests, e.g. by more careful logging, better reforestation, more adequate fire control, etc.

(d) by increased use of material that is currently wasted in processing.

(e) by technological improvements. Since our estimates have been based primarily on results obtained by current technological methods, technological improvements to the extent that they occur would be a bonus, although one of unknown dimensions. Nonetheless it seems reasonably clear that over the next eighty years technological innovations will enable substantially better yields to be obtained from the present forested areas.

(f) by the likelihood of higher yields from softwood plantations than those we have allowed, in view of the better quality of sites (e.g. in terms of soils and rainfall) now being used for plantations.

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1 Woodchip quantities of this fairly low order can be obtained in an environmentally sound way without any clearfelling, along the lines emphasized in Chapter 16 for example, in the same way that selective logging can be carried out. Woodchips after all are just another end use, and advocacy of such restrained use of some forests for domestic woodchip supply is quite compatible with opposition to current woodchip export projects as involving overexploitation, e.g. through indiscriminate clear-felling.

It follows that planting beyond 1½ million acres cannot be justified as an environmentally responsible provision for domestic requirements. Moreover the area of 1½ million acres can almost certainly be provided without the commencement of any new projects or the continuation of early projects. The completion of existing well-advanced projects, which will probably have to be completed for economic reasons, would add at least another ¼ million acres to the more than 1 million acres that has already been planted.[1] In addition, private planting of softwoods, which is largely on cleared agricultural land, has been proceeding recently at a rate of about 20,000 acres a year (and a figure of 19,000 acres is used in NAFTA [1] to project private planting). Continuation of private planting together with completion of existing well-advanced projects should, when added to the acreage already planted, give a total acreage well in excess of 1½ million acres by 2000 (even allowing for some variation in the rate of private planting). *There is no justification, then, for the commencement of further major softwood projects involving the clearance of large areas of native forests or for the continuation of similar projects that are not already well-advanced.*

The present national softwood program will actually deliver in excess of 3¼ million acres of conifers if private planting continues at the current rate. The more than 1½ million acres of wet forest that represents the discrepancy between what is justified and what will be supplied will almost certainly be destroyed needlessly or in pursuit of extremely dubious goals. In brief, some of the indigenous Australian forests are being destroyed, at considerable cost, to create what will almost certainly turn out to be another protected rural industry. Others are being destroyed in anticipation of future population levels which are far in excess of anything that is either likely or desirable. Still others are being destroyed in order to create and satisfy new and exceedingly dubious high consumption levels in packaging and disposable paper products.

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1 Because, as the tables above reveal, there is no great urgency for the completion of these projects, there would presumably be a strong case for the adoption of less reckless methods of land use in the completion of the projects than have hitherto been observed. Above all the opportunities to plant conifers on suitable adjacent cleared lands, and to complete parts of the projects with eucalypt plantations, are opened up.

CHAPTER 7

THE ENVIRONMENTAL COSTS OF AUSTRALIAN PINE PLANTING

Excessive consumption of wood products, and particularly of paper and cardboard products, may make a negative contribution to the real standard of living where a substantial environmental cost is involved in production or disposal of the products. (Again in Weaver's terms in [1], the environmental cost of the pine program is what shows that more is not just neutral but worse.) The environmental cost of pine planting differs in different states, and is somewhat less in South Australia where practically all planting is on cleared land than it is in NSW or Tasmania. The cost is particularly high in NSW because NSW has undertaken, presumably on the strength of the economically primitive doctrine that each state should produce what it consumes (enunciated, e.g., in Henry [1]), a greedy program of 1 million acres of plantation by 2000 (excluding private planting), despite the dearth of suitable public land.

However, the New South Wales Forestry Commission, (NSWFC hereafter) now denies that there is any substantial environmental cost involved in the pine planting program, and even maintains that the program 'improves' the environment (NSW [1], pp. 8-10; NSW [2], p. 1). It attempts, in its statements in defence of the program (e.g. NSW [1]), to present opposition to it and the priorities it represents as either completely irrational (stemming from a distaste for exotica, or for *Pinus radiata* as a tree), or as due to ignorance. The latter is to be dealt with by 'education' (Huddleston [2], Florence [2]); the partisan nature of this can perhaps be gauged from the fact that (in NSW [2], for example) those who appreciate pine plantations are referred to as 'the public', whereas those who do not are referred to as 'pressure groups', despite the fact that there is no real information as to the relative proportion of each group in the community. It is therefore necessary to restate some of the environmental disadvantages of the program as presently implemented.

Contrary to forestry misrepresentation, objections to their pine program are usually not based on an irrational objection to *P. radiata* as a tree or to pine plantations themselves. Plantations may, as the Commission claims, have their own attractions, like public parks, and they are often more attractive and interesting than surrounding cleared areas. Nevertheless a person making such a judgement about public parks would not be endorsing the view that most of our wild native forests should be eliminated and replaced by public parks. Objections to the program are based on the fact that plantations eliminate much of a beautiful, diverse and rich natural area and forest type, one which is confined to Australia and in extremely limited supply there; and replace it by an environment which is decidedly inferior in almost every respect (except wood production).

The NSW program concentrates heavily (and in view of soil and climatic limitations *must* do so) on intermediate and particularly wet mountain sclerophyll forests of the southern or cooler type, between altitude ranges of 2000 and 4000 feet. Australia, the driest continent, is particularly poorly endowed with cool wet forests (see map 1), and this forest type represents only a small proportion of the total of 32 million acres of permanently reserved production forest in Australia, and 8 million acres in NSW (figures from Comm [1]). The *full* extent of destruction of this mountain forest in NSW has not yet been announced; however, unless there are drastic policy changes in favour of purchase of cleared land in project areas, the program will, by 2000, have eliminated most of this forest type in NSW, which is permanently reserved, accessible and not excessively steep, as only a small amount is in national parks. What is left (e.g. Monga State Forest) might very well go in the second round, since the program, if unopposed, is unlikely to

stop at the million acres currently planned. Since cool moist mountain forest constitutes only a small part of the 8 million acres of reserved forest in NSW, the attempt to dismiss the extent and seriousness of destruction, as forestry services do (e.g. NSW [1]), by comparing the area to be destroyed with the Sydney metropolitan area, or the total area of forest and woodland in Australia, is quite misleading: a better comparison would be with the area of rainforest recently threatened by woodchipping. Not only will the NSW program eliminate very much of this mountain forest but the destructive effects are by no means confined just to the acreage put under pines. An intrusive and alien element will be introduced into many impressive wild landscapes (as on the Boyd Plateau, in the upper Shoalhaven catchment, and in the area of Badja). Even where a few areas of native forest are perhaps allowed to remain (as in Tallaganda), they will be broken up and unrepresentative, the best forest area being taken up into plantation and only those unsuitable for pines remaining. Finally there will be enormous pressure exerted to have what parks remain in the vicinity of pine plantations burnt frequently in order to protect the pines from wildfires beginning in the parks. 'For the protection from invading fires one important thing is to see what can be done to reduce the fuel in surrounding country' (Tas [1], p.7).

Wet sclerophyll forest of the type to be eliminated or degraded by burning, is often very beautiful, is one of our richest habitats for flora and fauna and is ecologically the richest eucalypt forest type. The montane variety, which is particularly threatened under the NSW program, carries a somewhat different range of species from the less threatened coastal type and is the main habitat of a number of species. Nevertheless, cool wet mountain forest (excluding alpine and sub-alpine forest) is not well represented in national parks – which is not difficult to understand, since it has generally been regarded as too valuable for timber production to release.[1] It is not easy to obtain an exact estimate: however there is probably not much more than half a million acres of this forest type (excluding alpine and sub-alpine and coastal forest) currently in national parks in NSW and Victoria. The NSW pine program is closing future options in an alarming way, since it will make impossible the creation of further national parks of any size in this type of forest. Yet present national parks are already inadequate. If the future population does reach the very high levels forestry planning anticipates there will be a need, not only for the increased supply of cardboard and throwaway paper products forest services have so conscientiously allowed for, but also for more national parks and natural areas. It is, in fact, methodologically unsound to assess timber and chip requirements in terms of future needs, but national parks and other reserve requirements in terms of present needs.

The program in NSW involves the alienation of large areas of Crown land.[2] In fact, most areas scheduled for plantation were Crown land, not state forest, at the inception of the program. Even with the projected takeover of most large tracts of cool mountain forest which remain as Crown land in NSW, the NSW Forestry Commission only has access to land for three-quarters of the target of 1 million acres. It seems clear that the shortage of suitable public land under native forest will increasingly force the Commission

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1 So it is not surprising that Victorian sawmillers are now campaigning to prevent the gazetting of the proposed Alpine National Park, effectively because it will reserve fine forest for parkland. Victorian graziers are of course stalwart opponents of this important park because it prevents summer pasturing of stock in highland regions. Yet Victoria is chronically short of park lands.

2 In fact the NSWFC has understated its intentions in NSW[1] and [2], since a 1972 Amendment passed through the NSW Parliament, the Forestry, Soil Conservation and Other Acts (Amendment) Act, requires that 1½ million acres of the 8 million acre statutory minimum area of state forest should be converted to exotic conifers as a statutory minimum. This figure is for the conversion of native forest (not including planting on cleared land) and does not even include private planting, so that an eventual figure of 2 million acres or even more can be anticipated for NSW, enough to enable self-sufficiency for the whole of Australia! The destruction of NSW forest, and particularly high quality mountain forest, entailed by this vicious legislation will be enormous.

to use land of an unsuitable type in order to reach its magic total of one million acres, land which is either excessively steep or has unsuitable soils, or which has a greater value for some other purpose if left under forest cover, e.g. as national parks, for watershed protection, or which carries good native timber. It appears that the target area of 1 million acres for NSW was arbitrarily set up before any attempt was made to determine whether such an area of suitable land – let alone land whose *best use* was pine plantation – could be obtained. Indeed the whole method of implementing the program in NSW would be excusable, if it were excusable at all, only if the program had an over-riding urgency and priority in providing for future basic requirements. But this it does not have.

In the southern tablelands area of NSW, east and south of the Australian Capital Territory, it is much easier to indicate the forested areas that are to remain than it is to indicate those which will go: what may remain are parts of the Tallaganda-Badja area (about 40%, i.e. 80,000 acres, which is unsuitable for pines), part of the dividing range in the Anembo area which has a much lower rainfall, (and therefore is not really wet sclerophyll forest at all), Monga State Forest, and most of the escarpment edges, which are too rugged and insufficiently compact for plantation establishment despite their high rainfall. There are also two small state parks in the Bombala area, with a total area of about 20,000 acres between them. In much of the southern tablelands of NSW, particularly the Shoalhaven valley area, the state forests are the only large areas of native vegetation over a wide area; what remains will be what persists along roadsides, as senescent shade trees on farms, or in the areas within plantations themselves that have been spared, because unsuitable. To the southwest of the Australian Capital Territory (another major plantation area) practically all the wetter forest outside Kosciusko National Park will be swallowed up by the giant Tumut project; and areas favourable for pines but intended for dedication as part of the Kosciusko Park were traded off to forestry for inferior land unsuitable for pines, e.g. a large triangular area centred on Dubbo Creek, and other areas intended for dedication as part of the Park and intruding far inside the natural boundaries of the Park were excised for pine planting. Likewise in the central tablelands the NSW Forestry Commission in its drive to achieve its target of 150,000 acres of pines around Oberon, appears determined to absorb all forest, outside present parks, at all suitable for pines into its project, and is steadfastly resisting moves by conservationists and councils to leave intact the Boyd plateau (38,000 acres) and a last 1000 acres of native forest in Blenheim State Forest near Oberon. In the northern tablelands, though the picture is less clear since main planting projects have only recently begun and details of areas intended for planting have not been disclosed, it is plain (see map 2) that much of the remaining montane forests lie within reach of proposed mill centres.

Much the same is happening in other states, in Tasmania, on a lesser scale in Queensland, where state forests are disappearing into stands of *P. elliottii,* and at a steady rate in Victoria, where what little native forest remains in western Victoria is being whittled away as the pines advance.

In an effort to mitigate this sort of criticism, NSW [1] has listed a number of state or national parks and state forests near to plantation areas. But most of the parks and forests listed are of a different vegetational type; e.g., in the case of the Tumut project, alpine and sub-alpine areas, in the case of the Moss Vale project where Morton National Park is cited, most of the area is Sydney sandstone vegetation or coastal heathland with very little forest of the relevant type, in the case of the Bombala project, the two state

parks mentioned are very small and of rocky upland country and the native plantations to the east of the region are lowland forests (where the 'permanent management' mentioned turns out to be woodchipping).

It should not be forgotten that what is left (unless it is in national parks) has only escaped for the time being. Much of it may be taken up after 2000, since as the Commission admits, the program will continue after that date. Furthermore, what is currently scheduled for destruction does not even cover the one million acre target by 2000. Here NSW [1] is unexpectedly candid:

> At present the Commission believes that it holds or has access to sufficient land for about three-quarters of the target plantation area of a million acres, but acquisition of a further 250,000 acres of suitable land will still be necessary over the next few decades.

Presumably this indicates that the Commission's methods of converting land to pine forest will have to become even more ruthless than they are at present and that some of the areas which have so far escaped will be swallowed up before the program's completion. No doubt once the present reservoir is exhausted more fine forests such as Monga will be discovered to be exhausted or uneconomic and accordingly destroyed. The land the Commission believes it 'has access to' (a belief which appears in the light of the policies of the present NSW Government to be fully justified) is of course Crown land, i.e., uncommitted land which should, theoretically, be available for a number of competing roles (of which forestry is only one, and a comparatively minor one), but which in practice the NSWFC seems to have first option on. The NSWFC has already taken over quite large areas of Crown land for the program; the area of Tallaganda State Forest[1] will be more than doubled by the addition of Crown land areas which could have served important alternative conservation and recreation roles. The area of state forest around Eden-Bombala has likewise been augmented by major Crown land additions, despite the recommendation of a scientific advisory committee that much of this forest be dedicated as national park. Similarly in the case of other projects, e.g. those at Tumut, Nowendoc and Oberon, state forests have been augmented by large tracts of Crown land. So it can scarcely be claimed (as in NSW [1]) that the NSWFC is simply exercising property rights over areas already assigned for forestry or developing its resources as it thinks best. The program is encroaching upon and monopolising Crown land areas which have important alternatives roles, in some cases preventing or threatening to prevent the creation of much needed national parks or of satisfactory boundaries for them. The excuse for this alienation has been the alleged high priority of the program in its role of providing for future domestic wood product requirements. But since the program does not have this sort of priority its interference with other important forms of land use is inexcusable, and conservation organisations should oppose alienation of such land for the program just as firmly as they would its release for agricultural purposes. In the light of the sort of forestry methods which are employed, this Crown land must be regarded as just as thoroughly alienated as it would be had it been released for agriculture.

The effects on flora and fauna

The actual way the planting program is being implemented (as an agricultural venture) also leaves a great deal to be desired; for instance, streams are being used as dumps and excessively steep hillsides are being bared. Despite assurances by the NSW

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1 Tallaganda Forest was increased from 34,000 acres to about 71,000 acres by the addition of Crown land in 1971; and a forest of 200,000 acres, which takes in Badja State Forest and much Crown land, is now envisaged.

Commission (NSW [1]) that strips of vegetation along streams are left and that hilltops are not cleared, there is a good deal of looseness about what counts as a 'stream' or an 'excessively steep hillslope' and usually only bush along large streams or even rivers remains intact, and 'mistakes' continue to be made which leave hilltops and steep slopes bare.

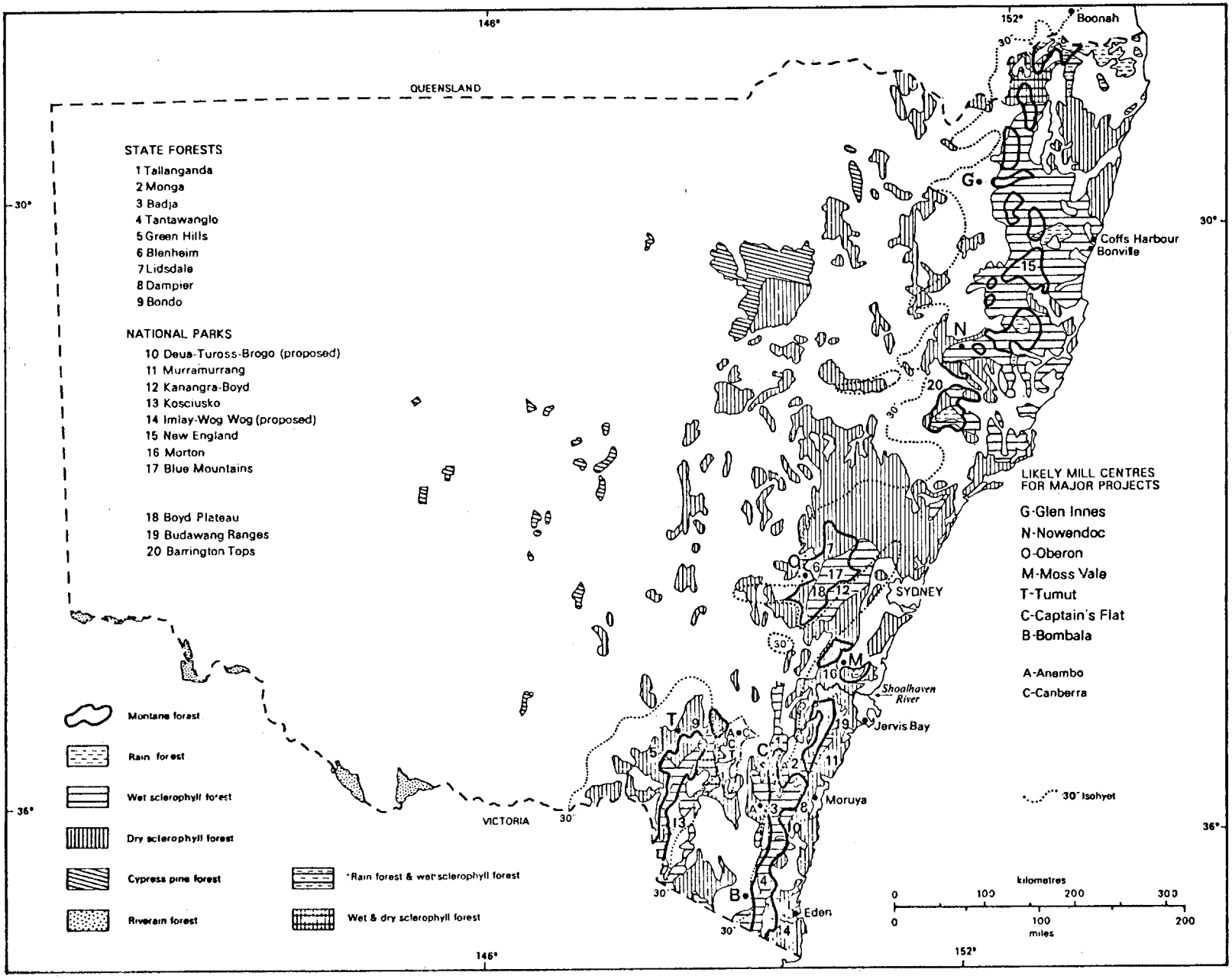
The effects on the native flora of clearing for pines are, as one might expect, very severe. Most of what is interesting and distinctive is eliminated, and what little remains is generally of the survivor-type which is able to persist through agricultural clearing and along roadsides. The fine flora of the wet and intermediate forests is very often eliminated without a proper botanical or ecological survey of the areas concerned;[1] e.g. no detailed botanical survey has been done of forests in the Bombala area, and in the Kanangra-Boyd area a survey of an area, adjacent to the National Park but threatened with conversion to pines, revealed several new species of plants.

Thus, contrary to NSW [1], it is quite untrue that 'most of the native forest intended for conversion to pines is of limited value . . . and of . . . limited aesthetic appeal'. The Commission's aesthetics is clearly dictated by its economics. In the southern tablelands area, for example, much of Tantawanglo State Forest is quite beautiful, as is Tallaganda State Forest where first-class forest with superb fern gully vegetation is among that being cleared. The colder eucalypt forests in the western montane tract of *E. dalrympleana* and *E. robertsoni,* which are being cleared for the Tumut project, are also very fine. Another forest which was considered for inclusion in the program, and rejected because of its small size (about 21,000 acres), but which can be regarded as saved only for the time being, is Monga State Forest. This forest contains some of the finest wet mountain forest and fern gully vegetation to be seen anywhere: the Monga waratah grows along its streams and many of its numerous and magnificent fern gullies support groves of pinkwood *(Eucryphia moorei)* and sassafras.

Effects on original fauna, particularly on arboreal fauna, are also and not surprisingly, very severe, although it cannot be claimed that native birds and animals are completely eliminated, particularly where pine forests abut native forests. As in the case of flora, many of the survivors are of the type that manage to persist where habitat is destroyed or partly destroyed in agricultural areas, and whose preservation is not therefore a matter of great concern. Indeed, some of the animals which eat young pines have become 'pests' and it appears that the NSWFC, like the Tasmanian Commission, will have to embark on a further extermination program. However, the many native birds and animals which depend crucially on a eucalypt environment are eliminated or greatly reduced in numbers after clearance of the forest. The area affected is the main habitat in NSW of the lyre bird, which is very common in the wetter gullies, and although some survivors remain after clearance it seems likely that soil changes under pines will eventually reduce and eliminate their food supply. In fact, many of the wildlife features under pines that foresters make much of (e.g. NSW [1], [2], Jacobs [7]) may well prove to be temporary and the survivors, particularly among the

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1 Although NSWFC now *claims* that it is prepared to leave interesting and attractive 'stands' where they occur, enquiries fail to elicit any information on how a decision on what is to be preserved is to be made. Presumably the matter will be left to the appreciation and knowledge of local flora of local forestry officers.



Map 2.

Montane forest and other forest types in NSW. Montane forest is found at altitudes ranging from about 500 m. (1640 ft.) to, in the south, about 1500 m. (4920 ft.), generally in areas with rainfall of 30 inches or more. Very little montane forest, except what is already included in national parks, is likely to remain when the NSW minimum of 1½ million acres of exotic conifers is met. Montane forest is that chiefly threatened by the pine program since it offers the most favoured sites for the 'wonder' tree, *Pinus radiata.*

Primary source: Comm [9].

birds, progressively eliminated as native plant and understorey species are progressively eliminated. However, temporary effects due to initial incomplete elimination of plant and animal survivors can scarcely be cited as evidence of the capacity of pine forests to support such native life on a long term basis. Since the original ecosystems are destroyed permanently it is this that one must be concerned with.

Perhaps it is true, as NSW [1] claims, that the effects on animal life are little worse than clearing for farmland (and for a few species better); but this is bad enough and is little consolation for the destruction of the richness and diversity of plant and animal life in cool wet sclerophyll forest. This is well described, in the case of vertebrates, by Tyndale-Biscoe [1], for the western montane tract near Tumut:

> The forest canopy is occupied by the greater glider, which feeds on the new shoots of the mountain gum, peppermint gum and snow gum and lives in the hollows of old trees of the two former species. Its main predator is the powerful owl, which makes its nests in similar hollows of old trees. The mouse-sized pigmy possum, and the little feathertail glider also live in the canopy foliage, subsisting on nectar and the insect fauna that can be found there. The pigmy possum shelters in hollow limbs and probably feeds on the larvae of wood-boring insects as well. In cold weather this species, and possibly the feathertail also, can go into torpor, dropping their body temperature and their metabolic rate.
>
> The brush possum, ringtail possum, koala, and sugar glider, occupy the second tier of the forest, feeding on the saplings and wattles. Many bird species occupy this habitat also.
>
> The forest floor is occupied by the echidna, the common wombat, the mountain possum, as well as the red neck wallaby, and the eastern grey kangaroo. In the deep valleys of tree fern and bracken lyre birds occur and also in the lowland forest the potoroo. Small native mammals also live in this habitat, notably three species of Antechinus, the native cat and tiger cat, the native rats *Rattus assimilis,* and *Mastacomys.* Dingo, fox, rabbit, pig, the brown rat and the house mouse, all introduced by man, also live on the forest floor, the former three species sometimes usurping the wombat from its burrows. As well, a wealth of reptiles occupy the forest; snakes, skinks and geckos.
>
> The creeks and swamps are occupied by many species of frog including the sub-alpine corroboree frog *Pseudophryne corroboree* and *P. dendyi* which undergo the larval stage inside the egg capsule. The water dragon and platypus live in the creeks and the swamp wallaby lives in the surrounding scrub. (p. 40)

The corresponding bird population of the cool wet region between 2700 and 3800 feet is described in Frith [2] as follows:

> This forest is particularly rich in bird species. Honeyeaters, thornbills, whistlers, the whipbirds, Satin Bowerbirds, Wonga Pigeons and Lyrebirds, occur in abundance. Along streams and tracks the Red-browed Finch and many small species live in the undergrowth. (p. 54)

The pine program will destroy, in NSW at least, a very large part of the main habitat of these creatures and many others. Naturalists are virtually unanimous that, as A.J. Marshall ([1] p. 208) puts it, 'The key to the survival of wild animals and plants is the preservation of their habitat.' A similar principle, can be found, e.g., in Frith [1], p.147, and Day [1], p. 192. The effect of clearance for pines on forest habitat, with particular reference to the greater glider, was also studied by Tyndale-Biscoe and associates, and the results of this thorough and independent study was reported in Tyndale-Biscoe and Smith [1]. This study revealed that these small non-obvious marsupials were uniformly and

widely distributed in cool mountain forest of around 3000 ft. elevation — a distribution of about one adult to every 3 acres was found for the greater glider — but were not found outside the forest areas. The elimination of these animals on clearing for pine was almost total, most dying in the first week; however they are quite unable to establish in the pine habitat. The authors sum up: 'The results of this study establish, what has long been known indirectly, that destruction of the habitat destroys the inhabitants.'

Of all the arboreal mammals mentioned, according to Tyndale-Biscoe [1], 'only the versatile brush possum appears to re-establish itself in the pine plantations'. The more recent work of How [1] has modified this claim in an important respect. Although both the brush-tail possum (*Trichosurus vulpecula*) and its very close relative, the mountain possum (*Trichosurus caninus*), were prominent in the pine plantations of north-eastern NSW, detailed searching of the plantation study areas indicated that none of the other three arboreal phalangers found in the region, the greater glider, the sugar glider and the ringtailed possum, occurred in the pine plantations. And, most important, it was discovered that no individual of either brush possum species remained exclusively in the pine plantations, but that natural vegetation in their home range was apparently a prerequisite for survival. If so it follows that *no* native arboreal mammals can survive solely in the pine plantations. Furthermore given very extensive plantations of the sort envisaged, of 100,000 acres or more of blocks of pines, even the arboreal animals that are found in pines would be confined to peripheral areas accessible from adjacent native forest. Similar results may well obtain for many of the birds found in pine woods and for some of the ground animals seen under pines, namely that they depend ultimately on adjacent native forest areas.

A major objection to the program, then, is that it is eliminating much of a rich, beautiful and diverse habitat and replacing it by something greatly inferior in every respect except wood production. Whether or not one chooses to refer to this simple substituted environment by the apparently easily misunderstood term 'biological desert' there can be no doubt that it is a greatly impoverished one, and that the program will progressively eliminate much of what is valuable and distinctive over a large area.[1] The objection cannot be met, as forestry sources seem to believe that it can, by pointing to the fact that a few of the commoner native animals may continue to be found, that strips of vegetation may be left along streams, or that plantations can be hidden from roads by leaving strips of natural vegetation, or designed with wavy edges to make them appear more natural from a distance.

Other environmental penalties

There are, however, objections other than preservation and aesthetic ones to pine plantations. It is too often blithely assumed that all forestry is an environmentally benign activity, because wood is 'a renewable resource'. This unfortunately requires qualification (as explained in Chapter 1). First a forest considered as a natural area, as an ecological unit, is only renewable under certain limited sorts of exploitation and management, and conversion to pine plantation clearly is not among them. Second, even considered as a mere wood production unit, a forest is not satisfactorily renewable under all methods of exploitation, and there is evidence that the methods involved in pine plantation are not among those that enable long-term renewal, particularly of soil

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1 Over time reductions in, and alteration to the balance of, insects and soil microflora can also be expected, and typical positive feedback effects will follow.

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reserves. Intensive plantation forestry suffers from almost all the disadvantages (discussed in detail in Commoner [1]) of intensive high-yield agriculture, and silvi-business is no more environmentally heroic than agri-business. In each case an important outcome may be soil erosion and deterioration of soils and soil fertility.

That conifers themselves can have an adverse effect on soils, particularly in pure even-aged stands, has been known for some time in the northern hemisphere, where it has been noted that they cause or aggravate podsolisation of soils. Furthermore the methods involved in plantation forestry, especially (i) clearfelling, (ii) soil disturbance and compacting by the operation of heavy machinery and (iii) burning, enhance the effects since they lead to a reduction of soil nutrients, and organic material in the soil. Wilde [1], for example, describes some of the combined effects as follows:

> Under natural conditions podzol soils support coniferous stands that show moderate rates of growth, but in time still produce high yields of valuable timber. Only after clear-cutting, the adverse effects of podzols become pronounced. In reforestation of cut-over lands the growth of planted trees on podzols may be hindered by lack of nutrients in the leached layer, impermeability of the accumulative layer, and unfavourable effects of the accumulative layer on the distribution of moisture during wet and dry seasons. (p. 148)

In 1953 Costin drew attention to these long-term soil effects and on these grounds criticised Australian forestry practices in conifer plantation. Costin's predictions (in [1]) were soon borne out. In the sixties some of these effects on Australian soils became a matter for concern and investigation, mainly because of the greatly reduced yields from the wonder tree (which in view of these results would perhaps be better named the nine-day-wonder tree) in second rotations in South Australia (reported, e.g., in Keeves [1] in 1966). Recent details of the reduction in growth of the second rotation is documented in SA [1] under the heading 'Second Rotation Problem':

> The current annual basal area increments in plots in first rotation Site Quality I – II [high quality sites] and in second rotation on sites formerly producing Site Quality I – III have shown differences between first and second rotation stands to the extent that:–
>
> > 3rd year increment is less by approximately 2/3,
> > 4th year increment is less by approximately 1/2,
> > 5th year increment is less by approximately 1/3,
> > in the second rotation stands on comparable sites . . .
>
> In the 6th and 7th years the basal areas increments have been of the order of one 1/10 to 1/12 less than in the first rotation and directly related to the actual second rotation site class. The plots measured have indicated a cumulative difference of about 50 sq. ft. per acre less basal area in second rotation sites by the beginning of the 8th year. This is equivalent to a reduction from Site Quality II in the first rotation to Site Quality IV in the second rotation.'

Moreover these effects are for the best South Australian sites. But the lower the Site Quality the worse the deterioration in yields; hence the deterioration in third rotation sites is likely to be even more drastic. Hence a plot of Site Quality II will have deteriorated to a site with Quality VI or more by the third rotation: but sites of less than Site Quality VI rate too poorly to meet even low forestry standards for commercial viability (cf. Lewis [1], p.101).

The results strongly suggest that South Australia, at least, is (as Dasmann has conjectured in [1]) about to repeat the German experience with intensive coniferous plantations. In Germany after 1840

> the growing demand for industrial wood stimulated the planting of profitable timber species, mainly conifers, and pure stands of spruce and pine . . . replaced broadleaf and mixed stands.

> Both clear-cutting and pure, even-aged stands were condemned at the time by experienced silviculturalists, . . . whose warnings have since been borne out by declining yields in the second and third rotations and by the disasters (windfall, insect damage, fire, podsolization) that have befallen many of the monocultural softwood stands. Since 1918 Germany has swung back towards natural regeneration, selection felling, mixed forests, and a preference for hardwoods — a combination that has come to be known as the 'Dauerwald'. (Lowenthal [1], p. 288.)

But as a second rotation problem has not so far been observed in second rotation forests in New Zealand, the applicability of Northern Hemisphere experience with conifers to Australian conditions has been challenged. There are, however, salient differences between the soils under New Zealand pines, which are chiefly newer volcanic soils of pumice type, and the soils under Australian pines, which, like the soils of the disastrous German experience, are primarily much older podsolic soils (see, e.g., Donahue et al [1] or the Soils map in Comm [9]).

It is not just that local soils are of a similar type to the German ones and that declining yields have already become a matter of concern with second rotation crops: experiments have shown declining suitability for plant growth, in terms of increases in bulk density and decreases in organic matter under pines as compared with native forest (Hamilton [1] and [2]). Hamilton reaches the conclusion:

> Analyses of soil samples from paired plots under *Pinus radiata* D. Don and native eucalypt forest show that important changes in soil properties occur under the pines. Increases in bulk density, decreases in organic matter and other changes suggest *declining suitability for plant growth.* This trend is confirmed by results of pot trials. ([1], p. 275; our italics).

Although the effects are less noticeable on the wetter sites *now* favoured for plantation, most Australian soils which will have to be used for the program (in contrast to those of some overseas competitors in pine plantation) will be of an unsuitable type, podzolics and such like. Waring in effect admits that if the full plantation program is to be carried out many soils of an unsuitable type will have to be pressed into use:

> On the evidence currently available podzols should not be used for the establishment of *P. radiata* forests until all available better class soils have been planted. On the other hand it is unlikely that any significant areas of the highest quality soils will be available at reasonable cost. On the basis of location, rainfall and availability the soils to be planted in the future will be the solodics and podzolics. *These soils have inherent physical and chemical problems of relatively great magnitude compared to the soils commonly available in other countries planting the species.* ([1], p. 23; our italics)

The process of podsolisation and exhaustion of soil nutrients resulting from intensive coniferous plantations is well enough understood (see, e.g., Costin [1]) to make it clear however that the same process must occur in time even with the better quality soils, if present practices which seem important for profitability, such as having dense and pure even-aged stands which are clear-felled, are continued.

> The early success of exotic conifers in many Australian plantations is related to the suitability of the climate and to the exploitation of previously formed soil reserves. Yields under the clear-cutting system can be expected to be maintained for a time, but only until these reserves have been reduced by the requirements of the conifer crop; thereafter declining fertility must express itself in declining yields. (Costin [1], p. 24)

The 'unsuitable' soils are simply those in which the processes of podsolisation and exhaustion of soil reserves occur more rapidly, perhaps showing up in reduced yields by the second rotation. The resulting soils would not only give much lower yields, but be inferior for catchment purposes, since podsolised soils increase surface run-off and siltation, reducing water quality.

Even apart from the specific and serious problems raised by coniferous monoculture under Australian conditions, the general problems of soil deterioration and watershed effects with intensive forestry and clear-cutting (in part at least a simple consequence of the conservation laws, that for crucial substances one cannot indefinitely take out what is not put back) throws up serious questions as to the viability of the intensive methods of exploitation employed in the long term (see Pierce et al [1], and discussion of the environmental effects of wood-chipping in Chapter 10).

The prospect then is either one of soil deterioration and deteriorating yield rates, which must seriously affect estimates of the profitability of the plantations on a long term basis, or of the adoption of what must (even on the optimistic assumption that they would be effective) be rather expensive measures to restore soil fertility, such as fallowing, the growing of leguminous crops to restore depleted nitrogen and humus, or ploughing in slash, or allowing natural regeneration of pines – all of which must also adversely affect estimates of profitability.[1] As in the case of crop-growing one has not only to reckon with the probable large expense of the operation (which might well destroy *all* the vaunted economic advantages of pine plantations over native forests), but also with the fact that many plantations are on modal slopes of up to 18°, and that slopes of up to 25° are sometimes planted. Intensive crop growing in such areas, even if it were practicable, carries many risks, for example soil erosion with excessive silt and run-off especially after burning, and water pollution resulting from increased silt and nutrient levels of surface water following clearcutting and fertilizer application (Pierce et al [1], Commoner [1]) – none of them matters to be treated lightly, especially in cases such as Tallaganda which drains almost directly into what will be NSW's most expensive dam. In fact undesirable hydrological effects are further environmental costs of the plantation program. The clearing and increased roading involved in plantation forestry increase surface run-off, erosion, and siltation and reduce water quality. In addition it seems likely that pines themselves have an adverse effect on watershed properties both through adverse soil changes and, at least as compared with grassland and probably as compared with eucalypts, through depletion of ground water (CSIRO [2]).

These facts cast very serious doubt on the program. They certainly undercut the view that the plantation program ought to be stepped up in anticipation of possible export opportunities (as suggested, e.g., by Cotton in Hansard [1], Patterson in Hansard [1]), or that more than is absolutely necessary should be planted. For there is good reason to doubt that the high yields, which are the main supposed advantage of pine plantations in Australia, and which seem essential to what small profitability they have, will be long maintained, and also good reason to think that Australia is at a comparative disadvantage as compared with rival producers such as New Zealand. As well the results cast serious doubt on statements such as those of NSW [1] and [2], that pine plantations are 'biological production units which are capable of supplying this raw material in perpetuity, protecting the soil . . .'. Australia is not oversupplied with good soils; we cannot afford to squander much of what there is on a program of doubtful merit.

To any reasonable person not totally committed to the program these results would suggest that the program should be re-evaluated, or at least halted until it is clearly established that the problems of soil erosion and deterioration and watershed degradation can be overcome on a long-term, environmentally satisfactory and economically feasible basis, particularly in view of the lack of urgency of the program. The case for a complete re-evaluation is more compelling if one recalls that the pine program was originally sold on the basis that *P. radiata* was a conifer capable of growing satisfactorily on a wide range

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1 Attempts to restore of fertility by regular additions of fertilizers such as superphosphates, too expensive to be feasible on lower quality sites (see Lewis [1]), frequently prove ineffective either because of lack of temporary soil storage points in nutrient impoverished soils (see p.190) or, in the case of podzolics, because fertilizer elements become bound up in the system and not released (Dasmann et al [3]).

of soils with rainfalls over 22", and which was perfectly satisfactory for Australian conditions and for Australian soils. This basis is now shaken, but the program charges on. Although it is conceded by some foresters that these features cast doubt on the program or at least its economics (e.g. Florence [1], p.69, 'The use of crop rotation in forestry may not be economically feasible'), what it suggests to them is merely that the program is 'a challenge' (e.g., Waring [1], Florence [1]). The program itself remains unchallenged, and the only question seems to be how best to ameliorate its potentially disastrous effects. But the unjustifiable and unacceptable risks involved in the program cannot be passed off merely as 'a challenge'; and indeed it is decidedly poor decision-making to deliberately choose (as Maddox [1] so often does in the case of environmental 'challenges') an alternative outcome with such penalties attached when acceptable alternatives are open.

The program then frequently replaces self-maintaining native forests, which do not cause soil deterioration, which are reservoirs of diversity and of native plants and animals, which can be selectively cut at any time without loss (since they do not require plantation), by systems which eliminate most native species and diversity, which show every sign of not being maintainable for long or without a very high degree of human interference and which require a great deal of advance planning involving uncertainty, with its attendant risks of oversupply and financial loss. This seems to be a classic case of long-term losses for relatively short-term (and at best marginal) gains.

Other attempts are made to stifle criticism of the environmental effects of the program by presenting forestry as an environmentally admirable activity. For example, NSW [1] and [2] claim, as part of the attempt to show that the tree-farm program 'improves' the quality of the environment, that wood products, in contrast to their competitors (given in NSW [1]) as 'concrete, steel, aluminium, plastics and synthetic paper (petrochemical products)', have no environmentally undesirable effects. But even if one accepted the equation of environmentally undesirable effects with pollution — which of course one should not — the contrast with uses in housing and structural materials, of wood with concrete and steel for example, carries comparatively little weight, since very little of the pine plantation yield will be specifically directed to satisfying these sorts of requirements, which can as well (or better, according to many builders and architects) be supplied from native forests. Moreover a well-regulated brickworks or concrete plant and its quarry result in the despoliation of a vastly smaller area and produce less pollution than a comparable integrated wood product mill and its supply plantation.[1] In fact the integrated mills proposed for inland sites such as Oberon and Bombala will not only tax local water supplies but will pose major effluent disposal problems — so much so that Brookes [1] (p.19) asserts that the economic use of wood from pine forests by fully integrated mills 'will be difficult or impossible unless effluent removal facilities are (publicly) provided' and suggests publicly-financed industrial sewers as a tentative solution. With respect to the contrast between wood products and petrochemical products such as synthetic paper and plastics, it is worth noting that pulp and paper mills are very heavy polluters (as instanced by the effects on Lake Baikal, USSR, cited in Goldman [1], p. 215-6, and Lake Bonney, South Australia), and the problem of disposal of effluent from these mills has yet to be properly solved (see, e.g., Kneese et al [1]) whereas the petrochemical substitutes are produced by less polluting distillation processes; that plantation forestry tends to require far greater amounts of pesticides, herbicides and pollution-producing inorganic fertilisers than what it replaces; and that with respect to disposal and litter problems wood products are by no means innocent, particularly since they are frequently combined with plastics in packaging. Furthermore in view of the fact that the aim of planning and forestry commissions is to raise consumption of such items regardless of their environmental effects, a concern with such penalties seems decidedly hypocritical.

In conclusion, there can be little doubt that the pine program, for what may well

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See next page for footnote.

turn out to be temporary and dubious benefits, will produce an environment which is greatly impoverished in comparison to what it replaces, that it will make a substantial contribution to the elimination of most of what is interesting and distinctive in the environment, particularly in the mountain areas of NSW, and that it will greatly accelerate the elimination of natural areas and native fauna, and the advent of the time when only a few overloaded museum-type national parks preserve the remnants of natural areas. Australia is often described as an 'underpopulated area'; however, the strain which allowing for future forestry 'requirements' has already placed on the environment and its quality must cast doubt upon these claims, particularly while self-sufficiency is maintained as a goal.

From a wider point of view the pine planting program represents in a miniature form an unusually clear illustration of the adverse effects of excessive population growth and high consumption levels on the environment. Crucial elements in producing a happier outcome would be not merely reduced growth of population and consumption, but also a style of planning and economic assessment which allowed for and encouraged these things rather than irresponsible growth.

Footnote 1 carried from p. 74

1 Dane [1] has shown that on a narrow materials balance approach the hidden environmental costs of concrete products (block and ready-mix) where there is little waste, one ton of raw materials yielding near enough one ton of output, are far surpassed by those of such rival construction materials as lumber, which uses 3.37 tons of raw material for one ton of output, steel which uses 9.95 tons, and aluminium, which requires 15.23 tons of raw material. Insofar as the analysis neglects energy inputs it does not give a true conservation picture. In any case Dane argues for the superiority of a social costs picture on the ground that the materials balance approach fails to differentiate between the environmental impacts of the wastes produced. Dane's main conclusion – giving social processing costs as percent of wholesale price (US 1970 figures) of competing construction materials as follows:

Lumber	Concrete (ready-mix)	Concrete (block)	Steel	Aluminium
2	24	48	9	28

is by no means decisive. Firstly, the percentages represent the compensation a polluter would have to pay, not the very different results that would emerge under the application of a polluter-pays principle where the processor is required to pay for equipment or methods which reduces the costs to some assigned acceptable levels. For as Dane admits the relatively high figures for concrete products result from the qualities of dust and particulate pollution near urban centres in cement manufacture. Yet the effects on prices of installing particulate filters (i.e. regulating the plant) would lead to much smaller price increases per unit than those obtained by adding estimated social processing costs to wholesale prices. Moreover the study takes account only of a quite insufficient range of environmental parameters, e.g., no account is taken of energy use or the environmental damage incurred in much timber production: thus the argument for timber as superior is but a disguised renewable resource argument. It is odd that bricks, which resemble concrete blocks on the materials balance approach, but where production is generally much less polluting, are not considered by Dane.

Naturally Dane's comparisons of certain materials available for construction purposes do not extend to such wood products as pulp and paper. As the results of Victor [1] (who used somewhat superior methods) show, Dane's results for sawnwood certainly do not extend to paper products, which involve high pollution and other costs. Nor of course does Dane pretend that they do: indeed he indicates the tentativeness of his conclusions even for the construction materials which he does consider. Consequently Dane's analysis does nothing to support the exorbitant claims that some Australian foresters have made, on the basis of the analysis, for the environmental virtuousness of all wood products.

CHAPTER 8

ARGUMENTS FROM PROFITABILITY AND ECONOMIC DESIRABILITY

Previously arguments for the pine program have generally centered on the need for increased yields from forests to meet future domestic requirements. Since the supposed need for enormous yields alone would justify pine plantation, the question of their profitability has not bulked very large. However even if this requirements argument is rejected, as we have argued it should be, there would still remain the issue as to whether pine planting should be continued beyond the level needed to ensure future requirements, not because of the urgency of increasing yields, but because it is profitable, or in some other way beneficial, to replace native forests by pines, e.g. in order to set up an export industry. The profitability argument, for instance, for continuing or stepping up the plantation program is increasingly encountered, and must be distinguished clearly from the requirements argument for plantations with which it is often confused. For profitability cannot be equated with high yields, with productivity per unit area (which would be important were the requirements argument correct). One might as well argue that farmers should go in for extensive (and expensive) handfeeding of their cattle on the grounds that much more beef would be produced. It is true that pines are so far more productive per unit area than all but the best stands of eucalypts. But (area) productivity is not profitability, and what those who are impressed by the high productivity of pine plantations ignore is that a great deal more must be invested to obtain these yields. Thus the preferability of pine plantations to native forests, once essential needs have been provided for, cannot be established simply by the higher yields of the former.

If the plantation program is to be justified as a profitable business development, and not on the basis of its being a beneficial, socially desirable, or necessary enterprise, then it must be assessed in the same way (and at the same discount rate) that any private sector business venture would be, namely that it gives a good return on capital outlay as compared with other possible ventures with comparable risk. There is no case for a social or special forestry discount rate for an enterprise that is supposed to be purely a profitable business venture and whose products compete in the market place with private-sector substitutes. (These points are spelled out in Leslie [1] and [2]). But considered in these terms, using market rates of interest, the plantation program comes out very badly, particularly in comparison with alternative investments. According to Watt (of the NSWFC)

> There is a growing body of economic thought which considers that the interest rate for appraising governmental investments should be an opportunity rate in the order of ten to twelve per cent, this being the rate which the private sector could safely earn with funds diverted to governmental use by either . . . legal restrictions . . . or taxation . . . but if an . . . opportunity interest rate of ten per cent or more was applied to silvicultural costs and returns evaluated at the Forest Service level . . . investment in silviculture would be economically indefensible [Watt [1]: what Watt asserts in [1] implies the selective quotation cited].

Should Watts' quite realistic commercial rates appear somewhat high, it is worth noting that the same points would hold good with rates of 8-9% (see below). The indefensibility of production forestry on straight profitability grounds[1] is also remarked upon by Cromer (see chapter 1) and by Leslie (e.g. [2], p. 18):

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1 The situation is not confined to Australia. In U K the forestry commission's return on expenditure 'which so far shows a negative rate of return' has 'a target rate of 3 per cent in real terms which it is proposed to set as a realistic objective for the less uneconomic plantations, with lower target rates of return where the Commission are required to undertake more uneconomic plantings' (U K [1], p.1) – which implies that 3% is a maximum rate of return from public plantation forestry in U K.

> It is no wonder then that forestry has been tempted to ignore capital opportunity costs in its accounting . . . Inclusion of capital opportunity costs can lead to the . . .very unpalatable conclusion that, in many forms of timber production forestry, costs would be greater than returns.

What data is available suggests that pine plantations in fact return less than 5% annually, *when properly costed.* Consider for example the financial yield tables prepared by Lugton ([1], p. 63) for certain NSW plantations. The costs listed under 'lands' (which include initial establishment costs such as site clearing) for Green Hills State Forest, on a high-quality site near Tumut, total $55 an acre; and at this figure the financial yield is less than 6% annually (under either of the thinning regimes graphed) while the return for Lidsdale State Forest near Sydney is well below 6%. But in these 'land' costs, the initial price of land has, as is typical in forest service estimates, been counted as zero. By no means all forestry land sold for plantation can be costed at zero value; for example the Victorian Forests Commission purchased 15,000 acres over the four years up to 1972 at an average cost of $27 an acre and with more recent purchases at $40 an acre. And to assess uncleared land at zero value is to place no value on native forest. But if instead it is assumed that uncleared land at Green Hills is valued at, say $15 an acre, then the maximum financial yield falls to less than 5.5%. Moreover these estimates make no allowance for land rates, for capital opportunity costs or for administrative overheads. Lugton remarks:

> It is worth bearing in mind, however, that if our interest lay in determining the absolute profitableness of an area the direct costs would need to be increased by something in the order of 50% to cover administrative overheads.

Even disregarding administrative overheads and rates, land at Lidsdale State Forest with its improvements (clearing, roading, buildings, etc.) would have to be valued at -31 dollars an acre, i.e. given to the NSWFC with 31 dollars for each *improved* acre, in order to earn a market rate of 8% (figures from Lugton[1]).

More recent estimates confirm Lugton's results; for according to Henry ([4], p. 67)

> In NSW allowing conservative overheads the Forestry Commission is receiving an internal rate of return of less than 5% on its *P. radiata* plantations. To increase its return to a very modest 6% would mean an increase in the present stumpage of approximately 40%.

It emerges (Henry [5], p. 64) that NSWFC is receiving between 4.6 and 4.7% from its radiata pine plantations, a return that would probably drop towards 4% when overheads are not conservatively estimated,[1] and fall still lower when forested land is properly valued.

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1 Most of the alleged counter-examples to this pattern of dismal commercial returns for public coniferous plantation forestry in Australia are not documented. A rare (apparent) exception is provided by a hypothetical economic evaluation of land use alternatives – forestry as opposed to beef production – for the southern wallum region of Queensland (McCarthy et al [1]), where an internal rate of return of 8.1 – 9.1% for forestry is conjectured. No detailed economic evaluation of the extensive and long-established South Australian operations is so far available. There is but one sketchy study which compares forestry and agriculture in south-eastern South Australia, Lewis [1]. The only relevant economic data Lewis supplies, however is the conclusion of an analysis for which no forestry data is cited, according to which the *maximum* value that the SA Woods and Forests Department can afford to pay for developed land in the better quality sites, and break even – while paying interest at the low level of 5%, though the value of SA government sawmilling is presumably included in the prices estimate – is about $330 an acre; apparently the Department cannot generally afford to pay more than $10 an acre for inferior sites. Moreover on every major soil type in South Australia where softwood forestry is practicable, except for the limited 'dune margins' (i.e. sandy meadow and groundwater podzols with adequate depth), agricultural enterprises have a higher land expectation value than forestry (see [1], Table 2). Accordingly Lewis tries to avoid more detailed comparisons of forestry and agriculture by contending that forestry and agriculture are better regarded as complementary activities rather than as com-

It follows that even given an opportunity rate of only 8 - 9%, investment in the pine plantation program would have to be regarded as decidedly unprofitable. Accordingly the consumption of wood products from local pine plantations has to be regarded as effectively subsidized – a fact which makes the attempts of forestry planners to create irresponsible consumption of paper and packaging, of negative benefit to the community, all the more difficult to comprehend or justify.

The fact that (as already explained) much of the produce of the pine plantations will be used for paper and paper-board means that the estimates of profitability for pine projects given are, rather drastically, on the high side. For estimates such as Lugton's are based on the assumption that every log that can be used as a sawlog is so used. If, however, these logs are used for pulping then the royalties paid are reduced by a factor of a third to a quarter or more (see, e.g., Tas [1]). Indeed farmers are advised not to grow pines for pulping, except with an advance agreement, because the prices paid are far too low (Brown and Hall [1], p.88). Thus when proper allowance is made in Lugton's tables for produce sold for pulping purposes financial yield will fall well below 4%.

For these reasons too the idea for building a (subsidized) export industry on the plantation program is a decidedly shaky economic proposition. The idea of an export softwood plantation industry should be resisted not just because growing pines is unprofitable and because Australia is at a comparative disadvantage as compared with

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1 (Continued from page 77)

peting forms of land use. Three other comparisons of forestry and agriculture, none especially favourable to the *general* forestry case when carefully evaluated, Treloar and Morison [1], Hoy and Sinden [1], and Gilmore and Reilly [1], exhaust what detailed published literature there is, through until 1974 at least, on the comparative economics of forestry in Australia; some aspects of these studies are discussed briefly in Appendix 3.

The fact that NSWFC is showing such poor returns on its radiata plantations is enough to arouse initial suspicions about McCarthy's economic evaluation; for features of forestry on the wallum lead one to expect returns inferior to those of NSWFC since conditions for silviculture are worse: not only is the wallum a notoriously difficult region for agricultural ventures (so that extensive areas of unoccupied Crown land remain along with numerous failed farming ventures), but as well the evaluation is for slash pine *(P. elliottii)* which returns average yields substantially lower than those of radiata pine but for comparable costs (see, e.g. Brown and Hall [1], p.167). These suspicions are soon confirmed: we set out seriatim some of the ways in which the study has managed to increase the expected rate of return from forestry by underestimating costs and inflating returns: (i) returns drop quickly when land is assigned an initial value, e.g. from 8.6% at zero value to about 6.4% at $50 an acre (according to figure 4 of McCarthy et al [1], but the large-scale resumptions required for the scheme (at least 219,000 acres from a total of 736,000 acres) cannot be effected without such costs; (ii) once again no adequate allowance is made for administrative overheads, but these would substantially increase the direct costs (allowed for in Table 5 of McCarthy et al [1], no proper contingency allowance is made for fire fighting costs and fire losses, and there is not even sufficient allowance for fire protection costs and roading costs; (iii) the prices assumed for both pulpwood and pruned slash pine appear too high; for the stumpage values for pulp, ranging from 5 to 16.7 cents per cu. ft., are higher than high values for that period of 2-4 cents per cu. ft. (cited in Brown and Hall [1], p.77), while the stumpage prices for slash pine logs appear to be inflated above standard prices by basing the prices on milled radiata logs (which are more valuable) sold at Adelaide and allowing only for very efficient milling and other costs (probably neglecting administrative overheads); and (iv) a somewhat high site index (SI 75 in fact) is assumed for such a poor site, yet 'a lowering of the site index soon makes a stand unremunerative' (Brown and Hall [1], p.169).

As product price levels have increased since 1969 by at least 15% (the 1971-2 Brisbane saleyard prices of 'chiller grade' bullocks exceeded the 1968-9 price by about 15%), McCarthy's ranking on profitability may have switched from forestry in favour of beef alternatives. But the question of the adequacy of returns remains. With characteristic developmental fervour McCarthy et al assert ([1], p.195): 'The region presents perhaps the last large-scale opportunity in Australia to plan development of a previously useless area so that the nation benefits most.' (The woodchip plans, discussed in Chapter 9, show that the southern wallum is by no means the only 'last' opportunity.) But it seems, especially given the opportunity cost of the developmental proposals, that the nation could benefit most by leaving the wallum 'undeveloped', e.g. set aside on a minimum cost reserve. The Queensland National Parks Association, far from regarding the wallum as a useless area, has campaigned for a park in the area.

countries such as New Zealand and does not need to engage in a subsidized and environmentally destructive industry in order to earn overseas exchange, but on other commercial grounds as well, most notably because, compared with other export opportunities, plantation forestry is a speculative, high-risk and inflexible operation (cf. Parkes [1])[1]. The development of a future export market, based on assumptions about world wood product requirements and prices 40 years and more ahead, is a highly speculative venture, since it is notoriously difficult to make demographic and economic predictions that are reliable for even a few years ahead. There is an especially high risk with plantation forestry because of the inflexibility of the crop. Consider, for instance, the time taken to convert to an alternative product in the case of forms of land use such as sheep grazing and beef raising; in the event of oversupply or declining demand conversion to an alternative form of land use which corrects the situation can be effected within a year. With plantation forestry such correction is impossible, so forestry is a bad venture in the event of overshoot of supply. Finally it is sensible to undertake speculative enterprises with a high risk only where the profits are especially high and where one operates at an advantage compared with likely competitors; but neither of these necessary conditions is met in the case of Australian plantation forestry.

If the profits from state pine plantations are unimpressive, how is it that a number of companies and private growers appear to be growing pines for profit? The major companies operating in Australia are mostly not growing pines for profit. APM, to take the biggest private grower, has a subsidiary company APM Forests Ltd., which grows pines but not at a profit and which sells the product to its parent company at cost. As already explained, the profitable part of the industry is the manufacturing part undertaken by the parent company; the subsidiary company simply furnishes as cheaply as feasible the supply of raw material.[2] In addition there are special advantages for shareholders in companies engaged in afforestation, which mean that such companies can afford to operate at lower profit margins than the norm: under section 77c of the Income Tax Assessment Act substantial tax concessions are allowed for initial investments in (calls on) afforestation shares.[3] Finally in some states the establishment of commercial plantations by private enterprise is encouraged by low cost long-term leasing of Crown lands for the purpose; e.g. in Victoria under the Land (Plantation Areas) Act, thereby further subsidizing APM.

Private planters, and also smaller companies, manage to grow pines profitably chiefly for two reasons: firstly extensive tax concessions can be claimed, and secondly substantial subsidies, chiefly in the form of low interest loans, are available in several states. Tax deductions are allowed, under sections 75 and 76 of the Income Tax Assessment Act, for all the silvicultural operations in growing pines including clearing forest, preparing of land, fencing, planting, thinning, and treating for pests and weeds, and also for the cost of depreciation of materials, machinery, equipment and buildings used in the course of these operations: (for a detailed discussion see Brown and Hall [1], p. 339 ff.). As well there are sizable savings, by way of exemption from sales tax under the Sales Tax (Exemptions and Classifications) Act, on the assessed cost of materials, machinery, equipment and installations used in the silvicultural operations. In short pine plantation activities, including

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1 In any case, according to Davidson [1],

> The possibility of Australia exporting timber at profitable prices has never been investigated. A study of the overseas demand and supply of timber and forest products abroad and the price which might be expected for Australian exports of timber and forest products should precede any large-scale forestry development in Australia' (p. 212).

2 Apparently the larger companies processing forest products which are also growers, such as APM, prefer to buy raw forest material from the states, presumably because it is provided more cheaply than they can provide it themselves and at less than cost, and to manage their own forests largely as holding measures to ensure continuity of supply in times of difficulty or higher prices.

3 Although the Treasurer has indicated that this tax 'loophole' will be closed, the Treasury Department does not consider abuses to be too high at this stage (*Canberra Times*, January 4, 1973).

the further destruction of native forests,[1] are encouraged by the Commonwealth through substantial taxation incentives (though the growing of eucalypts by natural regeneration of native forest is not). State forestry services, in contrast, as public instrumentalities cannot take advantage of the income or company tax concessions to reduce the costs, and so improve the profitability, of their operations. Both private and public planters can, however, take advantage of long-term low-interest loans to reduce substantially interest charged on the costs of their operations. Both NSW and Victoria encourage farm forestry by offering, as well as a free information service, seedling trees at a nominal price, and low interest loans for the establishment of softwood plantations. These loans, of up to $50 an acre, are for 25-30 years, interest free for the first 12-15 years (i.e. up to the first thinning stage) and at 4½-5% thereafter; that is loans at little more than 3% interest rate are available to encourage farm foresty, and indeed development of farm forestry 'does appear to depend on some [such] positive measures of encouragement' (according to R. Slinn in Brown and Hall [1], p. 338). As remarked, the Commonwealth has made loans available to the States under the Softwood Forestry Agreements Acts of 1967 and 1972. The first Act, designed to accelerate softwood planting programs from 40,000 to 75,000 acres a year, provided loans for 40 years, interest free for the first 10 years and at about 5% thereafter, in effect at a net rate of 3%, and effectively amounted to a loan of $114 an acre over the additional 35,000 acres. Without these Commonwealth subsidies the grand plans for softwood plantations that State forestry services have laid would not only not be viable, they would not be possible at all;[2] and even the not unwarranted delay in the renewal of the Commonwealth softwood agreement in 1972 drew some bitter criticism from forestry planners (e.g. Henry [1]).

But suppose that, however unlikely, softwood plantation forestry were to become profitable. Suppose that Henry's ideal Oberon project, which earns 10.9%, were realised. (Of course it's not much good appealing, as Henry [1] does, to a *possible* project, no doubt with possible prices. Of course it's *possible* that the Oberon project, when completed, yields a return of 12% on investment). For reasons already given, it appears decidedly improbable that prices will rise to an extent where softwood plantation forestry becomes so profitable. But even if it should, this would not be a sufficient justification for pushing ahead with the pine program. For one reason state forests are a public good, and hence general welfare, at least, has to be considered in issues as to their role; but profitability is only one factor in such an assessment, and by no means a dominant factor. Far from being dominant, the profit motive may induce, and characteristically will induce (as Kapp [1] has thoroughly explained), outcomes conflicting with general welfare. It follows, too, that a dominant use policy for state forests, as embodied in much state forestry legislation, can hardly be justified on welfare or desirability grounds.

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1 Deductions under sections 75 and 76 cost the Commonwealth more than $11.5 million in 1969-70, but it is not known how much of this is for clearing forest, or indeed how much forest is cleared annually. In Western Australia, the only state that *used* to keep statistics on this matter, the areas cleared were respectively 1.3, 1.4, 1.3, 1.0 and 0.3 million acres for each year up to and including the year ending 31 March 1971.

Although the Commonwealth was said to be seeking ways of restricting taxation concessions for clearing forests, and more generally for primary production, to genuine farmers, it remains to be seen how this will be done and whether the measures taken will effectively stop the granting of concessions for clearing forest for pines or other purposes.

A superior conservation policy would simply annul all concessions for clearing forest, and perhaps, as in Canada, grant concessions for maintaining native forest.

2 Thus the clever suggestion emerging from the Coombs Report (Comm [10]), that since forestry is an economic activity it can afford to pay bond rate interest, would indeed dramatically reduce conifer plantings.



1. Native eucalypt forest cleared for the pine project, Bondo State Forest, Tumut project. The Commonwealth-financed pine program aims to plant at least 3 million acres of pines by 2000, and even higher acreages are likely to result.



2. Bulldozing a fine Mountain Gum (*Eucalyptus dalrympleana*), Bondo State Forest. Almost all land for the pine program is obtained by destroying existing native forest.



3. Conservation activity, Bondo State Forest. The pine program has actually been hailed as a fine example of conservation – 'conservation of softwoods'.



4. Grove of *Eucryphia moorei,* Monga State Forest. This beautiful southern rainforest tree is highly prized in European gardens. Monga State Forest, with one of the finest occurrences of eucryphia, has already been seriously considered for the pine program, is a likely future candidate for clearance under NSW's statutory minimum of 1 1/2 million acres under pine.



5. High quality eucalypt forest cleared for pine, Tallaganda State Forest. According to the NSW Forestry Commission, the pine program is 'a positive contribution to man's search for a better environment'.



6. Conservatively managed forests, using careful selection or small patch cutting over part of the areas, can retain their beauty, diversity and value for many non wood-production purposes, and still provide *reasonable* quantities of wood: *eucryphia* gully, Monga State Forest.



7. Area bulldozed and partly windrowed, Tallaganda State Forest. The pine program will greatly reduce the already small area of indigenous montane forest, particularly in NSW.



8. Area of Messmate (*Eucalyptus obliqua*) soon to be bulldozed to make way for *Pinus radiata,* Tallaganda State Forest. This fine forest has, in its present form, a high value for recreation, aesthetic and other purposes in an area of rapid population growth.



9. An aerial view of clearing for pines, Tallaganda State Forest. Wet mountain forest is particularly rich in birds and mammals, and is the main habitat of many.



10. The NSW Forestry Commission's treatment of a stream in Tallaganda State Forest. Many of Tallaganda's steep slopes and highly erodible granitic soils drain almost directly into the expensive Shoalhaven dam, presently under construction, and a future major source of Sydney's water supply.

In sum, not only does profitability alone not provide a justification for the pine program, but, even if it could, the program cannot be so justified. Its justification, if any, must lie elsewhere, for example through its being overall socially beneficial in some way for us to have more wood products. And faced with the fact that their pine planting program is unsupportable on a commercial basis unless subsidized in one way or another (e.g. through low interest loans, free lands, taxation concessions), foresters have generally argued for it (or for these subsidies) on the basis of the program's carrying social benefits, for instance as meeting future needs or providing rural employment. But only a small part of the program can be justified on the basis of need, as the earlier chapters argued: the overall desirability of the rest of the program remains to be established. Assuming that one takes account of the desirability of the program as well as its profitability, this should be done in a systematic way which examines all its effects, its overall desirability and disadvantages, and does not merely consider in a piecemeal fashion a few side benefits such as employment, selected for the favourable view they give of the program but which are possibly outweighed by other disadvantages. The proper way to get a systematic assessment of the overall desirability of the pine program as compared with other forms of land use is by a cost-benefit analysis which considers a proper range of factors including so-called intangibles. Fortunately the framework of such an analysis, which includes profitability as just one among other relevant factors, is already available in Leslie [1]. Another cost-benefit evaluation of pine planting, undertaken by the Commonwealth before the agreement of 1967 was approved, has not been released and will not be[1] – allegedly on the ground that it contains confidential information, but more likely because it is not convincingly favourable.

Another merit of a cost-benefit analysis which considers a proper range of factors is that it enables the multiple roles of forests, not just their wood production roles, to be brought out. For our purpose it is important to compare radiata pine plantations with the sorts of forests they replace from the point of view of a comparison of overall desirability, not just from the point of view of a comparison of profitability. But it is interesting to observe that radiata plantations do not compare as well as is commonly supposed, for profitability, with the naturally-regenerating medium-grade eucalypt forests they all too frequently replace, once a realistic discount rate is imposed on establishment costs. Table 7 which follows compares, as investment opportunities, a low-yielding *E. obliqua* (messmate) forest which regenerates naturally with a *P. radiata* forest. (The table condenses Table 10 in Leslie [2]).

Even where there is an advantage in profitability for the pine plantations as compared with lower-grade eucalypt forests, the difference is not so great as to be decisive once proper account is taken of other factors, as we shall see. For a cost-benefit analysis, which takes account of sufficiently many factors and gives proper weight to them, shows that it is not generally justifiable to replace even unprofitable eucalypt forests by pine plantations.

A cost-benefit analysis

It is essential that a cost-benefit analysis takes account of an adequate range of factors, and especially of environmental factors. The conclusions of a cost-benefit analysis which fails, for instance, to take adequate account of environmental components, or to assign values to them, have simply to be set aside – until the results are properly

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1 According to the Minister for Primary Industry (K. Wriedt). Some features of the Commonwealth analysis (undertaken by Treasury: a parallel forestry analysis is discussed in the Forwood supplement below) have however emerged:– The analysis, discounted at 6%, apparently revealed in the best plantation examples a cost-benefit ratio of about 2 to 1, but for the run of examples a lower ratio, too often less than 1 to 1. Moreover the analysis 'was based on import replacement values and not on returns from individual acres' (Henry [6], p.73) – a procedure which is not legitimate for export commodities, and a questionable way of inflating price levels assumed for domestic products.

TABLE 7

COMPARISON OF EUCALYPT FOREST WITH PINE FOREST

	P. radiata MAI 255 cu. ft./acre		*E. obliqua* MAI 87 cu. ft./acre	
Discounted at	Costs in $ per acre spread over 40 years 194 (80 in year 0)	Revenue in $ per acre 864	Costs in $ per acre spread over 60 years 42 (0 in year 0)	Revenue in $ per acre 588
4%	178	264	21	84
5%	164	200	17	54
6%	152	156	14	33
7% (approximately)	140	132	12	21

Remarks:

(1) At more realistic discount rates the *E. obliqua* forest remains profitable whereas the *P. radiata* forest does not. However though forest services do obtain much of their land at zero cost, the assumption of zero land cost is pretty questionable, and an initial land value would upset the result. Although the NSWFC is financing its radiata plantations by long-term Commonwealth loans with very low interest rates, this represents a substantial subsidy which has to be taken into account in assessing real profitability.

(2) An MAI of only 87 cu. ft./acre appears to indicate, as Leslie suggests, a rather poor *E. obliqua* forest. Many of the *E. obliqua* forests being replaced by *P. radiata* would, it seems, have an MAI of at least this order over a 60 year rotation.

amalgamated with weightings for relevant environmental components.[1]

The decisiveness of any cost-benefit analysis may be challenged, for example because of familiar problems raised for such analyses over the values to be assigned to so-called intangibles: in many cases it is simply not possible to reach an exact assignment. It is not claimed however that exact results are obtained from the method, or that assignments are not in many cases disputable and in some cases arbitrary. But it does not follow that the method is worthless, or that it is not better than alternative methods.[2] For the result seems sufficiently clear-cut to allow for a substantial amount of disagreement on exact assignments and still come out with a clear decision in favour of retention of the eucalypt forests. Another major advantage of the method is that it exposes the assumptions involved in proceeding with the pine program, namely that one would need to give very high (indeed indefensibly high) values to high yield figures irrespective of costs involved and to benefits such as employment while discounting environmental values such as wildlife and soil protection. Most of the assumptions we have made in our assignments in Table 8 have already been argued for.

Despite the fact that there is a good deal of indeterminacy in some of the assignments, particularly in the absence of sufficient information, there are several guidelines we have tried to observe. Theoretically the value of an intangible is determined through its preference rankings with respect to tangibles, e.g. if x is preferred to y and y is worth S dollars then x is worth at least S dollars, and if z is preferred to x and z is worth S dollars, then x is worth no more than S dollars. In this way an intangible x can be assigned a value-interval on a linear (monetary) ordering. Further within a given factor one tries to get rankings by comparison of how well the benefit (or cost) is provided in comparison with other alternative courses of action. In addition to the arbitrariness of rankings within factors there is the more difficult problem of the relative weightings given to each factor as compared to others, e.g. wildlife as compared with employment. There is room for a great deal more disagreement here. However we assume the plausible principle that if there are a number of different ways of providing a given benefit, other things being equal, it should have correspondingly less weighting than if it were a unique result of the course of action. In short the importance of a benefit is, other things being equal, in proportion to the possibility of providing it in other ways (a matter which can be measured by an appropriate opportunity cost). For example, there are a great many other ways of providing employment in rural centres of suitable size, and many of these ways are probably more satisfactory and more profitable than that deriving from

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1 The benefits and costs of cost-benefit analysis in Australian forestry have been well brought out by Leslie [1]. The more general issues as to the advantages and shortcomings of cost-benefit analyses are outlined in Prest and Turvey [1].

2 It is important to distinguish cost-benefit analyses from the benefit-cost ratios that some forestry economists now favour; a benefit-cost ratio is simply the ratio of discounted revenues of an investment to discounted costs, and generally takes no account of factors other than narrowly commercial ones. Thus the benefit-cost ratio for the far South Coast timber industry given in NSW [12] would fail immediately as a cost-benefit study, because it entirely neglects, i.e. in effect assigns zero value to, environmental costs of operations.

the pine program;[1] but preservation of habitat is the only way of preserving wildlife values. For these reasons the latter ought to have much greater weight. The same principle counts against giving undue weight to profitability, since as good or better profits can be made in various other ways, less destructive of the environment, for a comparable investment.

We apply the principles outlined in the course of sketching some of the case, through a row by row commentary, for the values assigned in Table 8.

Row (1). **Timber production.** In the case of coniferous plantations the figures are derived from figures presented by Lugton [1] for Lidsdale State Forest, a low-quality site located relatively close to a large market, and for Green Hills State Forest, a high-quality site. As remarked Lugton's tables cost land prices at zero value and exclude land rates and administrative overheads, and these if included would add heavily to costs. The figures for eucalypt plantations are Leslie's estimates: here it is worth remarking that the figures in the EH columns are those for eucalypt plantations, such as *E. regnans* plantations with a relatively high establishment cost (because of seeding costs), and more favourable figures could be obtained by considering naturally regenerating (but lower yielding) eucalypt forests, as Table 7 makes plain. To admit easy comparison of our table with Leslie's table we have (lazily) used Leslie's discount rates. But the rate of 5.5% is too low a rate for wood production since on its own wood production is just another market activity. When a proper discount rate is applied the apparent profitability advantage of higher-quality pine plantations vanishes, as we have indicated. Despite this it might be thought that the profitability advantage of subsidized higher-quality pine plantations ought to be assigned more weight relative to other factors. However the values assigned to features other than wood production could be halved (or more), to give much more weight to production factors, without having much bearing on the outcome.

(2). **Investment and Trade.** We have already argued that the benefit of foreign exchange savings has been given far more weight in standard program planning than it deserves, and that given Australia's current and likely future foreign exchange situation there is no real point in accumulating more overseas reserves. Furthermore, this supposed benefit presupposes that one is replacing imports — which for the proportion of the program beyond what is needed for future requirements is untrue. Insofar as yields exceeded those required domestically, they would either provide an unnecessary and heavily subsidized export commodity (which might need to be subsidized even more than locally to compete with the cheaper NZ product), or a commodity which would have to be sold on the local market at a substantial loss or given away.

Even if the point of the remainder of the program was to replace imports, it would probably be far wiser in view of the unprofitable nature of the production of the material to take advantage of the preparedness of other countries thought to have balance of payments difficulties, such as NZ, to subsidize production to obtain exports. What slight benefit to international trade, inflexibility etc., might be gained by local production would be outweighed in any case by the corresponding disadvantage of tariff protection, resulting in high costs to the consumer. A further factor here is the opportunity cost to other industries such as the automotive which could have benefited by increased trade with NZ. We assume then that these factors balance out and have no effect on the end result.

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1 Cf. Leslie [1], p. 30: 'Qualitative statements are really not much more help in decision-making than no statements or even biased quantitative statements. It is hardly useful to assert that forests may provide certain services and benefits, where in fact there are other ways of providing similar benefits. What matters is how much, of what quality and at what cost they are provided.'

TABLE 8

Cost-benefit analysis of conversion of native eucalypt plantations to radiata pine plantations, in terms of annuity values measured in dollars per acre. Direct components discounted at 5.5% over two rotations of 40 years each, and indirect components illustrated, with social discount rate of 3%.

Alternatives:

EL. Eucalypt on low-quality site, 100 miles from capital city.
PL. Radiata on low-quality site, 100 miles from capital city.
EH. Eucalypt on high-quality site, 300 miles from capital city.
PH. Radiata on high-quality site, 300 miles from capital city.

Item	Costs				Benefits			
	EL	PL	EH	PH	EL	PL	EH	PH
Direct market components								
(1) Timber production	1	8	4	8	1	7	3	9
(2) International trade (Balance of payments, costs of protectionism, etc.)	0	2	1	3	0	1	2	3
Indirect components								
(3) Watershed values	1	1	1	2	3	2	4	2
(4) Wildlife and flora values	0	4	0	4	6	0	7	0
(5) Sustainability values	1	8	2	6	2	0	2	0
(6) Recreation (tourism, etc.)	2	2	1	1	4	4	2	2
(7) Rural employment (de-centralization, etc.)	0	0	0	1	0	2	1	4
TOTALS	5	25	9	25	16	16	21	20

Evaluations	EL	PL	EH	PH
(i) Benefits less costs	11	−9	12	−5
(ii) Benefit/costs ratio	$16/_5$	$16/_{25}$	$21/_9$	$20/_{25}$

Remark: A more sophisticated analysis than this schematic one would replace cost and benefit points by intervals. However, given the frame of values here presupposed, use of such intervals would make no difference to the final evaluations, as is argued in the text.

(3). **Watershed values.** Hydrological effects are very important, since water is a scarcer and more essential resource than timber and one cannot easily import it. It is not yet completely clear to what extent pines themselves have an adverse effect on water quality and run-off and studies are under way to determine this (see Costin [1]. Typically pine planting is proceeding without information on this important matter). However there are grounds for believing that pine plantations are mostly inferior to what they replace for this purpose. First clearfelling and increased roading increase surface run-off, erosion and siltation in rivers and dams, and reduce water quality. Second, adverse effects of pines on soils would also affect watershed values adversely. These are matters of some importance since some plantations adjoin expensive dam projects designed to provide water supplies for cities, and all are important watershed areas.

It is argued in NSW [1] that these disadvantageous features are offset by the absence of bushfires in pine plantations, since bushfires also have an adverse effect on watershed values. Whether this is so depends on the type of the burn; if it is not severe it apparently has little effect. But no burn, however severe, has the effect of clearing and disturbing all of the site as pine planting does. Moreover pine plantations are just as susceptible as eucalypt forest to fire — it is merely that more trouble and expense is gone to to protect them because they are considered to be more valuable. However this judgement begs the very question the cost-benefit analysis is supposed to determine, and in any case, the cost of extra fire protection must then certainly be counted as part of the cost of pine plantations. If a similar amount was then spent in protecting eucalypt forests they would almost certainly be superior for watershed protection.

(4). **Wildlife, flora, landscape and diversity.** This includes such features as the preservation of wildlife, of native flora, the effect on landscape (including adjacent national parks and wild areas), and the preservation of diversity, both from an aesthetic and from a more practical point of view. The preservation and enhancement of these features is taken as a benefit, their elimination as a cost. The criterion for deciding assignments is comparison with other practicable forms of land use. Thus pine plantation is assigned a high cost for the elimination of these features, and no benefit, not because it is assumed to be a biological desert, but because there are few forms of land use for the initially rich areas in question which would do more to eliminate these features and which would preserve less. (In contrast pine forest planted on already cleared land would have no cost in terms of these features and perhaps a small benefit). Retention of native forest cover in state forests is assigned a high value for better sites, first because the better sites are very rich in the values listed, and secondly because this form of land use would be better than almost any other (with the exception of allocation to national parks) for these features. Calaby's study [1] of the very rich mammal population of the upper Richmond and Clarence river areas of NSW reveals the very important role state forests can play in wildlife conservation, if retained under native cover and not turned over to intensive forestry. Both costs and benefits are assessed with high values, in the case of costs because of the extremely long-term nature of the cost — the features once eliminated are eliminated permanently — and in the case of benefits because of the uniqueness condition, that the benefit in question cannot easily be obtained as a benefit of alternative courses of action (again with the exception of national park allocation).

The values listed under (4) are likely to become much more significant in the future as natural areas disappear, i.e. their value will increase with scarcity. Thus an important consideration, as with (7) below, is the *extent* of the program. A small area of plantation which left large areas of native forest would incur these costs much less than a large area which involved a great deal of elimination of forest and made natural areas scarce.

(5). **Sustainability.** This includes the features affecting sustained yield over a long term, the most important being soil factors. There is a case for giving a great deal more weight

to this feature than we have (unless one is prepared, quite unjustifiably, to write off future losses), since this is a feature which would affect all the benefits of pine plantation, including profitability and employment, and which would add to the costs, particularly in watershed values. Where the Faustmann formula is used for calculating profitability deterioration in yield over rotation time can be explicitly taken account of by making the yield a decreasing function of rotation.

Efforts to neutralise this deterioration effect seem likely also to diminish or remove benefits and to cause increases on the cost side of the other values.

(6). **Recreation.** Allowing for sites near cities to have a higher value than those further away even if higher quality, eucalypt and pine forests are otherwise assigned equal values. This will of course be disputed, and may be unfair to eucalypt forest. However no real comp data is available. English data showing preference for coniferous forest over hardwood is plainly not automatically transferable to the Australian case. It must be stressed that one cannot obtain acceptable data on the popularity of pine forests for recreation and the proportion preferring them by interviewing the people in them (a method applied in the Australian Capital Territory). One might as well try to ascertain the popularity of racing in the community by interviewing people at race meetings. Many foresters are inclined to allow pine plantation a higher recreation value than eucalypt forest, pointing to heavy use of barbecue and picnic facilities in forest near cities. However observation of heavy use of such native forests as Sherbrooke and the Cumberland Falls area in Victoria suggests that fine native forests near cities are by no means despised for recreation where suitable facilities are provided (as is rarely the case in NSW). The range of recreational activities suitable to each is different; in the case of pine forests close to a city, horse riding, jogging; in the case of native forests, walking and nature observation, enjoyment of natural surroundings, interest value. Diversity of recreational opportunity and provision of opportunity for choice seem more important features here than numbers preferring each type.

(7). **Rural Employment and Decentralisation.** We have counted these as just one item on the grounds that the main virtue of the employment provided is that it is rural employment, since provision of a similar number of jobs would not be very significant in a city. (That is if we suppose that the employment was not rural employment, it would not have such high values as those assigned in (7).) The pine program assists decentralisation to the extent that it creates rural employment; it does not transfer an industry that would typically have had an urban location away from the urban centre. Thus listing rural employment and decentralisation separately (as in Leslie [1]) appears to be counting the same benefit twice.

We have not placed the emphasis on this feature which it is sometimes given in forestry sources, where it is sometimes virtually made to carry the program and considered to outweigh all disadvantages. One reason for this is that it seems clear that employment could probably be provided more satisfactorily in other ways. Therefore we have applied our principle that non-unique benefits cannot carry the same stress as unique ones.

There are other reasons as well for giving less stress to this benefit than it usually receives in forestry sources. The fact that forestry services make substantial use of prison labour removes some of the shine from the benefit. But, more important, both the quality and quantity of employment offered have been overrated. In any assessment of employment benefits the quality of employment provided must be considered, and here it seems that for employees of forestry services at least forestry is not as desirable a form of employment as its healthy open-air nature would initially suggest. First, it does not provide a very high standard of living, especially for the man with the chain saw. For example the Annual Reports of the NSW Foresty Commission for the years from 1968 to 1971 reveal that over these years the Commission has employed on the average

about 1450 people (excluding professional and public service staff), at an annual wage of less than $3000 each excluding overtime. This is far below the national average for the period. Moreover the standard of housing provided by services for employees, even where the housing is modern, appears to be poor by Australian standards. Secondly there is an extraordinarily high accident rate involved with these workers, consistent at around 23-24% of the workforce (excluding public service employees, according to NSW [3]), and this is not compensated for in the wage rate. As well chain saw operators are subject to a number of diseases, some of which resemble those of jack-hammer operators, e.g. Raynaud's disease, deafness (see Groves and Lawrence [1]) and respiratory disease. Operators of heavy machinery are also exposed to some of these health hazards. It seems too that the numbers employed may have been exaggerated in some forestry literature by counting secondary employment (see Brown and Hogg [1]), which is unfair when making a comparison with other industries. Just as standard employment figures for beef production do not include workers in abattoirs, boot factories or cattle trucking, so employment in plantation forestry should not include workers in transport and processing industries. The employment opportunities that pine plantations will open up (a commonly cited figure is 3 persons per 100 acres of pines: see e.g. Cotton in Hansard [1]), and also the contribution the pine program will make to the economy of certain regions, have been exaggerated in just this way, by the inclusion of secondary employment, as Moulds revealed: 'The industry is a very labour-intensive one, and with a fully developed mill complex utilising the pine product, employment can rise to 30 men per 1,000 acres' ([2], p. 6). Nothing remotely like 4500 men are required to plant and maintain a 150,000 acre plantation, especially since the advent of mechanical planting. The forestry claims depend on counting in mill operatives among the foresty workforce; but this is equivalent to including butter factory employment in the dairy farming workforce and is not accepted by the Commonwealth Statistician. Secondary employment, for example that provided by manufacturing industries using raw wood materials, cannot fairly be counted as parts of the employment benefits of a plantation operation or as a specific benefit of the pine program because they are not uniquely associated with the operation; the same secondary employment would still be provided if the relevant raw material were imported or obtained in some other way.

It is hard to avoid the conclusion that far more employment, and probably far more satisfactory and less destructive employment, could be provided, with a better return on the money invested, for the amount of money poured into the program by the siting of suitable labour-intensive industries in regional development centres. Since there are other more satisfactory and profitable ways of obtaining the same benefit which do not carry the same costs, this benefit certainly cannot be allowed to carry an otherwise unacceptable program or to swamp its disadvantages.

In addition extensive employment operations from forestry operations are likely to be shortlived, since forestry planners are interested, because of labour costs, and in order to increase labour productivity, in much increased mechanisation in forestry operations. With mechanical planters, mechanical thinners, and mechanical harvesters in production, some of them in use in Australia, this mechanisation is already under way.

The employment issue in particular raises the vexed question of secondary benefits (discussed more fully in Chapter 13). It is now fairly generally accepted that one should not count in secondary benefits and secondary costs in a cost-benefit assessment (see Leslie [1] and Prest and Turvey [1], and their reasons for excluding secondary factors). For once one begins to count in secondary costs and benefits it is very difficult to know where to stop, short of an examination of the world economy. The obvious boundary line, in order to keep the problem down to an assessible size, is that between primary and secondary factors (though exactly where this falls is sometimes more problematic). Where, however, some secondary factors are included this has to be done systematically. This means that one must consider not just secondary benefits (e.g. derived employment,

company tax returns to government), but also secondary costs. In the case in point this would include, for example, the cost of disposal of paper products to the community, the cost of meeting and accepting pollution produced by paper mills, and the cost to community of loss of such things as fishing industries (as perhaps in Victoria). It is quite unclear that the likely secondary benefits would not be out-weighed by such secondary costs. Basically looking at such advantages as company tax is just presenting a sophisticated version of the argument from the goodness of development and high consumption. But these too have their costs as well as their benefits.

Finally it is quite unclear that counting in secondary factors would make a difference to profitability or desirability of a pine project as compared with alternative courses of action, since a fair comparison must take account of secondary factors for the alternatives. Since the 'profitability' and other benefits of these alternative courses of action would also increase with the addition of secondary benefits, the position of pine plantation vis à vis these alternatives may not be improved significantly by adding secondary factors. Hence where 'profitability' is assessed in terms of opportunity costs, the addition of secondary benefits might very well not improve profitability. Here it should be pointed out that the desirability (or profitability) of an enterprise is not established by one's doing better than breaking even on costs and benefits, but by whether the enterprise is desirable or gives a good return in comparison to other feasible courses of action (i.e. through opportunity costs). The two notions would only coincide if resources were unlimited.

The outcome of the cost-benefit analysis is, as shown by evaluations (i) and (ii) in Table 8, precisely that in Leslie [1], *that it is not generally justifiable to convert even unprofitable eucalypt forests to pine plantations.* This has important implications for forestry planning. Forestry services in various states control or have a strong influence upon most of the remaining native forest land left in Australia, certainly far more than the meagre allotment of national parks. Their policies will have a crucial influence on the fate of these areas, on wildlife and flora conservation, and on whether the country remains an attractive and interesting place in which to live. If they regard these areas as mere wood-production units to be exploited for maximum short-term profitability, the prospects are grim. What is usually supposed to contrast with this attitude is the concept of multiple use of forest areas, in the assessment of which all the parameters (1)-(7) of the cost-benefit analysis figure properly. The basic unprofitability of production forestry, the need for public subsidy, means that multiple use of forests is not just a gracious concession to the community, on the part of forest services. It is something which is essential if many forestry activities are to be defensible at all as overall socially desirable, and if the control which forest services exercise over large and increasing areas of the remaining native forest is to be justifiable. However multiple use does not consist merely in allowing the public free access to wood production areas and providing a few picnic tables or barbecues. A genuine multiple use approach must take proper account of the benefits and costs other than wood production which forests can provide (as in the cost-benefit analysis), and take proper account of these in the initial planning for and assessment of programs such as the pine program. If this were done the pine program would be abandoned.

The best strategy under the decision theory model

To complete the decision theory model, it remains to assess desirabilities for direct outcomes and to combine these with the probable outcomes mapped in Charts 3 and 4. Because value judgements enter into assessing desirabilities, just as they enter into assigning values in cost-benefit analysis or into finding measurable substitutes for intangibles, there will usually be less agreement as to how desirabilities are distributed than about how probabilities are distributed. We have argued that maximization of commodities, consumption, or short-term profits is decidedly not what is most

desirable. But of course if the recipe according to which more consumption is better were followed, the distribution of desirabilities would be a fairly simple matter – desirability would increase with amount consumed, and given that the increase was linear only scale factors would have to be determined. We have already argued against such a distribution of desirabilities in criticising the overestimation method which likewise supposed that more is better, with but little respect for environmental penalties. Fortunately it is now increasingly recognised that the environmental penalties of production and consumption are undesirable, and that a different distribution of desirabilities is wanted (see, e.g., Boulding [1]). This distribution should take account not just of environmental factors but of all relevant factors, in the way that our cost-benefit analysis tried to do. In fact the outcomes of the cost-benefit analysis (as assessed by one or other of the evaluations of Table 8) provides a measure of desirability (or welfare, considered as a function of the parameters of the cost-benefit analysis). But the analysis does not, as it stands, provide a distribution of desirability over increasing derived outcomes, that is in terms of increasing acreages under pines. It can be elaborated to so, however, by considering how the factors vary with increasing acreages going under pines. The way crucial factors vary is shown in Table 9; it is evident from the tendencies of these factors that the dominant mode is that of increase of costs and decrease of overall benefits as the acreages under pines increases. In brief there is a cumulative effect, undesirability increases as acreages increase. To illustrate the point: environmental penalties and especially environmental destruction are, other things being equal, undesirable, and the greater the environmental penalties of an activity or program the more undesirable it is. In the limiting NSW case, where the pine planting program involves the destruction of practically all publicly-owned montane forest between 2000-4000 feet outside a few national parks in NSW, the program is completely undesirable. Given these evaluations, the desirability curve decreases, with increasing rapidity, as the destruction of native forests and natural areas, required by increased softwoods consumption, increases. (Value is, once again, a function of scarcity.)

There appear to be only two factors liable to upset this pattern of the desirability curve, of monotone decrease with increasing Australian consumption within the range of likely requirements, namely the undesirability of a damaging shortfall and the undesirability of a drop in the quality of life of the population. It is plain however from the estimates of Table 6 that a damaging shortfall is virtually excluded given the present plantation area of more than 1 million acres, since imports are almost certain to be available. And as the per capita consumption figures introduced envisage no reduction in the quantity or quality of wood products that each person has available, no diminution in the quality of life need occur. Nor is a desirable increase in the standard of living thereby frustrated; as explained, the availability of more locally-produced packaging materials, for example at the expense of native forest involves no increase in the real standard of living, but indeed a diminution because of the undesirable elimination of the forests.

Assuming, then, that the desirability curve is monotonically decreasing within the range of likely direct outcomes, the effect of the monotone decreasing desirability distribution on the direct outcomes shown in Charts 3 and 4 is to enhance requirements at the lower end of the range at the expense of higher requirement levels. If the curve is not too steep then the best strategy ranges for levels of requirements can be read off Charts 3 and 4 by a projection which transposes shaded zones downwards.

The outcome will be a best strategy range of between about 650-750 million cubic feet; that is the best strategy, to cover requirements at both 2000 and 2040, is to aim to meet total requirements of between 650-750 million cubic feet (given of course the earlier assumptions as to probabilities of population levels and population growth rates). These requirements can be most *cheaply* supplied without *any* more pines. So the best strategy is for the states to plant no more pines.

TABLE 9

Cost-benefit analysis of planned conversion of *further* native eucalypt forests (E) to radiata pine plantations (P), together with an indication of the differential effect on cost and benefit or increasing the proportion of pine forests at the expense of eucalypt forests. Figures in rows (1)-(7), in terms of annuity values in dollars per acre, derive from averages of figures in Table 8.

		COSTS		BENEFITS	
	Items	E	P	E	P
(1)	Timber productions	3	8	2	8(-)
(2)	International Trade	0	2	0	2
(3)	Watershed values	1	2(+)	4	2
(4)	Wildlife and flora values	0	4(++)	7	0
(5)	Sustainability values	1	7(++)	2	0
(6)	Recreation values	1	1	3	3(-)
(7)	Rural employment	0	1	0	3(+)
	TOTALS	7	25(+++++)	18	18(-)

Evaluation	Eucalypt Forests	Radiata Plantations
Benefits less costs	+12	-8

\+ indicates increase in the associated value, and

\- indicates decrease in the associated value, under increasing acreages under pine.

Opportunity costs and uncertainty

We have noticed that the standard arguments in favour of pine plantations, where they are not based on the naive assumption that one must maximize productivity regardless of cost, are usually based on the only slightly less naive assumption that one should maximize financial returns from each piece of land, and depend upon ignoring the crucial range of non-financial factors and non-wood-production values considered in the preceding cost-benefit analysis. Consideration of such values is crucial, particularly for a public authority operating with public funds, and ignoring them amounts to ignoring the interests of non-wood users and the public interest.

But one does not need even to consider non wood-production values in order to show that the simple procedure of assuming that pine plantations are preferable because they may produce a higher rate of return on capital invested than the native forests they replace, is fallacious. Both consideration of capital opportunity costs and of uncertainty reveal that even on *narrow* economic considerations, the preference for pines over native forest simply on the grounds of higher rates of return is mistaken. Such a preference rests upon a classic micro-economic fallacy to the effect that one should maximize returns on each piece of land. The fallacy consists in failure to take account of the fact that public capital resources (needed to obtain returns) are not unlimited, and that investment in one project excludes investment in another. When account is taken of this factor the relevant problem is that of maximising overall *benefit* for capital available – in short an optimisation problem – and for this reason consideration of capital *opportunity costs,* particularly where scarce public funds are involved is crucial, and the elementary procedure of maximisation of return on any given piece of land will not in general give an optimum.

Firstly considerations of uncertainty count against pine plantations as a good way of investing public funds. As already remarked, because of the exceptional time period involved in forestry in the time that elapses between the decision to plant and the marketing of the subsequent crops, forestry is subject to an exceptionally high level of uncertainty and consequent risk of loss. Uncertainty arises not only through the impossibility of predicting distant future demand without knowledge of future prices, and the difficulty of estimating even future requirements, which involves gauging long term population trends, but also through the difficulty in anticipating technological changes such as reduction in sawnwood used in housing and the development of substitutes and competing materials[1] and the effect of these on future demand and prices. Plantation forestry, with its high levels of initial capital expenditure for establishment, and heavy dependence upon advance planning and accurate prediction of expected prices and requirements 40 years or more ahead, suffers the drawback of uncertainty in a much more serious way than what it often replaces, namely low capital-expenditure naturally-regenerating conservatively managed native forests, which do not depend heavily upon advance planning and which, because of low capital establishment costs, can be cut or foregone at any time without much loss.

An attempt is often made to dispose of the uncertainty problem by arguing that satisfactory export markets are sure to be available; the main argument for this assumption rests on the increase in world population and in standard of living in countries such as China (e.g. Hanson [8]). However the mere availability of a population (who might be consumers given appropriate income levels, interest, etc.,) is no basis for assuming that satisfactory prices will be obtainable. On the same argument it is hard to see how any primary producer over the last 20 years could ever have failed to make a satisfactory return on his product through adopting a policy of maximising his production.

1 The uncertainty problem which arises in connection with forestry does not appear to affect alternative fibre sources (e.g., for paper) to the same extent, and must therefore be regarded a very distinct economic advantage for alternative fibre sources and other alternatives to forest products (e.g. video "newspapers").

Any proper economic assessment, especially one involving a long time period, must consider uncertainty, as we have already stressed, but uncertainty in this case substantially favours the naturally-regenerating natural forests over plantations even where the latter provide a better rate of return, e.g. a better benefit-cost ratio. The consideration of uncertainty (especially when combined with considerations of capital opportunity costs) means that the procedure of favouring pine or other plantations, merely because they may produce a slightly better rate of return and larger volumes of material than natural forests, has to be considered as naive and simplistic even where non-wood-production values and other intangibles are ignored.

The opportunity cost argument[1] against pine plantations depends on the fact that they involve a high level of public capital expenditure for establishment (as compared with naturally-regenerating conservatively-managed native forests) but provide a rate of return which is far less than might be obtained for other investments. As we have noted published estimates which are not based on highly optimistic speculative assumptions about future prices and which use realistic discount rates and other costings show that in general pine plantations do not show returns better than 4% or so. When account is taken of the effects of the excessive pine program on flooding the local market returns might well drop below this figure. The cost of establishment is heavy, commonly exceeding $80 per acre and for this heavy expenditure of and poor return on public funds the taxpayer will, if he is lucky obtain an investment which is speculative, inflexible, and involves a high level of uncertainty, and which will very likely be ploughed back into even more dubious forestry enterprises. (However the opportunity cost argument applies even where a plantation, by some good fortune, yields better returns, of say 6-7%, which are spent on welfare measures.)

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1 Although we have used the standard notion of opportunity costs, the problem is better treated as an optimisation problem. For one needs to consider not only the *best* alternative possibility but the range of alternatives upon which public capital may be to varying extents outlaid. Thus the problem of spending scarce public funds is an optimisation one, that of obtaining a maximum value over a set of alternative uses to which public funds may be put — but of course not one of maximisation of financial returns but utilities or welfare resulting for expenditure on the different alternatives. On this account what is involved is as follows: there are n alternative opportunities for public expenditure $a_1,\ldots,a_n$; and there will be constraints relating these alternatives. In particular, there may be a requirement to produce a given quantity of wood, and both alternatives a_1 (growing the wood in natural forests) and a_2 (investing in pine plantations) will meet the requirement. There will be also an overall constraint that the sum of the capital spent on the alternatives is fixed — the scarcity point. Within the constraints the optimization problem is to maximize the weighted sum:

$$\sum_{i=1}^{n} w_i u(a_i) = w_1 u(a_1) + w_2 u(a_2) + \ldots + w_n u_n(a_n)$$

where $u(a_i)$ represents the utility (or measured benefit) of the alternative a_j, and w_i the weight assigned to the utility of this alternative. In the sort of case that we are interested in where there are alternatives a_1 and a_2 (as specified above) and say, a further alternative investment possibility a_3 (a Sydney-Melbourne expressway say, or a manpower policy, etc.) the utility curves for each alternative do not increase indefinitely with capital invested but decline eventually to zero. Graphed they can be summed, given the weightings. In general a unique solution will not result upon summation, but constraints may limit the alternative local maxima. Given however that the constraints are reasonable, and accordingly can be reexpressed in terms of an appropriate set of equalities and inequality relations, an optimum solution will be determined, and will be given by the Kuhn-Tucker conditions for a stationary position.

In terms of such a model it is easy to see why, given a small more or less fixed sum of public capital, one would not in general obtain an optimum, either in financial returns, or in welfare, by attempting to maximise returns on each alternative investment unit (e.g. a forest area); and also how one can argue that if there is a *better* independent alternative with similar capital outlay one does not have an optimum.

Once account is taken of the fact that public funds are a scarce item it is evident that one would be much better off from a purely financial point of view (not to mention in other ways) accepting a much lower level of expenditure, even with a lower rate of return, by retaining areas in native forest; for the public funds so released could be invested far more advantageously elsewhere either to obtain a better rate of return of 12% or more, for less risk, or better (since it is doubtful whether scarce public funds should be invested simply to obtain a good return) on some of the urgent welfare measures for which such funds are in such short supply, e.g. low cost housing, education and public transport systems. These forms of investment of scarce public funds, as well as providing far greater social benefits than pine plantations, would also in many cases yield a better return (e.g. benefit-cost ratios of better than 4 : 1 in contrast to the best ratios obtainable for pines of 2 : 1).

CHAPTER 9

WOODCHIPPING FOR EXPORT

Many of the world's remaining forests are now threatened by woodchipping – by harvesting for woodchips destined for pulp and paper products. Many tropical forests in the Pacific basin have already been exhausted, e.g. forests in the Philippines and Indonesia, and the enterprise is rapidly extending to very many other tropical and temperate forests, not only in the Pacific region (e.g. New Zealand, New Guinea, and Malaysia), but also in India and Sri Lanka, in Africa and in Latin America. The forests of Australia are no exception, and foresters of Australia, like foresters in 'underdeveloped' countries, now see the opportunity of selling up forests run-down by extensive logging or not so far intensively exploited, and thereby of 'improving' the balance of payments situation in their country.

The woodchip export industry now threatens enormous areas of native forest in Australia with major changes. Large-scale woodchipping will produce an inferior environment over large areas, have a drastic effect on wildlife, and seriously reduce the value of great areas of forest from the point of view of values other than wood production. These effects will be produced without any adequate economic or other justification. Moreover these large-scale changes will be introduced without adequate research on their likely environmental effects.

But Australian woodchip schemes are not required in order to solve local 'balance of payment problems' or to meet domestic requirements. Australian forest industries used only about 58 million cu. ft. of roundwood in the production of paper, paperboard and fibreboard in 1969-70, with 74% of this deriving from broadleaf species, mostly eucalypt (figures are taken from FTB [1]). But more than this amount will shortly be supplied by the woodchip export projects already operating in Tasmania alone. As far as domestic requirements are concerned then, mainland woodchip projects are otiose. Indeed by applying intensive forestry methods, the whole of Australia's consumption of eucalypt pulpwood could, in principle, be produced from plantations within an area of 10 miles radius of a single mill, i.e. on slightly less than 200,000 acres (as Carter [2] has argued). Certainly the environmental costs of such intensive methods are high in terms of fertilizer and pesticide requirements (see, e.g., Jacobs [11] on the 'heavy costs of formicides and methyl bromides (mixed with tear gas for safety)' in intensive eucalypt forestry in Brazil); even so the costs likely to be incurred are no worse than those so far accepted in the case of intensive agricultural enterprises such as cotton growing. Admittedly the costs of commercially producing pulpwood by these intensive methods are substantially higher – a 7% return requires stumpage (royalty) values of $60 a cu. ft., or *more* if appropriate thinning regimes are undertaken (Carter [2]) – than stumpages currently paid to forest services (when the roading costs are deducted). But, as will be shown, royalties currently paid would have to rise appreciably for forestry woodchipping operations to begin to appear commercially viable.

The idea of producing all of Australia's pulpwood requirements from one such concentrated scheme is, despite its costs (and after all it can, at least as regards commercial costs, be subsidized in much the way that other Australian forestry ventures are), no doubt tempting both environmentally, because it could localize and concentrate environmental costs, and from a protectionist viewpoint, because it could be used to eliminate a major part of the forest product 'import burden'; but it is hardly likely to *restrain* forest services interested in exploiting, in one way or another, and for the most part regardless of financial returns, almost all Australian forests. For it is a corollary of

the total use principle that what cannot be used locally can be exported.

Large-scale woodchip plans

Australian forest services have extensive but largely undisclosed plans to woodchip something in the order of one-quarter of Australia's total real forest area and half the publicly owned coastal forests. Some of the evidence that forestry authorities hope to woodchip around 20 million acres of natural forest is to be found in the NAFTA [1] report and in particular on the estimates given there of future production of broadleaf pulpwood. These estimates are in turn based on data supplied by state forest services for each state: this data is presented in Table 10. It has emerged that these state estimates were not idly conjectured but were based on specific state projects with specific locations producing fairly specific yields: in short, the relevant projects have already been planned.

In order to convert the data in Table 10 into areas to be woodchipped assumptions are made as to the average yields in green tons from each acre woodchipped, as to the average density in pounds of a cubic foot of green chips, and as to the rotation period of chipping operations. Although forestry authorities mostly refuse to disclose the details on which their estimates of pulpwood production were based, reasonable estimates of acreages can be made on the basis of what is known from projects operating in Tasmania and at Eden and from a project planned in Western Australia (see Harris [1]) and relying on known details of the composition of coastal eucalypt forests. Thus if one adopts the assumptions as to yields and densities set out below Table 11 one arrives at the acreages shown in rows (1)-(4) of Table 11. It is commonly assumed that there will be rotation of about 40 years for Tasmanian projects and about 50 years at Eden and for Western Australia projects; there are in fact obvious constraints on length of the first rotation which will often cut through previously logged and often badly managed forests, since (apart from Northern Territory projects) Australian projects will be established with a view to providing indefinitely a continuous and uniform supply of chips.

Using the assumed rotation times it is easy to calculate the key acreages, scheduled for eventual woodchipping over the first full rotation, shown in row (5) of Table 11. To emphasize the vast scale of the plans, present acreage of total production forest are set out for comparison purposes in row (6) of the Table.

Evidence that the figures in Table 10 indeed represent the amounts the state forest services regard, and give out overseas, as available for woodchipping – while at the same time refusing to disclose any information regarding their plans to the Australian public – is contained in various professional forestry papers. For example Higgins [1] gives 74 million cubic feet, the figure of Table 10, as the amount of pulpwood that is available annually from NSW, and White [1] cites the metric equivalent of 74 million cubic feet as the amount of hardwood pulp that Japanese interests[1] will import annually from NSW. Independent conformation that the figures cited for Victoria are not far off the mark may be obtained from Table V in Vic [1], which estimates the availability of broadleaf pulpwood from Victorian forests. The estimated availability of pulpwood from Victoria

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1 Reportedly by Harris-Daishowa, the Eden operators, who recently, in the face of criticism of the Eden project, announced that they would shortly offer some shares to Australians. Also in their movie, 'Woodchips from Eden', a Harris-Daishowa representative stated that the company expects to undertake further chipwood export projects from NSW. Indeed according to Harris-Daishowa 'official approval has been given to the expansion of the Company's operations at Eden' (HD [1], which gives a brief summary of the proposed expansion). And the planned doubling of the chip mill capacity, through a new mill, is apparently proceeding though the environmental impact statement, expected before a Commonwealth export licence is granted, has not been submitted. The new plant, expected to be completed in September 1974, will increase annual plant production to 750,000 tons.

TABLE 10

ESTIMATED PRODUCTION OF BROADLEAVED PULPWOOD

(Millions of Cubic Feet True Measure)

Year	Australia	NSW	Vic.	Qld.
(1)	(2)	(3)	(4)	(5)
1975	295.6	74.0	59.2	12.2
1980	379.2	74.0	59.1	84.4
1990	382.4	74.0	59.3	84.4
2000	368.8	74.0	59.5	104.5

Year	SA	WA	Tas.	ACT	NT
	(6)	(7)	(8)	(9)	(10)
1975	–	24.2	76.0	–	50.0
1980	–	25.7	86.0	–	50.0
1990	–	25.7	89.0	–	50.0
2000	–	25.8	105.0	–	–

Note:

(i) Figures in Column (2) are the totals of Columns (3) to (10).

(ii) They also equal the totals of Columns (3) and (7) in Table R4 on p. 18 of NAFTA [1] Report, 1970, where they were used in *predicting* Australia's future production.

(iii) Figures in this table are derived from estimates supplied by State and Territory forestry authorities.

Source:

Table supplied by the former Department of National Development, 1972.

TABLE 11
ESTIMATES OF AREAS TO BE WOODCHIPPED ANNUALLY
(in thousands of acres)
AND OVER A FULL ROTATION
(in millions of acres)

		Year	Australia	NSW	Vic.	Qld.
Areas in thousands of acres	(1)	1975	362	82	66	14
	(2)	1980	452	82	66	94
	(3)	1990	455	82	66	94
	(4)	2000	380	82	66	116
Areas in millions of acres	(5)	Full rotation	20.1	4.1	3.3	5.8
	(6)	Total production reserves	32.6	8.4	5.67	8.9

		Year	SA	WA	Tas.	ACT	NT
Areas in thousands of acres	(1)	1975	–	25	64	–	104
	(2)	1980	–	27	72	–	104
	(3)	1990	–	27	75	–	104
	(4)	2000	–	27	89	–	–
Areas in millions of acres	(5)	Full rotation	–	1.3	3.6	–	2.0
	(6)	Total production reserves	.27	4.8	4.5	.03	.01

Source of row (6) is Comm [1]. This is included for purposes of comparison with row (5).

Assumptions:

(1) Volumes from Table 1 are converted to acreages using the following fairly realistic assumptions:–
   (a) The average yields per acre are 35 green long tons in Tasmania, 15 tons in Northern Territory and 30 tons in other states;
   (b) A conversion factor of 75 lbs per cu. ft., typical of green *E. sieberi* chips and of an *E. pilularis* mix is used, except for Tasmania where a factor of 65 lbs/cu. ft. representing an *E. regnans* mix is used and for Western Australia and Northern Territory where a factor of 70 lbs/cu.ft is used by forest services.

(2) A full rotation is assumed to be over 50 years, except in the case of Tasmania where a 40 year rotation is supposed and for Northern Territory where a 20 year period is taken.

escalates in 1975 to about 60 million cu. ft. from a 1970 pulpwood yield figure of 21.7 million cu. ft. It is in fact known that Victorian pulpwood has been offered for sale on the international market from time to time; but port facilities remain a problem, especially for the large East Gippsland supply (cf. Higgins and Phillips [1]). It is not merely that Australian forest services are anxious to dispose of the cited amounts of hardwood chips, on the Japanese side there is a strong demand for inexpensive pulpwood, in chip form, which is moreover expected to increase greatly in coming years (see e.g. White [1]). However although Tasmania with three very large export projects now in operation, one at Triabunna and two at Long Reach, and a fourth being considered, is likely to achieve its 1975 target of 76 million cubic feet (shown in Table 10), a number of mainland projects which would probably otherwise have been further advanced, e.g. projects in Western Australia and Queensland were delayed, firstly because of the temporary recession in the pulp and paper industry in 1971-3[1], and secondly because of the introduction in 1970 of a Commonwealth guideline export price designed to ensure some small Australian return from the sale of Australian forests. But the breathing space so provided will probably be shortlived (especially since currency revisions and a high inflation rate have eroded the former guideline price), and it can be expected that a rash of mainland projects will be announced, as usual as fait accompli, unless there is sufficient public protest to force Commonwealth or State revision of these plans (or to frighten Japanese buyers off). Perhaps this has already begun to happen with the new announcement that a Western Australian project at Manjimup will begin production in 1975. New projects are of course shrouded in secrecy, in accord with our great democratic tradition of closed government; but there is evidence that plans were laid (some now shelved) for projects in at least the following locations: Devonport (Tas), Albany (WA), Melville Island (NT), Murganella (NT), Gove (NT), Weipa (Qld), Shelburne Bay (Qld), Cairns (Qld), Gympie (Qld), Fraser Island (Qld), Boonah (Qld), Coffs Habour (NSW), Jervis Bay (ACT but drawing on NSW forests), Moruya (NSW).[2] As well keen interest is apparently being shown in the forests of Victoria, especially East Gippsland, and of the North Coast region

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1 In characteristic cobweb cycle fashion the recession was quickly transformed, by a prolonged strike in Canadian mills, into shortage of supply, chiefly of newsprint. Subsequently a good many vested interests tried to exploit the "world wide shortage of paper" for their own ends, such as calls for investment in new plantations. There was however no shortage of fibre, as more candid industrialists admitted, but only inadequacy in processing capacity, because during the recession normal expansion of capacity was postponed. It appears that the none-too-serious shortage of paper supplies in Australia will end in 1975 when a new paper-machine in New Zealand, also delayed through the previous recession, begins production.

2 Some of this information is contained in notes in the journal *Appita;* other details are contained in letters written to conservation groups giving details of governmental planning as at Jervis Bay, or of company operations, as at Moruya, Weipa, Gove and Shelburne Bay.

In the case of Northern Territory projects the following valuable details (which help to confirm our estimates based on NAFTA [1]) have been supplied by the Minister for Northern Territory (K. Enderby) in a letter of June 13, 1973:

> Some four years ago the Japanese pulp industry were examining the feasibility of utilising woodchips from the Northern Territory. Investigations showed that the three major areas of potential were Melville Island, Murganella and the Gove area. Each area has adequate supplies to support an industry of 500,000 tons of wood annually. The average yields per acre are of the order of 15 to 20 tons, although this could be increased in the second rotation. Although this would mean the treatment of some 25,000 acres in

of NSW (Higgins and Phillips [1]). Indeed, two projects, both located near Coffs Harbour, are currently being considered for northern NSW, one an APM scheme at Bonville and the other proposed by a subsidiary of Blue Metal Industries on the Clarence River. A new project, planning to export through the port of Brisbane, is also under Commonwealth consideration for an export permit (Hansard [2], p.692).

How woodchip projects affect pine planting schemes

The fact that Australian forest services have such extensive plans for woodchip export schemes refutes at once the claim sometimes advanced that the pine planting schemes are not all that evil really because coniferous plantation forestry can serve as a saviour of remaining native forests, through providing from a fairly limited area a substantial part of domestic wood product requirements. For it is now quite plain that forest services are not interested in, but are opposed to, forest preservation of any magnitude; they are not particularly interested in confining environmental degradation to a small forest area; what they are interested in is using forests, especially hitherto non-commercial forests or logged out forests, for woodchipping. Indeed it is fair to say that no Australian forest service is at all enthusiastic about preserving some further sizable piece of forest that it could use for timber or chip production.[1] These services have no intention of slackening their exploitation of native forests as more pines are grown; in fact they have recently jointly called, through the Australian Forestry Council, not only for continuing funds for softwood planting programs, but for further funds for the improvement, for wood production ends, of native forests.

Thus it is plain that no sort of ecological bargain will easily be struck (or equivalent segregation of facilities effected) whereby forest services will leave worthwhile areas of native forest intact in exchange for substantial areas of land for intensive forestry (e.g., what would be generous for domestic supplies, 2 million acres for pine plantations and 2 million acres for intensive eucalypt forestry).

On the contrary there are plans afoot to export surplus yields from softwood plantations; plans reflected, for instance,in the speeches of R. Cotton (Comm [5]) and K. Saito ([1], p. 63): 'in the not too distant future supplies of softwood timber may become available to Harris-Daishowa from pine forests being planted by the Government of NSW' (cf. White [1]).[2] Indeed some plantations, e.g. those at Bombala, appear to have been specifically designed for export purposes. The fact that softwoods can be sold –

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1 (Continued from page 95)

> each area annually, and over ½ million acres in each area over a rotation period of some 25 years, the actual total areas are many times larger since operations will be restricted to the more productive forest types and will avoid erosion prone areas and areas of alternative forms of land use. . . .
>
> The woodchip industry in the Northern Territory is very much bound up with the question of land rights for Aboriginals as the three major areas of potential for this industry are within the present Aboriginal Reserves. The timber rights on the Reserves are presently the subject of an Enquiry by this Government.

1 Witness the fashion in which the Victorian Forests Commission has succeeded in encouraging the Victorian Sawmillers Association to oppose the dedication of the proposed Alpine National Park in Victoria (see, e.g., Moulds [3] and the ensuing discussion, loc. cit., of this paper). Consider too the amount of merchantable forest in the park systems of such states as Tasmania, South Australia and Western Australia.

2 See too Jacob's claim that 'if we overestimated we would, without any doubt, be able to export it at a profit', *Australian Financial Review,* June 14, 1973, p. 9. The mistaken conception that excess softwood supplies can be freighted abroad to sell at an acceptable profit margin has already been dealt with.

even if unprofitably — to the Japanese along with chipwood and pulpwood is of course one of the underlying reasons why excessive quantities of conifers are being planted and why overestimation of domestic requirements is treated so lightly. It is moreover quite dishonest to continue to obtain Commonwealth funds for coniferous plantations on the alleged grounds that softwoods are essential to meeting basic domestic requirements when it is actually intended to export some of the plantation yields; the Commonwealth finance could be far better deployed elsewhere on genuine welfare measures.

Far from coniferous plantations relieving the pressure on native forests, grandiose export schemes, especially of woodchips, will impose pressure for increased coniferous planting and for 'improvements' of native forests (by intensive methods, species reduction and elimination of old trees and understorey). A criticism of woodchipping that sawmillers take seriously is that woodchipping takes on the cheap far too many (potentially) fine sawlogs, and that widespread woodchipping is going to reduce greatly sawlog availability — especially after the first rotation as many forests previously furnishing sawlogs will no longer do so. The real danger is then that reduction in sawlog availability, through extensive woodchipping, is going to increase dependence on plantation forestry, and especially on pine plantations. Once planned woodchip schemes are commenced, and many native forests are accordingly committed for the production of woodchips for export, increased forestry pressure for further coniferous plantations can be expected.

In some cases the result will undoubtedly be the conversion of woodchipped forests to pine plantations. Forest services in both NSW and Tasmania have indicated that some of the forests they plan to chip will be replaced by pine plantations. Conversion to softwoods is especially likely where species chipped are not highly regarded for timber or even for pulp production, do not grow as rapidly as pines would on the same site, and grow on relatively flat country so that mechanised forestry methods are easily applied. The marri (*E. calophylla*) forests of Western Australia, which are to be chipped for the giant Manjimup scheme, meet all these conditions,[1] and it is not merely coincidental that the plans of the WA Forests Department for pine plantations have escalated — on the alleged grounds of ensuring regional self-sufficiency in softwoods — to 3-400,000 acres, as their plans for woodchipping grew (so that earlier plans to chip about 10,000 acres a year have been superseded, and now more than 25,000 acres a year will be chipped to meet contract commitments to deliver 750,000 tons annually). The Queensland Department of Forestry probably has similar plans for the conversion of chipped coastal forests to pines.

In NSW the pattern established in the Eden-Bombala district, of coastal woodchip areas supplemented by mountain hinterland areas to be woodchipped as part of conversion to pine plantation, presumably will be repeated right along the NSW coast. Also following the pattern of Eden-Bombala, the woodchip port can be used for export of the products of the pine plantation, and the material can be transported to the port using the major roads set up for the woodchip project (financed under the guise of tourist highways); such pine projects would also have convenient access to the pulp mill already established for the woodchip scheme. In the Moruya district the requisite timber resource surveys have already begun.

If, as seems likely, other states have also understated their intentions or are enlarging planted pine areas under the stimulus of woodchip schemes, as WA has recently done, Australia could well wind up with a total of 5 million acres or more under pine. It is obvious that a figure of this sort cannot possibly be justified as needed for domestic requirements. It appears that the Commonwealth has been gulled into helping to finance, under the guise of supplying urgent future domestic requirements, an enormously destructive and poorly commercial program mainly designed for export. Since, as the NSW plans indicate, the states have resources to

1 The marri, which commonly grows in mixed forests with the highly Phytophthora-susceptible jarrah, grows on the relatively flat plateau and slopes of the Darling range, it does not grow as rapidly as *P. radiata,* and it is not favoured for sawnwood uses (because of extensive gum veining of its wood) or even especially good for pulping (because of wood, kino and bark problems).

It is worth noting too that the further spread of root-rot disease may very well encourage the conversion of eucalypt forests and even some eucalypt plantations to pine plantations, since favoured pine species are not very susceptible to the disease (Marks et al [2]).

finance areas of pine plantation well in excess of the area for which they receive Commonwealth assistance, the withdrawal of Commonwealth assistance would still leave Australia with a large and probably excessive area of pine plantation.

Information and choice

With woodchip projects of such magnitude in various stages of planning, it is important for Australians to have the opportunity to scrutinize the projects critically in order to determine whether the changes certain to be made to the environment are acceptable and warranted, *before* the contracts are signed and the projects announced as proceeding. Quite apart from the *independently-conducted* environmental impact studies that ought to be made before any of these woodchip projects is approved, interested Australians are entitled to be informed, in early planning stages, of the details of projects that will transform public forests. In New Zealand plans for woodchip projects have been made public well in advance (NZ [3]) with the intention of allowing public assessment, and a public inquiry will be held into the proposed South Island woodchip industries.[1] In Australia assurances have been given, by the Minister of Environment and Conservation (M. Cass), that no new export permits (essential prerequisites for projects) will be granted by the Commonwealth government unless the government 'is completely convinced that the project is in the national interest, both economically and environmentally'. Although this might appear to be an improvement on earlier procedures, it is still inadequate since the people engaged in 'reassessment' of projects are often those who were previously engaged in their promotion,[2] and it is still inferior to a public inquiry and full advance disclosure both of economic and environmental details and also of what of importance there is that it not known. Otherwise there is no adequate guarantee that the secrecy will not persist, that preliminary research undertaken will not remain quite insufficient, and the decisions taken will not be too narrowly based.

Moreover decisions on new projects are not simply matters of fact, but of values (as emphasized in Chapter 1). Australians are quite entitled to ask whether, with the projects, they are not compromising one of the major assets of the country, its areas of unique and still unspoilt natural environment, for quite inadequate returns and unnecessary export earnings. Australians are entitled to choose a more satisfying and diverse environment rather than, what may bring them no benefits at all, a larger GNP and more subsidised export earnings, and they should not allow such important value-based choices to be quietly made for them by development-minded 'experts' and empire-building forestry authorities with a narrow orientation to wood-production. Forestry expertise, insofar as it is available in Australia in areas other than wood production, is relevant to deciding how best to achieve the goals set for public forest management, but it does not entitle foresters to usurp the right to decide what forests should be used for and in particular to what extent forests should be used primarily for wood production. While it is of course permissible, indeed inevitable, that decision-making should be delegated, it should not be simply delegated to wood production interests, and furthermore the ground and detail of decison-making should be open to general assessment. An informed decision to override stated forestry opinion may then emerge simply as a decision to put values other than wood production first. As the House of Representatives Select Committee on Wildlife Conservation recently acknowledged (Comm [6], p.159): 'The native forests are valuable areas for wildlife conservation and human recreation . . . their value for these purposes may be greater than their value for wood production'.

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1 The NZ procedure, though enlightened by Australian standards, still leaves a good deal to be desired: the matter is taken up again in Chapter 15.

2 For example, prominent members of the Forestry and Timber Bureau and the Forest Research Institute are leading members of the Working Party which is supposedly looking critically at woodchip and pine planting projects.

Despite Cass' assurances the Labor government had (about May 1973) approved a doubling in capacity of the Eden chipmill plant and also a future pulp mill.

CHAPTER 10

THE ENVIRONMENTAL COSTS OF INTENSIVE PULPWOOD PRODUCTION

Woodchipping as an intensive forestry practice represents an advanced example of the conflict between wood production and other values. However, it is common for foresters to minimize, or even deny the existence of, environmental penalties. They may even claim that their activities improve the environment, and the battery of general arguments to this effect discussed in Chapter 1 is usually brought into play here; for instance the clearfelling forester is doing us all a service in replacing the decadent and degenerate old forest by a 'young, vigorous healthy new forest.' It would be a mistake to believe that just because Australian woodchip projects mostly make provision for a continuing supply of trees (timber) nothing is lost and there is no environmental cost. A forest is not just a wood-producing unit, and that something precious may be lost is evident from the case of the rainforests threatened by woodchipping. But even in less extreme cases there are costs, and once the general class of arguments designed to convince us that forestry exploitation improves the environment or has a benign effect on it is seen through one can proceed to the business of assessing just how serious these costs are.

The full environmental costs cannot be adequately assessed, firstly because the full extent and location of areas likely to be involved has not been announced (and no doubt each project will only be announced when arrangements have been completed), and secondly because little research is being carried out, or is planned, even on existing projects, to determine what the costs are. For example, little research is being carried out, or is projected, at Eden or in Tasmania to determine what effects virtual clearfelling for woodchipping has on animal and plant life, on watershed properties, or on soils. That forest services are prepared to introduce large-scale changes likely to alter huge areas without making any serious attempt to determine their effects on the environment is a sufficient condemnation in itself.

But worse, there is available plenty of indirect evidence which suggests that many of the modifications to the environment involved will be deleterious and that woodchipping involves methods which are over-exploitative and damaging. Some of this damage is subtle (e.g. effects on wildlife, nutrient balance and soils) and could not be noticed without extensive and thorough research, which is *not* being done. As Pierce et al [1] remark for the American case:

> Clearcutting causes major changes in the environment. All forms of plant and animal life undergo change. Gross changes are readily seen. What is not seen or readily detected are some of the subtle, gradual yet highly significant changes.

Hence impressions gained by casual inspections of projects by visitors are of limited value from the point of view of assessment of damage. It is likewise unsatisfactory to appeal, as forest services do (e.g. NSW [4]), to the existence of unmonitored but established clearcutting projects (such as those in USA or at Boola Boola State Forest in Gippsland,

Victoria[1]) as proof of the harmlessness of woodchipping; for, insofar as these established projects are comparable, they have not been monitored or checked for the relevant effects either.

Just how deleterious the changes will be depends on several different factors, as there are substantial differences in the way a woodchip project may be carried out even in the case where a continuing supply of wood is ensured. At one end of the spectrum are projects such as that at Eden which proceeds by virtual clearfelling of a community (adapted to occasional serious bushfires) which regenerates naturally after felling if the operation is conducted carefully. At the other end is the complete destruction of a valuable and irreplaceable non-regenerating community in short supply, such as the rainforest communities, and its replacement by plantations of hoop pine or an exotic. In between there is a progression through clearfelling, burning and windrowing and artificially regenerating by planting or (aerial) seeding with one or more of the original eucalypts (as in Tasmanian mountain ash stands), to replacing with different favoured native species, possibly in monoculture and unrelated to the original community, to replacing with exotic species (as at Bombala). It is not easy to draw a line in this progression, but it would certainly be a mistake to think that it is only where the replacement species is exotic that the process is unacceptable and the costs severe (it is hard to see, for example, that much less is lost when scarce rainforest is replaced by hoop pine or regresses to eucalypt than where it is replaced by exotic pine). The spectrum of cases can easily be exploited by those who wish to win acceptance for woodchip projects by the technique of introducing the most favourable projects such as Eden first and withholding the projects with the most serious environmental costs until other less controversial projects are safely established and accepted.

What all these projects have in common, at least as a minimum cost, and what the economics of a woodchip project at present prices is supposed to dictate, is clearfelling over most of the project site. Thus even in the most favourable case, where natural regeneration is used, there are severe environmental penalties, which can be illustrated by considering the Eden project.

The costs at Eden

The Eden project is sprawling over what was a few years ago the wildest and most unspoilt coastal area in southeastern Australia. In NSW it runs from the Victorian border, where many of the forests near the eastern escarpment are virgin and trackless, in the north to the touristically valuable coastal forests north of Bermagui and takes in the edge of the great Brogo wilderness area, and in the west it runs to the beautiful escarpment and tableland forests near Bombala, the latter being woodchipped in the process of being converted to pine.

It is significant that the Eden project, the first export project on the mainland and the one which to many people will be the test case is in fact the most favourable and is

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1 The project at Boola Boola SF, operated by APM in conjunction with the Victorian Forests Commission, though frequently cited as a paradigmatic example of an innocuous clearcutting operation is very far from decisive; for it is only in the first rotation stage, a second rotation has not been planned for, and, most important, no requisite monitoring is being undertaken.

Whether *any* clearcutting practices are acceptable is a highly disputed matter in USA, though it is there agreed that some clearcutting practices, including ones resembling Australian practices, are quite inadmissible (see USA [2], and Chapter 15).

not representative of the sorts of projects likely to proceed elsewhere, many of which are unlikely to use natural regeneration. For example Watt and Henry [2] imply that other NSW projects will *not* rely on natural regeneration:

> It has been considered that with the exception of the Eden area, the only possibility of producing sufficient volumes for a long term viable [pulpwood] industry, lies in the establishment of plantations.

In the Eden operations all suitable trees on a selected site are taken; the result, what we call virtual clearfelling, falls short of clearfelling of the site only because seriously defective trees and unsuitable species (e.g. very dense trees such as ironbarks and notoriously defective trees such as yertchuk) are left on site. Thus the few widely scattered trees remaining after virtual clearfelling are trees with unsuitable properties for chipping or seriously defective individuals, and these also would be removed but for the expense involved: (in fact there are obvious difficulties about leaving these trees since they are a fire hazard and since seed is then produced from undesirable species or individuals). There is no practice of leaving seed trees. Nonetheless some of the area, notably higher ground dominated by silvertop ash (*E. sieberi*), regenerates fairly quickly and the regenerated vegetation *appears* to retain most of the diversity of the original, although this has not been tested for anything other than species of eucalyptus. However about 50% of the site is disturbed, run over and bared by machinery, 20% is heavily disturbed with tracks and roads and is partly compacted (see FRN [1]), and at least 5% of the site is so badly compacted than no regeneration occurs on it. These areas, tracks and logging dumps, must be ripped and reseeded at some cost and even then are likely to present a severe erosion problem for some years since vegetation is slow to return. Some very steep slopes, too steep for machinery to operate on (i.e. more than 28°-30°), have been cleared, the material being winched out. Anti-erosion measures, consisting of cross-drains across snig tracks[1] on steeper slopes, are taken, but there is no evidence that these measures will be effective or keep erosion and stream siltation problems to acceptable levels; in fact no proper checks are carried out on stream siltation and pollution or erosion effects or as to the effects of operations on soils. The Eden area is subject to very heavy rainstorms, of average frequency twice a year, in which from 10"-17" may fall in 24 hours (see NSW [9], p.6),[2] and the area is largely rugged or mountainous and has fairly thin soils, so that erosion, siltation and leaching costs have to be taken seriously. Although comparatively little rain fell in the early stages of the chipping operations at Eden, many crossdrains soon filled with silt or else washed out, and erosion effects such as gullying occurred along several tracks.[3] The mere fact that some measures, possibly quite ineffective and certainly ad hoc, have been taken to 'minimize' these costs does not provide a reason for dismissing them or failing to check on them. Indeed with clearfelling

On a re-inspection in early 1974 very few cross-drains could be located.

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1 The actual prescription is as follows: for slopes less than 10° one cross-drain every 5 chains, slopes between 10° and 15° one cross-drain every 3 chains, slopes between 15° and 20° one drain every 2 chains, and for slopes of more than 20° one cross-drain every chain. But despite the prescription cross-drains were apparently not required on some slopes, and on an inspection of logged areas foresters had some difficulty in locating areas which had been cross-drained.

2 Although the mean annual rainfall at Eden averages 35", it has varied over the last 80 years between 16.6" and 71.4". Many parts of the Eden concession, e.g. Naghi SF, have average rainfalls of 40" or more.

3 Since the early stages heavy rains have produced much gullying along tracks and heavy erosion in some areas; little regeneration is to be seen on snig tracks and log dumps some years old; and attempts to reseed these tracks and dumps do not appear markedly successful. Symptoms of eutrophication effects in streams draining the chipped areas of Naghi have also become evident, as has siltation affecting the Wallagaraugh River and the entrance to Mallacoota Inlet.

on the steep upper slopes that are being cleared it is difficult to see that effective erosion measures could be taken.

Though no relevant hydrological investigations have been undertaken at Eden, it appears that *some* of the sites match a dry sclerophyll site (site D) in the Brindabella ranges studied by Gilmore. As with matching sites at Eden, at site D

> The soil fertility appears very low and most of the nutrient capital is probably tied up in the standing vegetation and the surface soil. Clearing and burning would result in the loss of a large part of this capital leaving the soil with an even lower fertility, and revegetation would be slow. Raindrop action and compaction by tractors would reduce the surface detention storage, and since the detention storage of the subsoil is naturally low, surface run-off would increase resulting in a marked increase in soil movement. This is quite evident in Wombat Creek catchment below site D. Beaver dams constructed across dry watercourses at plantation establishments are filled with debris and many have broken through and produced severe gullying . . . [One dam] is at the outlet of a catchment of 7.5 acres and contained about 2,500 cubic feet of soil material, most of which was probably deposited in the first few months after clearing and burning.[1] The volume of soil is conservative, as the dam was full, and an unknown amount must have washed over the top. Another example . . . is seen in Lee's Creek catchment. An estimated 9,900 cubic feet of soil material was removed from the scour during one storm and deposited in and around Lee's Creek itself. ([1], pp. 49-50).

Gilmore also showed that the soil losses from bare areas such as firebreaks were very much higher than from vegetated areas.

> The very high value of 60% for surface run-off from a firebreak plot mentioned has important consequences. Such a large amount of surface water has great potential for erosion, not only where it originates, but in normally stable areas nearby. [This was shown by downslope scouring produced by surface run-off from a partly bare firebreak. Moreover] each time heavy rain falls sediment laden runoff pours down this scour directly into the river ([1], p. 57).

The application of these results (and similar American results) to the Eden situation is immediate. If a heavy rainstorm occurs during the months after clearing before new vegetation covers the soil, and the odds in favour of this happening at least once in three years are quite high, then severe erosion and irreversible soil losses will occur.[2] These will of course bring in their train stream siltation and pollution, and detrimental effects on aquatic ecosystems and major Australian fish breeding grounds. Indeed some of these effects have now been observed,

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1 Burning following clearing has been abandoned at Eden, though it is an important part of Tasmanian operations. But the main relevance of burning is that it helps clear the site, something that happens for about half the Eden sites anyway as the result of tractor activity.

2 The severe erosion and siltation costs of American forestry practices are well revealed in USA [2], especially in the statements of Curry ('Western forests may have something less than 200 years of productive fertility remaining'), Ray ('sedimentation goes up 7000 times') and Platt ('Much of the accelerated sediment accruement is due to landsides and crags, which are generally associated with intensive climatic storms coupled with disturbed lands mainly from logging and road construction').

> . . . there has been significant erosion and loss of topsoil on steeper slopes. Silt washing down the Wallagaraugh River after heavy rains has affected Mallacoota Inlet (a small Victorian National Park) by heavily muddying the water and driving fish from the Inlet. Significant water discoloration has even been observed by abalone divers at Gabo Island which lies 8 miles from the mouth of Mallacoota Inlet. Thus even marine environments have been directly affected. (Rawlinson [1])

In particular the future of the southern sea bass, which spawns in the Wallagaraugh River, is jeopardised.

The eventual erosion and siltation problems[1] are likely to be severe at Eden because the area has such a high surface run-off, about 35% of the rainfall over the catchment area of the main river systems (the Towamba and Genoa-Wallagaraugh systems) drains away as run-off into the rivers, a percentage considerably above the average for coastal NSW. Plainly these soil and erosion problems are not going to be solved by minor measures such as the occasional short-term cross-drain along tracks: to solve them the whole method of operation will have to be drastically revised. There will have, for example, to be limits on the slopes logged (probably these should exclude the slopes of more than 19°, i.e. with gradients of more than 1 in 3, which occupy much of the area); controls on the design and construction of logging roads and minor snig tracks (along the 'minimum impact' lines now being suggested by American foresters, e.g. Montgomery and Walker [1], p.12); regulations to ensure the closure and proper revegetation of smaller logging roads and snig tracks immediately after logging operations are contemplated; severe reductions in the size of coupes clearcut; restrictions on logging along smaller watercourses; and so on. A code of admissible logging practices for the Eden operations should be drawn up, and enforced.

As with erosion, so with wildlife: in spite of the effects on wildlife only token measures have been taken to 'minimize' damage to wildlife. The House of Representatives Select Committee on Wildlife Conservation has called for surveys to be carried out before woodchip projects are set up in order to assess the value of the forests for wild life conservation (Comm [6], paragraph 160). However despite the fact that drastic modifications will be made to an enormous area near Eden (between half a million and a million acres, including much of the Bombala forestry sub-district) about which very little is known, no biological survey has been undertaken or is contemplated. Consequently no special protection measures can be taken for rare or uncommon species although there is good reason to believe that a number are in the area. Furthermore, in the absence of a survey, it is impossible to check the effects of the project, or the adequacy of the small refuges left within the Eden woodchip concession. (The NSW Forestry Commission's pronouncements on the effects on wildlife, e.g. in NSW [6], are largely a priori). It would appear however that the refuges, though not worthless, will be of very limited value, and do not make it possible to dismiss the serious effect on wildlife.

Much is nonetheless made of the presence of these 'biological corridors', strips retained in their natural condition, allegedly for the purpose of wildlife conservation. However it appears that at least part of the purpose of these strips (as indicated in NSW [6]) is to provide fire protection for the regrowth stands (which cannot be control-burnt for about 20 years and which are at high risk from fire: Felton and Cunningham [1]). Accordingly, these strips will be burnt very frequently, thus greatly diminishing their value from the point of view of wildlife conservation, particularly in the case of small ground animals requiring a dense habitat. Similar pressure to burn frequently in order to protect forest services' investments is being applied to the adjoining small national parks which have been left in the woodchipping areas, despite the presence of fauna and flora which may be adversely affected, e.g. small marsupials, and rainforest reaching its southernmost limits in the Eden region.

[1] These problems will be further intensified when logging of the virgin hinterland forests, which grow on highly erodible granitic soils, begins.

There are other important reasons for thinking that what small refuges are left — largely swamps or rocky hilltops, hardly widely favoured habitats, connected by corridors of only a few chains width — are of very doubtful value, even if the relevant animals should occur in them. The territorial nature of many species severely limits the extent to which numbers of refugees could be crowded into small refuges. Moreover the hope that refuges would be able to hold animals displaced by clearing operations is forlorn for many species. As Tyndale-Biscoe and Smith's study [1] of the effect of clearing[1] has shown, greater gliders which survived felling rarely survived more than a week and were unable to re-establish in adjacent uncleared areas. A similar result could be expected for many other arboreal mammals, and half the 30 species of mammals known to occur in the forests already being chipped near Eden are arboreal. The best one could hope for from the refuges is that they might provide small reserve populations of some of the species in the areas from which recolonization could eventually take place. However this again is a fairly forlorn hope for two reasons. Firstly minimum areas for the maintenance of temporarily viable populations of arboreal animals appear to be blocks of forest of about 1000 acres. As the refuges are smaller and highly dispersed, they can serve at best as stop-over points. Secondly it is not just that the habitats of most arboreal mammals and many birds are eliminated in the clearing process; given continued cropping or plantations, habitats will never be permitted to return. Thus the regrowth forests will be permanently depleted of an important range of animal life. Hence the leaving of refuges certainly does not eliminate the conflict between woodchip production and wildlife preservation.

Nor are the small parks, of about 10,000 acres each, left within the Eden woodchip franchise, adequate, it would seem, even to preserve local varieties of species such as the greater glider. Minimum areas for the permanent preservation of species of such animals appear to be blocks in the order of 30-40,000 acres. And preservation of species alone is not enough: numbers and local varieties are also important.

Although no proper studies have been done to determine the exact range of animals affected by woodchipping at Eden, or elsewhere, an approximate idea can be obtained from other studies, especially those of Calaby [1] and Tyndale-Biscoe and Smith [1]. The habitats which these studies show to be crucial for a range of animals, namely mature and old trees with hollows which provide homes for small marsupials, mammals and birds and nesting places for a further range of birds, are eliminated or virtually eliminated by the clearing process. Even where a few scattered trees remain these would be useless for many marsupials such as gliders since not merely a hole in which to live but also a canopy, provided by reasonable tree density, is required (Tyndale-Biscoe and Smith [1]); and in any case what slight benefit would be obtained from those old trees which did remain would be short-lived since they would not be replaced. Calaby's study [1] showed the serious effect on arboreal mammals of the removal of the trees for 'timber stand improvement.' The range of animals affected by this habitat removal includes some of the most useful as well as some of the most attractive inhabitants of the forest: the five species of gliders which are among the most regular but inconspicuous inhabitants of appropriate forest areas (all of which are found at Eden), the pigmy possums (of which one species is found at Eden), a large range of tree-dwelling bats (at least five species are at Eden), the tiger quoll, the tuan, one species of antechinus which is partly arboreal, and an important range of birds which live or nest in hollow trees. The bird species affected include all the owls and some nightjars, almost all the cockatoos and parrots, kookaburras, some kingfishers and diurnal birds of

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1 It is completely incidental that the clearing studied was for pines.

prey, tree-creepers, and others. There are as well a number of species of birds which habitually feed in the canopy and a number of small ground species which could be expected to be adversely affected by clearing operations.[1]

Despite all this it is sometimes claimed by proponents of woodchipping that it is better for native animals, e.g. NSW [4], [5] and [6], while according to Hanson ([5]. p. 4):

> On past experience it is likely that the resulting increased silvicultural operations will result in a build-up of the native animal population.

Although conditions for a few ground species, particularly kangaroos and wallabies, may be temporarily improved (so that costs of re-establishment in Tasmania woodchip areas include costs for exterminating these animals), conditions for many species are permanently worsened. But what is important, what conservation is about, is to provide for (by not destroying their habitats) a reasonable range of species, not for temporary and excessive numbers of a few species. The improvement in conditions for larger ground herbivores is only temporary because the increased grassy areas which follow clearing are, if regeneration is successful, succeeded in a very few years by dense stands of saplings which provide much less favourable conditions for understorey plants than what preceded clearing; hence the temporary rise in numbers of larger herbivores is likely to be followed by a subsequent decline in numbers to lower levels than before clearing. It is worth noting also that the species for which conditions are temporarily improved by clearing are already rather well catered for by the large and increasing areas of the continent which are cleared or partly cleared. Those which depend on the rapidly shrinking natural forest environment will be seriously affected. From the point of view of preserving an adequate range of animals, and particularly species which are dependent upon specialised habitats or the mature forest environment for survival, the 'young vigorous healthy new forests', the 'better forests for the future', will be vastly inferior, and indeed for many species little better than pines. This point alone refutes the view (cf. NSW [4] and Tas [4]) that a project such as the Eden woodchip project is not only justifiable, but will actually improve the environment.

As with wildlife and erosion, so it is with plants. The NSW Commission employs no wildlife specialists, no soil scientists and no botanists at Eden – and scarcely any elsewhere in fact.[2] The only botanical research undertaken on the project concerns the root-rot fungus *Phytophthora cinnamomi,* now found in Naghi SF, which constitutes a serious hazard (as will be explained) for the eucalypt forest. Despite the fact that woodchip concession covers a floristically rich and varied area which may be botanically important as the southern limit of a range of plants including several rainforest species, no checks have been made, or are intended, on the impact of logging and roading activities on vegetation (apart from regeneration growth and production features of main species of eucalypts used for pulpwood).

Finally, the planning and advance preparation undertaken for the Eden project are open to serious criticism. There are several indications that the NSW Forestry Commission was quite inadequately prepared to embark on the Eden project, and the project has to be regarded as a rash and far too large experiment. Thus, firstly, the only prior survey

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1 Some of these points can be easily checked by anyone with a good bird book; e.g. Frith [2]. A fine description of the wildlife of the forests of the Eden region may be found in Breeden [1], pp. 74-90.

2 When it comes to features of the forests that do not concern wood production NSWFC is a very tin-pot organisation; thus it is singularly ill-equipped to undertake the multiple use management of very much at all of the vast acreage of forest it now controls.

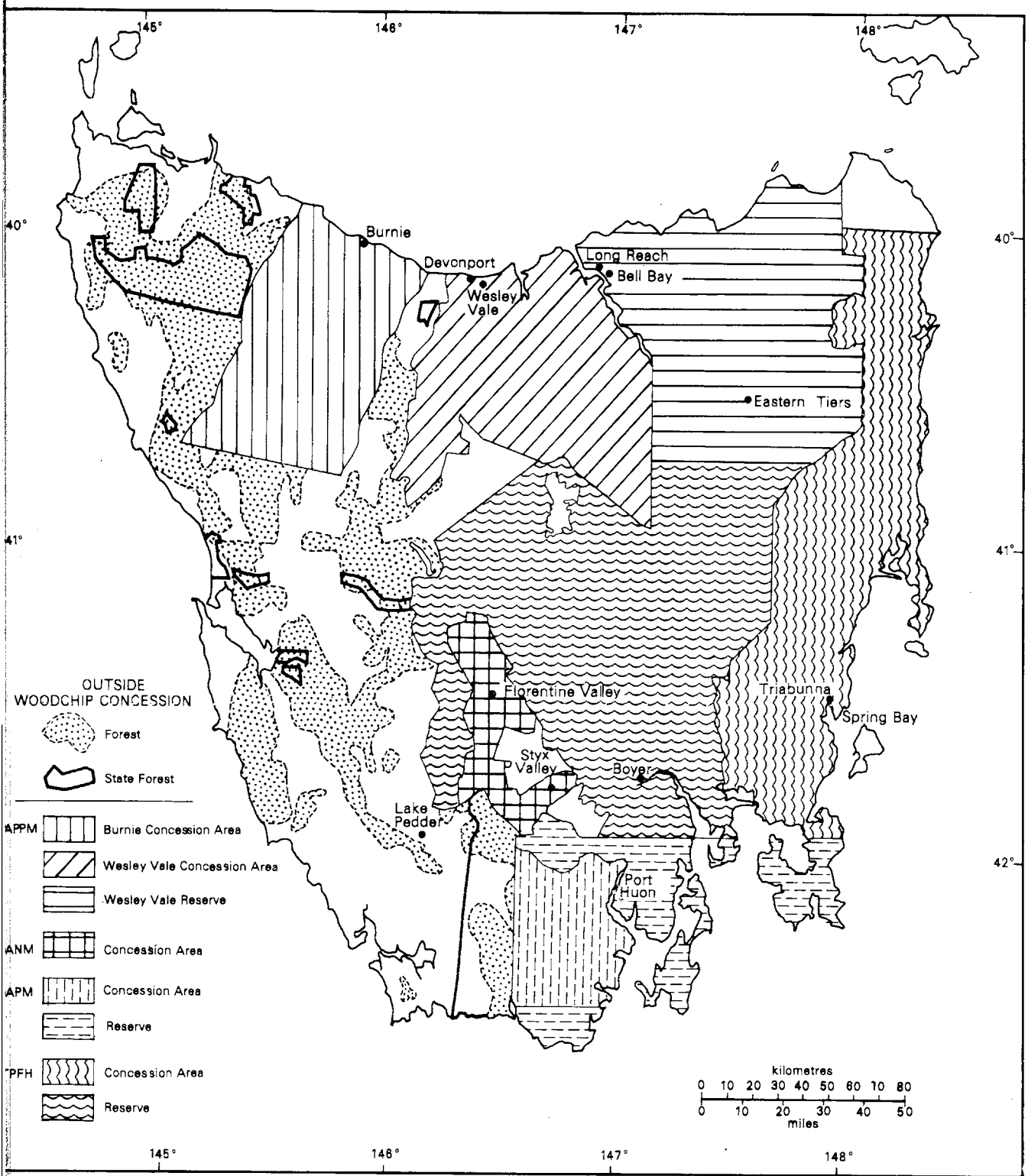
carried out in the Eden area was a survey by the Forestry Commission of timber resources; no other resource studies or ecological, biological or taxonomic surveys have even now been undertaken, and the only trials done before the woodchip operation began were a couple of trial shipments of chips to Japan so that pulp qualities could be tested. Secondly, the Forestry Commission appears to have been mistaken on several details of management and has had to revise several of its estimates and practices in the light of just a year's operation. For instance, early figures show that the Commission expected to obtain on the average 35 tons an acre, but in fact yields average 30 tons an acre; they expected to burn the considerable logging debris in the autumn following operations, but as the operations resulted in excessive regeneration not only of *E. sieberi* stems but also of competing acacia and casuarina the practice had soon to be abandoned, thereby creating a substantial fire hazard; they expected to log large coupes of up to 1,000 acres (as in Tasmania), but because of the immediate fire hazard from logging slash the policy had to be changed in favour of smaller and scattered coupes; they expected a rotation age of 25-30 years, but as regrowth has proved to be much slower than anticipated, partly owing to excessive regeneration, the rotation age climbed to 40 and then 50 years, and now rotations of 70 years (Watt and Henry [2]) or even longer are being contemplated.

The costs elsewhere

The Eden project is, however, the most environmentally benign of the woodchip export projects. In almost every respect the Tasmanian operations are environmentally inferior, and the same will probably hold for most projects proposed elsewhere.

As exemplified by the Eden project, the typical woodchip project involves the take-over for wood production purposes of enormous tracts of Crown land, much of it wilderness. The destruction of wilderness is typical of woodchip projects, first because they require large areas of bushland, usually of half to one million acres or even more, and secondly because they typically attack substantial areas of land (such as the Eastern Tiers of Tasmania) which were largely untouched, because they were considered so far unsuitable for farming or logging for sawnwood. Even where the natural ecosystems remain in a degraded form after logging operations, such areas are divided into 1000 acre grids and crisscrossed with roads, log dumps and snigtracks many of which will take years to disappear, if they disappear at all. The integrity and attractiveness of once great wilderness areas disappears under this treatment. This destruction of valuable forest wilderness cannot be shrugged off as a 'merely aesthetic' matter of no importance, particularly in a country with as much land cleared for agriculture and as little forest wilderness as Australia. Wilderness is scarce. The forested part of Tasmania is regarded as one of the last great forest wildernesses of the world. Soon it will cease to be; for according to Gardner ([1], p. 40) and as map 3 shows: 'Most of the forested part of Tasmania has been allocated to pulpwood concession areas.' Destruction of areas previously wilderness, as at Eden, in eastern Victoria, Tasmania and Northern Territory is one of the most serious costs of woodchip projects.

Woodchipping will seriously diminish the value of state forests and Crown lands chipped as reservoirs for wildlife, flora, and from other environmental points of view even where natural regeneration is employed. However the opportunities for continuing woodchipping projects involving natural regeneration are limited, and where natural regeneration is not employed the environmental impact will generally be more severe. If natural regeneration is employed with other than free-seeding species, such as *E. sieberi,* regeneration is likely to be uneven and inadequate in the short-term. For example at Eden even areas of messmate (*E. obliqua*), another exceptionally free-seeding species, which have been clearcut have not regenerated satisfactorily. Thus the Eden project, where *E. sieberi* forms a large proportion of the species cut, is quite untypical of



ap 3. Tasmania: woodchip concessions and forest remaining outside woodchip concessions.

urces: Tas [5] and Tas [6].

here are even pressures to have the small remaining forested area in the west and south-
st, outside concession areas, committed for woodchipping.

the sorts of projects we are likely to see elsewhere, which will typically employ plantation techniques or direct seeding. In woodland projects where it is intended to use natural regeneration, as at Weipa and in the Northern Territory, regeneration is unlikely to be satisfactory, and there will therefore be the further costs of elimination of forest or permanent or long-lasting degeneration of these areas as well as the likelihood of altering their composition. Very little is known of the regenerative properties under clearcutting of most of the eucalypts, but it is clear that it is a mistake to think of the eucalypt as infinitely resilient (a popular misconception of it). Even if only one factor in regeneration, seed production, is considered, species vary greatly in the quantity of seed produced, and even the quantity of seed produced each year by a given species is extremely variable, in most cases very little being produced in some years. Since seed rarely remains viable on the ground for more than a year, there is the likelihood of cutting in a year when very little seed is produced, resulting in little or no regeneration,[1] or of cutting in a year when a very large quantity is produced which could lead to excessive regeneration. There are then serious difficulties about ensuring the right quantity of regeneration, as well as regeneration of a satisfactory range of species, and of desirable pulping species. Careful pilot studies would need to be carried out over a number of years to ensure that natural regeneration would be satisfactory in areas where it is not intended to regenerate artificially (e.g. Northern Territory). However not only does it appear that little is being done to fill the gap in our knowledge in a number of these crucial matters, it also seems that we are being committed to a number of woodchip projects without the necessary preliminary studies (e.g., once again, in the Northern Territory). The situation with respect to private lands is even worse. In view of the lack of preliminary work many foreshadowed woodchip projects must be regarded as gigantic, and in view of Australia's small area of forest, irresponsible experiments.

Where re-establishment techniques other than straightforward natural regeneration are employed, as they are in Tasmania and often will be elsewhere, the environmentally damaging effects are likely to be far worse. It is for this reason that the environmental costs of the showpiece Eden project are the minimum we are likely to have to bear. Typical regenerative practices in Tasmania are more severe. Large areas (1,000 acre coupes) are clearcut, subsequently remaining vegetation is flattened and, when dry, burnt to ensure a good seed bed, and commonly the coupe is aerially reseeded with DDT treated seed of a single species of eucalypt. (Normal Tasmanian practice is described, and argued for, in Gilbert and Cunningham [1]; see also Korven-Korpinen and White [1].) With plantations the effects are even more severe since the residue after logging is windrowed as well as burnt.

The argument Tasmanian foresters put up for applying these severe methods everywhere, that they are quite essential for adequate regeneration in wetter forests and that the drier eastern forests are similarly improved by such treatment, is broken-backed. It by no means follows that the drier forests are best treated in this way, even if the wetter forests are. On the contrary, according to Jackson, though the Tasmanian Forestry Commission has experience in silvicultural techniques apt for wetter sclerophyll forests, 'it has little experience in low rainfall areas and knows little of the performance of various

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1 'The preservation of this tree (*E. sieberi*) is of importance in maintaining water supply areas and in preventing mountain erosion and floods. Where it grows at elevations of over 2,000 feet it is so valuable for this purpose that it is doubtful whether cutting of it should ever be permitted except under most rigid control. *Frequently it only forms seed abundantly every two or three years, and as it is rather sensitive to bushfires may fail to regenerate if the fire falls in a bad seeding year.*' Ewart [1], p. 827. Ewart's point clearly applies to the clearcutting of many variable-seeding species.

species in these areas' (Jackson in Tas [4]). Furthermore whether wetter forests have to be regenerated by these methods depends crucially on what counts as 'adequate' regeneration. It is only if adequacy is assessed in terms of optimum pulpwood stands or some such that severe methods may appear essential. For the fact is that even such prized species as mountain ash (*E. regnans*) will regenerate naturally without such intensive methods; but unless burning or site disturbance occur it regenerates slowly and patchily, usually in a mixture with other less favoured pulpwood species.

Since in Tasmanian operations, the whole site is bared and no anti-erosion measures are taken, and the rainfall mostly exceeds that at Eden, the soil, erosion and catchment effects are most likely worse than those at Eden. Naturally the effects have not been monitored; but the opinion of soil conservation experts is that there would be a very serious erosion hazard as a result of clearfelling and burning in an effort to regenerate, (Tas [4]), and it is also thought that the practices would have a detrimental effect in water catchment areas (Tas [4]; that they will, at least in the higher rainfall parts of Tasmania, is plain from Gilmore [2]).

The severe methods employed in intensive forestry practices result in damage to soil structure and its nutrient levels, increased compaction, and increased run-off and soil erosion (see Hamilton [2], and also Chapter 7). Where the very short rotations of 15 years or less reportedly desired by the Japanese (White [1]) are used, these effects will be intensified, particularly rundown of soil nutrients due to increased demands made on soils by rapidly growing young trees which will return little to the soils (Hamilton [2]), and increased and more frequent loss of nutrients and topsoil due to removal of vegetation and increased water cycling. Soil capital, the real basis of forest wealth, is progressively run-down.

Although Australian forest services attempt to play down the impact of clearcutting on soils, it has been demonstrated that clearcutting practices have a serious effect on soils, causing significant topsoil and nutrient losses, under certain conditions which appear to be satisfied over very many of the areas for which woodchipping is scheduled or contemplated. The soils which are most seriously effected by both these phenomena are shallow podzolic soils with infertile mineral subsoils where the nutrients are concentrated in the shallow top layer of humus. These infertile soils are very extensive in wetter Australian forest areas; for example red, yellow and brown podzolic soils of this type predominate in the Eden woodchip areas and over much of Tasmania. Similarly much of the beech forest considered for chipping in New Zealand grows on shallow podzols and podzolised yellow brown earths.

> In general the mineral horizons of these soils have low fertility, and for this reason the nutrients concentrated in the upper organic layers are essential for plant growth. . . . These facts strongly suggest . . . that the forest (both species diversity and growth) is almost totally dependent for its existence on this thin (2-20 cm.), rather fragile organic layer. . . . Physical destruction of portions of the humus by decomposition or mechanical displacement from a site could remove vital nutrients in the humus and decrease the absorbing capacity of the remaining humus to return other cycling nutrients. In soils where the humus depth is particularly shallow, reductions in humus could seriously jeopardise future forest stands. (Pierce et al [1], p.293)

In many rainforest areas, especially tropical rainforests growing in infertile soils and rainforests such as those of Fraser Island growing on pure sand (in both cases as much as 70% of the nutrient capital may be tied up in forest vegetation) the dependence on the humus layer is even heavier (cf. Hamilton [2], p.156).[1] The chipping of more than very small areas of such forests means the destruction of the equilibrium, and thereby any prospect of forest regeneration.

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1 Webb's study [3] of the soil chemistry on the deep sands on Fraser Island has shown that virtually all of the plant nutrients are circulating through the vegetation on the top 10 cm. or so of sand.

Topsoil loss is a serious problem wherever clearcutting is carried out on steep slopes in an area liable to heavy rains. In the Philippines there have been drastic topsoil losses following logging operations. Topsoil loss should be reckoned a major risk of woodchip schemes for Cairns, for New Guinea and for New Zealand. Topsoil loss continues until the area clearcut is sufficiently revegetated, which in areas such as coastal Australia with heavy rainstorms would normally be long enough for significant losses to have occurred (cf. Gilmore [1] discussed above). On the 20% of the site that is heavily disturbed and partly compacted in woodchip operations (the figure is for Eden, but a similar figure holds for logging operations in northern Queensland: see Gilmore [2]) revegetation may not be sufficient for several years, and tracks left down steep slopes are prone to gully erosion. On these areas what topsoil survives mechanical disturbance and is not destroyed by alteration of its structure through exposure or compaction, lies open to erosion for several years. On sites that are windrowed for subsequent planting the percentage of area disturbed is much greater and the effects correspondingly more severe (and a similar point appears to hold for nutrient loss: the greater the site exposure the heavier the loss).

In contrast to erosion, nutrient losses may extend for at least three years after clearcutting in spite of revegetation, and in fact the losses are more severe in the second year when revegetation has begun than in the first year after clearcutting (Pierce et al [1], p.294). In their studies of nutrient losses from clearcutting Pierce et al [1] convincingly argued that

> clearcutting on shallow, infertile podzolised soils subjects the site to nutrient losses for several years after exposure,

and also that there appear to be *significant* losses of several elements essential for plant growth, notably nitrogen, calcium and potassium. In view of the similarity of the soils studied to those commonly encountered under Australian forests, it can reasonably be expected that these results would be replicated in Australia were the relevant experiments undertaken.

Australian foresters typically meet objections to their clearfelling practices based on nutrient loss problems (e.g. that a forest lacking nutrients is liable to be less healthy, not more healthy as they contend) by pointing out that nutrient losses can be compensated for by fertilization; and fertilizing is being considered both at Eden and in Tasmania. Even where fertilizer can restore enough of the lost nutrients, without being leached out before it can be used by the young trees, it in turn is not going to cost nothing. Extensive fertilization is bound to upset still further the fragile economics of intensive forestry operations; it adversely effects the ecology and species composition of some native plant communities (especially understorey and heath plants) opening the way to invasion by introduced weeds (Specht [1]); it greatly increases the susceptibility of native plants to *Phytophthora cinnamomi* (Marks et al [2]); it enhances the local eutrophication of streams already caused by the release of nutrients after clearcutting and burning (Pierce et al [1]); and it would destroy some of the value of forests for water catchment protection.

Admittedly, as agriculturalists argue, soil costs and risks of the same order are sometimes incurred in clearing for agriculture, and nutrient losses can initially be compensated for by fertilization. But it is increasingly realised how heavy these costs are (see especially Commoner [1]), and agricultural clearing of steep slopes leading to erosion and topsoil loss is no longer simply accepted as quite permissible behaviour. In any case, woodchip ventures win approval partly on the (admittedly thin) pretext that the natural forests would be retained largely intact, not that they would be irreversibly modified along the lines of agricultural operations.

As well the serious site and soil disturbance due to bulldozing can be expected to lead to the elimination of a large range of plants and even in the loss of whole communities. Especially where the forest is replaced by a plantation consisting of just one or a few species eucalypts (e.g. the blackbutt and rose gum plantations threatened around

Bonville on the North Coast of NSW; see Watt and Henry [1] and [2]) both the overstorey and the understorey will be greatly impoverished and many localised species could be eliminated altogether. Because blackbutt grows about twice as fast as its associated eucalypt species (as Henry [4] remarks) plantations will be largely monoculture, and associated species will tend to be eliminated from improved' stands of natural forests. And the understorey may well be eliminated altogether because it has been found experimentally that if understorey plants are cut down or poisoned (and competition thereby removed) eucalypts grow faster; thus if volume production remains a main objective,the plantations of the future will be devoid of understorey plants these being either cut regularly or destroyed with weedicides. The reduction in floristic variety would be drastic.[1] Yet some of the communities threatened with elimination or reduction to sample plots — for example the scarce tropical rainforest communities threatend by the Cairns project, the temperate rainforest of Tasmania, the unusual eucalypt and monsoon rainforests of Cape York apparently endangered by the Shelburne Bay (or Cape Weymouth) project, and the mosaics of heath, rainforests and eucalypt forests on the sand dunes of Fraser Island[2] — are of immense scientific and aesthetic value.

The initial concession at Cairns apparently covers areas of tall eucalypt forest along rainforest margins. Clearfelling of these forests will have a damaging effect on rainforest margins exposing them and altering the microclimate of the edge, so that gradual contraction of the rainforests will be set in train. But as there are only 80,000 acres of tall eucalypt forest in the region affected, not enough to keep the proposed mill at Cairns going for long (in fact scarcely enough to keep the mill running for half of the fifteen years normally allowed for write-off of equipment), it is practically certain that there are undisclosed plans to extend the concession to cover parts of the only other major source of wood-fibre in the region, the rainforests. And the Queensland Department of Forestry has done very little to remove the impression that it is co-operating in plans to chip some of the rainforests. Mostly it refuses to answer questions on the matter — when it does however reply to questions asked in parliament or elsewhere, its replies are always consistent with chipping the rainforests and extending its practice of replacing them by eucalypt stands or hoop pine plantations.[3]

> About 3,000 acres of rain forest in some 20 centres throughout the State are felled annually for the establishment of hoop pine plantations. Unfortunately the wood chip industry will not accept this material. There is a large rain forest resource in North Queensland. The removal of the large volume of species, useless commercially, from these forests as wood chips would be highly desirable silviculturally but it appears that there is no current market for this material (Queensland [1]).

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1 A numerical measure of the *reduction in floristic* (species) *variety* is provided by the ratio of the number of species eventually occurring to the number of species originally occurring, e.g. plantation forestry reduces the floristic variety of a region to 1/50 of the original if only 10 species remain in a region which carried 500 species.

2 On Fraser Island and adjacent Cooloola (prized for its outstanding beaches and coloured sands), both under forestry management, the sand-miners are working, destroying incidentally the rich dune ecosystems. The latest plan for the destruction of much of these magnificent areas appears to be to follow chipping by sand-mining, and to restore by planting pines. Similarly Northern Territory administrators are anxious to see timber felled during mining, e.g. at Gove, put to some use, such as pulp.

3 Similar practices have long been adopted in NSW, and conversion of rainforest will continue, though only 340,000 acres of rainforest remain in state forests. For according to NSW [7], p.38: 'In the coastal forests where patches of rainforest occur commonly with eucalypts in the gullies, conversion to eucalypt plantation is the general aim. This is switching a natural succession towards the more productive community . . . Mill commitments are resulting in some Coachwood stands still being heavily logged, and in these cases the sites will mostly again be used for eucalypt establishment.'

However it is known that the Department is investigating ways of having the rainforest chipped. But fortunately vigorous conservation opposition appears to have defeated the Cairns project for the time being; the more sceptical view is however that the Cairns project has simply been put into cold storage until some of the less ecologically damaging Queensland projects are safely established.

Not only effects on flora, but effects on animals would also normally be more severe than those at Eden, both through the initial more complete clearing of sites (which would eliminate all but the hardiest ground animals, as in pine forests) and through the elimination of particular habitats and local plant communities on which particular migrating or localised species depend, e.g. honeyeaters, the ground parrot. In the case of the tropical rainforests there are important specialised fauna which would be eliminated with the habitat. Because of the thorough removal of habitats, and of food supplies, of so many mammals and birds with clearcutting, it is doubtful that the extensive aerially regenerated or planted even-aged eucalypt forests will be all that much better for wildlife than pine plantations.

Not merely shelter and nesting places but also food sources will be missing, for a big range of animals, from a large part of a woodchip franchise, notably in the dense young regrowth stands. On the average and particularly where regeneration or planting is dense, eucalypts would flower only for the latter half of their woodchip lives, i.e. for something like the last 20 of their 40 years, with the result that about 50% of the forest at any one time would be lacking a major source of food. A sizeable reduction in animal life is thus inevitable, as the Breedens point out ([1], p.40):

> The honey-flow in eucalypt flowers is copious and plays an important part in the forest ecology. Such diverse kinds of animals as moths, ants and numerous other insects, parrots, honeyeaters, gliders and flying foxes depend on nectar and also pollen for at least part of their diet. A flowering eucalypt is invariably a focal point for animal life and without the profuse blossoming of nectar-rich flowers the animal populations in eucalypt forests would be much poorer in variety.

There is also the all-important holistic effect: even if it is thought that no single project in the eucalypt forests is itself a complete disaster, the effects of the projects add up, and the virtual destruction, from the point of view of a significant range of wildlife, of one quarter of the country's remaining forest areas must have serious repercussions. For the most part Australian forests have a good range of forest dwellers both because there are large areas that have not been logged and because past forestry practices (involving selective logging, which took only a proportion of the forest crop) left older trees and did not grossly alter the habitats. As Tyndale-Biscoe remarks ([2], p.221)

> . . . we may conclude that the survival of the forest dwellers has been due to the fact that this habitat has been the least affected by man, whereas the grassland and savannah woodland has been the most thoroughly altered habitat and its indigenous mammals the most severely affected.

If intensive forestry methods become as extensively practised as forestry administrators hope, this situation is at an end. Whether or not species are actually eliminated from their original range will depend on the extent to which forest services manage to implement their intensive use programs. But even if no species are eliminated from their present range, or entirely, in the way that so many plains-dwelling species have been, the great impoverishment of the woodchip areas and eucalypt plantations in animal life has to be considered a severe cost of such programs. A reduction of marsupial species of at least 50% can probably be expected for the large-scale pulpwood plantations envisaged: the eventual reduction in actual numbers of animals by the replacement of native forests by plantations will undoubtedly be greater. Thus it is especially alarming that Tasmania, which has a number of species which are uncommon or not found at all on the mainland,

has committed so much of its forests for woodchipping. In sum, woodchipping operations ringing the Australian coastline will have a devastating impact on Australian fauna and flora and will do much to reduce their local variety.

What is even worse, almost all the areas involved are likely to be committed to destruction or drastic change without biological and other surveys to determine what is really there, or the ecology of the area or how valuable it is for other purposes. Nor is it just that the decisions to commit the areas involved to woodchipping are being made on an inadequate scientific basis and without adequate investigation of alternative roles for the areas; since the evaluation dates for decision-making could have been postponed without loss, decisions to proceed with woodchipping projects have to be condemned as hasty and reckless.

Again the Eden project illustrates a number of these points. Discussions on the woodchip project with the Japanese were begun in 1967, and the contract was signed in 1968 and completed in 1969. No thorough biological survey of the area was undertaken, and such a survey remains to be done. The Scientific Committee for Parks and Reserves, assessing (on a very sketchy basis) the fitness of the area for reserve purposes, only began its investigation in late 1968 and did not report on the potential of the area for parks until 1969, after commitment to the project was made. The potential of the area for other uses, then, was not properly investigated before the commitment to the project was made. The Scientific Committee thought, in fact, that the area with its extensive untouched forests, had fine potential for park purposes and recommended that a major park, the Imlay-Wog Wog Park of 220,000 acres, be created in the area and that a smaller park of 30,000 acres be declared at Egan Peaks. But most of this proposed area is to be chipped, and less than 30,000 acres, mostly of rocky upland areas, part of it badly burnt out and along a regular fire track, have been declared parklands.

The failure to conduct detailed biological and land role surveys *in advance* is especially conspicuous in northern Australia. Although a number of woodchip projects have been planned for northern Australia, and more would be operating but for aboriginal land rights issues, surveys have simply not been undertaken. Yet as Carr [1] remarks

> The possibly richer eucalypt flora of the Cape York Peninsula is perhaps even less known than that of Papua. It is quite likely that the species list is incomplete for both Cape York and Papua. Further exploration of these areas is necessary and should extend to northern Australia in general. The flora and fauna of eastern Arnhem Land [the areas to be chipped for the Gove project] . . . is almost unknown.

The same holds for the flora and fauna of the Murganella and Kimberley areas and also for that of Melville Island (except for a preliminary study of the flora by Stocker [1]), and also for land use studies of these areas (though land use surveys are at last being undertaken for regions of the Northern Territory farther to the south).

Further environmental risks

Several other undesirable effects on forest ecology may also be anticipated. The 'better forests' will in early stages be especially susceptible to fire damage, they will have to grow on worse soils, and they will be more prone to disease and insect depredation. The diminution in the number of birds and particularly bats, the removal of the canopy which increases likelihood of insect attacks and defoliation,[1] the vast simplification of the

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1 For instance in northern NSW Xmas beetles are much more numerous in early plantations where the canopy is not closed than in adjoining natural forests.

ecosystems into a few favoured species and young even-aged stands of these, will all help to increase the likelihood of severe insect attack, a problem to which many species of eucalyptus in Australia are particularly liable – in contrast so far to a number of overseas eucalypt plantations where eucalypt growth and health are not limited by natural predators.

Although, unfortunately, scarcely any quantitative details of the effect of eco-simplification in Australian forests are available, it is generally thought that the principles derived from studies of ecosimplification elsewhere apply. Most importantly, simplification of ecosystems increases their vulnerability to pests and diseases. Because of species reduction both pests and diseases will typically spread more rapidly, because natural biological controls are lacking; for example specific birds and small mammals which normally control pests will have vanished with the reduction in species. Complex ecosystems with diverse species are relatively stable because, as Elton [1] sets out to show, they have built-in checks and balances which damp down the effects of disturbances (short of catastrophic disturbances such as clearfelling); whereas a reduction of species numbers results in simpler, shorter, and accordingly less stable, food chains which are more readily disturbed. Investigations of the extent of animal damage in NSW forests appear to confirm the general principles; serious forest damage from animals – primarily from rabbits, wallabies, kangaroos, possums and black cockatoos – proved severe only where the original forest ecosystems were modified, and were apparently most severe where exotic monocultures replaced natural ecosystems.

Among the specific and serious risks of woodchip projects[1] must be reckoned the likelihood of spreading or intensifying the occurrence of *Phytophthora cinnamomi,* a dangerous fungal root-rot disease which has a serious effect on many native Australian plant communities and which either kills, or inhibits growth and regeneration of, many species of eucalypts. The fungus is (Newhook and Podger [1], p. 299)

> unquestionably the most destructive plant pathogen ever recorded in native vegetation of this and possibly any region. It is unmatched in variety of plants and the range of communities it affects. In marked contrast with chestnut blight, dutch elm disease, and white pine blister rust pathogens, each endemic on only one or two genera, *P. cinnamomi* kills plants in 48 families.

The disease is already a major problem in Western Australia where more than a quarter of a million acres of forests, mostly jarrah which used to have a fine understorey of wildflowers, is dead or dying (estimates of the extent of the seriously phytophthora-damaged forests in Western Australia range between 150 and 800 thousand acres), and it is quickly becoming a problem in Tasmania, especially now, with woodchip projects, that many forests are being roaded and logged for the first time (Felton [1]), and also in Victoria, where it is estimated that between three quarters of a million and a million acres of coastal forests are infected. The bearing of phytophthora on extensive woodchip schemes is straightforward. At Eden and in East Gippsland, for example, there are four conditions obtaining which mean that woodchip projects in the area present a very dangerous, indeed potentially disastrous, situation. The conditions are:– 1) *P. cinnamomi* is present in the Eden and East Gippsland areas (Marks et al [1], Anon [1]); it is widespread in East Gippsland as far as the NSW border, and there is serious infection at Orbost in Gippsland (Marks et al [2]); and it has been found at Eden where it has caused the die-back of regenerating eucalypts (Anon[1]). 2) It is generally agreed that *P. cinnamomi* is spread by, or at least activated by, earthmoving, roadmaking (particularly gravel spreading) and logging activities (Weste et al [1] and [3], Anon [1]); hence a woodchip project with extensive

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1 In New Zealand, possibly, as well as Australia: see Newhook and Podger [1], p. 319. In Tasmania this risk 'means that large parts to the State should not be open to chip activities' (Jones in Tas [4]): but there it is a little late.

roading provides highly favourable conditions for the spread of the disease. At Eden gravel from an infected gravel pit has been used to surface major roads in Naghi SF (Rawlinson [1]), so that substantial forest damage at Eden would appear almost inevitable. 3) Drainage patterns and climatic conditions in the Eden and East Gippsland forests are also highly favourable for the pathogen to flourish and spread (or be activated). For the regions have very wet periods (often of summer rainfall) followed by dry periods of moisture stress with high temperatures, conditions under which the disease flourishes (Weste et al [1], Marks et al [1]); moreover the wet periods, which result in high water runoff from an often mountainous terrain, hasten dispersal of the disease, since it is apparently spread by free water dispersing along drainage lines, especially from infected ridgetop tracks (Weste et al [3]). 4) The main eucalypt species exploited at Eden, *E. sieberi,* is highly susceptible to *P. cinnamomi* (see, e.g., the field tests cited in Marks et al [2], Anon [1]). Moreover

> The attack on susceptible species does not necessarily produce an immediate kill or outward symptoms of foliage deterioration. It may merely inhibit growth and this insidious effect is being encountered in Victoria where regeneration on die-back areas is much less vigorous, mortality is higher and growth rate of the next forest crop appears likely to be much below the existing one. Similarly in southern Tasmania the growth increment has declined disproportionately in die-back affected forests and apparently healthy trees are not growing as predicted. (Anon [1], p.253).

A woodchip project, such as that at Eden, where all these conditions apply, appears to present ideal conditions for a disastrous outbreak of the disease; such a project creates a potentially explosive situation, which risks the almost complete denudation of some of the forest landscape.

So far the only moderately effective (and economic) way of slowing the spread (or activation) of this insidious disease is by quarantine measures, by isolating susceptible but apparently 'clear' forest areas, e.g. by restricting soil and gravel movement into and through the areas. But the establishment of a woodchip project typically produces the exact antithesis of such control measures; and no quarantine measures are taken in present Australian woodchip operations.

As with the cases of soil deterioration under pines, nutrient and topsoil loss, so with phytophthora, there is the usual attempt to minimize the seriousness of the problem; no considerations of risks or costs must be allowed to interfere with forestry decisions to use the forests to the utmost. In the case of phytophthora it is suggested (by Pratt et al [1]–[3]) that (i) the fungus is indigenous to (southern and eastern) Australia[1] and

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> The hypothesis (i) has been progressively restricted, in the light of counter-evidence, from the hypothesis proposed by Pratt (following Bjorkman) that the fungus is indigenous to Australia, to the view that it is indigenous to southern and eastern Australia, and most recently (in [1]–[3]) to the hypothesis that it is indigenous to south-eastern Australia and perhaps associated with the apparently largely field resistant rainforest of the south-east.
>
> The recent paper [2], the results of which have been widely cited and which underpins the hypothesis and other theses in [1] and [3] claims that the disease has been isolated in an area described as a 'remote, undisturbed area' ([2], p.197, 199; [1], p.559) 'at the foot of the Budawang Ranges (5.7% samples positive)' ([3], p.22). It is on this basis primarily that Pratt, Heather and Shepherd suggest that (i) holds, i.e. that the fungus is indigenous. [In any case the other grounds advanced (see [1] – [3]) a) that the fungus is now widespread in

further (Pratt et al [2], p.203; cf. [1], p.570) that (ii)

> . . . if the fungus is indigenous, the quarantine programs practised in some forest areas of Australia are of doubtful value.

It follows from (i) and (ii) that Australian quarantine measures – instituted in Western Australia and now Victoria, but not in NSW or Tasmania – are of doubtful value; and elsewhere (e.g. [4], p.1100) Pratt, Heather, Shepherd and coworkers assert the stronger thesis that 'local quarantine to restrict dissemination would seem inadvisable.' However they have done nothing to establish the conditional premiss (ii) or its consequent, and there are good grounds for supposing that both (ii) and its consequent are false (as they in effect concede in their subsequent discussion, [2] p.203).). As well, weighty considerations have now been advanced against (i) (most significantly, combine Newhook and Podger [1] with Weste and Marks [4]).

1 (Continued from page 115)

native vegetation, b) that two mating strains occur, and c) that the fungus has achieved an apparent balance with plant species of differing susceptibility to disease in some natural undisturbed areas, do nothing independently to confirm (i). For there are many counter-examples to arguments of the form: a) and b) imply (i), i.e. that if a pathogen is widespread and naturalised, with mating strains, then it is indigenous; while c) is not independent of the primary basis for (i). As well no evidence is adduced in favour of c) which shows that 'an apparent balance' is achieved or that would eliminate rival hypotheses, such as that other pathogens (e.g. *Pythium* spp.) could account for the distributional features.]

However, as explained in more detail in Routley [2], there are numerous errors in the key paper [2] which have an important bearing on the conclusions drawn. The description of the rainfall and vegetation for the crucial wilderness zone (Zone C) is inaccurate; e.g. the rainfall for much of zone C is, as the Shoalhaven land use survey (CSIRO, [1], p.60) indicates, in excess of 60", not 40" as stated in the paper; and the claim that the vegetation is similar to that of the more coastal zones (Zones A and B) is incorrect (the vegetation at higher altitudes is quite distinct). More importantly, a small, now disused, sawmill (shown on standard, detailed maps) occurs well within the region shown as Zone C, described in the paper as 'completely undisturbed with no evidence of logging.' The sawmill operated until fairly recently and logged into areas at the top of key drainage points for the region studied (but it is well known that the pathogen moves downhill along drainage lines: see e.g. Weste et al [1], p.293). Furthermore two fire trails penetrate well into Zone C; also an old lease, to which 40-50 cattle were regularly driven, is located in the middle of the zone. The description of the semi-wilderness zone (Zone B) similarly fails to establish its undisturbed character (even if the fire trails in the area are generously overlooked). The paper states that 'no evidence of mining operations was found' and also that 'evidence of earlier disturbance was limited to several fire . . . trails'; however there is a gold mine shaft quite close to one fire trail in Zone B, and extensive gold workings, and some cleared freehold land within Zone B (these features are clearly shown on maps apparently not consulted by the authors of [2]).

The possibility that the root-rot disease was introduced into Zones B and C by logging and other disturbance cannot therefore be eliminated. Thus, whether or not the hypothesis that *P. cinnamomi* is indigenous is correct – which is increasingly dubious – the paper [2] in question has done nothing to support it. (However what the authors have inadvertently demonstrated is the scientific importance of setting aside and retaining large areas of genuine wilderness, and hence the sheer short-sightedness of forestry interests in opposing the reservation of large areas of forested land.)

Firstly whether or not the disease is indigenous it may be localised and not ubiquitous, in which case quarantine measures for areas not infested would be worthwhile. But Weste et al ([1] and [2]) and others appear to have established that there are very significant forest areas in Victoria which are clear, i.e. free from the fungus (see also Newhook and Podger [1] on regions elsewhere). Secondly even if the infection were however very widespread, it may only be present in a quiescent form in some areas, in which case quarantine measures designed to prevent activation of the disease would be worthwhile. Once again the evidence is that where the infection occurs it is activated (*if* not spread) by roading and logging (cf. Weste et al [1] and Newhook and Podger [1], p.315, while both provide evidence that it is spread). Finally, in such situations of uncertainty, it is a standard point from decision theory that it is a good strategy, where one of the alternative and by no means improbable outcomes carries such heavy costs as the total destruction of a forest, to take adequate precautions against it. Indeed, according to Newhook and Podger [1], p.319,

> the epidemic poses a serious problem for conservation in dry sclerophyll heath, woodland and forest communities, not only for the flora including the wildflowers for which these commodities are famous, but also for many dependent species in the fauna. Many of Australia's national parks and reserves are in jeopardy; it is a matter of the utmost urgency that they be protected from *P. cinnamomi* infestation for as long as possible. Without protection all the highly susceptible elements of vulnerable communities will be eliminated.

However adequate field quarantine measures have, it seems, still to be devised.

> In Western Australia rigid hygiene procedures have been adopted with strict control over logging road construction and vehicle movement. These measures have limited but not prevented the spread of the disease. The use of chemical fungicides has not been exploited to any extent because of their cost and possible effects on soil microbiology. . . (Anon [1], p.253; cf. Newhook and Podger [1], p.318).

This counts too against the proposal that the spread of the disease be halted by zones 4 metres wide injected with vapam (such zones provide, according to Weste et al [2], an excellent barrier to the spread of the fungus) in combination with some effective measures applied to tracked vehicles moving through the zones. Whatever their other effects, the costs of such control measures would be prohibitive in the case of marginal woodchip operations. In view of the features of the forests of east Gippsland, where very susceptible renantherous eucalypts comprise the main species, it would seem folly to embark on the extensive woodchipping projects contemplated for the area. Indeed given the negligible commercial returns and non-urgency of woodchip projects, there seem good reasons for suspending southern woodchip projects where possible and likewise the practice of imposing networks of fire trails on previously undisturbed forest regions – at least until much more is known about root-rot disease and its full and economic control – in order to avert the very real risk of major forest losses and the possible denudation of vast areas of forest should the disease continue its rapid spread and seriously infect regrowth areas.

The regrowth stands are also extremely susceptible to fire damage, since bushfires (which are frequent in many woodchip areas) would wipe out the young regrowth without hope of regeneration. Seed is not normally produced for 10 to 15 years, and when growth is in close dense stands which inhibit development it may be 25 to 30 years before eucalypt seed is produced. Since no mature seed trees are left a wildfire could theoretically wipe out 300,000 acres of the regrowth stands in an area cutting 10,000 acres a year, and up to one million acres in WA or NT projects, with no seeds remaining for regeneration. This represents a very serious risk that must be taken account of at least in assessing the economic viability of the projects. It is little wonder then that the NSW Commission places so much emphasis on the amount it is spending

on fire protection; but this is less a matter of generosity than necessity.

In the contemplated Northern Territory projects particularly, this risk of wildfire damaging or destroying large areas of young regeneration (whether from seed, coppice or rhizome) is a very serious one, since fires occur in this savannah country with an average frequency of one to two years (Stocker [1]). The economically very questionable[1] nature of Territory projects (due in part to low yields to the acre, and the high costs of attracting labour in northern Australia) would presumably rule out permanent fire protection for regenerating areas and also render revegetation after fire in such areas hopelessly uneconomic. This high incidence of fire means that even if good initial regeneration were obtained, woodchip projects in the Northern Territory would run a high risk of leaving large areas virtually treeless, with the subsequent destruction of much of the areas' remarkable, but largely unstudied, wildlife.

In the forestry attempt to make out that the forests of the woodchip region are generally in a derelict and degenerate condition one of the reasons often featured is that the forests have been extensively damaged (from the point of view of pulp production) by fires. It is certainly true that some forests, especially those adjoining agricultural land, have been badly and repreatedly burnt; but only some. Only a proportion of the forests in the Eden woodchip franchise, for example, are 'fire derelict.' However, some of these badly damaged areas, which are mostly avoided in logging operations because of the low yields they return, lie close to Eden; and visitors to the project are regularly shown these areas and left with the (false) impression that practically all the forests to be chipped are in a similar condition. Likewise many of the Tasmanian forests to be chipped are not badly fire damaged: some of the wetter forests have been neither logged nor recently burnt.

It is perhaps surprising, given forest service expenditure on preventing forest fires, that the effect of clearfelling is assimilated to that of a devastating fire. However the differences between clearfelling and bushfires are more than enough to demolish the Great Bushfire Argument (mentioned in Chapter 1), according to which the forests are only being harvested after the pattern of a major bushfire or before an equally devastating bushfire, bound to occur, destroys the forests (e.g. Henry [1], NSW [4], importing the American argument cited, e.g., in Montgomery and Walker [1]). That the results of intensive forestry, particularly where clearfelling is practised, are comparable to or no worse than those of a natural disaster such as a bushfire can be challenged on several counts. Unlike intensive forestry, no wildfire, whether in Australia or USA, imposes an extensive network of roads and tracks, disturbs more than half the soils on the sites and compacts many of them, or, as fires usually move on limited fronts, and only burn out part of an area, demolishes all trees over half a million acres, in 1000 acre coupes, and carts them away. Clearcutting destroys flora and animal habitats in a far more drastic way than any bushfire. Although a few individuals in the path of a fire may perish, bushfires do not normally eliminate animal habitats. After a bushfire many hollowed trees are left standing, and dead trees may stand for more than 30 years. Furthermore a bushfire practically never kills all trees over more than a small area, and many of the burnt trees soon recover, producing lush epicormic growth. In addition in neither the wet sclerophyll forests of coastal Australia nor the Douglas-fir forest of the Pacific Northwest do fires occur regularly on a 50-100 year cycle as clearcuts now do. Many of the old growth forests of the Pacific Northwest are more than 200 years old, as are some of Australia's wetter forests. Once again it is false that 'logging duplicates nature.'

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1 A commercial cost-benefit analysis of the proposed Gove project by Nabalco Pty. Ltd. apparently indicated the project to be 'a pretty marginal exercise,' SMH (January 29, 1972). As well the Yirrkala Aborigines of east Arnhem land have declared themselves opposed to the Nabalco project; so hopefully the project will not be approved.

In any case not all natural occurrences are desirable, certainly not natural disasters, and it seems strange to deliberately simulate an occurrence which is elsewhere admitted to have such undesirable effects. A natural disaster is hardly a model for ecologically sound practice (as too many American foresters seem to think). Moreover the possible occurrence of such disasters as thoroughly devastating bushfires scarcely provides a justification for forestry operations, unless it is claimed that the damaging techniques replace or exclude the natural disaster they simulate; otherwise one simply has multiple disasters. But forestry operations do not exclude bushfires; indeed such activities as woodchipping often increase the fire hazard by creating tinderbox conditions.

In sum, the ecological stability of the new forest systems, the 'better forests for the future,' is decidedly suspect. However as in the past, so with new projects; it is unlikely that the requisite and urgent research will be undertaken in advance of implementation of the projects. (In NZ [4] it is actually proposed that research on the biological impact of the South Island beech forest project can be undertaken as the project proceeds!)

The environmental features brought out amount to a very serious set of risks and costs, which, it will emerge, are being incurred for no good monetary or other reasons. A proper economic evaluation should take account of these environmental costs (e.g. soil erosion, animal reduction, amenity loss) and risks (e.g. fire, disease, pests). A cost can be assessed in much the same way as an intangible, by rankings with respect to tangibles which provide a cost-interval (as indicated in Chapter 8); while a risk, as a probable cost, can be assessed by multiplying its associated cost by its probability (ranging between 0 and 1). For example, the associated cost of severe root-rot infection which kills or bonsais much of the Eden forests is at least the revenue of one rotation of the total Eden project, say about $50 million; and suppose that its outbreak is at least as probable as not if the project continues in its present fashion; then the risk of serious root-rot infection exceeds $25 million. If so this risk alone far outweighs net returns from the Eden project. More generally the environmental costs of Australian woodchip projects are heavy and the risks severe (because their probabilities are not all negligible). They cannot be neglected, and together[1] they far exceed what marginal public benefits the projects will provide. Were wise decision-making practised, projected Australian woodchip export schemes would be abandoned, and present schemes would be phased out, preferably before the current contracts run their course.

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1 The risks and costs cannot be simply added as they are not all independent and some threaten the same region. However the general addition theorem of probability theory can be applied to sum risks and costs.

CHAPTER 11

FORESTRY ECONOMICS OF WOODCHIPPING

Economic and commercial viability must surely be *necessary*, even if *not sufficient*, conditions for an activity as environmentally degrading as woodchipping. And it is commonly thought that woodchipping has a good economic, or at least commercial, justification. But this is far from being the case. Not only do forestry services, for which the public pays, operate their woodchipping projects at a loss, but the disadvantages and costs of woodchipping in terms of deterioration of the environment are severe and the risks considerable; moreover there are few compensating benefits, and what benefits there are flow to a very few people.

The revenue received in Australia from a woodchipping export project can be divided into public and private sector parts, the public sector part being that paid to forestry services in the form of royalties for the wood extracted (and to cover roading and supervision costs),[1] and a private sector component which includes firstly that paid to contractors who extract the wood from the forests and deliver it to the chip mill, and secondly that paid at the wharf by the overseas company buying the chips to the company that operates the chip mill. This last figure provides the 'export earnings' figure for the project.

The revenue outside Australia from the sale of processed products of woodchipping such as paper and newsprint not only covers costs but provides a good return on investment; so there are of course profits in the enterprise for overseas buyers, invariably Japanese companies. What is not under dispute, then, is that a pulp and paper enterprise as a whole may be a profitable commercial one, profitable for *somebody*, even if one heavy in external costs; but these profits do not accrue to Australians: what is in question then is the value of the woodchip industry to Australia and the Australian public.

Sorts of woodchip operations

It is too often said, and too often accepted, that there is a good forestry case in terms of production economics for woodchipping, i.e. that woodchipping is a profitable commercial venture for forestry services. It is not, as the Tasmanians have shockingly disclosed (Gilbert and Cunningham [1]). Given the small price paid for the material product of woodchipping, a price comparable with that for firewood and far lower than that paid for sawlogs (by a ratio of at least 4 to 1), woodchipping only has a chance of being economically viable under one of the following cases:—

Case 1. The once-only operation, where no attention is given to regeneration, or to re-establishment of forests, where the forests chipped are not treated as a renewable resource in any sense, and the land is abandoned for the time being for agricultural or silvicultural purposes. This is the current fate of much tropical rainforest, e.g. the forests of West Malaysian states; and it may be the fate of much Australian forest e.g. the savannah forests of Northern Australia, and private forested lands in eastern Australia.

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1 In projected woodchip ventures based on private lands the royalties, which make no allowance for roading or supervision, will be paid to owners of the land.

Case 2. The royalties cover, or help to cover, the cost of establishing a second rotation for pulping (with the second rotation supposed to be commercially viable). Typically the forest concerned is regarded as a resource renewable in perpetuity, for pulping. Strictly case 2: divides into two subcases, case 2a where the rotation operates at a (marginal) profit and royalties do cover the costs of re-establishment of a second rotation which is improved for chipping purposes; and case 2b where the rotation operates at a loss but royalties help to cover the costs of re-establishment of an improved crop of trees for chipping.

Case 2a can only occur where costs of satisfactory re-establishment are very small or zero and re-establishment is based on natural regeneration. The conditions required for this case are rarely met, and do not appear to be satisfied under Australian conditions. In the case of the most favourable Australian project now operating, that at Eden, the royalties ought to cover the cost of establishing an economically viable second rotation, but on the figures available (set out below) they do not; and the claims by the NSW Forestry Commission that the Commission is operating profitably at Eden (though with a profit of less than $20 an acre on the rotation, or 40 cents per acre per year!) must depend on putting off essential re-establishment costs, that is in effect on treating the Eden project as a type (1) operation. The remaining Australian projects currently operating in Tasmania clearly fall under case 2b. The forests in Tasmania and at Eden can be improved for woodchipping in the second and later rotations because the forests have, so it is alleged, been rundown (from a wood-production point of view, and genetically) by repeated logging over the last hundred years or so, and because trees with more desirable pulpwood qualities can be nurtured by artificial regeneration.

Case 3. The royalties (just) cover, or help to cover, the cost of establishing a second rotation for something other than pulping, e.g. a plantation designed to provide sawlogs, or farms for other agricultural activities. In this case woodchipping is simply being used as a way of reducing the heavy costs of clearing land (for plantation or agriculture) and not as a viable continuing activity. It is a single rotation operation but with a different end result from that in case 1. The concession to chip the tableland forests near Bombala (part of the Eden woodchip concession) provides an example: chipping of these forests is to be followed by windrowing and pine planting. Similarly in New Zealand it is proposed to replace many of the beech forests chipped by pine plantations, and also to 'enrich' many of the remainder with eucalypts. And it is intended to use chipping of some New Guinea forests in order to set up new agricultural ventures, a pattern already in use in Brazil. Similarly in Tasmania many private landowners are using chipping as a 'cheap' means of clearing further land for agriculture.[1]

Case 1, the fate of much tropical rainforest, is a straight case of depletion of valuable biological capital for quick financial returns (of the sort discussed in detail by Commoner [1]). It is a case of narrow commercial exploitation of the worse sort, of seemingly ready profits to the owners of the forests, and of easy increase in GNP through exhaustion of world biological resources by Japan, whose companies buy the material cheaply.[2] Indeed too much of Japan's large and fast increasing GNP, like that of

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1 This is at the root of some of the frequent complaints by Tasmanian farmers that the wasteful loggers are not removing all the trees and are cutting the trees they do take too high: the farmers are of course also worried by the cash foregone thereby. And they are finding, given the mess in which the loggers mostly leave private land and the expenditure required to clean up, that the clearing operation is not so very cheap.

2 There remains however both for the resource owner and for the entrepreneur the intertemporal problem of optimim exploitation even for commercial gain: it seems that some forest owners may have failed to maximize their gain through selling too soon at too low prices, and likewise some operators may have bought too much too soon.

Britain's in colonial times, is not creditably produced, but is bought by running down biological resources of the oceans and of other countries, by resource imperialism. Very often the forests so damaged by chipping operations do not recover, because conditions are unfavourable for natural regeneration, e.g. heavy erosion or laterization occur, and seed is not available or cannot establish because the microclimate has been disturbed or the requisite soil conditions destroyed. Many ecosystems have already been permanently destroyed in this way, since mammals, birds and reptiles as well as plants perish with their habitats; and even where it is possible to regenerate rainforests the costs of doing so on a large scale are prohibitively expensive and certainly not met by prices paid for chipwood. Yet vast areas of tropical rainforest are being chipped on a once-only basis, e.g. about 700,000 acres a year in West Malaysia (Mahmood [1]).

The present price structure of woodchipping operations virtually assumes that they are once-only operations destroying natural areas which have not cost anything to grow or, more accurately, do not have any alternative role (any opportunity cost); that is the price structure virtually assumes that woodchipping falls under case 1, and the profits certainly do not allow for replacement. Since there are many states, especially in the Pacific basin, willing to sell their forests at low prices on a once-only basis, to supply chipwood as a case 1 operation, the prices have settled at case 1 price levels, that is competition has driven down prices to a level which does not cover re-establishment. Because it economically presupposes the elimination or run-down of many of the world's already scarce natural forest environments, woodchipping must be regarded as one of the most environmentally vicious industries currently operating. And type 1 operations, which make mockery of the idea that forests are renewable resources, are ecologically reckless operations.

The upper limits of prices for woodchips are then imposed by the lowest common denominator provided by once-only operations, and these provide average figures of less than one dollar a ton (all tonnage figures are for green long tons). Indeed for many tropical forests the price paid in royalties is much less than one dollar a ton since the chips are of variable quality for pulping, and are susceptible to fungal and other complaints, and access is often difficult. Even for the readily accessible rubber plantations chipped at Selangor the royalties only amounted to 17 cents a ton.[1] It is readily apparent how cheaply tropical forests are being sold up: as a forest would not generally provide more than 75 tons per acre from suitable species for chipping, tropical rainforests are being sold up for rather less than 75 dollars an acre. Actually the best yields recorded from the fairly uniform Dipterocarp forests of the Philippines, Sabah and Sarawak amount to only about 74 tons an acre, while average yields are in the order of 46 tons an acre (figures from Financial Review [1] converted using data from Browne [1]). The yields from Solomon Island and New Guinea forests, both of which suffer from the 'problem' of species proliferation, are much smaller, e.g. the Vanimo timber area of New Guinea, one of the better New Guinea areas,[2] will provide less than 40 tons an acre of suitable species (figures from Higgins and Phillips [2], p.37). Despite the shabbiness of the sell-up of

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1 See *Malayan Forester* vol. 33(1970) p.337.

2 Such was the enthusiasm of the Island's administrators for exploitation of the native timber resources that they exported saw logs to Japan at a substantial loss in 1968-9; for figures see Financial Review [1].

tropical forests in terms of values other than dollars, the operations can nonetheless be quite lucrative. For the forest is, under this treatment, like minerals or buried treasure, a relatively free good (for the exploiters), and the only commercial costs are those incurred in the removal of its wood to a suitable processing plant or chipping terminal. Thus in terms of revenue for money outlaid the returns can be good. This point is important in explaining the price structure of woodchipping operations and also why private forest owners are frequently eager to sell up their forests for woodchips.

But it does not provide the full explanation of the way prices, and especially royalties, are determined. The fact is that the international market in woodchips is effectively monopsonistic. The Japanese companies buying chipwood operate as an effective cartel (and though it is rumoured that companies from other Asian cities, notably Hong Kong, Taipei and Singapore, are going to enter the woodchip market as buyers none have yet done so); and companies in this effective cartel buy from states and private companies competing to sell their products. Not only has there been competition between states and private companies throughout and even beyond the Pacific region, there has also been competition between forest services of different Australian states.[1] Competition between these sellers has driven prices down towards case 1 levels. Japanese buyers have selected Australian forests as a source of inexpensive woodchips from among forest concessions offered for sale in Japan not just because of the uniformity of chips these forests can furnish, but in part because Australia is relatively close to Japan so that freight costs (a function, among other things, of distance) are reduced in comparison to those from Brazil for instance, and in part because Australia is politically stable and a commercially long-term investment in a chipmill and associated infrastructure, over a 15 to 20 year depreciation period, can be safely made.

Most Australian woodchipping operations are however supposed to fall under case 2, the case of continuing chipping operations over at least two rotations. But even when they fall under case 2 the prices paid are primarily set in terms of case 1 operations and so do not cover the true costs of production or re-establishment. Since the prices paid do not cover the true costs and make no allowance for re-establishment, it is not possible to operate economically if very much at all in the way of production and establishment costs are incurred. In fact the costs are such that any forestry profits are at best marginal. Why then are Australian forest services so enthusiastic about large-scale woodchipping operations? A full explanation would have to take account of both economic details and of more complex sociological details (already sketched in Chapter 1).

The year-to-year accounting picture

The immediate economic appeal of woodchipping operations to forest services is that they yield an immediate return in the first year of operation, and that they provide guaranteed revenue from forests previously largely non-commercial, i.e. from forests where it was not worth while carrying on any more than small-scale logging operations because either the timber was not of millable standards or millable timber had been exhausted for the time being or it was not worth milling because the timber would not be marketable, e.g. because too far from main markets, or because of insufficient demand. Moreover as the initial cut is ready in the first year (a free good, 'free for the exploiting,' according to J. Henry, NSWFC; see SMH [1] January, 3 1973) chipping operations

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1 Though resembling the sand mineral market with respect to foolish inter-state competition, against Japanese buyers apparently operating in collusion, the woodchip market differs in that Australia has nothing approaching a monopoly on woodchips (and similarly for Australian oil).

enable forest services to undertake large-scale intensive forestry operations without, so it seems at first sight, the 'crippling' effect of compound interest which 'plagues' such intensive forestry operations as plantation forestry (Jacobs [10]). The difference can be emphasized by comparing the accounting details of woodchip operations over a forty year rotation with a pine plantation operation, also with a forty year rotation. Call the first accounting picture the *year-to-year picture,* the second the *plantation* or *continuing picture.* In year one the woodchip operation provides revenue from the area cut over, say 10,000 acres, but the pine plantation incurs only heavy establishment costs (up to $80-100 an acre if dense bush has to be cleared). In each year the woodchip operation provides revenue on the area cut over, whereas most years the pine plantation simply incurs more costs. It is not until 12-15 years that returns are made on the pine plantation and then they are small, and only at 40 years are main returns on investments obtained. Now in order to estimate the returns on investments made at year 40 of the pine plantation operation, costs incurred in the course of the rotation have to be compounded at a relevant interest rate (since e.g. the money could have been earning a comparable return by alternative investments with no more risk). Net gain at year 40 depends then on subtracting from returns (with earlier small returns also compounded over the intervening years) net costs compounded over the years for which they operate. In short, money invested in the course of the rotation increases by compound interest at relevant rates over the remainder of the rotation period, and returns must cover these costs as well as providing a profit on money invested. Computations readily show that the final net gain of plantation forestry is highly sensitive both to initial establishment costs and to compound interest rates (or discount rates).

In the face of these obstacles to plantation forestry, forestry services plead for special interest rates for forestry activities, e.g. for a low social discount rate, and for Commonwealth loans at these low rates to cover establishment costs. In order to obtain such loans they are obliged to put up some sort of case for their activities. With woodchipping, and its year-to-year accounting picture, all these obstacles are seemingly avoided: the accumulation of compound interest is avoided, establishment costs can be reduced, and, best of all, as there is no apparent need to appeal for loans, no detailed case, open to public assessment, has to be made for projects and no justification offered.[1] The fact that, even given annual accounting, expenditure on a woodchip project may exceed revenue need hardly worry a forest service. For Australian forestry services are state government instrumentalities, financed by public money, which are well-accustomed to operating at a loss (see Chapter 1). Moreover as no special funds need to be borrowed to initiate woodchipping projects, forestry services can avoid proper independent feasibility studies of their projects; they have only to be approved by busy development-oriented politicians, who rely for their statements on forestry on the forest services themselves.

Any independent study of woodchipping is likely to reveal that at best negligible returns on capital invested in case 2 forestry operations, the chief reason being that given: that the prices, set in terms of case 1 operations, do not make proper allowance for reforestation, even on a year-to-year accounting picture. In Tasmania, where by far the most extensive woodchipping operations in Australia are under way, reforestation and other costs typically exceed revenue. For direct regeneration costs the Tasmanian Forestry Commission, on the average, $42 an acre for high quality sites with rainforest understories (type 1 forests) and $29 an acre for high quality sites with wet scherophyll

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1 This helps explain why, though there is a lot of literature in favour of, or defending, the pine planting program, there is so far little literature of the same sort on woodchipping programs; until very recently there was little need to convince sceptical public servants.

understories (type 2 forests), excluding staff overheads which may increase these costs by a further 50-100%, yet the royalties received by the Tasmanian Commission, which range from 4 to 74 cents a ton, average only 39 cents a ton, and an acre in Tasmania only yields on the average 35 tons (most of the figures cited appear in Gilbert and Cunningham [1]: generously assuming, for the present, that state roading taxes, of $1 a ton on the average, just cover roading costs). Thus even if we generously suppose that type 1 forests yield 60 tons an acre, a high figure for previously milled through forests, and 70 cents a ton is paid, and we discount all adminstrative overheads and subsequent management costs, the Commission is only just breaking even with $42 an acre. Similarly if we suppose that type 2 forests yield 50 tons an acre on the average and that 60 cents a ton is paid, then the Commission makes just $1 an acre, hardly enough to cover administrative overheads. The financial picture in the case of more open forests where regeneration costs are smaller, $9-12 an acre, is scarcely better since the yields are smaller, averaging probably 30 tons an acre, and the royalties paid are correspondingly smaller. For example, even if the royalties averaged 50 cents a ton the Commission would only realise $3-6 an acre, an amount which might cover administrative overheads and fire protection costs, but which would not meet subsequent management costs which average more than 25 cents an acre over each year of the rotation (Tas [1]).

For private forests in Tasmania the situation is similar. Royalties paid, ranging between about 20 and 40 cents a ton, are by no means adequate to cover regeneration costs.

> . . . a royalty of around $2 per ton would be needed to make forestry on private land an economic proposition, . . . prices being offered by wood-chip companies at present will not encourage regeneration (Tas [1], p.11).

Because of these inadequate royalties and because there is no legislation in Tasmania (or elsewhere in Australia) requiring regeneration of forests cut-over for chipwood sales,[1] much private forest in Tasmania will be converted to pasture. But in Tasmania 1 million acres of forested land is held privately, that is about one-quarter of the commercially productive forests; and in the opinion of the Tasmanian Commission most of this private forest will be chipped (Gardner [1]). Consequently *there will be a heavy loss of forested land in Tasmania.*

Extensive woodchipping raises especially severe environmental problems with respect to private lands, in Australia generally, not just in Tasmania, e.g. about 40,000 acres near Eden will probably be chipped. Even the minimal environmental controls imposed by forest services are no longer observed when it comes to logging out private property, and many of the environmental costs (discussed in Chapter 10) are accordingly increased.

For forest service projects on the mainland the commercial picture is similarly dismal. Expenditure on the Eden project appears to exceed revenue *when* proper re-establishment costs are included. Though the NSW Forestry Commissioner has revealed but few figures, insisting that details of the Eden project are confidential,[2] it is

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1 The Senate Committee felt that direct controls over private land would be too drastic. 'Although [the] Committee does not at this stage recommend any direct control over private forest, it believes the position of regeneration of adequate areas of private land should be watched closely' (Tas [4], p.11). It is significant that environmental legislation applying to freehold lands was considered a live option.

2 SMH [1], January 1 and 3, 1973. But some useful, though incomplete, figures are cited in Henry [2].

possible to build up a rough but (we believe) nonetheless accurate enough picture of the cost structure of the Eden project. It is plain moreover from the picture built up in Table 12 that the NSW Forestry Commission is operating the Eden project at a loss when re-establishment costs are allowed for as they have to be for a case 2 operation. When re-establishment costs are included the Commission is losing about $29 an acre on its woodchip operation (see Table 12); and even when these costs are not included the Commission is, on our figures, making only about $9 per acre cut – a quite inadequate commercial return.

Moreover our figures do not measure the full costs incurred, e.g. costs for surveys, research and information, which the Japanese purchasers are obtaining free but for which they should be charged; they make no allowance for possible costly extras such as costs for fertilizer or for controlling pests or diseases (risks which could be measured through insurance premiums); they make no allowance for land values, or rates which reflect these values; and they do not even begin to measure externalities, the true environmental costs (something the royalties paid ought to reflect: see Chapter 14). Yet if the full commercial costs (still neglecting externalities) were added to initial expenditure, this would far exceed revenue. For example, if agricultural land rates were charged, as a token measure of land value, at a minimum agricultural rate for the south coast and the table-lands of NSW of about 15 cents an acre annually, then over a 660,000 acre forest area rates would amount to almost $100,000 annually. Plainly, as there are other initial costs, full initial costs swamp revenue.

Yet it is unlikely that *any* Australian woodchipping operation will show up better than the display project at Eden. For royalties paid at Eden are high (because indirectly subsidized) not only as compared with those paid elsewhere in Australia but those paid elsewhere in the Pacific region (cf., White [1]). Furthermore the main eucalypt alliance in the Eden areas, the *E. Sieberi* alliance, is especially favourable from the point of view of natural regeneration. However even the best, or cheapest, forest from a re-establishment point of view is going to involve some costs, and these costs do not have to be large to exceed the royalties paid.

It is worth reflecting on the difference between the royalties paid in Tasmania (now averaging 70 cents a ton) and those ($1.50 – $2.25 a ton) paid at Eden. The difference is largely, but not entirely, explained by the fact that in Tasmania a separate roading tax, averaging $1 a ton is paid, whereas at Eden roading taxes are included in the royalty figures (in an interesting way). When the roading tax is added to Tasmanian royalties, the result averages $1.70 a ton, while at Eden the royalties will average a little more, perhaps as much as 20 cents a ton more. There remains also a discrepancy between the royalties paid to private land holders in each state; for in Tasmania these now average 40 cents a ton (and may fall as low as 20 cents a ton; Tas [1]), while at Eden they average about 60 cents a ton (ranging between 50 and 75 cents a ton). But once again there is a road levy in Tasmania and not in NSW. This explanation is now fairly obvious. The private landholder in NSW is being subsidized, through road maintenance costs, by the State to the tune of about 20 cents a ton for each ton extracted. However to ensure that road taxes foregone do not emerge as private gain for the Eden operators, Harris-Daishowa, a correspondingly higher royalty is paid to the NSW Forestry Commission. The upshot is that the NSW Commission is receiving a quite substantial indirect subsidy for its operations in the form of funds that in Tasmania are paid for the upkeep of roads used for chipwood billet extraction.

In NSW, then, the public is subsidizing both the private seller and the NSW Forestry Commission through public works maintenance on main roads. That is, the real costs of the Eden woodchip project have been disguised; in particular public funds have been surreptitiously diverted from the Public Works Department, which pays for main road maintenance (outside forest), to the Forestry Commission. Hence a proper assessment of the Eden project would include a figure, of about 20 cents a ton, for main road mainten-

TABLE 12

ESTIMATED FORESTRY REVENUE AND EXPENDITURE ON THE EDEN WOODCHIP PROJECT, FOR AN AVERAGE ANNUAL 10,000 ACRE CUT

	Figures in dollars	
Chipwood Revenue, i.e. royalties paid for chipwood billets (30 ton/acre at $1.90/ton average [$2.00 ton/average])	570,000	[600,000]
Initial Expenditure		
(1) Roading costs (1 mile/500 acres at $2000/mile)	40,000	
(2) Administrative overheads (50 staff at $5000 average, plus $10,000 for equipment etc.)	260,000	
(3) Fire and accident control and insurance	180,000	
Total Initial Expenditure	480,000	
Further Expenditure: re-establishment and other control costs		
(4) Regeneration of compacted areas (5% of site at $25/acre)	12,500	
(5) Culling of unsuitable standing trees and undergrowth ($12/acre)	120,000	
(6) Thinning of excessive regeneration (and weeding) ($25/acre)	250,000	
Total Further Expenditure	382,500	
Total Expenditure	862,500	
Revenue minus Total Initial Expenditure	90,000	[120,000]
	OR $9/acre	[$12/acre]
Revenue minus Total Expenditure	-292,500	[-262,500]
	OR $29/acre loss	[$26/acre loss]

Synopsis. When initial expenditure is subtracted from revenue it can be seen that there is a paltry return of $90,000 or $9 an acre; and when full expenditure on the site is subtracted from chipwood revenue there is a loss of $292,500 or of $29 an acre.

Source of data: see Appendix 4.

ance. When the resulting figure of $600,000 for an average annual 10,000 acre cut is taken into account in Table 12 any revenue the NSW Commission may earn is rapidly turned into a deficit.

Switching to the continuing picture

How can forestry services justify economically projects that run as a loss? And how can they justify, on economic grounds, the inauguration of new projects that will also run at a loss? There are two sets of arguments, often run in combination, that the services put up in defence of their projects. One set, which we shall discuss later (in Chapter 13), appeals to the indirect benefits brought by a woodchip project to a region and emphasizes the benefits of a project in regional development. The other set of arguments, which changes the accounting picture (to one like that for pine plantations), is based on the assumption that the services are restoring forests run down by extensive or excessive logging or by bad fires or by mismanagement, and producing 'better forests for the future,' that is pulpwood forests for later rotations which will pay their way in second and later rotations. When woodchip operations are viewed in this way, however, to keep the accounting honest the picture has to be changed and re-establishment costs charged to the rotation to which they contribute, in particular initial re-establishment costs have to be included as part of the costs of the second rotation. In this way too the first rotation can be represented as profitable, though the profits so obtained are pretty paltry. For example, the average return at Eden of $9 an acre, or 18 cents an acre for each year of a rotation, is a trifling return given the costs involved (quite apart from the value of the forests for other purposes). In fact the public investment in the Eden project is decidedly dubious from an opportunity cost point of view, that is the money expended could have been better invested elsewhere. To illustrate:— The NSW government has, it seems, invested more than $6 million in capital expenditure at Eden, e.g. $5 million was allocated in 1969 for public works in harbour and site facilities alone (Beale [1]). But invested without risk at 6% this $6 million would earn $360,000 annually whereas the Eden project returns only $90,000 annually (or $215,000 with sawlogs) to the NSW Forestry Commission (and but few other funds flow indirectly from the whole operation to NSW governmental agencies).

From a profit point of view the second rotation with its improved pulp producing forests is also dismal. For the compound interest incurred over the rotation period on the establishment costs and administrative overheads increases these costs to such an extent that, together with subsequent management costs, they swamp revenues yielded. In the summation of Gilbert and Cunningham, who have documented the extent to which the regeneration costs for the Tasmanian Forestry Commission exceeds their revenue, 'it is clear that present average prices received do not cover the real costs of production' ([1], p.45). For the regeneration costs (analysed in Table 13) range from $1.74 to $3.49 a ton whereas current royalties paid in Tasmania to the Commission range from 4 cents a ton under the oldest agreement to 74 cents a ton under the latest, with an average figure of 39 cents a ton in 1970-1. Admittedly a roading charge of 1 dollar a ton on the average is also paid to the Commission but this appears to do little more than cover the Commission's expenditure on roading. In sum, unless the improbable happens and prices paid rise dramatically, the Tasmania Commission will operate at a loss on its second and later rotations. But the situation is a good deal worse than a simple comparison of regeneration costs and royalties reveal, as there are several other significant costs in production that should be included and properly compounded (strictly at a more realistic rate than 6%); namely management costs such as fire protection and thinning costs, research costs and land costs, as well as administrative overheads which increase other costs by 50-100%. In fact so bad is the situation that the Chief Commissioner of the Tasmanian Commission has appealed publicly for Commonwealth funds, in the form of a long-term low interest loan, to cover regeneration costs on the large and growing back-log of unregenerated

TABLE 13

ESTIMATES OF REGENERATION COSTS FOR FUTURE PULPWOOD YIELDS IN TASMANIA

Forest type	1	2	3	4
Stand characteristics				
Mature height (feet)	160-220+	120-160	90-120	50-90
Site index (height at 50 yrs)	135	95	72	60
Understorey type	dense (rainforest)	dense	open	open
Regeneration costs ($ per acre)				
Fireline construction	1	1	1	1
Fuel preparation	23	14	—	—
Burning	2	2	1½	1½
Sowing and killing cull trees	3½	3½	5¼	4¼
Animal control	½	½	¾	¾
Total Regeneration Cost	30	21	8½	7½
After 40 years				
Pulpwood yield (tons)	162	90	50	31
Direct regeneration cost ($)	309	216	87	77
Regeneration cost/ton ($)	1.91	2.40	1.74	2.48
After 50 years				
Pulpwood yield	200	111	65	41
Direct regeneration cost	553	386	157	138
Regeneration cost/ton ($)	2.76	3.49	2.42	3.37

Source: Gilbert and Cunningham [1]. Interest is compounded at 6%; costs are based on 1970 figures; yield figures are somewhat optimistic. The estimates given for regeneration costs are lower than those (cited earlier) that have actually been incurred in regeneration; for it is assumed that there is an economy in scale.

forests in Tasmania (Unwin [1])!

The second rotation at Eden appears to face precisely the same predicament — on the rotational accounting picture costs exceed revenue. Even if, to take a favourable view, establishment and thinning costs (which will have to be met eventually) can be reduced to $8.50 an acre (when discounted back to year 1) and yields average 65 tons an acre, direct costs would be $2.42 a ton (as with type 3 Tasmanian forests; see Table 13), that is costs would be in excess of average royalties paid at Eden — and this at too low an interest rate and without including estimates of several other essential costs. Thus the new 'better' forests will be worked at a loss, and likewise later rotations. Moreover there will be no side profits from sawlogs at second and later rotations, since sawlogs would only be available if the trees were grown on for a longer period (probably 80 years or more at Eden) than that favourable for the chipwood cycle.

Thus forest services will not merely be giving woodchips away, but actually using up taxpayers' dollars in order to be able to give them away. For the chip buyers, the papermakers, are not being charged the costs of production. Were the full costs of production charged, woodchipping would not constitute a major environment problem in Australia; for Japanese firms would find it uneconomic to establish or to purchase chips. Commercial overexploitation of some of Australia's forests, especially those in Tasmania, is occurring in part at least, then, because the full commercial costs of exploitation (quite apart from the significant environmental costs) are not being borne by the exploiters: they are being distributed onto the largely unsuspecting Australian public.

CHAPTER 12

ROUTES TO COMMERCIAL VIABILITY?

There seems to be no way forest services can break out of the pattern of losses each rotation with ongoing woodchipping projects unless either

1) costs can be severely reduced, or
2) royalties paid for chips rise appreciably, or
3) losses are absorbed as part of a larger operation which include so-called value-adding operations such as pulping, or
4) a shift is made to case 3 operations, e.g. at the second rotation.

Such possibilities as that the costs of each rotation are somehow written off and the second rotation and each later rotation begins like the first with a free good, can be dismissed. A market gardener who, in order to produce a better garden for next year, treats his first year's crop as compost, cannot then proceed to write off his losses in the first year in assessing his profits in the second year; the moves he took to produce a better garden for next year have to be taken into account in assessing his market gardening venture. Nor can a public instrumentality go into bankruptcy and have a new service rise phoenix-like to replace it.

Forest services tend to look to some combination of 1)– 4) in order to make it appear that their woodchipping operations constitute a worthwhile business enterprise, and they have in fact floated every option open under 1)– 4). These options are taken in turn.

Reducing costs?

Second rotation costs can be reduced either by lower initial establishment and maintenance costs or by working with a lower interest rate. Forestry services are interested in reducing labour costs by employing prison labour and by increasing mechanisation. But it is doubtful if either of these moves will reduce costs significantly. As it is forest services frequently cheat on the cost side by failing to include administrative overheads in their costs: what private firm could afford to carry out its accounting in this way? The fact is, as Tables 12 and 13 make plain, there is little scope for reducing establishment costs.

The only hope of sufficiently reducing establishment costs lies through natural regeneration of forests without burning and reseeding and without thinning of regenerated stands. The NSW Forestry Commission has assumed that at some stage in the rotation at Eden a non-commercial thinning of the forest will have to be undertaken, at a projected cost of $25 an acre (Powis [1]); but under pressure of increasing criticism of its Eden project as unprofitable, the Commission has apparently (inconsistently) claimed[1] that thinning operations will not be carried out at Eden – in short, the Commission may be tempted to run a case 2) operation with the profit advantages of a case 1) operation. The vacillation is easily explained: the Commission is hoping not just to postpone thinning costs, but to avoid thinning altogether. But this will not work. And, for similar reasons, forest service attitudes towards re-establishment are very often

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1 Verbal communication. Moreover there is so far no evidence that thinning operations when undertaken will be successful; for (unless Tordon is liberally applied, a costly and environmentally suspect procedure) it seems likely that regrowth from lignotubers and by coppicing will continue to curtail growth of main stems.

inconsistent. For on the one hand they repeatedly tell us of the better forests they are making for the future (e.g. NSW [5], [6], [7]), better forests for future pulpwood production, but on the other hand they speak of a profitable continuing commercial operation. The better pulpwood forests will have to be thinned and managed, but with thinning and management regimes the continuing operation is unprofitable.

The NSW Forestry Commission is of course trying to make its Eden operation look profitable by working higher yield areas close to the chip mill (royalties decline with distance from the mill and for low yield areas: Appendix 4) and by postponing essential re-establishment costs. The operation is running thus far as yet another 'grab now – pay later' forestry operation. Since there are many foresters, apart from the NSW Commission, who seem to think that the Eden project can somehow be continued without thinning operations, despite the fact that thinning operations are standard practice in forestry plantations, some of the facts about regeneration at Eden will have to be adduced. Though, as we have noticed, eucalypt forests are often, unlike many tropical rainforests, resilient enough to regenerate, the results may be very far from satisfactory from the point of view of a continuing pulpwood operation. For example, a favoured species (such as *E. regnans* in Tasmania) may be displaced by less favoured species, regeneration in areas with dense under-cover regeneration may be patchy, slow and in places non-existent, and in areas with open understorey regeneration may be excessive or far too sparse, depending on the conditions at the time of and after seeding. Although a small trial area at Eden appears to show that at least on slopes and hilltops the species composition of the regenerated forest is roughly similar to that of the former forest, regeneration is otherwise unsatisfactory in the long term being generally excessive on slopes and hilltops and inadequate in wetter valley bottoms. (On regeneration difficulties encountered at Eden see NSW [10]). Unless the valley bottoms are abandoned, as at present, some treatment such as clearing will have to be undertaken to induce regeneration adequate for pulpwood harvesting to be undertaken in the next rotation. On the slopes and hilltops, much more extensive in the Eden region, there is precisely the opposite problem, excessive regeneration. It may be reckoned, however, that competition among excessively regenerated forests will soon enough result in natural thinning. But what evidence is available seems to refute this idea; for under crowded conditions growth of stems of *E. sieberi* slows and then stops. Thus according to NSW [4]

> The native forests . . . in the Eden district are for the most part in a derelict condition, Net growth in such stands is virtually nil . . .

But *E. sieberi* is regenerating with 3,000 – 4,000 stems per acre on many sites, and more than 5,000 stems an acre is not untypical after burning, whereas an optimum figure is about 300 – 400 stems an acre (in contrast to 400 – 700 stems/acre for short-rotation coppicing of thin-barked eucalypt species). In very dense stands growth of *E. sieberi* virtually stops after 15 years or so. In one study plot of regrowth after the 1959 bushfires *E. sieberi* trees have an average diameter of 5 inches at breast height after 32 years growth, and there are no signs of growth becoming more rapid. Yet a minimum diameter for woodchip logs (see Tas [1]) is 6" – 10" at the small end of an 8 – 10 ft. log. It is plain then that where excessive regeneration of *E. sieberi* occurs much of the regrowth is not going to be ready for harvesting in the next rotation unless thinning is undertaken. Moreover it is decidedly impractical to remove even minimum size logs because of the expense of debarking. In fact small logs of the sort that will be available after 50 years in excessively regenerated stands at Eden are currently being left on the ground that it is not worthwhile to remove them! It has been suggested that nonetheless thinning is unnecessary because the dense stands can be mechanically harvested like coppice growth in the next rotation. But quite apart from the fact that most of the slopes are in excess of those where harvesting machinery can operate, technology which can handle the thick bark of the main species at Eden is simply not available (cf. e.g. Carter [2]). It would be extraordinarily cavalier to operate (as Henry

is prepared to; [4], p.69) in the hope that technology will somehow manage to fix things up in time,[1] and a little decision theory shows that to so operate is a decidedly poor strategy. The upshot is then that not only are there not going to be better pulpwood forests for the future without thinning and other management regimes, but that much of the second rotation is not even going to be harvestable after 50 years unless thinning operations are undertaken.

A final possibility is that thinning may be avoided by considerably lengthening the rotation period, say to 100 years. This possibility is suggested by the discounted net profit of $20 million the NSW Commission hopes to make from the timber industry in the Eden region (Henry [3]), reportedly over the next 100 years.[2] (That is, incidentally, about 25 cents an acre each year — enough to cover shadow rates reflecting the natural forest's value?) But a 100 year rotation would double the area required to twice that in the Eden region, and 6–700,000 acres of Victorian forest would have to be committed for the Eden project. It is to be hoped that such an area is not available for woodchipping. But in any case, the effect the length of time would have, through compound interest realistically assessed, on initial costs and maintenance costs, is enough to make this proposal of very doubtful commercial merit.

Less interest or better prices?

Another move commonly made with a view to severely reducing the impact of establishment and management costs is to appeal for, or simply to use, a special discount rate much lower than prevailing commercial rates. Forest services and forestry economists are accustomed to appealing for a special discount rate for their commercial activities, or indeed claiming that they ought to be able to avoid the effects of compound interest altogether (e.g. Jacobs [4]). Whatever the rights of this appeal for a social, or special, discount rate in the case of timber supplies for essential housing, *that* appeal does not extend to cover commercial dealings of forestry services in an inessential export industry (as explained in Chapter 1). There is no case for a social discount rate for an activity which is claiming viability simply as a profitable and worthwhile export venture. Such a venture has to be treated in the same way as private business ventures and discounted accordingly, i.e. at a market rate of at least 8 — 12%. There is no case for a social or special discount rate for an activity where social and environmental costs far outweigh any benefits it affords. There is certainly no case for Commonwealth subsidization of forestry woodchipping operations along the lines of Commonwealth subsidization of forestry pine plantations under the Softwood Forestry Agreements Act, especially since that subsidization was argued for on the basis of meeting essential *domestic* needs.

The question arises as to what sort of returns (e.g. internal rates of return) forestry woodchipping operations should show. There is a wide spectrum of opinion ranging from 18% down to less than 6%, with foresters favouring, not too surprisingly, the lower end. But there are good reasons for thinking that the returns should be towards the high end of the spectrum; for firstly as the operation is a high risk one, because of the extraordinary length of time, the high fire and market risks etc., it should yield returns comparable with those for other speculative activities; and secondly forest services, as

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1 In any case, anyone prepared to punt so heavily on technology should take seriously the possibility that wood is superseded by various substitutes for pulp and paper purposes through technological innovations — after all wood, like wool, has known shortcomings as a fibre.

2 In fact the return, conjectured in NSW [12], allows for two rotations over the 100 year period. The estimates made in NSW [12] are critically examined in Appendix 4.

public organisations, operate on a tax-free basis so that a rate of return of 18% say is only equivalent to a return in the order of 12 – 13% for an equivalent private organisation, and a rate of return of 12% is the lowest sort of return one would expect to get from competitive enterprises (such as synthetic paper making).

But the question of the proper rate of return is not pressing since it is apparent that even the best forestry woodchipping operations cannot yield a rate of return of 6¼% with present pulpwood prices. The NSW Forestry Commission has made a study of what would presumably be its most profitable chipping operations, namely plantation forests on the north coast of NSW. That plantation forestry offers the best hope of economic pulpwood production appears to be asserted in Watt and Henry [1]:

> In NSW, although there is a physical abundance of fibre, the economic availability of pulping supplies is limited. However there are prospects of creating an economic supply source by the establishment of plantations.[1]

According to this study, in order to obtain an internal return on investment of 6¼%

> standing pulpwood prices, *exclusive* of all logging costs including high capacity extraction roading, will have to be of the order of four cents per cubic foot or (about) $2.50 per BDU of roundwood [our italics and comma],

that is about $1.62 a (green long) ton. Watt and Henry continue:

> These prices are generally in excess of those currently obtained for eucalypt pulpwood in Australia, but improved wood properties and potential processing efficiencies from high per acre yields of young trees of uniform size should enable them to be obtained.

The first claim is something of an understatement. Roading costs alone are averaging $1 a ton in Tasmania and are slightly higher at Eden; and administrative overheads are likely to increase costs by a further 50% or more. So it would seem that pulpwood prices would have to exceed $3.90 a ton on the average, *not* just for the very best stands, to yield 6¼%; that is, standing pulpwood prices would have to increase by almost 60% on the best prices currently paid and by more than 100% on the average prices paid at Eden.

It seems decidedly unlikely that these vastly inflated prices can be obtained. First there is reason for thinking that pulpwood prices are not going to increase generally in real terms. The argument from scarcity – that as tropical hardwood forests are mined out so quantity available will decrease and hence prices will rise – cannot be sustained, firstly because buyers will simply go further afield, to South American and African countries keen to exploit their forests further, and incur small rises in freight costs rather than absorb large increases in royalties, and secondly because of the ready availability of substitutes, both synthetic and alternative cellulose substitutes. Paper has for long been manufactured from cotton products, and it is now being made from bagasse, straw, bamboo, etc. Nowadays synthetic paper is being made from petroleum distillates, and more companies are planning to produce synthetic papers. What is more these substitute products are practically competitive with wood-based products; the synthetic products are only slightly more expensive and efforts are being made, through improved technology, to reduce costs of production. Moreover it is known that demand for pulpwood is sensitive to price increases (see Yoho [1], p.175; Ferguson [1]), and accordingly should decline with the increased prices proposed. It is unlikely, then, that real pulpwood prices will rise substantially. What evidence is there then that pulpwood from NSW north coast

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1 The remark also suggests, what Watt and Henry [2] specifically excludes, that the other NSW supply source, at Eden, is not economic in the narrow sense.

plantations will provide an exception? None has been advanced.[1] But, firstly, the range of prices paid in Tasmania and at Eden, and more generally in the Pacific basin (see Higgins and Phillips [1], p.50), indicates that so far buyers are not prepared to pay twice as much for pulpwood from high-yielding even-aged monoculture stands. Secondly, substantially higher prices are not being offered for pulpwood from North American stands which have the main advantages of these monoculture stands (see White [1], Higgins and Phillips [1]). Thirdly even Watt and Henry have doubts as to whether these higher prices will be realised and allow for the possibility that they are not.

Adding value by processing?

The only way for forest services to show a substantial improvement in woodchipping from a commercial viewpoint is to combine forestry operations with value-adding operations, in this case chip and pulp mills, and perhaps paper mills, which produce a (partly) processed product and absorb the losses otherwise incurred in continuing forestry operations; in other words for forest services to pursue the lines established by private pulp and paper companies which grow some of their own raw materials but make their profits through manufacturing. Given the now familiar (but appalling) forestry assumption that forest services form part of the forest industries, Jacobs' recommendation ([12], p.9) that the growth of the forest industries be stimulated by concessions, protection and financial assistance, because of the value added in processing and because of the ensuing industrial growth, amounts to just such a proposal.[2] And undoubtedly processing vastly increases the value of the product; e.g. 4 green tons of chipwood, worth between $0.16 and $2.96 in royalties to the Tasmanian Commission, yields about 2 dry tons of chips, worth about $36 at the wharf in Tasmania, which is equivalent in turn to 1 ton of newsprint, worth $140, or 1 ton of writing paper, worth $320 (on 1967 Sydney prices).

Seen in this light woodchip projects are the thin edge of a wedge; having woodchip projects established is a devious way of foisting expensive pulp mills onto a still unsuspecting public: because only in this way can the already established projects be got to make much commercial sense (though *not* good economic sense).

There are, however, several problems with the suggestion. Firstly private enterprise will not welcome such governmental intrusion into profitable activities. They will not, without a major struggle, surrender a profitable processing enterprise, especially when it can work on a government-subsidized raw material, and allow a forest service to occupy a new, and unprecedented, commercial role (see also Chapter 1). Moreover it would be

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1 So the claim, like too many of Watt and Henry's claims, is difficult to assess. The matter is not helped by the fact that the full version of Watt and Henry's paper is not available and appears to have been suppressed. All that is available are two different abstracts (Watt and Henry [2] and [3]) both pointing clearly to a much more substantial paper than the very short paper that was available as an *Appita* preprint. Thus the assumptions Watt and Henry have made, the bases and details of their analyses, and the evidence they have for their claims is not generally known.

2 Indeed Jacobs ([12], p.9) goes so far as to assert that 'substantial assistance is justified in attracting them if there is a chance that they can be viable,' because pulp and paper mills act 'like a calalyst in attracting still further industries.' However this is only part no doubt of his (mistaken) view that industrialisation and consumption ('an important step in stimulating the use of wood in any locality is to grow it and process it in that locality', p.2) are on the whole desirable in themselves.

environmentally disastrous to hand such industrial operations over to forest services; for, roughly speaking, what little chance there is of persuading forest services (not distinguished for their efficiency) that forests are not just, or primarily, wood production units would be thereby lost.

Secondly without co-operation from some overseas competitors there would be a substantial difficulty in finding markets for the processed products were such projects to proceed. For a limited local market, given appropriate tax and tariff structures, there is no doubt that a local operation can show satisfactory returns when the forestry operation is combined with pulping and perhaps paper making; witness the returns of such near-monopolies as the three companies which divide and largely control the Australian market, APM, APPM (Associated Pulp and Paper Mills Ltd.), and ANM (Australian Newsprint Mills Ltd.): (see also Davidson [1]). However the local market can absorb only a very limited quantity of the material exported from woodchipping operations (see Chapter 9); and selling an export commodity is quite another matter from selling a protected local product. It is, to say the least, very doubtful whether Australian products, with their relatively high labour costs and low investment in technology, could compete on world markets with Japanese and other producers (cf. Ferguson [2]).[1] A further consequence is that any financial gains that do accrue to pulp and paper manufacturers cannot be fed back to public instrumentalities (e.g. by way of higher royalties or further company tax) without jeopardising the manufacturers' ability to compete internationally.

Thirdly, it appears unlikely that Japanese companies will be prepared to export more than minimal processing plants, such as chip mills, to Australia – unless they *fail* to solve the pollution problems the further processing mills face in Japan. Why otherwise should these companies be prepared to give away lucrative commercial activities? It looks even less likely once it is realised that separating pulp and paper-making, by a dry pulp stage, almost doubles production costs. However it is commonly supposed that the opportunity for 'Australian' – though not forest service – engagement in value-adding processing will arise in a few years, as export contracts so far signed usually include, so we are told, provisions for the construction of pulping mills – given certain feasibility conditions. What are these conditions and how tight are the contracts? It is suspected that the Tasmanian contracts are none too tight; but once again the contracts are confidential, and we do not know. What cannot be simply assumed however, is, that the construction of pulp mills will proceed (cf. Ferguson [2]).

More important, it should be asked whether we eventually want combined chipping and pulping and perhaps paper-making operations, whether publicly or privately managed, for an export industry when these involve such heavy environmental costs ('externalities' on the standard economic picture), e.g. the degradation of large tracts of land coupled with heavy pollution from the mills.[2] There are grounds for serious doubts as to the

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1 The same points tell against the popular notion that Australian self-sufficiency in paper products should be achieved by local processing. It is generally cheaper to import finished paper products, something we can well afford to do, thereby avoiding substantial environmental costs.

2 Less polluting pulping and paper-making operations which use purely mechanical means have not yet been perfected even in the case of softwood chips for the full range of paper products – despite frequent claims about new wonder methods (where however this or that has still to be perfected, or the method is presently rather expensive). A technological alternative to chemical pulp mills in the case of hardwood chips may still be a long way off, and the problems of pollution of chemical pulp mills are very far from satisfactorily solved (Kneese et al [1], White [1]). The large mill which APPM plans to establish at Wesley Vale in Tasmania by 1978 will once again be a chemical pulp mill (Tas [5]). As usual, technology is

merit of such industrialisation offering low-quality employment, especially for non-metropolitan regions such as the Far South Coast of NSW which have full employment (see Brown and Hogg [1]). What is clear is that Australia will succeed in getting pulp mills if the associated pollution problems are not solved cheaply enough. It is well enough known (cf. Goldman [1], p.171) that Japanese companies are keen to transfer such very polluting parts of paper making as chemical pulping and bleaching abroad, to countries such as Australia and Brazil which (seen from an international viewpoint) do not care about their environments and are prepared to accept more pollution. A recent study, sponsored by the Japanese government, sets out the plan of N. Amaya (director-general of the International Economic Affairs Department in the Ministry of International Trade and Industry) for transferring much of Japan's heavy industry, including pulp mills, to Australia, a major reason for relocation being that cited in the case of iron and steel (Amaya, *The Australian* June 7, 1973, p.1):

> It is a good example of a large materials, land, water and social-capital consuming industry and of a large pollution-producing industry. If the factories are moved to Australia the problems in Japan . . . would be solved.

And at the Australian end there are influential foresters who believe that such a move might find favour in Australia, e.g. M. Jacobs, now a spokesman for the forest industries ([11], p.53)

> The present tendency . . . to prefer Brazil to make pulp and pollute its own skies rather than to send chips will suit Brazilian Government policy. The tendency may suit Australian Government policy also.

But the pulp mills and smelters that other countries would foist upon us, as a way of exporting their pollution problems, should be resisted, at least until the pollution problems are solved (and then resistance will not be needed). Pulp and paper mills are already responsible for major pollution of air and water in Australia. In Tasmania paper making is one of the main sources of pollution (Tas [3], p.5); it causes 3300 lbs of the 6000 lbs of mercury entering the entering the environment in Tasmania annually from man-made sources; and it spills out 15,000 million gallons of liquid effluent annually (the mining and metallurgical industries, its nearest rival, produce 12,000 million gallons), primarily from log debarking, digestion and bleaching processes, pulp solution and gas scrubbing. The effluents (which are characterised by a high biochemical oxygen demand that may exceed 10,000 mg./l. on a five-day basis) contain organic fibre, alkaline and organic extractives, chlorine and sulphur compounds and trace metals. Yet according to Tas [3], p.7

> No effective measures are at present being taken to control these discharges which are largely confined to the North-West coast and the Derwent and Huon estuaries.

A South Australian report has also documented the quite serious local effects of paper making (see SA [2], especially concerning Lake Bonney); but the polluting effects of pulp-making and of paper-making in Australia[1] are almost certainly more widespread,

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1 (Continued from page 136)

far too optimistic about solutions. And once again if technology is so smart if may well provide substitutes both for chipwood and for softwood products.

1 In USA and in Canada the situation is much the same: the processing stages of forest product industries are comparatively inefficient at present with enormous tonnages of unrecovered waterborne and airborne wastes and colossal water usage. Kneese et al [1], p.35 ff, discuss forest product problems in USA; and Victor [1], Chapter IV, gives a valuable and detailed analysis of the huge waterborne and airborne wastes from paper and allied industries in Canada.

e.g. it is believed that mills emptying into Bass Strait take a good deal of the responsibility for the mercury pollution of the area which led to restrictions on Bass Strait fishing. Eden, a projected pulp mill site, is one of the main fishing ports on the eastern seaboard of Australia; any mill erected there should have to meet stringent pollution controls so as to avoid damaging fishing and fish-spawning grounds. But the imposition of appropriate controls would make any mill very expensive, if feasible at all: the Japanese would most likely lose interest and dismiss the pulp mill project as not 'feasible.' The same sorts of considerations *should* apply elsewhere, e.g. to projected mills in Tasmania. If the full pollution costs of pulp or paper-making were charged, overseas companies would no longer be so interested in locating mills in Tasmania.

The impact of pulp and paper mills on the local environment is not limited to the pollution they generate. Pulp mills will typically require for their full installation massive landscape works and harbour facilities, power supplies and water works, and so will involve heavy public expenditure (since large-scale industries still expect 'encouragement' to locate in a state from the state government). As well the huge water demands of the mills will very often force the construction of major dams on nearby rivers. For example it is estimated that with the construction of a pulp mill on Twofold Bay the water supply demand of the Edrom industrial complex will rise from about 30 thousand gallons a day (for the chip mill) to 7 million gallons a day (NSW [9],p.30). Since this is much more water than the 1 million gallons daily that the present district supply system can deliver, new storages will have to be constructed in the Towamba or Genoa river valleys, if the pulp mill proves 'feasible'; and provision has in fact been made in the long-term program of works of the NSW Water Conservation and Irrigation Commission for the construction of a suitable storage dam in the Towamba River (NSW [9], p.33). Not only are major dams very costly public works; their impact on local environments is now well-documented (e.g. Dasmann[1], Ehrlich [1]).

Furthermore the environmental costs should be commercially reflected in prices for paper and packaging products which register the real costs of production. The present costs of production incurred by the producer and paid for by the consumer fall short of the total social and environmental costs of production (in the way that Pigou [1] long ago explained), because the present costs do not include such costs as those of preventing or cleaning up the pollution of waterways caused by production. The real cost of production of paper should include the cost of a suitable purification plant, or, less satisfactorily, an allowance for the loss of a public amenity (cf. Davidson [1]; environmental pricing which does register real costs is advocated in Chapter 14 below). The extent to which real costs of paper production in Australia are currently understated can be gauged from the case of APM's Maryvale mill, where a suitable purification plant would cost several million dollars – vastly more than the $300,000 APM pays the Victorian government annually for the use of an industrial sewer which pumps untreated effluent from the mill out into Bass Strait.

As an export exercise, then, the value-added idea faces severe environmental problems and costs as well as economic difficulties.

The remaining option, 4) above, is to shift out of woodchipping rotations, to a case 3 operation. In fact Watt and Henry hedge their bets by allowing for sawlog production from their pulpwood plantations in case of insufficient demand or inadequate

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1 (Continued from page 137)

Victor applies his data, using economic-ecological input-output models, to compare the relative ecological (= pollution in [1]) costs of Canadian economic commodities. Needless to say, on every model paper and paper products emerge as commodities with very high ecological costs, ranking below only petroleum and coal products and sewage and well above all other commodities (see [1], p.194 ff.).

prices for pulpwood: 'To hedge against market uncertainties current plantings are primarily of blackbutt, a species producing quality wood with a variety of uses' instead of flooded gum (Watt and Henry [1], p.1-2). *Provided* that the sawlogs produced can be sold it may be possible to make a profit this way and so break out of the loss pattern: but while this strategy may succeed for a small number of plantations, the feasibility of selling a great quantity of hardwood sawlogs at expected prices needs to be demonstrated before this alternative is taken seriously. The fact is that only a few of the better pulpwood forests that we will have in the future can be made viable in this way; otherwise the market for sawn timber, already at or near saturation, will be flooded. In any case the method of hedging bets by allowing for a change to type 3 operations is open to criticism not just on environmental grounds but on opportunity cost grounds: that in view of the uncertainties and low levels of returns public money, a scarce resource, could have been much better invested elsewhere.

CHAPTER 13

WIDER ECONOMIC CONSIDERATIONS

In most forestry enterprises the profitable part of the operation lies, as we have seen, in processing the material rather than in producing the raw material. The woodchip operations, no exceptions, conform to the well-entrenched forestry principle of 'socialising' the losses or the least profitable parts of the activity while keeping the profitable parts firmly in a few private hands, and in this case the hands are often not even Australian.[1] But the public forests being woodchipped are a collective good, so that Australian society should (as a necessary requirement) obtain a net collective benefit from their exploitation. What benefits, then, does Australian society reap from the woodchip industry? What benefits there are, not many, are indirect, and these are outweighed by indirect costs.

It is often claimed (especially by government ministers triumphantly announcing projects) that such projects are highly desirable because they earn many millions of dollars *'for Australia'* (e.g. according to Beale [1], the Eden project 'will bring in export earnings of $10 million per annum'). However such 'export earnings' claims must be regarded with a critical eye, for they attempt to give the impression that there are general or widespread public benefits. But this is very far from being the case, although there are, as we have seen, general and widespread costs in the shape of a degraded environment. It is, in any case, misleading to simply cite the gross commercial value of woodchip exports without subtracting the commercial costs incurred locally in production of the material sold: it would be far more responsible to present the more informative value-added figures (which would in the case of the Eden project amount to little or nothing).

Apart from net forestry revenues (mainly negative), the way in which benefits from woodchip exploitation of public resources, namely the forests, are supposed to flow back to the public sphere are twofold: firstly, through the tax mechanism, through taxation of the profitable activities of the processers and exporters and also of the contractors, and secondly through industrial interaction, through the contribution woodchipping makes to other industries and to regional development. The question of these secondary benefits is taken up later.

The taxation argument

As to the first set of benefits, it is true that the tax mechanism ought to return an amount to the Commonwealth by way of company taxation, provided Commonwealth guideline prices on the export price of chips apply. A Commonwealth guideline price of $27 per bone dry unit (BDU[2] for short) minimum was introduced in early 1970, to apply, so it was said,

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1 Of the four groups currently exporting chips (in 1973-74), one is entirely Japanese owned, one is at least 50% Japanese owned and a third is substantially controlled by British interests.

2 The BDU is an American measure commonly used for quoting export prices: one BDU is equivalent to 2,400 pounds of oven dry chips. The unit is apparently taken from the oven dry (i.e. bone dry) weight of a cord of Douglas fir pulpwood. The oven dry weight of eucalyptus is regularly 12% less than the air dry weight; and the oven dry weight less by something in the order of 50% or more, but varying according to the species of eucalypt, than the green weight. The oven dry weight of *E. sieberi* typical of Eden is about 50% of the green weight, that of Western Australian species about 60%. The conversion factor for converting BDU to (Eden) tons is accordingly 9/14, i.e. a green ton is about 64% of a BDU. The conversion factors vary for different species, e.g. for an *E. regnans* mix the factor is about 15/22 – the difference from *E. sieberi* is a point of some importance for any guideline price policy.

to Tasmanian projects. The fact that Commonwealth guideline prices can vary with the circumstances of a project does not imply, as is sometimes suggested, that there is no such thing as a guideline price (the price can be a function of certain parameters). It is evident, however, from the following table that at least some Tasmanian companies are not selling at a guideline price of $27 a BDU. For it follows from the table

Total quantity and commercial value of woodchips exported from Australia 1970-73 (after Hansard [2], p.692).

	Quantity (in tonnes)	Commercial Value (in $ Australian)	Export Price per Ton
1970	22,500	332,000	$15
1971	344,000	5,038,000	$14.9
1972	942,000	13,809,000	$14.9
1973	2,492,000	36,446,000	$15

that the maximum average export price is less than $24 per BDU, yet the Eden project with an output not exceeding 400,000 tonnes in 1973 at an average price at the loader of about $14 a ton ($22/BDU) could not possibly reduce the 1971 total to an average of less than $24 per BDU were the remaining 2 million tonnes to sell at the standard guideline price. It is a reasonable conjecture then that at least Tasmanian Pulp and Forest Holdings, the legislation regulating which began to be brought down in 1968, is not selling its woodchips at the standard guideline price.

What can happen when the Commonwealth guideline price does not apply is well illustrated by the Eden case: in such cases the public sector can make a substantial loss. The Eden contract was drawn up well before 1970 (in fact the project was announced by Askin [1] in 1967 and contracts were completed in 1969), so there is good reason to believe on the basis of the above data that the Commonwealth guideline price does not apply to Eden. Moreover it is possible to estimate, within reasonable bounds, the export price of chips from Eden. Unfortunately, to complicate the picture, many of the figures which were supplied by politicians were inaccurate: (the employment figures, of 400 or more persons, were also much exaggerated). The annual total export value of chips from Eden was assessed at $6 million by Askin [1] and later at $10 million by Beale [1]. The completed contract would provide for the export of a minimum of 500,000 tons of chips annually according to the premier, Askin [1], but for the export of 450,000 tons according to his minister, Beale [1]. In fact the licence granted authorised a *maximum* of 500,000 tons annually (Henry [2]), and the annual delivery rate has been about 300,000 tons. Of these disconcertingly inconsistent export prices, Beale's figure of slightly more than $22 a ton, i.e. about $35 per BDU, errs seriously on the high side, while Askin's figure of $12 a ton appears to provide a somewhat low lower bound. The average figure of $15 a ton given above determines an upper bound on the Eden export price; but a better upper bound of $14 a ton can be inferred from the fact that Japanese consortia were endeavouring to impose a ceiling price of $14 a ton ($22 per BDU[1]) not long after the Eden contract was negotiated, and not prepared to pay more than this amount. It should be realised that such a decidedly low export price, of $12-14 a ton, i.e. of about $18-22 per BDU, well below the standard guideline price of $27 a BDU, is

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1 According to R. Swartz, Minister for National Development, in a Press Statement of January 15, 1970: 'No floor price has been set by Australia but it appears that certain Japanese interests have sought to set a ceiling price of $22 per unit.' In an earlier release (January) he asserted that a price of $22/BDU was inadequate and that for a soundly based project the price should be higher – from which it would follow that the Eden project is not soundly based. Fortunately the contracts are written in Australian dollars.

is a perfectly realistic one, given that the local holding company operates at a loss[1] or, at best, makes no profit. Firstly the Commonwealth guideline price was regarded by Japanese consortia, who sought to impose a ceiling price of $22 per BDU, as exceptionally high, and a number of contracts fell through or failed to win Commonwealth approval after the introduction of the guideline price. One such was the Western Australian project at Manijimup, where an even lower export price than that at Eden was contemplated: (it was hoped to slash labour costs in production; see Harris [1]). Secondly, a price of $14 a ton would enable the holding company Harris-Daishowa to cover costs and pay a management fee. Billets for chipping are delivered at the mill gate for about $14 a ton. The breakdown per delivered ton is as follows: royalties $1.50-$2.25 a ton, and contract work involved in extracting and delivering billets approximately $11-12 a ton. The difference between the wharf (i.e. loader) and mill gate price, $1 a ton or so, should at best be almost enough to cover chipping costs and management fees[2]; at worst the local company would be operating at a small loss easily made good by the parent company which has the advantage of very cheap raw material. Although estimates of the average cost of chipping one green ton of wood are impossible to obtain, a figure of $1 is of the right order. For recent American estimates give US$4 as the cost of debarking, chipping and materials handling, but two-thirds of these costs, i.e. almost $2 worth, have already been covered under contractors' charge.

Our claim then is that Harris-Daishowa operates on a non profit-making basis, and sells its woodchips at the Eden wharf at $14 a ton. A confidential report confirms our independent estimate of $14 as the likely export price, and the local company's management confirms that Harris-Daishowa (Australia) is operating on a cost-plus basis.

The upshot is that Harris-Daishowa is selling chips to its parent companies in Japan, Daishowa and Itoh, at no more than cost. Thus Australia makes nothing at all by way of tax on the companies' profits for there are no profits to tax: (as well there is an opportunity loss of income or withholding tax on company dividends). Not only does the Commonwealth make *nothing* from the sale of these Australian resources by tax means, but, looked at from an opportunity cost point of view, the Australian public can be regarded as losing appreciably each year in so-called export earnings through loss of foreign exchange that would otherwise have been obtained had an adequate price been agreed upon for Eden. For example, had the guideline price applied at Eden,[3] Australia would have gained at least a further 300,000 x (27-22) dollars, i.e. $1.5 million, annually in exchange.

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1 On Askin's figures the company would operate at a loss. It is possible however that prices have been renegotiated and revised since Askin's statement [1].

2 The fact that Harris-Daishowa (Australia) makes no profits and was operating at a loss presumably explains the withdrawal of Brambles Ltd. and APM, who formed part of the original Harris Holdings, the company which preceded Harris-Daishowa (Australia).

3 The Australian manager of Harris-Daishowa (Australia) Ltd., E. Cane, contends however that the Eden contract has been amended since 1970 so that the parent company, Harris-Daishowa, is now paying more than the minimum guideline prices; at the same time he maintains that the local company is operating at a loss but that this is due only to initial difficulties, teething troubles. The line is not consistent. If the guideline price were being paid to the local company it would not be operating unprofitably, since the chipping of billets and delivery of chips to the wharf costs nothing like $18 (i.e. $27-$18) per BDU. Nor would the Australian average export price of woodchips be as low as $15 a ton. Furthermore if the operations were shortly going to become profitable other companies would not have dropped out of Harris Holdings so quickly.

Furthermore when account is taken of the capital expenditure on 'public' works by the NSW Government for the Eden project, for example $5 million dollars on a wharf[1] and mill site on Twofold Bay and several million dollars in roads, including a 'tourist' road connecting the Bombala tableland region destined for chipping with Twofold Bay, and of the substantial taxation concessions for engagement in export activities granted to contractors who would otherwise have paid more in taxation (e.g. to a subsidiary of Brambles Ltd.), it is evident that the public sector is losing heavily on the Eden project. Indeed these losses far outweigh the inadequate profits the NSW Forestry Commission would make from royalties if it could somehow avoid re-establishment costs. A few Australian contractors may be better off but the main gain is clearly being made by foreign companies. Thus it is no exaggeration to claim that Australia is losing substantially both environmentally and economically at Eden. We are in fact not just giving resources away but actually paying for foreign companies to take them away. The same criticism is valid for those operations in Tasmania where exports do not meet the standard guideline price.

Yet surprisingly State Governments seem quite anxious to persist with such disadvantageous arrangements; both Western Australia and Tasmania as well as NSW can be so criticised. Fortunately this situation should less readily recur because of the export guidelines, but even with some guidelines the public benefits obtained from a woodchip export project scarcely seem remarkable. The amounts returned to the public purse by company tax are, like almost everything else about the private sector engaged in woodchip projects, confidential. However the amounts cannot be large in view of the rebates at present[2] obtained on company tax by engaging in an export activity. For example it is estimated that the company tax paid by a sandmining company operating at Myall Lakes is reduced from the normal rate of 47.5% (47.5 cents in each dollar) to 22% through these concessions; and by a set of recognised tax-reducing strategies APM manages to reduce its company tax to the order of 25%. Suppose, to get some idea of the amounts returned from woodchipping, that the guideline price applied at Eden, that Harris-Daishowa cleared (after they had spread their costs and allowed for depreciation) $½ million and that they paid 25% tax; then Commonwealth taxation is only $125,000, an amount which does not cover interest at realistic rates on the capital allegedly outlaid by the NSW Government for the project. Moreover if (as at Eden) companies involved are able to take advantage of the export incentives and concessions to pay less tax on other activities than they would have paid had they not been engaged in the woodchip venture, then again the net public returns probably lie on the negative side.

The taxation argument does not hold up then, either with respect to Eden or for Australian woodchip operations generally. The tonnage of woodchips exported from Australia up to and including 1973 totalled about 3.7 million green tons. The net taxable company profits on these exported chips must have been much less than $(15-14) per ton, i.e. less than $1 a ton. Thus the total company tax paid for the woodchip exploitation of

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1 There is undoubtedly something fishy about the wharf (mooring and loading facilities) provided at Twofold Bay for the Eden chip project. This was supposed to cost the company half a million dollars but ended up, so it has been said, costing the State Government (?) more than $4 million. Beale's statement [1] on these costs is thoroughly ambiguous. No explanation has been offered and, as for other sensitive features of the Eden project, it is difficult to obtain details of what exactly has been spent and how it has been spent.

2 One main rebate is at present under review, and may (perhaps) be reduced or terminated next financial year (1974-5). But there is no guarantee that woodchip companies are paying the standard levels of company taxes; for they may, like many mining companies, have gained special concessions ('incentives').

Australian forests for export purposes to the end of 1973 has been much less than one million dollars — in the circumstances a piffling amount. Yet public assistance of woodchip operations far surpasses one million dollars.

Because of this and because large depreciation claims can be made on the capital invested by companies in plant, power, roads and wharf facilities, it is very doubtful whether the total tax returns from Tasmanian projects would do very much more than meet the losses that would be incurred by the Tasmanian Forestry Commission were it up-to-date with regeneration of forests. A rough quantitative idea can be obtained in the case of the operations of Associated Pulp and Paper Mills (APPM) in the vicinity of the port of Long Reach. APPM reportedly expects to earn about $2.3 million annually from the export of 900,000 tons of chips (Higgins and Phillips [2], p.35). Tax revenue on the earnings (actually profits are probably smaller) assessed at 25% amounts to $.58 million. But regeneration, for 605,000 tons (only 65% of the total will be taken from Crown lands) averages 93 cents a ton, whereas royalties paid average only 66 cents a ton of which at least half would be absorbed in administration and management costs. Hence the public will have to meet regeneration costs of about 60 cents a ton that is about $.36 million annually. Thus the return by company taxation on this major project exceeds public regeneration expenses by a mere $220,000 a year.

When public expenditure in Tasmania on roads and railways, outlaid primarily for the benefit of private woodchipping operations, is taken into account, public expenditure almost certainly exceeds public revenue from taxation. Substantial public expenditure on chipping transport infrastructure is incurred in three ways in Tasmania, by capital expenses on rail, freight subsidies on rail, and expenditure on roads. Firstly the Liberal government in Tasmania promised to build a rail link from the main North-East line to Long Reach; the line together with associated upgrading of the main line is estimated to cost $34 million (for details see Scobie [1], p.14). As Scobie remarks 'the public have been committed to spending $34 million to assist a project where private investment is no more than $20 million.' As well the return of 6% that could be obtained on the investment of $34 million, viz. about $2.3 million, swamps all returns by way of company taxation. Secondly the rail freight rates to be paid (1.5-2.5 cents a ton mile by APPM as compared with 2.5-4 cents a ton mile by Northern Woodchips: see Scobie [1], p. 15) generally do not cover the real costs involved. Likewise the road taxes charged do not appear to cover the real costs of upkeep of roads damaged by chip transport; it is for this reason that Tasmanian local councils, dissatisfied with the levy of 1.4 cents a ton mile, want the levy increased to 2.5 cents a ton mile. The estimated $2.5 million needed to bring 30 miles of the Tasman Highway up to standard indicates the magnitude of woodchip roading cost to the State (Tas [4], p. 22). At Manjimup the picture is similar:

> One of the factors in the final success of the venture was a more liberal approach to infrastructure costs by the West Australian Government.
>
> After an earlier series of negotiations broke down (prices offered by the Japanese were considerably below those considered economic by the West Australian companies), the Government sharply reduced the capital the venture would be expected to contribute towards infrastructure. (McIlwraith [1])

Even where the guideline price applies, then, there is good reason to suppose that the public is doing extraordinarily poorly on these woodchip projects even on the narrowest commercial grounds: when the environmental costs and indirect costs, all of which are incurred by the public, are taken into account the situation is of course far worse.

In any case, the argument that one ought to virtually give away, or as in the Tasmanian case extract at a loss, Australian resources for foreign companies to capitalise upon, in the hope of making a small amount back in company tax is untenable and, whatever its commercial attractiveness, no longer holds much appeal for many Australians. One does not engage in undesirable activities, e.g. opium plantations, or slave trading or blood sports such as cock-fighting, in order to obtain company tax and employ a few people. By Commonwealth standards the amount of company tax paid on woodchipping

activities is trifling, and the Commonwealth is not so desperate for tax revenue that there is any sort of case for supporting such environmentally undesirable ventures as large-scale woodchipping simply in order to obtain the small tax revenue.[1]

Indirect benefits?

As with a number of other activities that cannot be economically justified in a straightforward way, various secondary and indirect benefits are dragged in to vindicate the activity – primary and secondary costs are characteristically neglected. The recent favourites are of course the three sacred cows: employment, decentralisation and regional development. Woodchip industries, whatever their economic and environmental effects, seem to have great appeal to those who would like to turn Australia's coastline into another Ruhr, in the name of providing clean country living.

To take employment first, neither the quantity nor quality of the employment provided by woodchipping operations is particularly impressive. At Eden, for instance, fewer than 200 people are employed by private contractors and forestry services combined, though in planning stages it was anticipated that 400 would be employed. Tasmanian projects are also expected to employ about 400 people each. Most of the work – in timber extraction – is not well-paid, involves large amounts of overtime, is probably only suitable for young and fit males, yet involves much unpleasant unhealthy work with heavy machinery, and has a high accident rate. The direct employment numbers do not in fact compare well with what similar areas would support if used for extensive primary industry, e.g. beef production; and primary industry is supposed after all to be the *poorest* employer. For example, if the proposal to preserve many of the Eden forests in national park had been adopted the forests would have provided some direct employment (e.g. Kosciusko National Park, not yet a large employer, employs more than 70 people) and would have generated much secondary employment through recreation and tourism. Actually Eden was already a thriving centre, with considerable tourist potential, when the woodchipping project was inaugurated; and far from there being an unemployment problem at Eden, the woodchip operation had considerable difficulty initially in finding suitable labour. In Western Australia 'one of the greatest problems . . . is the shortage of labour . . . This means that the chipwood production operation has to be as highly mechanised as possible' (Harris [1], p.36). Similar problems could be expected to appear in Northern Australia. The direct employment advantages of the woodchip industry have, then, to say the least, been considerably exaggerated.

Much is therefore made of tertiary benefits such as the indirect employment and spin-offs generated by the employment in woodchip operations (see especially Ferguson [2]). According to Ferguson 'the total employment created by a woodchip project is probably double the direct employment in the project itself' and 'a substantial proportion of the indirect employment would be local' (p.19 and p.15). But Ferguson's main argument is flimsy and by no means establishes his conclusions; and his conclusions appear to be false. Ferguson takes Western Australia (including Perth) as a region and generalises from indirect considerations for this region to the effect of a woodchip project on regional development, a misleading procedure insofar as one wants to determine how woodchipping assists decentralisation. The generalisation is suspect, as we shall soon see for regions such as the South Coast of NSW (comprising the shires of Shoalhaven, Eurobodalla, Mumbulla and Imlay) which exclude the capital city and chief industrial centres of the state. As Western Australia has no woodchip project operating, woodchipping is represented by (some amalgam of – what sort of amalgam will turn out to be crucial) three associated industries – forestry, sawmilling, and road transport – which though 'they do not provide a complete or well-integrated picture of a wood-chip project . . . do provide a reasonably clear picture of the main characteristics in relation to a regional economy' (p.16). No convincing evidence is presented in support of this

1 For these reasons among others we have not attempted, what would in any case be very difficult without company or Commonwealth assistance, anything more than primitive guestimates of the company tax actually paid for ongoing woodchip activities.

proposition (on which Ferguson's whole paper depends), and the resemblance is questionable because of distinctive features of woodchipping, e.g. the scale and methods of the forestry operations, the processing (e.g. export chip mills are highly mechanised and offer very little employment, certainly far less than sawmilling) and export operations, and the class of externalities induced.[1] Ferguson's main argument is based on the following table (part of Table 2, p.19): –

Western Australian Industries		Forestry	Saw-milling	Road transport	(1)
Wage content per unit of sales to final demand	Total, i.e. direct and indirect	.407	.509	.420	.44
	Direct	.183	.274	.339	.26

Thus, for example, a $100 of sales by forestry to final demand[2] has a total wage content of almost $41 but only $18 of this wage is paid directly by the forestry industry, a good proportion of the remainder being paid in transport and related service industries. Now were woodchipping like road transport then the indirect effect on employment would be small, and Ferguson's claim, that total employment is in the order of double direct employment in the West Australian case, would be plainly false; were it like a direct sum of the three industries the claim would again be false as the averages in column (1) of the table show. In fact the outcome depends on the amalgamation of industries representing woodchipping, on what proportion of each is involved, and little can be concluded without some data on the amalgam.[3] For example total employment could vary from less than half direct employment to as high as double. Ferguson has conveniently neglected unfavourable but much more probable cases. For it is only if woodchipping is like Western Australian forestry or else an average of forestry and sawmilling that one has one confirming instance for Ferguson's probability claim. However Western Australian forestry is unlike a woodchip operation in that it includes *no* transport component, that being undertaken by independent contractors, whereas an important part of the direct employment in a woodchip operation is provided by transport operations. Thus forestry without road transport cannot be taken as adequately representing a woodchip industry. In short, Ferguson's one sample for his probability claim does not support the probable doubling claim.

Furthermore regions like the South Coast region of NSW which exclude capital cities and major industrial cities not only appear to refute the probable doubling claim but suggest that the regional indirect employment effect of a woodchip project is not especially impressive. The main reason is that 'transport and related service industries play by far the largest role in supplying the direct and indirect requirements of forestry' (p.18) and they also play a large part in supplying requirements of sawmilling (p.18); but for non-metropolitan regions these industries are often located outside the region and hence do not contribute to indirect employment within the region and indeed do not help decentralisation. In fact the region centred on Eden would seem to provide a

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1 Most simply, people objecting to a woodchip project in Western Australia or some other state on economic and environmental grounds are not objecting to going forestry, sawmilling and road transport industries on these grounds.

2 In an input-output model for a region the sink, *final demand,* is the ultimate consumer of good and services; it is the sum of all sales to households, investment expenditure, inventory accumulation and exports from the region.

3 Ferguson appears to have averaged, i.e. assumed equal proportions of each: see his remark on the industry income multipliers for the woodchip project on p.19. But this is inconsistent with his doubling claim.

counterexample to Ferguson's claim that indirect employment doubles direct employment and is mostly *local.* For the population of Eden has increased by about 900 people since the Eden woodchip project began. Not all of this increase is due to the project as tourism is also important in the region, and the fishing industry has expanded: (in the South Coast region the number of fishermen rose from 345 in 1966 to 437 in 1971, i.e. by 4% on the average, while the number of timber getters and other forestry workers rose from 322 to 343, i.e. by only 1.2% on the average; and in both cases the main rises were in the shire centred on Eden, namely Imlay shire). Thus the dependents of the 200 people employed on the Eden project, maybe 500 people, would account for practically all the further increase in population due to the woodchip project and the remaining growth can be accounted for in terms of the average growth for the South Coast Region as a whole of 3.9%. But on Ferguson's hypothesis the population of Eden could be expected to have grown by nearly 2,000[1] if the indirect employment were of the order claimed and were indeed local.

Thus the case for woodchipping and forestry generally creating a large amount of indirect employment falls down on empirical investigation just as the case for its creating a large amount of direct employment does. As Table 14 reveals, only a small percentage of employment in the shires of the South Coast region is in forestry, namely 1.8% in 1971, and the percentage rate is declining. Yet these South Coast shires have some of the highest proportion of land area under state forest of any shires in NSW and indeed in southern eastern Australia. Although forestry, and even woodchipping, because highly mechanised, employs comparatively few people compared with other industries, it can have a crucial and widespread effect on the local environment, far out of proportion to its workforce size; e.g. in Imlay shire with a workforce of 4.7% of total labour force, forestry will affect at least two thirds of the land in the shire.

Furthermore one is not entitled to conclude that woodchipping is a particularly desirable industry in a less developed region, as Ferguson does, simply on the grounds (not established incidentally) that it compares well with agriculture, the poorest employer. Ferguson makes no attempt to compare woodchipping with other industries which offer rival employment opportunities; but with many woodchipping does not compare at all favourably. For example, in the South Coast region employment in timber getting and other forestry work in 1971 occupied only 1.8% of the workforce, as compared with 7.6% in entertainment and recreation (which reflects the tourist industry) and 18.85% in the wholesale and retail trade.

Employment is a major component of regional development; and just as claims as to the importance of woodchipping for employment are exaggerated, so likewise, and partly for the same reasons, are those for the importance of woodchipping projects in regional development. The advantages of a woodchip project in regional development are taken to consist firstly of direct gains or benefits from the project (e.g. a project exporting 500,000 tons will involve an initial investment of about $10 million for equipment, roading and wharf facilities and will provide employment for 400 or so men), and secondly of indirect benefits of a similar sort, investment, employment, etc. In order to show the importance of indirect benefits, as Ferguson [2] wants to, it has to be shown that indirect purchases, investment, and so forth are made locally. But for small non-metropolitan regions this does not appear to be so, e.g. a substantial part

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1 When services for the families of employees are included and allowance is made for average regional growth. Note that the purchase of these services is not indirect employment in the woodchip industry on the input-output model since it is not an input to woodchipping.

TABLE 14

EMPLOYMENT OF TIMBER GETTERS AND OTHER FORESTRY WORKERS IN SOUTH COAST SHIRES OF NSW

	1961	1966	1971
Shoalhaven (including Nowra/Bomaderry)	183	174	140
Eurobodalla	102	86	68
Mumbulla	29	36	21
Bega municipality	4	5	7
Imlay (including Eden)	67	21	107
Total regional forestry workforce	385	322	343
Forestry regional workforce as percentage of regional workforce	2.7%	1.9%	1.8%
Forestry workforce in Imlay shire as percentage of total Imlay workforce	3.6%	1.0%	4.7%

Source: Commonwealth Bureau of Census and Statistics. The table is derived from Brown and Hogg [1].

Note:

(i) The years cited are recent census years.

(ii) The regional decline of forestry employment, partly because of increasing mechanisation and partly because of declining demand for sawnwood from the region, has been tempered by the Eden woodchip project. Even so the percentage of the workforce in Imlay shire engaged in forestry remains small and is not substantially higher in 1971 than 10 years before in 1961.

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11. Sad remains of some of Tallaganda's fine forest dumped into a steam bed. After clear-felling, soils do not receive adequate protection from erosion for up to 6 years.



12. Fern gullies like this are common in montane forest being cleared for pines, and are the haunt of the lyre-bird. Wet montane forest is its main habitat.



13. Treatment such as this if often excused with the claim that the forest is 'a renewable resource'. However the only property that is guaranteed renewal (hopefully) under intensive methods is the wood-producing property, and there is no guarantee that the most delightful or valuable features will be retained.



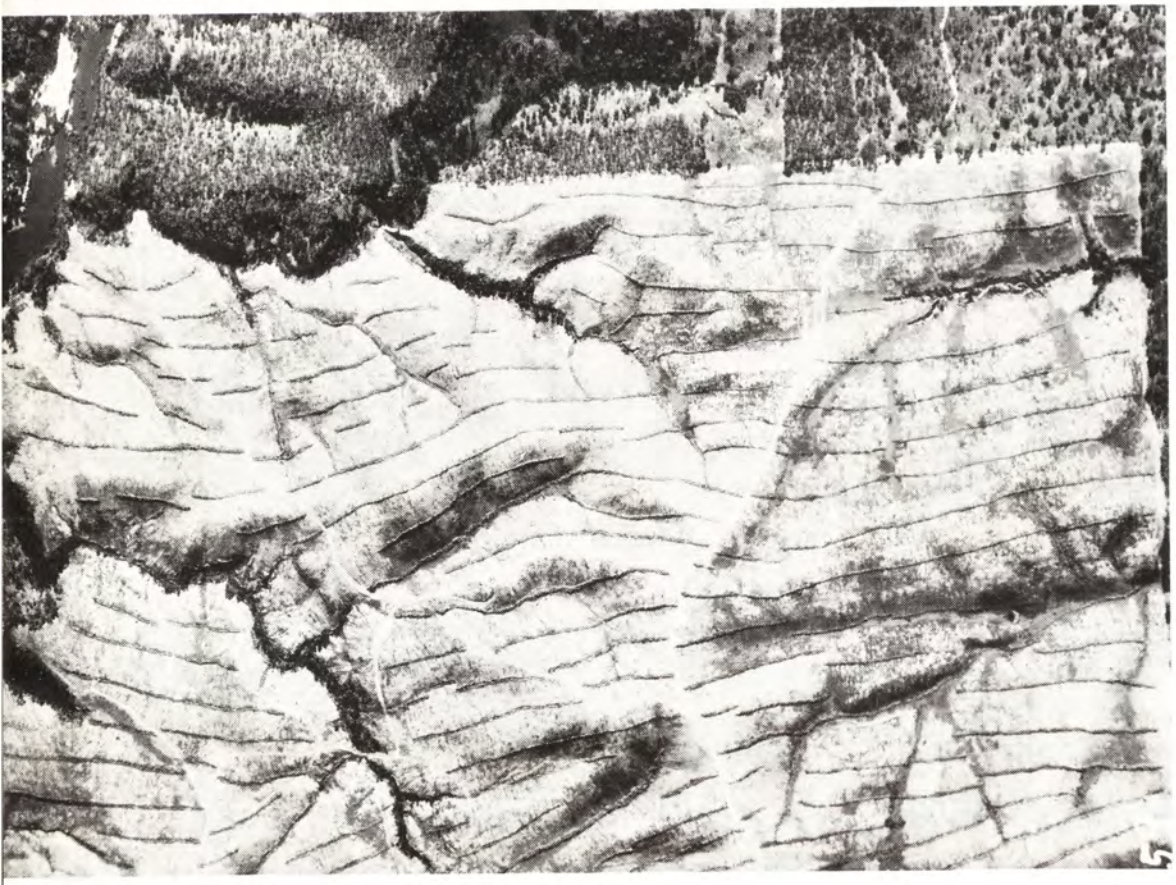
14. The results of pine planting by machine on private land near Braidwood. Machine planting will increasingly be used in the future as forestry becomes more mechanised.



15. Part of the large Bombala complex, now to be woodchipped as a preliminary to being planted to pine.

Although the pine program has been justified as necessary to meet future domestic requirements, the Bombala project, like many others, is conveniently located for export, in this case through the port of Eden.





16. (a). Private land prepared for pine planting near Braidwood. The bared area is a fire-break set up to protect the pine seedlings. Planting on private land is not always as harmless as has been thought.
(b). Part of the same private project; Mongarlowe River at left, not far from the Shoalhaven Dam. Private forestry is in need of far stricter controls.



17. Forest on the Boyd Plateau, scheduled to be bulldozed as part of the giant Oberon project. Retention of the Boyd Plateau area under its native cover is essential to maintain the integrity and scenic value of the Kanangra-Boyd National Park, one of the most spectacular parks in Eastern Australia. (Photo: Colong Committee).



18. 'Decadent', 'degenerate' trees of *Eucalyptus obliqua;* Tallaganda State Forest. In addition to the grandeur of such trees, the hollows in them provide important habitat for a large range of arboreal mammals and birds. Forests from which they are removed are greatly impoverished.

of the indirect purchases of woodchipping (if it had a high forestry component) would go to manufacting industries, which would mostly be located in metropolitan centres. But as in the employment case, so more generally with regional development, it is not nearly good enough to show that an activity increases regional income or generates direct and indirect benefits. A whole range of destructive or undesirable activities can lead to an increase in regional income (exactly as they can lead to an increase in gross regional product): from the manufacture of napalm and military equipment through to sand mining. Indeed the argument is so undiscriminating that (apart from legal difficulties) it would have justified keeping the gas chambers at Belsen open: they employed people and no doubt assisted with regional development and decentralisation. Furthermore the increase in regional income may result indirectly from undesirable activities as when funds are invested to clean up pollution from pulp mills or to repair roads which are broken up by transport of woodchip billets or to restore forests run down by bad forestry practices. The disadvantages and costs, both direct and indirect, of an industrial activity have also to be taken into account in proper assessment of it. Regional development is not per se desirable, and there are plenty of examples of bad regional development projects where the costs of the projects outweigh their benefits. Some woodchip export projects fall into this class on our estimation, as cost-benefit analyses which distributed values properly would quickly reveal. But such economic methods as input-output analysis which neglect costs and externalities, e.g. important environmental costs, provide inadequate tools for assessment of projects. In fact input-output analysis, as often practised,[1] is a clever device for counting in remote benefits but discounting significant costs.

Adding the indirect costs

Among the more obvious costs of a woodchipping operation, apart from the environmental costs already discussed, are costs induced by the operation of heavy machinery, such as traffic congestion and accidents caused by the heavy volume of trucks carrying logs and billets, wear and tear on the roads, and noise; pollution costs[2] such as water pollution by siltation of rivers and chip spillage in harbours and air pollution and severely reduced visibility by smoke from extensive burning off; and aesthetic costs such as those caused by the scarring of landscapes with firetrails and log dumps, and by the visual ugliness of clearfelled forests and of bays spoilt by obtrusive chip mill installations.

Consider, for example just the congestion, wear and tear on roads and noise effects of heavy trucks in the region where roads converge on a chip mill site. As well at Eden heavy loaded trucks will regularly pound along the main coastal highway from Gippsland. In the case of a large project such as a Tasmanian operation it is estimated that 10 ten-ton trucks would have to operate 10 hours daily for 6 days a week 50 weeks a year and would have to deliver a load every 3 minutes.

The water pollution costs are more insidious. The siltation of rivers, following disturbance and exposure of soils through clearcutting operations, has (like accompanying increases in nutrient levels) a damaging effect on aquatic life and is known to interfere with the breeding of valuable fish (e.g. southern sea bass in the rivers of the Eden

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1 Input-output analysis can however be fruitfully extended to allow for at least some economic and environmental interactions, such as pollution: see Victor [1].

2 Both air and water pollution costs will be exacerbated if pulp mills are constructed.

district); moreover as large quantities of silt are gradually deposited near the river mouth, the river will be gradually silted up with further ensuing effects on aquatic ecosystems and also on navigation. Though the spilling of chips into harbours upon loading, because chips are blown overboard, is less inevitable than soil erosion and nutrient loss after clearcutting, it is occurring, and spillage will increase with the increasing volumes of chips loaded at each harbour. The effects of chip spill are already known from experience with loading chips from Vancouver Island; there, according to an eye-witness,[1] the ocean has become a slushy brown over an area of more than 45 square miles and much of the marine life has been destroyed.

Some of these costs will rebound on other enterprises, especially fishing or tourism. But all these costs will fall once again on the public, and what is more these costs will be heaviest where most of the regional population is concentrated, along the populous coastal strips. But like most so-called intangibles, these costs are difficult to cash in monetary terms (except within the framework of a preference or choice system of some strength), and so are all too readily forgotten about by those promoting woodchip projects for regional development or private ends. But however these costs are evaluated, it is fairly clear that they, together with other environmental costs, do not have to be at all large to out-weigh the small public benefits in employment and investment that a woodchip project may bring or to make it apparent that money invested in woodchipping would be better invested elsewhere. Nonetheless benefits do flow to some few members of the private sector, and so long as they do there will be great resistance from many business interests to make any proper allowance for costs. The resistive pressure is highly concentrated, like the benefits for which it works, whereas the costs are widely dispersed, and accordingly the political and economic power is correspondingly weak (cf. Barkley and Seckler [1], p.138). Commercial forces have so far dominated, and woodchipping provides another striking example of the redistribution of public funds and resources, at considerable cost to the public, into private hands.

Because woodchip projects have little merit in regional development – because a project is a regional liability – so they have little merit as parts of decentralisation schemes. Yet Ferguson goes so far as to suggest that woodchip projects, with their linkages, 'offer a possible nucleus for viable decentralization' ([2], p.21). But a coastal industry that employs only a few hundred people can hardly offer such a nucleus. Strictly of course a woodchip industry cannot form part of the decentralisation of industry and so cannot offer a nucleus; for decentralisation means moving people, organisations and industry out from an urban centre, whereas a central location for a woodchip industry was never a possibility, relocation was never a possibility. But it can, loosely speaking, be part of a decentralisaton scheme. However as one of the main reasons, or excuses, for decentralisation is to increase the welfare and quality of life of people remaining in the urban centre as well as those moving away from the centre, it seems perverse to destroy one of our major assets, the natural environment, in doing so. For the most part, however, decentralisation is but part of the development syndrome: decentralisation is development, only development away from urban centres.

In any case even if Ferguson's contentions (also those of the NSW Forestry Commission) that a woodchipping project is outstanding for regional development and rural employment, and valuable in decentralisation, had been established (which they certainly have not), it would be quite illegitimate to conclude that any project which promoted such things was therefore highly desirable. For there are a great many activities, including many undesirable ones that promote these things, e.g. opium growing,

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1 W. Oyen in a letter to the Brisbane *Sunday Mail*, January 14, 1973.

extensive cedar getting, and coastal smuggling. The familiar practical arguments for cases of regional development have in fact several things wrong with them. The arguments run:

(i) Activity a is a case of (contributes to) regional development;

(ii) Regional development is desirable;

Therefore, (iii) do a – or alternatively, (iv) activity a is desirable. The arguments are invalid. For even if regional development is desirable – an unacceptable assumption, since there are many regions where development is not desirable – it is not the case that every activity that contributes to a desirable condition is desirable. Hence the fact that an activity contributes to regional development is a quite insufficient reason for proceeding with it; it must always be only *one* factor to consider. Since resources and capital are limited, and there are a great many alternative ways of promoting regional development and opening employment opportunities, many of which may have smaller costs, higher profitability or may be more satisfactory in other ways, the mere contribution of an activity to regional development is never decisive and may not even weigh in its favour. In particular the provision of employment and contribution to regional development of an activity cannot justify the destruction of something valuable or the degradation of the environment. The suggestion that something as valuable as Queensland rainforest should be destroyed solely or largely to employ a few hundred people is comparable to the suggestion that we make papier machiè boomerangs (for export, so that our balance of payments is improved) out of the rare books section of the National Library in order to employ similarly a few hundred people. There is, in Australia, no need for such employment. Clearly it would be better to pay such people to do nothing than pay them to destroy something of such value – something Australians can well afford to do. It would cost little more than one to two dollars annually per head of population to support most of the would-be employees of the total 20 million acres of woodchipping projects in luxurious idleness. Hence those who advocate the destruction of these areas entirely or largely for supposed employment benefits are placing only such a value on this important part of Australia's natural forest areas (and this is on the assumption, quite unrealistic in Australia's full employment economy, that the potential woodchip workforce could not be alternatively employed in less destructive fields). And some idea of the comparative destructiveness of the industry can be gauged from the fact that the number employed on the total 20 million acres would amount to only about 0.2% of the total Australian work force (of 5 million), but these few would achieve an impact on the environment of the populous coastal strip far out of proportion to their numbers, and probably more serious than any other industries, destroying or degrading some 50% of reserved coastal forest. The value system of those who believe that provision of a small quantity of poor quality employment alone justifies woodchipping obviously places little or no value on the natural environment, and is quite undiscriminating in its attitude to development.

Not only is the intrinsic value of such forest areas ignored in these 'economic' evaluations, so usually is their value, particularly their future value, for other purposes if left intact. Thus, for example, little or no account is taken of the future recreational and tourist potential of areas such as the rainforest near Cairns or the areas of potential parkland destined for woodchipping in Tasmania. Fine natural forest areas, particularly rainforest, are rapidly disappearing, and whatever their value now for other purposes, they can be expected to have greater wilderness or tourist and recreational value in the future, and perhaps a far greater value than for woodchipping.

But although forest planners feel free to make quite extravagant allowances for future requirements for forest products, in their assessments of the future value of their tree farms, recreational and tourist potential of forests is underestimated, and is apparently to be judged solely in terms of *present* demand for forest areas for these purposes. Thus both in Tasmania (e.g. Felton and Cunningham [1]) and in northern

Queensland it is claimed, in defence of the destruction of other values by chipping operations, that only a few people are interested in these areas.

Moreover where the intrinsic value of such forested areas, and their value for human welfare purposes such as recreation, does receive some recognition, this value is usually assessed by excessively crude and narrow (and anthropocentric) criteria which would, if applied elsewhere erase altogether too much of what is usually felt to be valuable, e.g. prized human artefacts. For the value of such areas is assessed in terms of crude behaviouristic criteria such as the number of visitors annually or the amount people are prepared to pay to get to the areas (criteria explained in Barkley and Seckler [1], p.157 ff). If one applied such criteria to the rare book section of libraries one would have a first-rate case for turning them into beer parlours. But one is not entitled to destroy something valuable simply because a majority of people at some time fail to appreciate it (a quite standard point in ethics). The value of such things is reflected at least in part, in the way in which they increase choice and opportunity for knowledge and experience; even if not many people choose, say, to visit the rare book section, or the rainforest, or the local art gallery, it is important that the opportunity to do so is open, and where the opportunity to do so vanishes we are significantly impoverished. In these terms many of the natural areas concerned, e.g. rainforest, are extremely valuable, more so, especially if the costs of replacement are considered, than many of the human artefacts on which such high value is currently set.

The upshot

It is plain, then, that the woodchip industry, particularly should it become as extensive as planned, is a bad bargain for Australia. The contribution it makes to degrading the environment, which effects everyone now in and the future, far exceeds what Australians generally, as opposed to a few individuals and a few foreign companies, can expect to receive in the way of benefits. In this respect it closely resembles sand-mining: it is an activity one would countenance only if one set practically no value on the environment. If then we are going to start being selective about kinds of economic growth and industrial development – and it is certainly time we did start discriminating – the woodchip industry, along with beach-sand mining, is a good place to start. That is new large-scale woodchip export schemes should not be permitted (most simply by a Commonwealth refusal to grant export licenses) and present export schemes phased out at least when current contracts (none of more than 20 years duration) expire – unless, what seems most unlikely, the economic and environmental costs can be severely reduced.

The Australian woodchip enterprise seems, as we have seen, to be motivated by a rampant development ideology, the horror of the unexploited or unused, the obsession with putting to commercial use every bit of the forests[1] regardless of whether it is really in Australia's interests to do so. We have seen how badly values other than wood-production fare in the woodchip process, which makes nonsense of the notion that our forests are managed on the principle of multiple use conceived as taking account of all values of a forest in decision-making. With only a comparatively small area of real forest which must serve a variety of purposes and a rapidly growing population, Australia cannot afford this narrowly exploitative attitude to its forests. Nor is there any good excuse for adopting it either in terms of outstanding benefits likely to be received or in terms of pressing economic need. Australia is a reasonably wealthy country by world standards, and can presumably afford to be more discriminating about the sort of industrial activity it allows; there is no need to engage in such environmentally degrading

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1 A sentiment well exemplified by R. Patterson in his classic statement in the debate on the Softwood Forestry Agreements Act: 'If you've got a resource, develop it' Comm [5].

activities in order to provide a reasonable standard of living for everyone and no pressing necessity to earn a few more export dollars. It is very hard to see how what one could purchase in return for the rather insignificant export earnings (cheaper TV sets? or a few more gold bars?) could compensate for the destroyed or degraded forests. That the earnings could not compensate is particularly clear in the case of the rainforests. The situation regarding exploitation of the rainforests can be compared with that of the wealthy man who sells off the two hundred year old beech trees in his park for firewood; he could buy nothing of comparable value with his unneeded earnings. Although such a course of action, particularly where it involved replacement by young healthy vigorous new trees, would doubtless be urged by foresters, most of us would regard the wealthy person taking it as sick. It is hard to see why similar considerations do not apply to collective behaviour.

Resisting measures, such as woodchipping, which degrade the public environment when the measures have no sound economic basis and heavy environmental costs, is simply a matter of rational behaviour. So too is a wealthy man's putting a satisfactory and attractive environment ahead of negligible or negative profits. And even if, what is very unlikely since great price increases are decidedly unlikely, the woodchip industry were to become commercially attractive from the public viewpoint, the option of putting an attractive, rich and diverse environment before public profits is a very real one: to do so is neither unrealistic nor hopelessly romantic, and such an important decision should not be conceded to commercially-committed forest services.

CHAPTER 14
THE MANJIMUP SCHEME IN WESTERN AUSTRALIA

In late 1973 the Departments of Environment and Conservation and Primary Industry have announced that the Environmental Impact Statement (EIS)[1] for the Manjimup Project in WA has been accepted and that an export licence has been granted for the project. The Minister for the Environment (M. Cass) said in his press release (Cass [1]) 'this proposal is soundly based and, I believe, in the national interest', whereas his colleague the Minister for Primary Industry (K. Wriedt) claimed 'an adequate price would be obtained for the woodchips and the environment would not only be protected, but in most aspects improved' (Wriedt [1]).

In many ways the Manjimup project, far from being the exceptionally sound proposition the Minister for the Environment has claimed, is a particularly vicious one. This can be gleaned from a critical reading of the EIS, prepared by the WA Forests Department (FD hereafter). It will affect about 1.2 million acres of WA's real forest (or more than one quarter of WA's remaining forest area).[2] The 4.45 million acres of forest in WA is the only real forest in the whole vast area of the western part of the continent (see map 1, p.3). The project will take in much of the small area of high rainfall forest of WA (see again map 1) and much of the extremely beautiful remaining forest of karri *(Eucalyptus diversicolor),* one of the finest of the eucalypts, exceeded in height only by mountain and alpine ash. At least 5% and perhaps as much as 20% of trees used for chipping will be karri (p.1). All the remainder, the bulk of the chipwood, will be marri (*E. calophylla)* which occurs in the franchise forests in the ratio 1:1 as compared with other eucalypts (karri and jarrah). The project is in an area which is admitted in the EIS to encompass 'one of the most important tourist and recreation areas in the state of WA' (p.15). The scarcity of western forest alone (and the even greater scarcity of the wet forest involved in the program) would dictate something other than the brutal treatment much of it is about to receive under the woodchip proposal.[3]

The decision-making procedures followed in setting up, evaluating and approving the project fall far short of the ideal. 'Secrecy and haste have shrouded the woodchip deal' (Conacher [1], who goes on to set out details). Prior to the agreement being signed, there was no publicity, and no public evaluation; and the strong impression emerges of unseemly haste and inter-Departmental/industry secrecy. Since these are State forests that are involved, not only is there a clear breach of faith with the public to whom the forests belong, but legitimate suspicion of the West Australian Government's motivations.

Despite the extravagant claims of the Ministers as to the merit of the scheme, the data in the EIS reveals that the project is both commercially indefensible and environmentally damaging.

The economic data provided in the EIS reveals that the project will operate at a direct loss, and will involve heavy public subsidies:

> Estimates of the costs of the Project to the Forests Department exceed the values directly returnable to it from royalties . . . The annual financial deficit, and advances [$286,600 in 1974] to cover a planning and preparation stage are an essential provision from the State Treasury to allow the procedures within this Impact Statement to be fulfilled [p.9; but the EIS tries to suggest that the direct losses are attributable to the fact that 90% of the royalties go into a Reforestation Fund].

These are not the only advances that the public will be asked to find:

> It is estimated that $480,000 is for housing and at this stage it is not known who will be responsible for the provision of housing (Addendum 8, p.3).

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1 Unless otherwise indicated all page references in this chapter are to the EIS, WA [1].

2 Some of the remaining forest is threatened by open cut bauxite mining.

3 Much of the remainder of the wet sclerophyll forest outside the woodchip concession areas, appears to be destined for clearance for pines, evidently designed largely for export.

Table 16 shows that over the first four years of the project's operation, 1974-77, the minimum direct commercial losses will be nearly $1 million. The losses are minimum because owing to the haste with which the EIS was produced many costs could not be estimated (and no doubt costs have been conservatively estimated in the interests of having the project approved):

> A complete accurate appraisal of extra costs, conferred by the Project on the Forests Department (planning and supervision of logging, extra regeneration, burning and monitoring of logging, education and training) requires at least a year's detailed planning to establish actual road location, coupe sizes, burning and regeneration programs, etc. (p.8).

In short, in the unwarranted rush to have the project approved, a proper costing, which includes the cost of the environmental control measures the FD has proposed, has not been done. Even so, as Table 15 shows, the project will operate at a direct loss, after capital costs, estimated at at least $595,000 (see Table 15), have been met. The $34,504 by which royalty revenue (680,720 tons/year at a royalty rate of 85.3 cents/ton exceeds FD estimates of running costs, is likely to be swamped by fire protection costs alone, not to mention the other direct costs which have not been included in the estimations. A recent estimation of WA fire protection costs for the 4.45 million acres of forest, most of which is 'intensively protected' amounts to almost $1.7 million.[1] It follows that the fire protection costs alone for the Manjimup project, much of which will have to be very carefully protected, will probably exceed $.5 million, not very far short of the total revenue returned by chipwood royalties. The Department admits that it will do no more than break even;

> It is estimated that the royalties will only be sufficient to meet the direct costs of control, forest regeneration and the implementation of environmental safeguards (p.32).

But the clear fact of the matter is that royalties will be far from sufficient to meet even direct costs. The regeneration and fire costs match or exceed those in Tasmania and the royalties are not substantially higher; so for the reasons set out in Chapter 11 expenditure is bound to exceed revenues. Thus the Department's statement:

> The utilization of marri *for profit* is the key to maximum productivity in the southern forests (p.1, our italics),

is at best thoroughly misleading.

Despite the fact that a large part of the point of the project is supposed to be the maximization of wood production and utilization and of the future timber resource, there is no attempt in the EIS to arrive at an estimate of the likely future returns (or losses) from the resource produced, and hence no attempt to consider whether the maximization of the future timber resource and the return on capital outlaid, is a commercially sound and reasonable venture. In particular there are no rotational accounting details, no consideration of the issue as to whether the second rotation, the establishment of which is a major supposed justification of the project, is likely to be commercially defensible in the light of the compounded costs incurred in establishing it. But given details of expected royalties and likely expenditure involved it is virtually certain that it would prove indefensible.

To top the disastrous commercial picture off, the WA Government has agreed to meet substantial capital costs and heavy infrastructure costs. The initial capital costs exceed $605,000 (see Table 15), and no opportunity costs for this investment are considered. In addition the state will provide deep water harbour facilities at Bunbury, will maintain railway rolling stock free of charge, and will pay for the upkeep of state highways used for forestry operations. Naturally none of these and other public subsidies

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1 Information unintentionally supplied by A. McArthur.

for the proposal (e.g. cheap rail freight rates for the transport of chips from the chip mill at Manjimup to the port of Bunbury, a publicly provided water supply for the chip mill, free planning and research) are mentioned in the EIS, but the terms of the contract (before emendation) are included as an addendum ('The woodchipping industry agreement', No. 55, 1969). The major State obligation is the design, construction and dredging of a deepwater berth, a project that will cost in excess of $3.5 million and perhaps as much as $8 million. In short the project will require total public subsidies in the order of many millions of dollars. If the proposed pulp mill at Bunbury does go ahead the extent of public subsidy will increase still further as the State is committed to supplying huge quantities of potable water for the mill.

The WA division of the Institute of Foresters of Australia, apparently not satisfied with the extensive public subsidies already being supplied, has even called for more public funds to be made available,[1] to enable what they euphemistically call 'good management practices' to be applied.

The Manjimup project is the first Australian woodchip project for which much of the direct commercial basis has been made publicly available. The figures provided in the EIS suggest in fact that some of our estimates of costs at Eden (in Appendix 4) may be rather conservative. Details of the project provide striking confirmation for the claim, already pressed, that woodchip projects add little or nothing to the public treasury, but require heavy public subsidies. The Manjimup project will follow the now established policy of not merely giving away Australian forests but actually subsidizing their export.

Not surprisingly, the discussion of economics in the EIS places no emphasis on the financial returns to the state from the project. It lists only the following three benefits under the heading 'economics', viz. that the project will provide employment for 350 men; it will assist decentralisation by strengthening the rural railway; and it will provide needed infrastructure for future development in the region.

The EIS provides no estimate of the percentage increase in regional employment that is likely to occur, or what proportion of the regional workforce will be employed in the project, so that it is not possible to appraise the real importance of its contribution to the region.

However, A.C. Harris, former Conservator of WA forests, has remarked in [1] that the Manjimup operation will have to be machine-intensive because of the serious difficulty of obtaining labour. Recently also in WA there have been complaints about the small reduction the Federal Government has made in the immigration program, the ground being that the state has a serious shortage of workers. Under these circumstances the provision of a small amount of low quality employment for the class of workers (viz. young, able-bodied males) in greatest demand, can scarcely be regarded as a benefit at all.

The last two considerations are so undiscriminating that they can be applied to justify any sort of rural development at all that made use of the railways, such as the bauxite industry and extensive strip mining of forests. Since the upgrading of the railway will be done at public expense, it is not a benefit provided by the chip project. Furthermore, since it appears from the EIS that the chips will be transported at less than true cost, the claim that the project will 'strengthen' the railways is a very misleading one.

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1 Letter to the *West Australian* Friday August 6, 1973, p.6. As well as making the naive forestry assumption that a simple separation of environmental and economic factors can be effected ('the benefits outweigh the possible adverse effects . . . provided that enough funds continue to be made available'), the Institute makes the arrogant (and also false) assumption that 'control measures needed to minimize any adverse effects on the environment [are] well within the technical and managerial ability of foresters'! So we have noticed: can the Institute's members halt the spread of *Phytopthora cinnamomi*, stop nutrient depletion and increasing stream salinity, prevent for sure fires destroying large regrowth stands, avoid the further restriction of the range of the numbat and woylie?

TABLE 15

ESTIMATES OF CAPITAL COSTS AND ANNUAL RUNNING COSTS FOR THE MANJIMUP PROJECT

	Item	Annual cost in dollars
(1)	20 operational staff	117,300
	21 operational employees	98,700
	8 planning and research staff (including silviculturists)	49,100
	5 head office staff	25,000
	training costs	24,000
	Total of (1)	314,100
	50% overhead loading	157,050
	Total salaries and overhead	471,150
	Hand planting	25,000
	Plant hire for regeneration	50,000
	Total of these operational requirements	75,000
	Total Annual Costs	546,150
	Buildings	560,000
	Vehicles	32,000
	Nursery equipment	5,000
	Radios	8,000
	Total capital requirements	605,000

Note: Costs omitted include heavy fire and accident costs, expenses for monitoring equipment, for publicity and education campaigns, for further regeneration. If regeneration fails as is not improbable at least in some cases, costs will of course soar.

Source: WA [1]

TABLE 16

MINIMUM DIRECT COMMERCIAL LOSSES FOR THE MANJIMUP PROJECT (1974-77)

Year	Running Costs	Capital Costs	Total Costs	Revenue	Net Loss
1974	136,550	150,000	286,550	0	286,550
1975	273,050	305,000	578,050	193,103	384,947
1976	546,150	150,000	696,150	381,103	315,047
1977	546,150	0	546,150	580,654	-34,504
Over the 4 years			2,106,900	1,154,860	952,040

Source: WA [1]: primarily Addendum 8.

Notes:

(i) It is assumed that the operation will not reach full production until the third year; and that no more than one-third of full production will be achieved in the first year of operations, 1975, and no more than two-thirds in the second year. The Eden project, for example, took longer than this to reach the first stage (300,000 tons/year) of full production.

(ii) Once again the losses are minimum losses because much expenditure to which the WA Forests Department is committed is not included in the estimates, notably costs for its monitoring equipment and research, for fire protection and prevention (including expensive aerial operations), etc.

(iii) Revenues are based on a royalty of 85.3 cents/ton (74 cents/m^3) for full production of 680,720 tons/year.

The EIS does not deal adequately with the conflict between the new industry and other established industries in the region such as tourism and beekeeping. Yet it is almost certain that tourism and recreation will suffer in this very important tourist and recreational area.[1] It is well-known that tourism and recreation generate more employment (including decentralised employment) and much greater regional income dollar for dollar than forest industries, as well as adding far more to the quality of life. For example, in West Virginia (scarcely a major US tourist state), tourism and recreation earn $10 for every $1 earned by forest industries, and at Mt. Macedon pine plantation near Melbourne recreation earns more than $14 for every $1 earned by the forest industries (according to Ferguson and Grieg [1]). The beautiful karri forests near Pemberton which

1 It is often claimed (e.g. Hanson [5]) that woodchipping does not conflict with tourism, since it is itself a tourist attraction: people come to look at projects, particularly controversial and highly publicised ones. However, the same could be said of many undesirable enterprises, such as strip and sand mining, which are of temporary controversial interest but involve a longer-term conflict with tourism; or for that matter of other disasters, such as areas devastated by tidal waves, floods or hydrogen bombs.

are used in national promotion of WA tourism and are an important tourist attraction are included in the woodchip franchise; while according to the EIS 'marroning and trout fishing are important recreational activities within the woodchip franchise.' Although the Forest Department claims that 'as far as possible' main highways will be avoided in the transport of chip billets (a fairly indefinite assurance) it is certain that they will receive substantial use from the woodchip industry, representing a further indirect public subsidy and bringing it into further conflict with tourism and recreation. Unlike the Tasmanian case, there appear to be no roading taxes to help cover maintenance of public roads damaged by chip industry operations.

As the EIS admits, the small but vigorous honey industry based on marri, which is a high quality honey tree, will suffer. This is not a large industry, but it is as environmentally admirable an industry as one is likely to find, and unlike the woodchip industry requires no public support and shows a small profit. The EIS has made no study of the extent to which these admirable alternative activities are likely to suffer, a quite unacceptable feature.

Not only will the project be unsatisfactory from a commercial viewpoint, a critical study of the EIS reveals that there is serious risk of environmental deterioration and some certain costs associated with the project. The practices the FD intends to adopt will make the costs particularly severe, yet no objection has been made by the Department of Environment to their proposed modes of operation. It involves clearcutting about 27,000 acres per year in large coupes of 500 to 2000 acres each. There are essentially two classes of operation, depending on the forest type: for the jarrah-marri forest types, favoured coupes are about 2000 acres. Coupes of this size have been strongly criticised in the US and are regarded as involving excessive environmental costs, even by members of the US forest service. (A corollary is that the Department of Environment and Conservation is less demanding even than the US forest service.) Although these forests are said to be cut under 'heavy selection' in fact only unsaleable culls are to be left and these are subsequently to be removed by felling before regeneration burning (EIS, p.7). Thus the operation amounts to a clearcutting one. For the predominant karri-marri forest type (and the very small areas of pure marri) favoured coupes to be clearcut are about 500 acres.

The regeneration practices proposed are equally alarming. For the karri-marri forest type it is proposed to 'scrub-roll' by bulldozing all but the few karri seed-trees left from the clearcut, and, when the debris is dry in summer an intense burn is made. This method, which kills the remaining seed trees, is designed to shift the forest in favour of karri, since no marri seed remains. In the case of jarrah-marri regeneration, no seed trees are to be left, and a less intense 'top-disposal' burn is applied to debris.

The evidence that regeneration will be satisfactory is not there, since neither technique has been tested over large areas or for a suitable length of time as the EIS concedes. The EIS admits that regeneration has failed in some cases (probably due to light seed production in some years), and planting techniques have been devised to restock failed areas. (This will add substantially to the losses the project will incur.) In other cases excessive regeneration in the order of 40,000 stems per acre (instead of the 400 or so desirable) has been obtained by the proposed methods. As at Eden there is an exclusion factor with eucalypt regeneration after clearcutting; regeneration is either excessive or inadequate, owing to variable seeding. The operating costs have been worked out on the assumption that regeneration will be moderately successful on the whole; if however, as the evidence seems to indicate, it is not, then the project will be even more uneconomic. Needless to say the thinning of 40,000 stems to the acre is a decidedly uncommercial proposition, and for most purposes such areas are a write-off.

The clearfelling and regeneration practices will have major effects on other environmental values, notably on the flora and fauna. The EIS admits that felling and subsequent burning will kill practically all the small mammals and birds of the undergrowth. As safe-

guards against the total destruction of such animals, the FD proposes to 'leave non-forested areas and flats' (p.23), and as this is scarcely sufficient, uncut strips of forest along streams 100 metres wide so as to form a strip network. This area of forest, less than 8% of the total, will eventually provide the only mature forest habitats (p.23).

> Even with the adoption of these safeguards, many fauna species dependent on native forest will only be present in 10% of their former numbers, existing entirely within the uncut areas. There are also a few species of animals which would not survive the operations even if provided with reserved areas, e.g. the Numbat and the Woylie. (p.24).

The numbat, one of our most beautiful marsupials, has already had its range greatly reduced since European settlement. No evidence is presented for the 10% figure cited in the EIS, which could well be an overestimate and seems to have been arrived at from the area percentage estimate, a crude and unsound procedure. If the uncut strips along streams and roads are eventually to provide the only mature forest habitat, then many animals could be eventually eliminated from the areas altogether, because of minimum area requirements. No consideration has been given in the EIS to minimum area requirements for fauna, and work carried out appears to have been largely of the survey sort.

It is difficult to see how, despite disclaimers, the intense summer burns used for regeneration can be stopped from entering the uncut strips. Confinement of wildlife to small refuge areas carries a high probability of their eventual elimination in the event of a disaster.

In reply to a question from the Department of Environment as to how it was proposed to exclude the intense summer burns used for regeneration from the adjoining refuge areas, the Forest Department replied that the refuge areas would be control burnt, an answer apparently satisfactory to the Department of Environment. However, not only would control burning greatly reduce the value of the area for small mammals, but it cannot be assumed that control burning would protect refuges from intense summer burns on adjoining land in a high proportion of cases. It seems that, just as at Eden, the main purpose of so-called 'refuge' areas is to act as fire-breaks, thereby reducing their value for wildlife purposes.

The FD admits that 'rearrangements of the fauna population will occur in cut over areas'. The 'rearrangement' will consist of elimination of native species and an increase in introduced species such as rabbits, mice, foxes and cats. 'The increased numbers of foxes and cats are most likely to influence the native predators through competition. Species such as the Native Cat and Wambenger could suffer' (p.25). Contrary to the claim of the EIS (p.31) such severe costs to fauna do *not* follow selective logging.

It is interesting to compare these admissions in the EIS of severe costs to fauna, even on optimistic estimates, with M. Cass's press statement [1] that 'there will be some loss of wildlife habitat, particularly of mature forest, but this will be reversible and the program might even increase wildlife diversity'. Perhaps M. Cass is referring to the increased numbers of foxes, cats and rabbits that are expected to invade the area. 'Some loss' is 90%, optimistically; and once an even-aged stand is established mature tree habitat will not return in the cut areas unless the foresters can be induced to refrain from cutting usable trees, and even then will take a very long time to reappear. Thus the loss of fauna habitat is perhaps *theoretically* reversible (assuming the relevant fauna succeeds in hanging on in the inadequate areas remaining, which is by no means certain), but is very *unlikely* to be reversed, unless the woodchipping scheme is stopped.

One of the most important environmental considerations involves the future use of the area for catchment purposes. As Conacher [1] has argued, the area is of vital importance as a future source of fresh water in a region of rapid population growth where few other sources of fresh water supply are still available.[1] This aspect receives

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Footnote on next page.

scant attention in the EIS. Effects on watershed properties from the program are likely to be serious, and to appear through sedimentation following erosion, through pollution from high nutrient levels, and from salination.

Under the proposed forestry practices substantially increased soil erosion will be inevitable. Even the EIS admits that increased soil erosion 'will be a distinct possibility' and that the afterburn 'will increase erosion'. The FD proposes a number of steps which they hope will 'minimise' these problems, for example, not logging excessively steep slopes, installing crossdrains on main tracks, encouraging the use of rubber-tyred logging vehicles. However, there are no specifications of any acceptable standards for excessiveness of slope, or excessive sedimentation in streams, or for what levels of erosion are acceptable, and in the absence of such specifications the reassurances given are meaningless. In fact it emerges that the Department intends to log practically all slopes in the area, claiming that none are excessively steep. The FD tries to console us with the remark that 'increased erosion is a short-term risk not . . . significant when compared to that prevalent [on private property]'. It is extraordinary that a forest service supposedly managing a public resource in an environmentally responsible way, should take as its standard of acceptability damage going on on private property; and as American studies indicate, the erosion effects from clearfelling are characteristically severe. Assuming a period of six years after regeneration takes place during which soil is at risk from erosion due to absence of adequate cover (a figure established after clearfelling and burning in some catchments planted to pine: Goard [1]), and allowing an average lag of two years before regeneration occurs, this would yield at any one time an average area of over 200,000 acres of the project on which soils are inadequately protected against erosion. So much for effects being 'short-term'. The greatly increased density of roads involved in such a project is also a permanent source of increased erosion. It is a retrograde step that road construction, a matter which is very sensitive from the point of view of erosion and stream siltation, has to be left to private operators, and that quite inadequate standards have been specified on their construction, e.g. there are no requirements that cuttings are to be avoided, verges to be seeded, on placement of culverts, etc.

Equally cavalier is the FD's attitude to sedimentation, namely that 'measures described above should contain the risk' (p.20). Once again no reference is made to any studies on the subject, and no standards are proposed.

The problem of nutrient depletion, which given the types of soils involved and the length of time which can occur before revegetation, could be rather serious, is not even mentioned in the EIS. (But perhaps the FD and the Department of the Environment are unaware of the problem.) Under the discussion of chemical pollution only pollution from herbicides is mentioned, and it is only in connection with herbicides that the EIS asserts that 'streams will be monitored to detect and evaluate any increases: if any risk arises' (p.20). So far streams have been monitored only for salinity levels; however, the result of even these checks is far from reassuring: several streams in the area have already proved too salty for domestic use (exceeding public health standards of 500 ppm. of NaCl), though evidence suggests that the streams contained less salt in the past (p.13). Salination is known to occur in the north of the area following clearing for agriculture, is coupled with clearing, and is a clear risk following clearfelling (Conacher and Murray [1]). Although the FD has, on its own initiative and without citing any evidence, classified the karri and karri-marri areas as 'safe' with respect to salinity (p.20) 'the possible

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1 (From page 160)

The effects of the project on fresh water resources may indeed induce a conflict in forestry interests themselves in view of the extensive fresh water requirements of the proposed pulp mill.

salt problem in the northeast section of the licence area necessitates restriction of cutting during the first decade to experimental stages to define the impact of further logging on stream salinity' (p.21). Clearly even the FD regards the risk as a fairly serious one. Yet in Cass [1] it is asserted that there is 'no significant danger' of salination.

A prime cause of soil erosion, nutrient depletion and increased salinity appears to be increased water cycling and run-off: in particular the expected increase of 30-50% in run-off immediately following cutting which will reduce to normal levels only after 5-6 years (p.18), and the temporary rise in the water table (p.22).

Both the rise in water table and the expanded logging operations (together with the region's climate) will provide ideal conditions for the spread of *Phytophthora cinnamomi* (p.17, p.22) which has already wiped out hundreds of thousands of acres of WA forest and is present in the franchise area. 'The result will probably be a severe reduction in the *Proteaceae* and other susceptible species, particularly in the gullies and low-lying areas'. As Conacher [1] points out, these low-lying areas and the susceptible areas along roads are the main areas which it is proposed to leave for wildlife refuges. WA banksias, dryandras and other western members of the protea family are extremely fine, and their reduction and elimination (even prematurely) is not a minor matter. Destruction of susceptible species appears to be permanent and little regeneration of susceptible species occurs. Not only is jarrah, which is highly susceptible, a substantial component of the forests, so that its regeneration is likely to fail in affected areas, but regrowth of even some non-susceptible species of eucalypts may be severely retarded (Marks et al [2]), a fact receiving no mention at all in the EIS. It is both puzzling and alarming that the EIS goes on to say

> The effect on Jarrah regrowth is difficult to predict but it is not likely to be as drastic as the effect on other scrub species . . . In the long term this will result in the destruction of a large portion of the native flora within the Jarrah-Marri type'.

The EIS attempts to dismiss these severe costs of the project with the following words:

> This destruction of susceptible species is inevitable whether or not a chipwood project is introduced. Chiplog extraction will merely hasten the process.'

The result is by no means so inevitable as this statement assumes. And acceleration of the disease as a direct result of the chip project is itself a serious cost. And Conacher [1] says:

> It is ironic that in one part of the state forests movement of men and machines is severely curtailed in an attempt to reduce the rate of increase of die-back infestation, whereas in this area the acceleration of the process is accepted with apparent equanimity.

It is interesting to compare the EIS claim that spread of *Phytophthora cinnamomi* will be accelerated with M. Cass's statement in accepting the EIS that there was no significant danger from plant disease as a result of the project.

Since the relevant eucalypts tend to produce sufficiently heavy seed fall for adequate regeneration only every fourth year[1] (as the EIS admits) there may be a delay of up to 4 years before regeneration can be effected, with the result that very large areas,

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1 This also points up in an interesting way a general problem with large scale clearcut projects involving mixed eucalypt species, since adequate seed production of the different species may not coincide. The result will inevitably be a tendency to regeneration procedures which heavily favour one species out of a mixture. The resulting widespread ecosimplification will have serious repercussions for much wildlife dependent upon flowering eucalypts, and is very dangerous from many points of view, including susceptibility to insect attack, since it is well-known that diversity of species provides some protection against insect attack.

perhaps up to 120,000 acres, could be deforested at one time (Conacher [1]). One consequence of this coupled with the general reduction in forest size, is the possibility of significant local climatic and hydrological changes, as Conacher [1] explains. Further environmental risks are mentioned in the EIS only to be dismissed: one is from insects ('the Jarrah leaf miner is an unknown factor', p.24), a problem which will be the more serious as a result of the ecosimplification involved in shifting the two-species associations of karri-marri and jarrah-marri towards single species stands. Another is from fire: 'regrowth requires complete protection for 15 years' (p.30) – i.e. an area of at least 405,000 (15 x 27,000) acres will always require complete fire protection. The consequences of failure to exclude fire could be very serious indeed, since a hot fire would wipe out the regrowth over a large area and no seed would remain for regeneration (since the regrowth will not produce seed until it is more than 15 years old and possibly much later). Thus entire areas of regrowth could be denuded if a fire should penetrate them. But the chances of such a fire occurring are extraordinarily high, given only the Tasmanian escape rate of 15% from 'controlled' burning. In fact the WA escape rate is likely to be much higher than this, because intense burns are to be conducted in the high risk summer period for regeneration purposes, quite apart from the risk of a fire being started by other means.[1] This gives an extremely high probability of fire burning out and then denuding substantial parts of the regrowth areas, and also completely destroying the remaining fauna in the refuges. Yet this subject receives no proper discussion in the EIS. This risk alone, if it were allowed for in the proper way and the expense of replanting destroyed regrowth areas considered (not to mention the permanent loss of wildlife in the refuges), would be sufficient to make the project staggeringly uneconomic. Yet not only is there no allowance in the economic assessments of the EIS for this risk, but there is not even a proper allowance for *fire protection costs,* which (as explained) can be remarkably high in WA even normally, whereas in this case especially stringent and expensive ones would be required. This is worse than a shipping line or airline company ignoring the cost of insuring its fleet in its economic assessments.[2]

Not only will almost all forest values other than wood-production be seriously affected, the costs to the general public, in terms of loss of recreational opportunities (an opportunity cost which is completely neglected in the EIS) are also severe. The aesthetic and environmental and recreational effects of deforesting the large areas involved are certain to cause hardship to and draw criticism from a range of people – fishermen, hikers, campers, tourists etc. as the FD realises. Their solution is the usual two part one: first, leaving veneer strips to hide their activities from the casual visitor, and secondly the spending of public funds on a so-called 'publicity and education' campaign, designed to justify the scheme to the public who is paying both for the damage and for the resulting 'education'. 'To cater for this social impact . . . adequate publicity and education are required'(p.26). The relevant publicity campaign is not allowed for in the economic assessment of the EIS.

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1 The chances of stopping an escape once it reaches a regrowth area are slight, especially given the high oil content of karri leaves (Blakely [1]). The large dead trees (stags) and other dead material remaining in the regrowth area also represent a serious fire hazard.

2 And the analogy of fire protection with insurance is generous since fire protection measures by no means ensure freedom from fire costs.

The EIS tries to minimise the costs by pointing out that the contract is only for 15 years. But it is plain from internal evidence e.g. the discussion of establishing a pulp mill and the fact that the area has allowed for rotations to be operated on a 40-50 year basis, that the intention is to operate for far longer than 15 years. Given the investments involved, and the problem of retrenchment of employees, closing such a project down after 15 years would seem to be a very difficult task. And given that an even-aged stand has been established over a large area, it would be very difficult, or even impossible, to induce forest services to break out of the clearcutting cycle.

The extensive research into the effects of the clearfelling and other procedures on the environment and wildlife, which is obviously needed and which the FD has given rather indefinite undertakings to perform (in response to questions 5 and 17 of the further questions asked by the Department of the Environment), has not been allowed for in the expenditure and is also to be a burden on the public purse and a further form of subsidy, as the additional capital is to be provided by grants from state treasury. In response to a question from the Department of the Environment as to whether it was proposed to fund needed research by contributions from the company involved, the FD replied that it was not. It claimed that such research was 'a cost not directly attributable to the project', on the specious grounds that research would have been necessitated by the existing sawmilling industry and that the proposed project was *but an intensification*[1] of that industry. But it is nonsense to pretend that the effects of clearfelling over large areas and the regeneration procedures described are similar to those of small scale selective logging. It is plain that the research required is a direct cost of the intensive methods adopted under the project and necessitated by the fragile economics of woodchip projects. It would seem that the Department of the Environment is prepared to accept any faintly plausible looking answers to its not very searching questions.

A reserve of almost 50,000 acres[2] is proposed by the Department of the Environment and Conservation to attempt to avoid the total elimination of the numbat and the woylie from the franchise area (Cass [1]). This is approximately 4% of the area and is situated in the dry north-east portion and includes none of the wet sclerophyll forest or touristically important areas. It has been sited in the north-east area of lower quality forests where salinity problems are expected to be severe and where it was proposed to restrict logging to small experimental levels because of salinity problems; the river on which it is centred, the Perup River, already has excessive salinity levels, with a weighted mean of 1135.36 ppm of NaCl, well in excess of the public health maximum of 500 ppm for drinking water. Only 4% of the area in a region important for recreation and tourism and where forests are so scarce is reserved – less than the UN minimum of 5% and far less than the desirable 10%. The Department of Environment and Conservation can scarcely be accused of over-ambition in setting aside reserves in an important tourist and recreation area. This is despite the fact that a large national park would cost the public far less to run than the woodchip area and would provide far more public benefits. And the Department of the Environment appears to have gone along with standard forestry thinking

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1 Of course switching from taking 5 trees out of 100 to taking 95 out of 100 is 'only an intensification' in terms of volume. But it does not follow, and is plainly quite false that, it has the same sorts of *effects*, any more than it follows that the effects of taking 200 aspirin are similar to or 'merely an intensification of' the effects of taking 2.

2 Conflicting figures however are given in Cass [1] and in the EIS where the reserve is stated to be of 100,000 acres.

according to which areas suitable for national park are not those with the highest value for recreation, scenery, wildlife and so on, but those which are not suitable for logging.

It is amazing that anyone should accept (let alone describe as 'soundly based and in the national interest') a project with as staggering a selection of costs and risks, which also requires substantial public subsidy and support and returns little except costs to the public. Since it has no commercial appeal (except to private enterprise) and little else to recommend it, it is not only difficult to understand how such subsdized environmental deterioration could be accepted by a responsible Department of Environment, but also difficult to understand why the Forests Department should have proposed it. The real motivation (hinted in the EIS) for the persistence with this uneconomic and damaging project is that sawmilling activity is virtually at a standstill in WA. 'Demand for Marri is at present virtually zero' despite very low royalties, and other forestry activities have declined also. The motivation then appears to be that of *using* the forests in an over-exploitative and damaging way (even uneconomically) rather than allowing wood production to decline; in this way too the forestry empire can be expanded (instead of declining in importance; 'production forestry is an important part of the State economy', p.9), and the wood production ideology furthered ('essential for . . . maximization of the future product resource', p.9). It is hardly surprising then that the forest industries adamantly oppose the increase of royalties to cover costs, for 'the effect of considerably higher royalty loadings would be reflected in a *lower standard of utilization*' (p.32).

The argument the FD falls back on is that because the forests have been run down by a long period of selective logging they will cease to yield sawlogs unless they are rejuvenated by something like the woodchip scheme. But this argument basically rests on a false dichotomy between, on the one hand, use of *no* regeneration methods, and on the other hand, the use of large scale clearcutting and follow-up methods. However there is no reason to believe that adequate regeneration could not be obtained by the use of much less damaging smaller-scale methods, such as timber-stand improvement or patch cutting, carried out over small areas. Such methods were in fact successfully employed in WA during the Depression. Even if such methods resulted in less than maximum quantities of regeneration and some material remaining unused, there is no virtue in using the material at a loss, as is happening in the woodchip project, and no good reason to demand excessive standards of regeneration.

The use of less damaging alternative methods to obtain some regeneration would also enable avoidance of a major disadvantage of the present woodchip scheme, the establishment of huge even-aged areas of forest which will then continue to be clearcut on subsequent harvesting. The clearcut method proposed is not, as sometimes suggested, a once-only rejuvenation process which will remedy the present run-down state of the forests, but determines a cycle of 40 year clear-cuts over large areas, by establishing large areas of even-aged forest, with much habitat and wildlife more or less permanently confined to uncut strips where there is continual danger of wipe-out of populations due to fire escapes or phytophthora eliminating habitat, etc.. Some rejuvenation could be obtained without these extremely undesirable consequences, by alternative methods. However, as usual, research into feasible alternative methods with less damaging impact has not been done and is not really encouraged.

The desire of the Forests Department to maintain and even enhance its position and importance at any price and to use material that can feasibly be used regardless of costs and the absence of benefits led, in EIS, to some remarkable rationalisations for the woodchip proposals; for example (p.31):

> Reconciliation of the implications of the above adverse effects with reasons for proceeding initially rests with the belief that all the adverse influences can be associated with the continuance of the sawmilling industry, established in this State, and that this industry is a necessary requirement for public welfare.

It is of course completely false that the adverse effects discussed are produced by sawmilling using careful selective logging. It is most unsatisfactory to argue that because

some forestry activity (e.g. provision of sawnwood for housing) is necessary for public welfare, *any* forestry activity at all is also 'necessary for public welfare'. It is even worse to argue that because one is prepared to accept some adverse effects from something which is regarded as essential, one should equally be prepared to accept them from an activity which is quite unnecessary. The argument relied upon is easily parodied as follows: 'This is an activity which will involve staggering public costs and diseconomies, will require heavy public financial support, and which is not directed towards satisfying any important local commercial requirements (and will conflict with some non-commercial ones) but is entirely for export: nevertheless, we should continue with it because it is *Forestry,* (and Forestry is always justifiable even where its costs outweigh its benefits) and Forestry has in the *past* been an important part of the State's economy.' This evidently is the basis upon which the Departments of Environment and Conservation and Primary Industry have accepted the project as 'in the national interest'.

It is not merely that the Department of Environment and Conservation has endorsed a project which is a prime example of development for its own sake and which subsidizes environmental deterioration; it has also accepted an EIS which takes as acceptable many serious costs and risks and which apparently received no real critical appraisal. Since any EIS prepared by the proponents of a proposal will attempt to put the proposal in the best light and minimise or dismiss environmental costs, it is clear that it is essential that they be scrutinized with a critical eye and are the subject of a public hearing.

In particular it is important not to accept the valuations of the EIS and attempts to give no or little weight to costs. Yet this seems to be exactly what the Department of the Environment has done, viz: to simply *undervalue* such costs as the impoverishment (probably permanent) of a million acres of scarce western forest from the point of view of wildlife, the virtual elimination of an uncommon and beautiful marsupial from the area and the further contraction of its already greatly contracted range. This is dismissed as 'some loss of wildlife habitat'. Perhaps the Department of the Environment considers the drastic reduction of wildlife populations in an area of no consequence unless a species is imperilled (by which time concern is generally too late). The approach reveals scant concern for the aesthetic and other value of wildlife, as indeed it reveals scant concern for any other aesthetic or non wood-production value. If a project with such serious drawbacks and so little to recommend it passes the test of the EIS and policies are consistent, it is difficult to envisage projects that will not. And since the Manjimup project is a particularly vicious one, it is difficult to see how any of the other projects forest services have plans for (see Chapter 9) can consistently be refused, (with the possible exception of rainforest projects).

The standards of proof and evidence for assertions and claims in the EIS appear to be quite inadequate. Many claims are made with no back-up evidence cited, and the basis for many claims is left completely unclear, e.g. the classification of erosion-liable areas, and of other areas as involving no salination risk and the claim that 10% of fauna will continue to exist in refuges. But this is not all. The statements in Cass [1] also present evidence of an alarmingly unsound approach to evidence and decision in the EIS. For example it was claimed that 'on present evidence the proposal represents no significant danger'.[1] But one cannot dismiss risks merely because it has not been conclusively demonstrated that they will occur. This amounts to neglecting probabilities, allowing for which is a fundamental and essential part of an evaluation or decision-making procedure (since contrary to prevailing economic assumptions we never work in a state of perfect knowledge).

Further in stating that the project was acceptable because 'on present evidence the proposal represents no significant danger' Cass has taken the onus of proof to be on

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1 A statement which is in any case inconsistent with the EIS, which admits adverse effects but regards them as justified for the progress of total forestry.

opponents of projects to provide evidence of damage, not on those who wish to undertake them to produce evidence that there will be *no* damage. But absence of evidence of damage can be obtained by the simple expedient of refusing to look for it, or working from inadequate and incomplete data. Cromer [2], writing on behalf of the study group set up by Departments of Environment and Conservation and Primary Industry to study the woodchip industry, stated that the group considered the available data on the effects of forestry activities on wildlife to be very inadequate (cf. Chapter 16). The study had a considerable further time to run. Not only is it strange that such a decision should have be made before the study was completed, but the Department has accepted that there is no evidence of damage on the basis of what they themselves admit to be very incomplete work. And if projects are to be allowed to proceed merely because in the absence of adequate work there is no evidence of damage, it is clear that the approach to proof, evidence and decision involved is methodologically unsound. Environmental impact statements accepted on such a basis will be virtually worthless. What is required of course is that there should be evidence of *no* damage, which involves work to establish effects and is rather harder to obtain than 'no evidence of damage'. The statement of the Minister also attempted to dismiss these risks with a claim that projects will be monitored. Monitoring will not *prevent* damage. Are we really expected to believe that after a contractual commitment and an investment of millions of dollars in a chip mill, plant and infrastructure such as improved port and railway facilities, the project will be abandoned if monitoring reveals that environmental damage is occurring? The procedure of undertaking monitoring only *after* projects are set up is methodologically quite unsound, since the results cannot be taken into account in assessing the costs of the project before commitment is made to it.

The approach to uncertainty and risk — that in the absence of adequate preliminary research and in the face of severe risks and possible penalties one can proceed because there is *no evidence of damage* — is equally unsound. The degree of uncertainty, and some of its implications, was recognised by the WA Environmental Protection Authority, which stated in its report (EPA [1] p. 9)

> The EPA remains unconvinced that sufficient is known about environmental implications of the Woodchip proposal for it to be completely endorsed at this point in time. Equally well as outlined above the EPA is scarcely in a position to render at this stage a blanket disapproval of the project;

and also stated (p.8)

> However, we are advised that some 60 to 80 per cent of the soils in the licence area are yellow podzolics, grey sands and gravelly soils. These are soils which generally have pallid zone material underlying them and as in areas other than in the licence area pallid zone materials have been identified as being the source of salts which redistribute in the land-scape following changes in catchment hydrology. Therefore the concern of the EPA persists as to whether the Woodchip project may gravely jeopardize what is after all a natural resource far more vital to the people, i.e. water rather than woodchips.

One can add to these observations the decision-theory point that there appears, in the Manjimup case, to be a substantial degree of uncertainty, and that the project risks very substantial penalties in return for extremely dubious gains[1]. In such a case even a slight probability of incurring the serious penalties involved would provide excellent grounds for rejecting the project if rational decision-making procedures were followed.

If these approaches to proof, evidence, risk and decision are continued, EIS's will be valueless. They will be meaningless gimmicks which have the drawback of making people think that environmental factors have been considered and given weight when in fact they have merely been dismissed, and which will hamper attempts to obtain more worthwhile methods for taking account of environmental costs and risks and halting the deterioration of the environment.

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1 As also in the case of supersonic transport.

CHAPTER 15

PARALLEL PROBLEMS IN USA AND IN NEW ZEALAND

The elimination or degradation of natural forests is occurring apace in many countries, in the Americas, in Africa and in south-east Asia, as well as in such parts of Oceania as Fiji and New Guinea, the Solomon Islands and New Zealand. The Official View of course supports such activities. The presentation of a more critical view is accordingly virtually confined to those countries where expression of dissident views is permitted or fostered and which have strong conservation movements or traditions. It is instructive to consider briefly the fight against intensive forestry in two such countries where forestry interests have encountered strong opposition, USA and New Zealand, and the alternative views of forestry projects put up by those concerned about the environment in those countries. Neither dispute has had much of a hearing in Australia, though one side of each dispute, the forestry side, has been presented to some extent in forestry journals received in Australia and has been reflected, in the case of the US dispute, in Australian forestry magazines, which have however systematically misrepresented the dispute as being merely about clearcutting, when it in fact concerns a far wider set of issues. The other side has however been completely neglected, and except for the valuable Senate hearing *'Clearcutting' Practices on National Timberlands* (USA [2]) the American conservation literature is largely unobtainable in Australia. It is particularly unfortunate that the US dispute is generally unknown in Australia; because the Americans have been longer engaged on a quite similar set of issues concerning forestry ideology and practices, particularly intensive forestry practices, and their battle provides a fine preview of the local scenario. Indeed it is hard not to be struck by the parallels between the US situation, as revealed in many of the conservation[1] submissions in USA [2], and the situation in Australia.

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1 Though we have preferred the term 'conservationist' to such different alternatives as 'environmentalist' and 'preservationist' on the ground that it is less liable to distortion – preservationists, for example, are too easily misrepresented as those who wish to preserve all remaining natural areas or to reserve all forests – it is still liable, like any term trying to fulfil the requisite role, to distortion and redefinition. In particular the base term 'conservation' is not adequately redefined in the much favoured 'use of resources' way, e.g. as 'the wise use of resources'. Apart from the unfortunate evaluative component in this definition, which means that conservation cannot occur through stupid uses or accidentally, for example, conservation is not a matter of using resources as much as husbanding them or *refraining* from using them. Moreover the definition is compatible with exploitation such as sandmining if that is wise, and still worse with the elimination of *everything* natural; so that the definition leads to results (no doubt convenient for politicians who can blithely speak of the NSW pine planting as a major conservation project and of the Eden woodchip operation as 'the greatest conservation move on the South Coast') inconsistent with what is meant by 'conservation', which entails some preservation, and carefully managed and properly justified uses, when uses there are. The repulsively chauvinistic definition adopted by the Society of American Foresters (and applied in NZ [4]) according to which 'Conservation as applied to the forest is the management and husbandry of the forest for the specific objective or objectives to fulfil human needs . . .' similarly falls down and should be rejected. It is compatible with total use and with no preservation at all.

The dispute in USA is not just about clearcutting practices – though it has regularly been misrepresented as such, especially for forestry interests – but goes far deeper: it is about the management of public forests and forestry methods *generally* and about the practices, assumptions, commitments and ideology of the US Forest Service and associated organisations. The dispute concerns forestry practices on almost the whole system of US national forests, from California to Alaska in the west, and east to the West Virginian forests.

The most notorious examples of forest degradation by logging exploitations have been in Monongahela National Forest of West Virginia and on Bitterroot National Forest in Montana, where 'the scars of the denuded valley slopes are glaringly obvious to the casual visitor' (p.70[1]), 'a devastation of landscape beyond belief or description, wrought by foresters playing God at public expense' (p.149). But what has happend to these forests, the forest destruction, has been repeated in the national forests of Wyoming, Idaho, Alaska, Washington, Oregon and California. As Robinson, a professional forester, argues (pp.95-6)

> The best kept secret in this period of great concern about the declining quality of our environment is the declining quality of our forests lands . . . the forests of America have been relentlessly plundered ever since Europeans invaded the western hemisphere 500 years ago. The destruction continues almost unabated today despite the contrary impression many people seem to have inferred from slick nationally circulated tree farm propaganda. Nevertheless, during the past twenty years forest industries through their many and varied lobbying organizations have been vigorously campaigning both thru administrative and legislative channels to require the United States Forest Service and the Bureau of Land Management to vastly increase the sale of timber from our public forests. The reasons they are giving now are that we have a critical housing shortage requiring low cost housing which in turn ostensibly requires increasing quantities of wood.
>
> The private forests, they say, are gone and the only way we can meet the . . . crisis is to cut more timber from our national forests. . . Actually however, the amount of timber cut annually in the United States has been roughly constant since 1900 and if prices are allowed to seek their natural level there is no reason to expect any great rise in the use of wood in the forseeable future except possibly for pulp and that increase while of doubtful social value can be easily met by the shoddy forestry being practiced in the South. (Robinson, p.96)

The 'shoddy forestry being practised in the South' is of course a leading model for Australia's future forestry.

The similarities between the American and Australian situations are conveniently divided into ecological and other similarities. The ecological parallels are considered first.

Probably the most serious and damaging ecological criticism in the American case has centred on the effects of clearcutting and intensive management on soils and water-

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1 (Continued from page 168)

> And as human needs swell with increasing population, exploitation of the forests, not their conservation, will increase. The Society's redefinition of 'conservation' is, like many of their other definitions, part of a propaganda attempt to combine their timber-getting doctrines and activities with a conservation image.

1 Unless otherwise indicated references throughout the remainder of this section are to USA[2]. For the most part we make only fairly general points concerning the American scene: the interested reader can find copious detail in USA [2], and a popular account in Wood [1]. Robinson [1] furnishes a diary of main events in the US forestry-conservation dispute from 1967 through until February 1974.

sheds. Devastating criticisms of forestry practices (to which forestry interests took very strong exception) are made by Curry, a professor of environmental geology, who concludes (p.173 and p.170):

> Present evidence suggests forest cutting, by any but the most conservative and careful methods, appears to completely defeat the nutrient cycling and soil nutrient storage capacity, as well as to increase erosion. Western forests may have something less than 200 years of productive fertility remaining before permanent . . . eradication of productivity for saw timber production. . . . evidence gives us a finite life for our forests in all but the flat deep soil areas of the south-east where tree farms can be carried on like any other farming with full utilization of the materials and slow nutrient depletion offsetable by fertilization.

Curry bases his claims on two separable matters, erosion and nutrient depletion, which we discuss in turn.

After many intensive forestry exercises, the effects of erosion and larger-scale soil instability, such as land slides, are distressingly evident, especially on steeper forested land (e.g. p.84, p.110, p.169, p.314).

> . . . landslides, the major producer of nutrient and watershed destruction on the north coast, are not being prevented or avoided with any seriousness. On that basis alone, the Forest Service in northern California is failing to conserve the land over the long haul . . . (Van de Mark, p.641).

According to Gray, a university civil engineer who has conducted detailed field research on the impact of forest clearcutting on the stability of natural slopes,

> there is overwhelming evidence to suggest that large-scale clearcutting promotes not only accelerated soil erosion, but also increased susceptibility to mass-soil movement . . .
>
> A forest cover on a slope enhances the deepseated stability in two principal ways: by beneficially modifying the hydrologic regime in the soil mantle and by mechanical reinforcement from its root system. Large scale removal of the forest cover results in wetter conditions in the soil mantle (inimical to stability) and gradual deterioration of the anchoring root system (thus they become zones of weakness).
>
> It is a fallacy to believe that removal of the forest cover enhances slope stability by removing the weight of the forest from the slope. While it is true that the weight of the forest has a downslope (destabilizing) component, this is more than offset by an increase in strength of the soil produced by the weight component acting perpendicular to the slope. This is a nicety of soil mechanics which is often overlooked in more intuitive approaches . . . .
>
> Clear-cutting should be scaled down considerably (i.e. smaller areas cut) and . . . certain steep watersheds should not be cut at all . . . it is imperative that road construction be held to an absolute minimum and that roads be carefully located and built in order to prevent excessive soil erosion and mass-wasting. (Gray, pp.625-7).

Soil erosion limits logging and other forest practices even more than larger-scale soil stability.

> In almost all measured cases, soils in logged areas are being lost faster than they are being formed and the sustained yield concept is being patently violated . . .
>
> Common erosion rates in agricultural regions such as midcontinental U.S., average about 2-3 m./1000 years (compared with a pre-human erosion rate based upon geologic evidences of 5-10 cm. in the same areas) . . . Even in the warm, humid, longstable southeastern U.S., soils

> seldom develop to much more than 3 m. in depth and the young soils of glacial regions from Ohio northward possess generally less than 0.6 m of total exchangeable substrate materials. Clearly most U.S. agricultural regions will not sustain tilling for more than 300 years and many such hill regions in the southeast and the arid regions of Oklahoma and Texas are nearly depleted of their soils today and require annual expenditures of fertilizer and much energy just to make the most primitive plants grow. . . . For montane western Montana about 0.7 m. of soil, not all composed of materials with exchange capacity, has formed in 16,000 years for a rate of 3.8 cm./1000 years absolute maximum rate of formation. True average rates may be one-half this figure. Local erosion, on specified watersheds, is as much as 15 cm./100 years . . .If formed at a rate of 3.8 cm./1000 years and 0.7 m. deep, we would have 200 years of soil left to be stripped. Since the 15 cm. rate, as measured from rates of siltation in streams and behind debris dams in small watersheds in logged areas, appears to have been in force for the last 50 or more years, we may have as little as only 150 years of forest soils left in some locales. Or perhaps enough time for two more cuts before sustained yield becomes a joke. (Curry, pp.167-8)

Australian forest soils are generally not deep (e.g some of the commoner podzolic soils have an average depth of only about 0.5m.), the proposed forest rotation periods are much shorter, and it is unlikely that siltation is markedly less: what lifetime do Australian forest soils have under intensive forestry practices?

> When logging occurs in steep watersheds, erosion rates go up tremendously . . . In the redwood forests, soil is being lost 100 times faster than being formed for a predicted total soil loss in [less than] 400 years.
>
> . . . Erosion can progress in deforested watersheds at great rates without the material actually reaching a stream for measurement. Current 'good' management practice is to leave a vegetation buffer along streams to protect fish from water heating and stream siltation which deleteriously affect salmonoid species. The Federal Water Pollution Control Administration also recommends debris dams and the leaving of slash on the deforested hillsides to reduce sediment reaching water courses. This is all well and good but it does little to protect the soil — only the fish — and it even protects the fish only from silt without regard for the chemical quality or toxicity of the water . . . . this practice of leaving forested buffer strips along streams, while preserving spawning-grounds a little longer, is assuring high fingerling mortality from chemical water pollution in that supposedly clear water draining 'properly logged' watersheds is toxic to young fish near the logged regions. (Curry, p.167).

The reason is that with clearcutting soil nutrients are washed into watersheds.

> Recent work on soil and forest watershed chemistry . . . indicates that chemical reactions in the soil following logging in many areas cause the soils to be stripped of their nutrients so rapidly that soil sterility is virtually assured in a matter of two to, at maximum, six theoretical recyclings for forest growth . . . (Curry, p.165: compare also the material on nutrient depletion cited in Chapter 10).

The empirical base for these claims is primarily recent research in north-eastern USA (Pierce et al [1], and other papers cited therein), which shows huge increases over the two years following cutting in water run off (as much as 400%) and on average stream water concentrations of calcium (417%), magnesium (410%), potassium (1558%) and

sodium (177%, according to the percentages Curry cites). Though there appears little reason to doubt that these results extrapolate to Western US forests, as Curry remarks (p.172),'hard data' was 'not being sought' at that time. Nutrient depletion of soils provides a plausible explanation of some[1] of the regeneration failures or reduced growth of trees after clearcutting. Such deforestation is followed by increased flooding, because of increased run-off.

Where topsoil and nutrient losses have been severe, the nutrients cannot be restored by spreading fertilizer.

> One cannot readily 'build' a soil. Laboratory clay mineral weathering is very time-consuming and natural distribution of clays is such that, although ubiquitous, there are not large minable deposits of clays of the types that hold most nutrients, like montmorillonite and vermiculite. Mere spreading of fertilizer on mineral soil or even incorporating it by tilling is fruitless and a criminal waste of energy. Without storage sites, the fertilizers merely dissociate and volatize or leach away in 1-2 years, while many thousands of years are necessary for even the smallest accumulation of storage media. Leached fertilizers pollute streams and cause eutrophication by encouraging algal growth in those fertilized waters. (Curry p.167).

From a water quality standpoint, there are three major effects standard (bad) forestry practices cause: sedimentation, thermal pollution and organic loading of streams.

> The most obvious and most serious impact of improper logging on water quality is the greatly increased sediment load caused by erosion of the mineral soils from the surface of logged over areas and from logging roads . . . Under natural conditions, sediment loads in the streams measured 10 ppm or less.
>
> The actual felling of the trees may cause some soil disturbance and result in some acceleration of erosion. Usually, however, the dragging of a heavy crop of felled logs down, across, or even up the slopes, but especially across or through the streams, disturbs nearly every square foot of the cut-over area and may cause suspended sediment concentrations of approximately 100,000 ppm in any affected watercourses. By comparison, suspended sediment concentrations in a stream immediately downstream from an improperly logged area exceeded 70,000 ppm — *a measured increased of 7,000 times the natural sediment content* . . . High sediment inputs from many small streams result in huge sediment loads in the main stem rivers which these small streams feed. The damaging effects of excessive sedimentation are numerous and widespread, including loss of natural stream vegetation and food organisms.
>
> The fresh water habitat for resident and migratory fish is significantly damaged with reduction in the number, size, and general health of fish. Sediment loads seriously reduce propagation of the fish by silting spawning gravels and smothering fish eggs and fry . . .

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1 The failure of other logged areas to regenerate in the mountain west of USA is 'probably [accounted for through the] slow progressive climatic change wherein increased summer aridity limits reproduction of the species outside a forest canopy' (p.170). As well, there are other cases resembling the situation of much tropical rain forest: 'Relict stands like those on the San Francisco peninsula, once cut are doomed, since they are creating their own microenvironment and retaining their own soils'. (Curry, p.169)

> Suspended sediment increases the cost of water withdrawn for municipal water supplies and causes excessive wear on turbines, pumps, irrigation sprinklers, and other equipment with increased expense to water users.
>
> A 1962 study of Pacific Northwest streams has shown that clear-cut logging caused increased stream-flow which in turn caused increased sediment production. The heavier water and sediment loads result in increased flood peaks.
>
> The deposition of sediments in rivers and estuaries increases the need and the costs of dredging to keep channels open for water-borne transportation. Such sedimentation also can significantly alter the environment of, and subsequently the productivity of, estuarine areas which are known to be more productive of a high protein food supply per acre than most agricultural land. (Ray, p.314-5; our italics).

In North America thermal effects are also important.

> Logging to the water's edge exposes the stream to the full impact of heating by the sun with resulting increases of water temperatures to levels damaging to the cold water fisheries. Water temperature increases are particularly damaging in small spawning streams in the summer months when the sunlight is more direct, cloudless days more frequent, and the small streams carry their heat load into larger streams which in turn become increasingly warmer. (Ray, p.315)

This thermal (pollution) effect, which is also important in some parts of Australia, is however easily avoidied by leaving an adequate uncut buffer strip along stream edges. Not so organic leaching.

> As . . . organic debris and litter in contact with surface and percolating waters, go through the age-old process of decomposition, measurable increases in dissolved chemicals and plant nutrients occur in the forest streams. Of particular concern are the wood sugar products readily released by leaching.
>
> The direct evidence of such water quality degradation is the growth of bacterial slimes and algae which thrive on the materials released by organic decomposition. (Ray, p.315)

Organic leaching can be reduced, but not eliminated, by combining as much as possible of the slash, i.e. residue debris, with the soil: needless to say, this procedure is expensive, is not feasible on steeper slopes, and further exposes the area treated to erosion. The combined effects of such measures, designed to cut environmental costs, on the flimsy economics of American production forestry would be shattering.

The effects of intensive forestry on streams are very conspicuous, and widely remarked upon, especially sedimentation. 'Many rivers now run muddy, especially in spring', and 'Logging is one of the most serious sources of water pollution in the Pacific North-west' are constant themes.

> The Forest Service has largely ignored stream protection, with the result that logging operations have resulted in siltation and erosion. Often large expanses of streams are affected, their protective canopy removed, logs skidded through their beds, with the result that water temperatures are increased significantly, to the detriment of trout and other cold-water fish. (Tepfer, p.276).

A detailed study of the effects of logging and road construction on an aquatic habitat, that of the South Fork Salmon River, Idaho, has been made by Platt. It was found that

> much of the [river's] accelerated sediment accruement is due to landslides and slumps, which are generally associated with intense

climatic storms coupled with disturbed lands mainly from logging and road construction . . . The bedload sediment, because of its predominance and characteristics, is the major factor responsible for destroying the [river's] aquatic habitat. . . .

The data shows that salmon are not capable of eliminating the required amount of sediment from the egg incubation areas that would result in good permeability. . .

Sediment damages the . . . aquatic habitat by lowering the permeability of the materials in the spawning areas. Based on findings in other studies, it is doubtful that embryo and alevins in the spawning gravels are getting an adequate supply of oxygenated water due to heavy sedimentation. It also eliminates rearing and overwintering areas, reduces food and production, and forms blankets of impenetrable sediment (to movement of alevins and water) over salmonoid production areas. Following the December 1965 storms, spawning areas were blanketed with up to four feet of bedload sediment . . .

The harvest and resulting road construction of 325 million board feet of timber removal from 7 percent of the area caused the majority of the aquatic habitat degradation. It will take the river an estimated 85 years to again gain reasonable conditions, but could brought back under a minimum rehabilitation program in a reasonable length of time for $5,500,000. (Platt, pp.114-5).

Not only aquatic habitats are destroyed, other habitats[1] are drastically interfered with by much intensive forestry, and in the North-west clearcutting is a constant precursor of animal problems which can be avoided where selection is used. (Cf. Evans, p.85.) Hooven has studied the population changes in small animals resulting from habitat modification by clearcutting and burning in western Oregon.

Shrews, chipmunks, red-backed voles, snowshoe hare and squirrels are among the more important forest dwelling animals. After the timber is removed, . . . red-backed voles and squirrels [which] require a forest habitat [disappear]. Shrew density declines to about half that in the forest if slashings are left on the clear-cuttings [usually they are not]. Chipmunks are absent in fresh clearcuttings, except for those occupying areas near the forest edge.

Prescribed fires [also cause high mortality]. Although many animals die of heat prostration, asphyxiation, or burns, the burned units usually contain only 50 percent fewer small mammals.... Small-mammal populations continue to increase [again slowly] on clearcut units as the density of vegetation continues to increase ([1], p.213).

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1 Several wildlife problems in North America have however no very clear parallel in Australia, most notably big game management. For example, in Wyoming 'the basic problem [for game managers] has been an apparent loss of the major portion of the resident elk population. . . . The timber roads have opened vast stretches of this land and thus brought unbearable pressures on segments of the elk, moose and sheep populations.' (Turner, p.570).

This is part of Hooven's so-called 'wildlife brief for the clearcut'; but in fact [1] is primarily a report on changes of fauna and flora populations as a result of staggered patch cutting,[1] in this case logging of fairly small cuts, 30-60 acres, of Douglas fir, distributed in a patchwork fashion in uncut forest. Obviously what holds for fairly small patch cuts within forested areas does not extend to extensive cuts of 1,000 acres or more, for bad ecological effects tend to be magnified with increasing area clearcut. Yet in Alaska 'some cuts exceed 3,000 acres, and many are over 1,000 acres' (Merriam, p.593).

If logging is too extensive some threatened species may well be lost. For instance the habitat of the now rare ivory-billed woodpecker is destroyed by logging, but its remaining areas of occurrence are not being protected from logging (p.148).

> Timbermen and foresters insist that the practice of clearcutting opens the woodlands, increasing the growth of herbs and shrubs for game; the Forest Service publishes color propaganda brochures giving the impression that 'deer' [for Australia substitute 'kangaroos'] and 'game' are synonymous, failing to mention that when one species moves in there is apt to be a mass exodus of many other species. The key idea in forest wildlife management is diversity of habitat, yet vast areas that once supported mixed forests are being reduced to 'even-aged' stands with few plants desirable for game . . .
>
> The grizzly bear and wolf have been wiped out of the forests; the elk is confined almost entirely to the Western States. (Conley, p.150).

In short, the US Forest Service prefers to ignore the adverse effects of clearcutting on many species of wildlife and makes much of the temporarily improved situation for deer, just as local forest services discount adverse effects on arboreal and other animals and even claim that the conditions are improved for animal life because they are temporarily improved for a few macropods.

> Many wildlife forms decrease or altogether disappear under even-aged management with 'clean' logging, i.e. removal of snags, culls and downed logs. A partial list would include squirrels, marten, fisher, raccoon, sparrow hawk, owls, bluebirds, nuthatches, woodpeckers, chickadees, creepers, and other insect-eating birds. It is taken as an axiom that the variety of wildlife is dependent on the variety of forest cover . . .
>
> After the final clearcut step, it is true, there is a temporary increase in deer, rabbits, and mice, and sometimes elk, but all these, and others, including chipmunks and bears, both of them insect-eaters, and seed-eating birds, are basically undesirable from the tree farmer's standpoin especially during the early stages of forest regeneration. When poisoning programs are resorted to, other forms of wildlife, including those already hit by evenaged management, are further depleted. Chemical brush and insect control measures and forestland fertilization schemes will finally remove any possibility of adequate fish and wildlife preservation on lands dedicated to fiber production. (Eisler, pp.534-5)

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1 *'Patch cutting* – A modification of the clearcutting system developed in the Pacific Coast region of North America whereby patches of about 40 to 200 acres are logged as single settings, separated for as long as practicable (preferably until the regeneration is adequately shading the forest floor) by living forest, so as to secure optimum dispersal of seed and to avoid the high hazards of large continuous areas of slash, particularly as regards fire and insect pests' (p.703). In *small* patch cutting *much* smaller areas are cut.

Both Dahlsten, a professor of entomology, and Stocking, a biology professor, emphasize further ecological costs and risks of such intensive forestry practices and of forest monocultures in particular.

> The current trends in forestry toward even-aged management, mechanical harvesting, fertilization, and pressures for intensification of management [and]... The trend toward monocultures will create problems similar to those faced by entomologists and pathologists in agriculture. Along with this will come the need for increased use of insect control techniques (perhaps chemical insecticides) and the use has created some of our most severe environmental problems. (Dahlsten, p.650)

> It is well-known that pure stands of even-age timber are much more susceptible to insect and disease damage than are mixed stands. Monoculture, whether practiced by farmers or foresters, provides ideal conditions for insect species to become scourges, and for fungus and other diseases to reach epidemic proportions.
>
> Species planted outside their normal ranges typically lack their normal biological controls as well as the strength they have in their natural environments. When insect infestation or fungus infection strikes one tree, every tree is threatened and whole stands may succumb. I have observed essentially this happen in the ponderosa pine plantations which were planted following the McGee Burn in the Sequoia National Forest in California. Here the pine reproduction weevil took a dramatic toll. (Stocking, p.636)

At this stage it is important to distinguish among silvicultural methods — and particularly among different costs of even-aged silviculture, where the forests or units each consist of overstorey trees having at most relatively small differences in age — as some methods are much more environmentally hazardous than others. Even-aged management need not involve clearcutting, and clearcutting may not be followed by a forest monoculture; but the trend both in USA and in Australia is towards even-aged management achieved by clearcutting followed by a planted or directly seeded forest monoculture. There are however three commonly recognised and applied methods of even-aged management, each with variations, namely the shelterwood methods, the seed tree method, and clearcutting followed by planting or direct seeding (see, e.g. Davis [1], p.392, or almost any standard American forestry texts). The first two methods are both claimed to be rather more expensive than clearfelling, as they involve two cutting or culling operations; they are sometimes alleged to be less effective in obtaining regeneration of the desired species; and they limit changes in species and genetic improvement. Thus clearcutting is strongly favoured over other methods of even-aged forest management for commercial, and associated efficiency, reasons, because it leads to highest wood value production of the desired type; and so it is strongly advocated by the forest industries (see, e.g., industry statements in USA [2]) and hence by most foresters. The real basis for intensive forestry practices based on clearcutting and forest monoculture is a narrowly commercial one. But many of the very features which lead to these practices being so highly favoured are those which are environmentally most costly.

> It is clear that intensive timber management — tree farming — of our National Forests will have an adverse impact on other forest resources, including the soil, water quality, wildlife, scenery, and recreation. The characteristics of intensive timber management are: a greatly increased density of roads, up to five miles of road per square mile of forest land; even-aged management [usually] (monoculture) [for example] of Douglas fir, rapid liquidation of old growth stands, 'clean' logging, chemical brush control, chemical control of insects and tree diseases, chemical (poison) control of seedeating and browsing wildlife, chemical fertilization, and the development of 'supertrees'. The short range effects

of many of these management practices are all too obvious, e.g. the effects on scenery, and are serious enough to give a prudent land manager reservations about their use. But the forest research people are unable to predict the long-range effects of any of them on the soil, water quality, fish and wildlife populations, or the timber resource itself. In most cases, they can give only speculations based on inadequate data . . . Someone has termed it 'Russian Roulette' with our public forests. There is no possible justification for such a gamble with resources held in the public trust. (Eisler, p.534).

Clearcutting[1] and forest monoculture simply provide especially conspicuous cases where forestry takes environmental shortcuts in maximizing its organisational interests; and they reflect the swing of forestry practices to less and less environmentally satisfactory methods.

Logging practices and some silvicultural practices should be re-evaluated. Clearcutting in large blocks tends toward a monoculture and creates many entomological problems. In many cases, it is necessary to reseed and then it is necessary to treat seeds with various chemical toxicants. . . by reducing the allowable cut that many entomological problems can be solved. . . Practices such as removing 'snags' (dead trees) as fire hazards or human hazards must be reevaluated too. From my research work as well as from other studies it is being shown that hole nesting birds play an important role in forest ecology. Removal of all the dead trees removes all the nesting sites and very likely reduces the bird populations. Clearcutting would have the same effect. The birds involved are several species of woodpeckers and then several species that use old woodpecker holes such as mountain chickadees, red-breasted nuthatches, white-breasted nuthatches. These birds are primarily insectivores and their diets include many potential forest insect pests. . .

[But] the forest as a living unit must be stressed so that insects are not always thought of as pests. . . A general public that has been inundated with information on the harm that forest creatures cause are not going to be sympathetic to virus programs, parasite releases or even bird protection programs. A dead tree, for example, is anathema in forestry but to woodpeckers and other hole-nesting birds (chickadees and nuthatches) these trees are nesting sites. The Europeans have been aware of the value of small hole nesting birds for years and have large nesting box programs to encourage them. Only recently have these small birds been considered in detail as important predators of forest insects. . . The mountain chickadee eats many potential forest pests and the role of woodpeckers with bark beetles has been known for years. What does cutting snags or clearcutting do for these birds? It can't be beneficial. The forester of today doesn't

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1

Serious doubts about the soundness of, or opposition to, large clearcuts, as distinct from opposition to small patch cuts, is by no means uncommon among American foresters (even some as mainstream as Crafts [1]); and reservations about the method even extend to Australia (cf. Higgins and Phillips [2], p.40). The mainstream conservation position on clearcutting is more clearcut:

care but the future will have to bring ecological consciousness and a realization that in a mixed, uneven-aged forest there are many natural forces working. The even-aged forest will mean headaches for all in the future. The forester and entomologist must learn to take advantage of the animals that work for him such as the birds. . . small mammals have been greatly neglected as insectivores. Is the forester taking advantage of a small mammal's insect-eating habits when he treats seeds with endrin?

Forest entomologists must begin to study the impact that forest insects have on stands of trees — what insects are pests and deserve attention and what phytophagous insects can be forgotten about. The economics of phytophagous insects in the forest have never been treated. With some of the control programs (bark beetles, gypsy moth, spruce budworm, etc. etc.) the cost over the long term objectives of forestry isn't justified. . . Cost of pest control is a critical factor in forestry . . . The control agencies have not established economic levels for their pest insects and it is never considered whether a particular insect is a pest or not. Generally, then, most, insect control projects are merely military-type exercises in killing some insects .. .

With respect to insect control, alternate methods to chemical insecticides must be sought. Broad spectrum chemicals tend to simplify areas biologically and tend toward ecological instability. (Dahlsten, pp.650-660; our rearrangement).

There are still further ecological objections to clearcutting and monocultural practices as opposed to selection management of natural forests; e.g. selection methods avoid windthrow and extensive damage of forests from ice-storms (p.35). It follows, assembling the ecological and other evidence, that *multiple use on US forests is a myth,* a major theme in fact of conservation contributions to USA [2] (see e.g., p.589 on Alaska, 'multiple use in the Tongass NF is a myth', p.357 for Wyoming, p.112 for Idaho, p.292 for Montana, pp.134-135 for the northern mid-west states, p.35 for West Virginia, etc.; only criticism of south-eastern forestry by people from the region was conspicuously missing). Chapman captures a commonly expressed view (pp.112-113):

> Present multiple use plans are not meaningful. These are largely window-dressing because of inadequate inputs on the part of resources that are inadequately financed. Thus timber management and roads that are built primarily to get logs to the mill are financed at a relatively high level. Fish and wildlife staffs, which are at the other end of the funding scale, do not get enough funds to inventory those resources and to participate fully in the planning and management of the area . . . No powerful, well-heeled lobbies support budget requests . . . to get money for recreation, fish and wildlife, or even watershed work, where social benefits are difficult to identify.

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1 (Continued from page 177)

. . . only in unusual circumstances, and only after much careful research should any clearcutting be done; that even this should be done in small blocks of a very few acres; and that in order to prevent serious land destruction it should be done where there is almost no slope, that is, on essentially level land. (Stocking p.636)

The US forest service is largely but not entirely responsible however for the fact that timber production is grossly over-funded in comparison with other forest roles, and that commercial matters such as range and (in part) water management are better funded than wildlife protection — in the way that the following table reveals.

TABLE 17
MULTIPLE-USES IN US FORESTRY
(Appropriated funds, in millions of US dollars, 1969)

	Timber	Recre-ation	Wildlife habitat	Range	Water	Other single uses or benefits for all uses
National forest protection and management	52.3 19.4	35.2	4.6	6.2 3.3	6.3	4.6[1] 6.8[2] 29.2[3] 6.9[4]
Water resource development	----------	----------	----------	----------	3.6	----------
Fighting forest fires	----------	----------	----------	----------	----------	4.3
Insect and disease control	11.3	----------	----------	----------	----------	----------
Aquisition of land	----------	----------	----------	----------	----------	----------
Forest and range management research	10.5	0.98	1.3	1.4	4.4	----------
Forest protection research	4.8 2.8	----------	----------	----------	----------	3.8[3]
Forest products and engineering	9.3	----------	----------	----------	----------	----------
Forest resource economics research	6.2	----------	----------	----------	----------	----------
Construction	----------	9.1	----------	----------	0.54	5.8[5]
Forest roads and trails[6]	120.0	46.0	----------	----------	----------	----------
Total	235.7	91.3	6.0	15.6	14.8	61.4

1 Mine claims, special uses

2 Land classification

3 Fire

4 Fire, general

5 Fire, research land aquisition.

6 This figure was not broken down in the Forest Service Information Digest (No.18, July 23, 1970) which was the source of the other figures. Region 2 supplied the breakdown which the Washington office gave them.

Source: Hicks, p.588.

For the years 1963-70,
the Forest Service got 95% of the funds it sought from Congress for timber sale activities in all the national forests, but only 40% of the money it asked for re-forestation and timberstand improvement. Likewise the other required uses of the forest system got shortchanged. Recreation got only 4% of the

> funds requested, wildlife management 63%, soil and water management 52% and range management 81%. (Risser, p.355; further details are given by Stoddard, p.134).

Obviously the funds requested for wildlife and ecological matters generally are small in comparison with those sought for wood production purposes. The further responsibility for the funding situation can be traced back, as both Chapman and Risser remark, to the timber lobby and its backers in Congress. The imbalance in funding is hardly a new phenomenon, however; and the swing away from largely accidentally achieved multiple use with the widespread move to intensive forestry is something that can be blamed squarely on the forest service, as a differently oriented service would have continued multiple use with the considerable funds at its disposal; it did not have to succumb to industry pressure or to compromise or sacrifice other values in the way that has happened.

> And the regeneration practice of clearcutting-and-terracing constitutes a classic example of single-use, which sacrifices all other on-site values. It doesn't *compromise* other values — it *eliminates* them for the time it takes the *diverse* vegetation to become established. (Bolle, p.182)

Another major conservation theme, connected with the theme that multiple use is not being practiced, is that *much-needed research,* especially on ecological issues, ***has not been done*** and is not being done (e.g. p.179, p.534, p.641, p.659). Much of the clearcutting has occurred

> without prior studies as to its effects on wildlife habitats, watersheds, fisheries, grazing and recreational activities (Turner, p.570).

Hooven, in [1], admits that 'little is known as to how clearcutting affects the various species of birds' and

> how changes in the physical environment affect biota is still being studied, because the physiological requirements or tolerances of plants and animals are still largely unknown. Changes that benefit some animals impair others.

In USA, as in Australia, forestry research has largely been silvicultural research, and this research has followed commercial dictates:

> . . . research has been related to harvesting what is there in the cheapest way, and growing what is believed to be the most desirable species most quickly (Crafts [1], p.14).

In research as elsewhere the wood production ideology prevails.

What is even more striking than the ecological parallels are the economic parallels and the similarities in forest service orientation and ideology. On the economic front there are at least the following important parallels:— *The US forest service,* like its Australian counterparts, *often operates at a loss, and subsidizes the forest industries.*

> [Americans] are in effect subsidizing environmental deterioration by subsidizing a marginal lumber industry, whether it is the smoke billowing down the Wind River Valley from Dubois or the thin top soil that gullies and washes off each spring from 'clearcut' mountain sides (Risser, p.363).

It is quite certain that Americans are losing in the wider economic sense: but it looks as if they are frequently losing even in a narrow commercial sense.

> While profits have drifted elsewhere, the American public has burdened much of the cost of road building, sales management and replanting (Turner, p.570).
>
> Situations have come to my attention where the cost of timber sale administration and site rehabilitation have actually exceeded the revenues derived from the sale of timber, but because of the separated budget categories comparative analysis is difficult (Stoddard, p.134).

Cases abound:—

> . . . in the case of clear-cutting, terracing, and planting on the Bitterroot the costs clearly exceed the expected returns from timber. To be a viable practice, therefore, it would have to be justified on the basis of returns from other uses. However, when we examined wildlife we found no additional benefits but instead actual additional costs. There were clearly no esthetic benefits, only additional costs and lasting scars. From a watershed standpoint there is danger in case of unusually severe storms. And, there appeared to be no benefits to range. So, not only did the non-timber uses and users suffer *costs,* but there were no added *benefits.* (Bolle, p.179).
>
> Because the Wyoming-type timbering operation is marginal in profit returns to the lumber industry, the industry would not be interested in operating in the state if it had to bear the costs of regeneration. In Wyoming therefore, the Forest Service is very much nursemaid . . . to the lumber industry . . . It is the public that to an undetermined extent is subsidizing an intrusion upon and devaluation in some of its best future recreation lands (Risser, p.361).

In fact the point appears to apply fairly generally.

> One disturbing aspect of many of these sales is the incredibly low price that is often paid for public timber . . . [many] values will be destroyed. . . and the public will hardly even get a return to its treasury, for the sale of its timber (Evans, p.83).
>
> Private lumber operators[1] are . . . subsidized by the public taxpayer - with public timber supplied at a stumpage price below the cost of production' (Bolle, p.185).
>
> The various rates at which the Forest Service offers timber for sale — particularly 'distressed' timber — are absurdly low if one considers the amount of *land* that is involved in addition to timber. The rates do not reflect the amount of land itself given over to one purpose. The Forest Service bears many costs of the operation, not excluding much of the road development and all of the regeneration. What the net bill to the public is is everyone's guess but it must be substantial. Suffice it to say that the highly favourable treatment it gets on public property makes lumber industry activity the public's business (Risser, p.361).

As in NSW and Tasmania regeneration and thinning cuts are put off for as long as possible with a view to minimizing apparent commercial losses;

> the Forest Service in recent years has fallen into the clutches of the timber lobby . . . Today it is 5 million acres behind in reforesting previously logged public lands, another 13 million acres behind in badly needed tree-thinning and other timber-stand improvements. Edward P. Cliff, chief of the Forest Service, admits that the total cost of wiping out this backlog would be a staggering $900 million (Risser, p.354).

Subsidization is frequently channelled through roading costs.

> [In West Virginia one finds] the construction of so-called scenic high-ways through the middle of our natural areas, which in fact are poorly disguised attempts to get at more coal and timber (Barb, p.65).
>
> In the proposed Siskiyou Wilderness Areas, California, another super-road (cuts and fill construction, two lanes, etc.) [will] be rammed

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1 'These people seem determined to have us say things we neither say nor believe' (The Bolle Committee).

down the high crest . . . [to] be built out of recreation funds, thus attempting to hide its real purposes . . . What I have described is no isolated miscalculation. It is happening everywhere . . . South of the Siskiyous proposal another trans-forest highway the Gasquet-Orleans Road (connecting extensive virgin areas in the Six-Rivers and Klamath Forests) is being built at great expense to the land and the public's pocketbook, to log not only the Siskiyou wilderness area but other extraordinarily steep and erosive country which now has only a few roads and is still beautiful. Again and again, the problem is locked into the commitment to take the trees. Considering only about 25% of the planned road-net is built in some of these forests, and noting that bigger and more insensitive equipment is being used all the time to construct them, the next 75% of roads will turn northern California's north coast into a disaster area (Van de Mark, p.643).

In steep mountain terrain such as the Bitterroot, the roads leave scars visible for miles, they cause erosion and affect our wildlife. The Forest Service seems determined to get a road into every drainage as fast as possible. . . . The cost of these roads is high. The Forest Service engineers the roads and determines the cost without reference to a figure for profit, since there is not supposed to be any. The lumber company builds the road and receives the cost of the road in credit towards stumpage . . . . For example a [timber] sale may be for $130,000. From this, the cost of the road, say $96,000 is deducted. In actual fact, the cost of the road to the company may not have exceeded $30,000. The Forest Service then deducts its own costs of administration. A small residue, perhaps a few thousand dollars, *may* remain for regeneration. If the first attempt at seeding or replanting trees should fail, there is no more money and the aftermath of this particular sale will lay unrepaired. The government has not netted anything, except for a bare mountainside, laced with roads which the taxpayer never wanted in the first place . . . [Moreover] most of the roads in the Bitterroot are overengineered and overbuilt. (Schloemer, pp.667-668).

Not only are stumpages inadequate, there are tailor-made sales, special favours, and collusion.

It appears that timber sale prices are adjusted or reduced when necessary to protect the local economy. [In a case where the stumpages fell, in effect, from $28.27 to $2.30 within a year] the only essential difference we could determine is that the lumber companies in the lower priced instance were having difficulty staying in business (Henault, p.125).

In contracting to sell timber to commercial loggers, the Forest Service sometimes under-appraises the value of the timber. Particular sales are often tailored to the needs of an individual lumber mill. There is collusion between lumber buyers in bidding on government timber (Risser, p.355; see also p.357; and testimony as to tailor-made sales and collusion, pp.666-668).

There is a potentially scandalous situation too in the way the Forest Service sells its trees to the timber industry. A previously unreleased study by the Forest Service's northern regional office — obtained only after repeated requests to the agency — documents numerous instances of questionable price appraisals of timber . . . In one instance . . . Forest

> Service officials set up a planned timber sale to meet the needs of a particular timber buyer . . . Then there is the problem of dishonest bidding . . . Robinson charges that the Forest Service bases its timber appraisals on statistics supplied mainly by industry, with a generous profit margin of 12 per cent or more figured in. Even with these favourable prices, 'buyers of national forest timber frequently agree among themselves in advance of bidding to keep prices under control.' Robinson's complaints are borne out by Forest Service and industry sources. One Montana timber company buyer said privately that 'Certain types of sales are set up to help certain companies'. . . (Risser, p.356).

As in Australia, so in USA, there is censorship, blockage of information, and pressure to conform on public service members.

A useful account is given by Brandborg of 'the influence of special [private commercial] interests that resulted in the appeasement policies that so completely dominate national forest administration' (p.71). Verbal instructions were given to forest service employees to avoid regulatory actions in favour of appeasement, and 'field forces received verbal instructions to destroy a publication . . . prepared by the Forest Service [describing] regulatory and other means for achieving full production of all forest lands.'

Stoddard, a forest resource consultant, remarks (p.136) that efforts to suppress reports – of research by fisheries biologists, hydrologists and a soil engineer which has 'blown the whistle on the terrific damage being done by clearcutting on steep slopes (slides), on damage to stream bottoms from skidding logs and general erosion, and siltation by mindless road building – have not been successful. The President of the University of Montana received a few letters suggesting that he censor the Report of the Bolle Committee (p.178).

> We in the Idaho Environmental Council have been approached by countless frustrated public servants in the Fish and Wildlife Service, the Forest Service, and other agencies responsible for the stewardship of our public lands, who complain that they cannot do their jobs properly, and cannot speak out publicly because of these pressures. (Henault, p.124)
>
> Again, as in almost everything, the Forest Service decides as to which areas they report on or log by internal doctrine indecipherable to the general public (Van de Mark, p.641).

The anachronistic free good approach to timber resources persists (along with state boundaries).

> We have exploited our land as if there would always be more of the same resource beyond the horizon . . . We have reached the horizon where we can see that our conduct under this philosophy has not been free, that it will cost us many billions of dollars and many years to undo that part of the damage that can be undone. Much of it, of course, can never be undone. . . . Much of the problem . . . is inherent to our capitalist system in which various profit-making interests must compete. It doesn't pay to stay behind and plant new trees when there is more to cut on the next hill; and it especially doesn't pay if the other guy has already moved on . . . regulations are going to have to go across state boundaries . . . We cannot solve our problems with laws that require the miner in Idaho to spend 10% of his profit restoring the land while the miner in Colorado is required to spend

nothing. Where we have existing regulations, they must be continually up-dated to cope with the changing technology and man's changing ability to alter the land (Henault, p.123).

The parallels continue in the larger orientational and ideological issues. *The forest service is excessively oriented toward wood production;* something that appears, for example, in its policies, staffing and funding.

> . . . the policy of the Forest Service towards [other] values — particularly the value of wilderness — seems to have been one of maximum exploitation of . . . resources, with the overwhelming emphasis on timber . . . an overwhelmingly excessive emphasis and concentration on the extraction and exploitation of the timber resources in the national forests has resulted in many individual instances of severe damage to watersheds, to wildlife habitats, and even to productivity of forest soils themselves (Evans, p.81).
>
> Getting the logs out comes first (p.354).
>
> The problem is not, as is so often stated by both the Forest Service and the timber industry, simply a matter of getting more funds for more staff to supervise timber sales. Timber is already grossly overfunded in comparison to all the other multiple use values of our national forests; timber sales and administration and logging roads get far more money in the yearly budget than most of the other uses combined. More money will simply mean more logging, not less; and most of the examples of the disastrous impact of such logging on other values comes from sales which were supervised, and which were laid out with full knowlege of the Forest Service that there would be environmental problems.
>
> The problem goes deeper — far deeper — than mere financing. It goes to the very roots and basic philosophy of the Forest Service itself. It goes to what appears to be the inherent philosophy behind the forestry profession as well. This philosophy may be perhaps best characterized by a pervasive feeling that if there are big trees which can be economically cut, they should be cut. The first emphasis is on cutting and logging, and other values are attempted to be fit in where they can be. This is called 'multiple use' planning; but it is the farthest thing from it. The American people have paid a terrible price in terms of damage to their forests already. (Evans, p.85).
>
> Many in the forestry profession moved away from ecological silviculture, in favour of economically determined maximum cellulose production. . . . The public is beginning to realize that when some foresters are turned loose to 'manage' a natural forest ('vegetative manipulation' is the pseudo-scientific term now used), they are simply rationalizing industry's demand for a fast dollar return (Stoddard, p.136).
>
> Forest Service professional staffing is lopsided in favour of timbering and road building [91% of the professional staff in Region 1] (Henault, p.125).
>
> We know the inadequate funding of the Forest Service for every activity except timber management and the overemphasis of . . . the administration of the Forest Service for timber management at the expense of other vital factors such as wildlife and watershed management (Barb, p.65; see also Stoddard, p.134).

The forest service is prostituted to industry.

> In the middle 1940's, the leadership in the Forest Service and other public land agencies capitulated to the timber barons and other economic forces. . . ."Most of the money is going into timber harvesting, and very little into the other uses of forest land. We are overcutting. We are far exceeding the sustained-yield capacity of the timber lands to produce. The pressure," says Brandborg, has come from the timber and housing industries and presidential directives to cut down more trees. Through it all, the Forest Service has silently complied and "has betrayed the public by not telling them what is happening" (Risser, p.355).
>
> [Forest Service] officials at all levels tend to identify with the extractive uses of the forest resource rather than the vast majority of the public which sees other values in the forest (Evans, p.91).
>
> Multiple-use and other resources are secondary in importance to the sawlog forester. Empathy with loggers and, where grazing is important, with livestock graziers, stems partly from Forest Service policy, as part of the Department of Agriculture, to promote development of rural areas . . . in spite of the fact that the bulk of the American population . . . resides now in urban environments. As long as the sawlog forester is in power, aided and abetted by an industrial lobby and local commodity interests, the single-use sawlog philosophy will tend to perpetuate itself . . . A new generation of men who can think of the total environment cannot break into the power structure. . . . one way to quickly break the system is to place the Forest Service in a National Department of Environment or Ecology; in any case to remove it from the direction of the Secretary of Agriculture. (Chapman, pp.100-101).[1]

As it is the forest service has become'a classic case of a regulatory agency being governed by the industry it should be regulating' (Evans, p.356).

1

> Chapman also asserts that 'another way to break the system is simply to kill the allowable-cut concept. Heavy pressure to meet the allowable cut comes from industry'. This method, even if it would work, is not directly applicable to Australia as no such quotas are imposed on most local forests; however it suggests that the appealing idea of stopping overexploitation (if not changing the system) simply by imposing strict quotas well within sustained yield (of values) limits is not quite as straightforward as it may initially seem. Certainly in Tasmania a rudimentary quota system has done little to prevent forest exploitation as quotas are set too high.
>
> The strategy of transferring Australian federal forestry organisations from the Department of Primary Industry to the Department of Environment and Conservation, when this is sufficiently large not to be swamped by forestry interests, is also worth some consideration.

Industrial pressures force excessive cutting and hence clearcutting and intensive forestry.

> A couple of years ago a task force appointed by the President put the question to the Forest Service of what the demand will be for lumber and plywood some 10 years hence, under three conditions. One. . . that prices remain as they were from . . . 1964 to 1967 level. Second, at a level 30% above that, where they were in 1968; and third, on that second price level, on the assumption that it would increase at the rate of 1% for the next decade. The answer to the first question was the demand would be 18 billion feet more for that period of time. The answer to the second question was 6 billion feet more. The answer to the third one, it would continue at about the present level.
>
> This translated means that *if prices are allowed to seek this level, there would not be any substantial increase in the sale of lumber and plywood.* Industry, however, took the word 'demand' to mean requirement, and is using this as a basis for trying to stampede Congress into appropriating funds to justify further increasing the sale of timber from the natural forests' (Robinson, p.95).

But the extra cutting industry demands cannot be sustained without resort to intensive forestry practices (p.94; and as explained shortly).

> My concern rose when I realised that if the mills wanted to increase their capacity, it appeared that the timber just happened to increase its growth at the same rate. . . . the increase is due to pressure group tactics and a lack of understanding by the Forest Service, rather than in a form of better timber management (Schloemer, p.667).

The influence of technology and the new mechanisation is also too powerful.

> Another major source of pressure to monocultural clearcutting has come from developments in logging technology. Within the past decade-and-a-half, forest harvesting has shifted from equipment that could leave hillside watersheds and residual trees undamaged, to mass production 'take-everything'. The results have been clearly documented in a number of research studies: gouged out stream-bottoms, sliding mountainsides, unnecessarily wide-sweeping roads going nowhere but to a log deck, and silted streams damaging to fish populations. If trees are re-planted in such areas (and they usually are) they often dry out and die in the barren exposure or if they live, grow up to form an even-aged monocultural biological desert. . .
>
> Use of less damaging equipment adapted to the shelterwood and selection systems, or to small patch cuttings, would avoid this while protecting the forest environment and still yield forest crops. Conservative forestry is still being practiced in many places. I have done so on my own forest in Northwestern Wisconsin for thirty-two years.
>
> . . . with the tendency toward specialization, the fascination for new technology in timber harvesting and the recent emphasis on economic efficiency to fit the computer, forestry colleges dropped their ecological bent. Emphasis now is on growing wood cellulose for industry, and graduates have little inspiration or background to deal with *environmental problems* which *require a background in social sciences* (Stoddard, pp.136-7; our italics).
>
> That the forest service should now be employing methods that are reminiscent of the timber baron era [of the nineteenth century]

> is not satisfactorily explained by the development of new insights into forest management but seems, rather, an accommodation to a new far more powerful technology. It has been mentioned that the economics of lumber production are marginal with profit-taking on the low side. What has caused a striking acceleration in timber-cutting in Wyoming in the last few years is the application of machinery – not new and more promising techniques of forest mangement – to the problem of making timber cutting in Wyoming of more interest to the industry. Specifically, 'clearcutting' on a vast scale has become possible thanks to machinery developments over the last generation which make it possible for trimmers to upend as much as 1,500-1,800 trees in the course of a day, thus leveling a timber stand over hundreds of acres in a surprisingly brief interval. The machinery involved [e.g. oversize logging equipment, p.35] is not adapted to selective cutting (Risser, pp.361-2).

It is not surprising then that heavy machinery producers form an important part of the forest industries lobby, and are major advertisers in forestry journals. The forestry temptation to use heavy high-powered machinery, everywhere, has to be resisted. As Risser points out (p.364)

> adaptiveness in a technological society requires knowing the limits to which technology is beneficial, and the point at which our hands must be raised in the silent message: 'No not here; this land, this forest, this river, this lake are for other purposes'.

The forest industry's structure is being shifted in favour of larger companies. As in Australia, smaller operations such as local sawmills are often condemned as uneconomic, and there is pressure, not for their elimination of course, but for their amalgamation in favour of larger integrated mills, and much talk of economies of scale. The process is assisted by differential stumpage rates and better deals for larger operators.

> [In California] the Forest Service has had difficulty in marketing trees from [sanitation and salvage] sales . . . It appears that lumber companies are most interested in the large block, allowable cut sales and can afford to wait for them. . . This means that the Forest Service, as the major forest landowner in California, has saturated the market to the point that only large land areas involving large volumes per acre are economical to harvest. . . Forest Service sales have favoured the large operators over the small ones. (Dahlsten, p.657)

There is overexploitation of the forests. Overcutting of private forests, many of which are currently exhausted, has led – because of the cheapness of the wood the forest service is keen to supply – to industrial pressure on the national forests. Though the amount of timber cut in USA has remained roughly constant, 'timber cutting on the national forests has more than doubled since 1950' (p.353); hence the many violations of the 1960 Multiple-Use Sustained-Yield Act. The allowable cut (or maximum quota that can be cut in a given period) on national forests, imposed to ensure among other things a sustained yield, is often exceeded. For example,

> Forest Service figures set the timber industry's 'allowable cut' – in the Bitterroot forest at 50.3 million board-feet a year, a figure that was exceeded in actual cutting by 6 million board-feet in 1968 and by almost 13 million board feet in 1969 (Risser, p.354).

Moreover the allowable cut on many forests has been vastly increased, e.g. for some Oregon forests from 500 million board-feet in 1937 to 1,170 million board feet in 1970, with actual sales escalating as high as 1,708 million board-feet in 1970 (Robinson, p.97); for

> as a result of political and economic pressures from the timber industry,

> the annual allowable cut now greatly exceeds the annual increment of growth (Tepfer, p.276).
>
> These increases have not been earned through improved forest practices or enhanced growth but rather have been achieved though application of a long dismal series of rationalizations invented to justify appeasements of the timber industry and to obtain increasing appropriations from Congress (Robinson, p.97).

Robinson discusses in detail several strategies by which the Forest Service has rationalised the overexploitation of the forests, through excessive logging that it permits; in particular (i) the reclassification of forest lands, e.g. the service recently changed the definition of 'commercial forest' land from land capable of producing 25 cu. ft. of wood annually to land capable of producing 20 cu. ft.;[1] (ii) the enlargement of management units, by gerrymandering working circles, thereby increasing the allowable cut in readily accessible high quality areas on the strength of inaccessible timber or timber growing on steep slopes; (iii) the shortening of rotations, by calculating rotations to maximize pulp production rather than sawn timber, thereby increasing the cut allowable to sustain yields; (iv) the numbers game, namely selling timber under one standard of measurement, while computing future yields under another; (v) the switch to clearcutting and even aged stands, to maximize volumetric production; and (vi) the anticipation of plantation yields, i.e. the service immediately increases the cut of old growth timber on the strength of estimated growth rates applicable to future plantations without waiting for the growth to actually occur. According to Robinson there are cases where the US forest service has in fact sold far more timber than is available, e.g. in Alaskan forests.

However the situation may well get worse rather than better: 'The Nixon administration has recently announced a plan to increase the annual timber harvest by 60 percent . . . by 1979' (p.353, also p.90).

The forest service, in striving to augment its empire, opposes the dedication of wildernesses and parks. Forest service organisational aims, self perpetuation at least and substantial empire building if it can be achieved, very often work against the best interests of public lands.

> In Idaho . . . we see the Forest Service lobbying against a national park because it would mean the loss of land to manage. We see it by timber sales in a de facto wilderness area that, if classified by Congress as a wilderness would mean the loss of responsibility. . .
>
> One of our biggest complaints about the Forest Service is the 'foot-in-the-door' approach for our de facto wilderness areas (Henault, p.124 and p.126).

Vast areas of de facto wilderness have been lost to logging (p.89). Forest Service tactics are either to make timber sales on wilderness areas or to have these areas so classified, e.g. as primitive or limited areas, that logging can still be carried out.

> The Forest Service . . . avoids talk of wilderness wherever there is potential timber. Rocks and ice they'll be glad to classify as wilderness, but not trees (Henault, p.126)
>
> Most Forest Service wilderness areas are largely non-forested, or with non-commercial forest, or above the timberline . . . Where [the wilderness areas have commercial forests in them], it did not happen by the conscious decision of the Forest Service to forego timber in favour of other values (Evans, p.87, Similarly Merriam on Southeast Alaska, p.59).

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1 The real forest area in NSW appears to be 'undergoing enlargement' by a similar strategy.

> Clearcutting up to the boundary of a wilderness area or other protected area is a common practice in the Northwest (Henault, p.126).
>
> The U.S. Forest Service has been using public funds to fight, lobby and propagandize against the Sawtooth National Park — National Recreation Area complex. The campaign is similar to the one waged against the North Cascades Park, including private lobbying by the Regional Forester and his staff, press releases implying that a Park would obliterate all existing uses. . . (Henault, p. 127; see also Merriam, p.594)

Hardly surprisingly then, there is also parallel forest industry antagonism toward conservationists;

> the conservationist . . . is constantly accused of wanting to lock up our forests for the benefit of the rich few. Or of wanting to give up our cars and air conditioners and go back to a nineteenth century standard of living (Henault, p.123).
>
> [In similar vein] E.C. Shalts, vice-president of Tree Farmers Inc., of Missoula whose parent firm . . . cuts some 40 million board-feet a year on the Bitterroot, blames criticism on 'people like the Sierra Club, who pose as conservationists but really are damned hard-core preservationists. They always want to tie up commercial timber land in wilderness and take it out of the economy. We can't afford to waste all these resources'. (Risser, p.354)

All these points have already been met: the false dichotomy between total preservation and no preservation; the shift between the narrow sense ('commercial') and wide-sense of 'economic' (and economy), between what helps industry and commerce and what is desirable and increases welfare; and the general fact that Americans are better off not subsidizing the use of such 'resources' as some of the forests of the Bitterroot NF.

Forestry interests try to evade conservation criticism mainly by resort to a set of pseudo-ecological arguments. Despite the impressive array of evidence that clearcutting and other intensive forestry practices have a drastic and bad effect on forest ecology, official forestry persists with the line that these practices are ecologically and silviculturally sound methods which may actually improve the forests, with the new broom, clean sweep and new start analogies, and indeed with all the other tired and largely invalid analogies already shown to break down in chapters 1 and 9, in the Australian case. The US forest service and the Society of American Foresters in the main meet the mass of evidence that clearcutting is not in general an ecologically sound procedure by sheer counter assertion, unsupported by empirical evidence and usually backed only by some variation of the Great Disaster Argument. It is tempting to conclude that the criterion of 'ecological soundness' employed is that of contributing to maintaining the health and soundness of the forest industries rather than the forests. B. Evans, representing the Sierra Club, does a neat job exploding what he calls

> several basic myths which pervade the Forest Service, as well as most of the rest of the forestry profession [namely the] myths . . . that 'clearcutting is a useful tool, and must be done for many species' [that] 'logging actually enhances scenic and recreation values because it gets rids of big old diseased and ugly trees' . . . We know of no recreationists who feel that logging improves a forest: this is only foresters' talk . . . logging does [nothing] but destroy scenic and recreational values.[1] . . . Another myth is expressed in the form that 'we simply must go in and log these areas in order to salvage them before they are killed by bugs or disease.' To hear foresters talk, one wonders how the forests of the Northwest or elsewhere actually

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1 This point demolishes the primary justification of so-called 'enhancement logging'.

managed to survive for tens of thousands of years before they finally came upon the scene. The answer is, that individual trees or patches of trees — will die, but forests do not. Disease and insects are as much a part of the life cycle as are young growing-up trees. Beyond this, it is a rare occurrence when an insect infestation, for example, spreads over a very large area. [At least in diverse natural forests] most are quite localized, and are a normal part of the life process of a forest. There seems to be a mania among foresters — an inability to tolerate any species which feed upon trees, as if their only value is for board feet. (pp.85-6).

The Beetle Argument, a variation on the Natural Disaster Argument, is rebutted in pleasant detail by Risser (p.362):

> Isn't it better, asks the Forest Service, to go into an area where the timber beetle has become epidemic, try to control it by cutting and then leave? Isn't the recreational value of the area actually protected? Isn't the attempt to limit the beetle's spread preferable to the beetle's depredations? Specific answers are:
>
> a. While ugliness is in the eye of the beholder, the fact is that beetle damage, while plainly visible, is insignificant esthetically speaking compared to 'clearcutting'. One can pass through a beetle-damaged timber stand without feeling that havoc has occurred, as is also the case with a windfall of timber. The soil is relatively undisturbed. No work roads sear the environs. Even an area of recent forest fire seems less destroyed than a 'clearcut' area where there are not only heaps of slash but humps and furrows across the landscape left by heavy machinery, uprooted rocks along system roads and, often, signs of serious erosion. The beetle pest in all his potence will never manage a fraction of this devastation.
>
> b. There is no assurance that cutting in marketable stands of timber will control a beetle epidemic. Where the beetle attacks in non-commercial stands of so-called overmature timber the Forest Service is relatively less active in beetle control efforts than in commercial stands. Where the beetle is primarily a threat to recreational rather than lumber values no great urgency towards its control is evidenced by the Forest Service.

The other forestry technique for meeting specific criticism of their activities, also very familiar from the local scene, is the cry of outraged virtue — 'The Forest Service is as fine and responsible a body of men as ever trod . . . etc', 'We were the first conservationists. . . etc.' This type of appeal is strikingly reminiscent of that reaction which is usually evoked by criticism of the defence establishment or armed forces, and does just as little to meet specific criticisms of specific policies; apart from being question-begging, this move is an attempt to turn discussion and criticism of policies into a criticism of the personal integrity or virtue of individual foresters — which is of course a rather different issue. Perfectly legitimate attempts by members of the public to criticise policies, or the system or to influence decision-making are thereby represented as unfair slur on the personal virtue or professional competence of individual foresters.

> . . . Conservationists know we need forest products, but we question the overwhelming commitment in the high elevation, erosive, and low productivity forest areas. As the Bitterroot report noted, that is timber mining. The long term results are of no benefit to a society that is at least planning to stick around a while longer. All the intangible values

are being destroyed; such as water quality; the chance to see the natural life systems as they evolved; a chance for just a *little more wilderness* – that is all we ask for, because that is all we have – to be preserved for recreational and scientific [and other and non-human] purposes (Van de Mark p.643).

Clearcutting seriously diminishes scenic and aesthetic values and impairs recreational opportunities. In USA this is no longer a minor matter, for vast areas of national forest have been clearcut since 1970. In fact an increasing proportion of all forests logged are clearcut; in 1970 60% of the timber harvested in the West and 50% of that in the East was by clearcutting. Largely because of the ruination of scenery and of former recreational opportunities, extensive clearcutting has drawn heavy and increasing public criticism, not just from conservationists but from such a diverse range of people as hikers, fishermen, campers, hunters, tourists and real estate agents. For clear-cut areas look like the disaster areas that ecologically they are.

There are repeated stories of the peaceful walking trail that vanished under a high-capacity extraction road scarred through the landscape and going nowhere but to a logging dump, of the de facto wilderness area that became a network of logging roads and skid trails, of slash and logging litter replacing a picnic ground. Recreation areas, trails, camp sites and scenery are all too often destroyed by intensive forestry practices. In Alaska

> sheltered bays and inlets are usually the best sites for recreation and have the highest wildlife populations. Unfortunately these bays are usually the first to be logged as they provide protected anchorages, good camp sites and contain some of the best stands of timber. Many exceptional bays have already been cut, and I know of no bay in Southeast Alaska supporting significant stands of commercial stands timber which has a classification for resource use other than logging (Merriam, p.593).
>
> . . . the Bridger National Forest proposed timber sale area, like so such of the forest land of Wyoming tier of the Rockies, is of unsurpassed scenic and recreational value. . . . A brief hour or two's drive to the north are the crowded camp grounds of Jackson Hole and beyond are the tent cities of Yellowstone Park. The inevitable increase of tourist visits to the region makes obvious the growing need for dispersal. If this long, narrow strip of forest land has not yet begun to feel the weight of crushing numbers it is nonetheless in an ever-increasing recreational area. It is the Bridger Wilderness area nearby, however, site of 88,900 man-days of use in 1967, that provides the most arresting lesson. This 'inaccessible' wilderness, supposedly the sanctuary of the 'privileged few' is already being visited in such numbers and subject to such heavy use it seems certain major adjustments in its management will become necessary. The Forest Service has been caught short here. (Risser, pp.357-8)
>
> While tourists camp close to dusty roads in Forest Service campgrounds that are too few, too small and outdated; while visitors to Yellowstone and Teton Parks crowd in tent cities; much of the recreation potential of the future in surrounding areas is being decimated by Forest Service policy and the lumber industry. . . In attaining [its predetermined wood production level] the Forest Service has been obliged to intrude upon hunting, fishing and camping areas that are already in short supply, never mind about tomorrow. . . . to maintain this level of board feet cut annually the Forest

> Service will have to continue to intrude more and more, on an increasingly wider scale. One fears that, for example, if the Sky-line Drive area of the Bridger Forest is, in the end, spared, the threat will be pressed against another precious area elsewhere. Conservationist groups are limited in means and time and can be worn down. (Risser, p.363)

Yet the fact is that at least in the economy of West Virginia 'recreational use in the forest generated $10 . . . for every $1 generated by the traditional lumbering industry' (p. 105).[1] *Mainstream forestry does not meet criticism, particularly of clearcutting, by substantially changing its practices, but by quite minor concessions and by resort to propaganda.* The core forestry assumption is that clearcutting, properly applied as it was not at Bitterroot, is an effective, economical, ecologically sound, and silviculturally sound and necessary forestry practice which should be continued; see e.g., the statement by K.P. Davis, president of the Society of American Foresters, p.550 ff., also printed as Davis [1].[2] Connaughton [1] 'clearcutting is a sound ecological practice which should be continued'; Crafts, former deputy chief, US forest service, in [1], 'clearcutting is a perfectly reputable and accepted form of even-aged timber management'.[3] Public opposition to clearcutting must then be either due to misunderstanding or else based on aesthetic considerations, for foresters are prepared to admit that clearcutting has a 'sudden and severe impact on the environment' at least visually (Connaughton [1], p.265), 'after the loggers leave a clearcut, the land has an *aura* of total devastation' (McGee [1], p.542, our italics), 'it may *appear* harsh'. In their view the clearcutting offence is 'primarily aesthetic' (Crafts [1], p.15; see also McGee [1], p.540). But clearcutting practices must be able to proceed, for one *or* other of two reasons; first, it is essential for foresters to increase wood production levels to meet basic requirements for shelter (e.g., Montgomery and Walker [1], p.10), secondly foresters should, if they can, 'retain freedom to use clearcutting' (McGee [1], p.542) and more generally to make the decisions as to how public forests are to be managed (e.g. Florence [5] and [6]). But if foresters do not take immediate evasive action they may lose that (unwarranted) freedom (e.g. again, McGee and Florence); or, on the first alternative,

> if we reject our critics completely, . . . we may be overwhelmed by public opinion, just as has already occurred in at least one state (whose legislature has resolved against clearcutting). . . we have only one real course of action — to adopt practices so that clearcutting combines as well as possible the silvicultural requirements and public opinion (Connaughton [1], p.265).

The two-fold outcome (whichever of the alternative routes is taken) is almost immediate: firstly 'offending procedures', primarily aesthetic, must be 'minimized', and secondly an

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1 An even larger ratio, about $14.5 dollars for every $1 generated by forestry has been argued for in a case study of recreation uses in Mt. Macedon Forest Park, a pine plantation 70 km. northwest of Melbourne (Ferguson and Grieg [1]).

2 A number of Davis's replies to conservation criticism depend on a simple confusion of necessary with sufficient conditions. For example he replies to what amounts to the criticism that extensive clearcutting is sufficient for violations of multiple use (his first 'allegation' [1], p.391) that extensive clearcutting is not necessary for such a violation, and to the criticism that clearcutting is destructive of soils and causes erosion that such results could be obtained in other ways, e.g. by improper road building. Thus his replies are irrelevant and do not meet the criticism. Of course *properly* applied clearcutting is a sound practice: but does that happen outside ideal forestry worlds?

3 Many conservationists, in both USA and Australia would, however, settle for Crafts' guidelines for permissible clearcutting ([1], p.16), which include no clearcutting of hardwoods except under emergency conditions and no clearcuts for softwoods in excess of 25 acres.

'educational program must be undertaken to acquaint the public with the biological soundness of these silvicultural practices. Both of these approaches will [of course] cost . . .' (McGee [1], p.542).

The aesthetic fix is to be achieved by a set of veneers and petty clean-ups, through uncut strips left along main highways and along streams, smaller harvest openings with irregular edges, tidiness around logging decks (i.e. dumps), removal of slash, beginning at the rear of the coupe, or, more expensively to cater for air as well as highway travellers, through 'planned pattern harvesting', which is

> 'an attempt to *visually* tie clearcut units together, creating patterns that complement the landscape. The pattern may be designed so that the timber harvest is de-emphasized and prominent landmarks or scenic features are accented' (McGee [1], p.542, and similarly Montgomery and Walker [1], p.12).

The resulting disneyland forest, ideally pleasant to the eye and perhaps ear and affording still fine vistas, could no doubt be rounded out by natural-looking plastic, or even better, cardboard trees, to substitute for the temporarily displaced forest. But it would undoubtedly be cheaper 'to control the visual impact, a chief concern of the environmentalists' (Montgomery and Walker [1], p.13), by persuading the environmentalists to wear planned-pattern-harvest glasses. For the mainline approach is unbelievably phenomenalistic; what the public does not see, or at worst hear, does not exist, or at least does not matter. All the main measures proposed are designed, not to reduce the damage done by forestry activity, but to disguise it, at least from the casual observer (the same phenomenalistic position is adopted in NZ [4]). Such measures,[1] though they may patch-up some local aesthetics, do *nothing* to meet the main ecological criticisms of clearcutting as practised (presumably not properly).

Public understanding is to be improved by a communications campaign designed to 'counter misconceptions and inaccuracies', to 'show how and why foresters manage land' (for an outline of such a program see Plumb [1]; see also Montgomery and Walker [1], p.13). The main aids are to be, according to a typical forestry statement, 'use of mass communication media, individual contacts, and strategically placed signs' to give 'a factual explanation of what is being done and why' (McGee [1], p.544). What is more the public is expected to fund such a campaign, allegedly designed to counter its own misconceptions, but essentially in the interests of the forest industry. What is misconceived is the whole proposed education campaign, which will be yet a further extravagance with public funds and will do nothing to mitigate environmental damage and risks. Far better than trying to keep afloat the erroneous assumption that clearcutting is economical (in the wide sense), sound and necessary, would be an ideological revolution in forestry which abandoned such fundamental commitments as the cheap wood doctrine, and thereby removed the pressure on national forests. In short, what is needed is not a public education campaign by forestry, but quite the opposite, a forestry reorientation and re-education campaign. It would be cheaper too to subsidize the latter campaign, and far cheaper than subsidizing, as

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1 There are however other measures, proposed for improving logging practices, which *would* make for improvements, to small patch cutting and properly selective logging equally, e.g. seeding skid trails (McGee [1], p.54) flying logs across watercourses, limiting tractor activity and reducing soil exposure (Montgomery and Walker [1], p.12). But it is *mistakenly* assumed that the public as distinct from the consumer of the products, should pay *these* environmental costs. Needless to say, these costs will be avoided by logging operators if possible; as it is where promised strips are left they are only a couple of hundred feet wide (p.668).

Similarly on the South Coast of NSW, logging operations away from Eden and out of the public glare, e.g. in Yardboro, Currowan and Dampier State Forests, although practically as environmentally ruthless as those at Eden, meet not even the minimal controls imposed at Eden.

now, for short-term industrial interests, the degradation of the forest environment.

What is important is to change forest service orientation and ideology. The general conservation verdict is that 'a complete re-evaulation of forest management is necessary' (p.661), and that dominant use for wood production should be abandoned in favour of some form of multiple value management.

> . . . Something is very deeply wrong with the Forest Service at the present time. Its emphasis is still overwhelmingly on timber production, and, as the exhibits show, this emphasis is apparently at the sacrifice of other values. We do not believe that this is what our national forests were set up for. The 1897 Organic Act states that not only are the forests to be set up to provide timber and act as sources of water, but that the forests are also to be *protected;* surely this means protect fisheries and wildlife, scenery and wilderness, as well. It does not mean just cut all the trees wherever they may be, and leave the rest for other uses. But this is the painful result of the practice of the present management policies. We hope this can be stopped'. (Evans, p.86).
>
> Public lands managed by public agencies with commodity goals should not be managed, in our judgment, with primarily a 'dominant use' philosophy the way that term has come to be used (Bolle, p.185).
>
> The narrow single-use orientation of the Forest Service is similar to what we have seen in the Corps of Engineers . . . These agencies must be reoriented if they are to become responsive to all public needs, and they need to learn how to involve the public in their decision-making processes (Brandborg, p.69).
>
> A freeze against further development should be placed on large blocks of undisturbed lands until they can be examined more rationally for all potential uses. . . . the ability for interested citizens to take part in decision-making processes on all aspects of the national forest should be provided for (Van de Mark, p.643).

An accompanying change in forestry education is also important.

> The approach has not been ecological but has been economic [in the narrow sense], i.e. the forest manager sees only dollars from timber when he looks at a stand rather than viewing the stand as a complex forest community. Perhaps the genesis of this problem is our forestry schools where the orientation and curricula are economical and not biological (Dahlsten, p.651].

Whatever the outcome of the American dispute, the result cannot be transferred without modification to the Australian scene. For there remain however some outstanding differences between the American situation and the Australian. These differences divide, like the similarities, into ecological and non-ecological. The most striking, apparent, ecological difference between intensive forestry in USA and that so far in Australia is the widespread failure of forest regeneration after clearcutting in USA. There are numerous stories of regeneration failures from every Western timber state (e.g. p.82, p.126, for Idaho). In parts of Willamette NF, Oregon, there is no regrowth after 21 years; some areas of Wenatchee NF 'the Forest Service . . . has planted three times, but the trees just will not grow back' (p.82). In Wyoming

> While the Forest Service tenaciously holds to the fact that regeneration of 'clearcut' areas does, in fact, take place readily it needs to be kept in mind that (1) natural regeneration often fails as evidenced by numerous occasions

in which the Forest Service has had to come to nature's rescue with seedling planting and that (2) replanting by artificial means often fails upon the first try and has to be repeated. It is the Forest Service that is responsible for the regeneration, not the lumber industry. (Risser, p.361).

In parts of Bridger NF, Wyoming, replanting has failed three times over 10 years (p.172).

In Montana

> Douglas fir and spruce plantings in the Bitterroot have been almost total failures. I have looked at almost every fir and spruce planting in the Bitterroot and in my opinion they will not yield the results which the Forest Service expects (Schloemer, p.668).

Although much of the data concerning the effects of intensive forestry obtained in America, especially that concerning soils, should transfer to Australia, what information there is concerning the effects on plant and animal ecology generally will not. For no American forests resemble Australia's eucalypt forests with their remarkable understorey and their arboreal animals. Australia's forests have distinctive features which make the effects of clearfelling and even-aged management particularly severe . One of these is the habit eucalypts have of dropping limbs thereby leaving hollows which provide habitats for many animals and birds.[1]

An undesirable feature of the US forestry controversy which has not yet appeared in Australia, is extensive advertising, by newspaper, magazine and radio, not only by forest industries[2] but by the US Forest Service. A radio advertisement sample (cited by Henault, p.127) ends thus:

> . . . To ask for laws with strict conservation measures for mining, citizens must be willing to pay for it, in higher costs of fewer products. Are you willing to pay the price? A Forest Service public message.

However similar widespread advertising by public utilities in favour of their own (anti-environmental) activities is by no means unknown in Australia; recall for example the campaigning by the Tasmanian Hydro-Electricity Commission in favour of its Lake Pedder proposal.

Such advertising involves a decidedly objectionable use of public funds for utility image building and for propaganda. As Church (a US senator) remarks

> The lobbying activities of Federal agencies . . . has become an extremely important question . . . millions of dollars are being spent by Federal agencies, out of public funds, to merely sell the agency and its program. There are policy questions here that have not been faced by Congress. To what extent are agencies justified in utilizing public money to indoctrinate public opinion, for purposes related to the activities of the agency? It is self-perpetuation . . . The Forest Service . . . is just one of many agencies that are presently engaged in this kind of activity. Public relations is built into these agencies. . . . The point, of course, in the case of public agencies is that public funds are being used and instead of the product being bought by a purchaser who decides how to spend his money and buys it freely, the money is derived from taxes. It is money taken compulsorily from the public and then utilized by agencies for these purposes. (p.122).

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1 A similar result is achieved on a small scale by woodpecker activity in North America. Australia has no woodpeckers.

2 'The extent to which the industry is PR oriented is illustrated in its extensive advertising campaign, particularly in the prestige magazines' (Risser, p.361).

The budgetary motivation that the US forest service finds for extensive clearcutting does not apply in Australia, where clearcutting appears to have been copied *without* the same underlying financial incentives.[1] For in USA

> a major reason for shifting from sound silviculture to clearcutting has been a budget process which pitches appropriations to timber sales and increase in the allowable cut (Stoddard, p.135).

An encouraging feature of the US controversy has been the splitting of forestry ranks, a feature which is not matched in Australia where forestry ranks have been closed (using the mixture of education, persuasion and duress already indicated). Even in the Australian universities there has been disappointingly little deviation from the official position. In USA the situation is very different. Opposed to widespread clearcutting, to many other intensive practices and sometimes to basic mainstream ideological commitments are not only many university foresters and some independent forestry consultants but also many older foresters, retired from the US forest service, who recall the better days before the recent clearcutting wave[2] swept US forests; e.g. Smoot explains multiple use management practices on Monongahela NF where he was a district ranger in the good times before clearcutting overtook and mostly destroyed the forest in 1964 (p.35 ff); and Brandborg, former supervisor of Bitterroot NF, writes

> I protested the destructive overcutting and unrestricted clearcutting practices in harvesting timber in the Bitterroot Forest. I have been criticised by industry representatives as well as my former associates for assisting in these efforts. (p.69)

New Zealand woodchip export schemes

New Zealand and Australian forestry operations cannot of course be on the grand scale of US forestry operations, though their degradation of forests over smaller areas can be just as drastic. New Zealand, for example, covers an area of only about 103 thousand square miles, that is slightly less than the state of Colorado and only about one-fifth of the areas of NSW; and its forests cover only a small proportion of the 183 million acres of national forests (not all forest however) in USA.

Nevertheless the New Zealand forest service, which was previously respected as an environmentally responsible body, has recently decided to join the rush to the intensive forestry bonanza. Until recently there was comparatively little clearing of native forest *for exotics,* the main plantations being established on failed agricultural land or previously treeless areas;[3] but recently plans have been made to convert sizeable areas of the remaining native forest (now only a fragment of the original) to exotics. There are some small schemes in the North Island (e.g. in the Mamaku ranges), but the main project proposed is that referred to as the 'Utilization of the South Island Beech Forests' (NZ [3]), a project designed to 'utilize'

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1 However this is not the only incentive: clearcutting also promises maximum (if short-term) wood yields.

2 It is not the first American wave. At the beginning of the century 'Pinchot actively promoted the substitution of such ecologically sound forest harvesting systems as selection and shelterwood systems calling for an end to the wave of clearcutting then sweeping the nation's forests' (Stoddard, p.133). However the clearcutting of the timber barons has been far surpassed in the recent wave because of the new technology.

3 This is not to concede that adequate areas of (often undervalued) scrublands, fernlands and dunelands should not be preserved. And very large areas of native forest have been completely cleared, primarily for agriculture.

about 800,000 areas of forest, that is about one-tenth of the remaining South Island forest area of 8.5 million acres, and more than one-sixth of the 4.7 million acres of state forest. Yet South Island forests have already been substantially depleted and now cover scarcely a quarter of the Island, most of the podocarp-hardwood forests having disappeared.[1] The Beech scheme, as now modified (by excluding forests in Nelson; see NZ [4]), aims to convert 718,000 acres of forest (529,000 acres lie in Westland and the rest in Southland) to production forest, except that 12,000 acres will be released for agriculture. Of the proposed production area which is predominantly beech forest (of the 596,000 acres of beech, *Nothofagus* spp., 451,000 acres are virgin), with small areas of podocarp-hardwood forests (38,000 acres) and semi-pakihi (20,000), almost half (346,000 acres) will be converted to exotics, and much of the remainder (178,000 acres) will be managed as 'enriched' beech forests, i.e. beech forest supplemented by exotic plantings (mostly eucalypt species). However the Beech scheme, if it wins approval, may not remain at this size (NZ [4], p.56).

To its credit the NZ forest service has fairly limited ambitions at least as compared with Australian state counterparts,[2] and has announced its Beech scheme well in advance to enable public discussion and assessment — in contrast, for instance, to the Manjimup scheme in WA where there was *no* public evaluation of the project before the contract was signed. However despite the acclaimed honoring of 'the undertaking to put the facts before a wider public' (NZ [3], p.7), crucial economic information on the scheme, without which a proper assessment is impossible, has not been released even in the form of preliminary estimates. The only (narrowly) economic details given in NZ [3] indicate the export value for NZ forest products with and without the Beech scheme. One is left with the impression that the NZ forest service seeks the chipping of the beech forest primarily to ensure that the rate of increase of NZ forest products is smooth and approximately linear (as otherwise the graph for increase of output would be humpy because of the cessation in coniferous plantation between the thirties and the end of World War II). For then

> production should come on stream just when it is needed to maintain the present fast growth in the forestry sector, a development which would be most desirable from the viewpoint of the national economy. (p.6, also p.36.)

This is a pretty poor sort of reason. It doesn't even have the excuse of maintaining markets, since not only are additional commodities produced for which new markets will be required, but hardwood chips are a different commodity from the softwood products for which they substitute.

What indirect economic information is available suggests that profitability will be no better than that of Tasmanian woodchip projects, where the picture of alarming public costs and an almost destitute forest service, unable to afford to regenerate the forests it has sold, presents a grim warning. Firstly, the NZ forest service operates just as unprofitably as its Australian counterparts (its expenditure-revenue ratio being comparable to that of Victoria, as a comparison of the following table with Table 2, p.6, reveals).

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1 Moreover the South Island, comprising rather more than half the land area (58 thousand square miles), contains the bulk of the remaining native forests.

2 Also NZ is vastly better supplied with forest parks than Australian states. For example one-quarter of the remaining South Island forest (2.1 million acres) is preserved in national parks or equivalent reserves.

TABLE 18

RELATIVE LOSSES FOR THE NEW ZEALAND FOREST SERVICE

Year	1966-67	1967-68	1968-69	1969-70	1970-71	1971-72
Expenditure (E)	19.8	22.6	27.0	31.9	35.7	41.4
Revenue (R)	11.3	12.2	17.3	21.6	23.8	26.9
E/R	1.75	1.85	1.56	1.48	1.50	1.54
E-R	8.5	10.4	9.7	10.3	11.9	14.5

Source: NZ [5]. Figures are in millions of New Zealand dollars. E-R represents the net finance required from NZ Government funds.

As usual these losses disguise the large extent to which forestry operations are subsidized by public expenditure on transport infrastructure, particularly through roads and harbour facilities and on rail freight costs. The reason for the poor commercial performance of the NZ forest service is not the amount it spends on non wood-production activities, which is comparatively little; undoubtedly one of the main reasons – a reason which helps to account for Japanese interest in NZ forests – is the low royalties being charged for NZ wood, i.e. the cheap price at which the forests are being sold. In fact the inadequacy of NZ stumpage rates, even by low Australian standards, is rather notorious.[1] There is no reason to suspect that woodchip royalties depart from this pattern. Indeed chips exported in 1971 were sold for an average of $25.5 a BDU (using figures from NZ [5], 1971-72, p.71; NZ and Australian currency were on a par at that time) – less than the Commonwealth guide-line price of $27 per BDU considered necessary in Tasmania, but still insufficient to ensure adequate royalties so that the Tasmanian Commission can afford to undertake proper management practices. For the cost structure of the Beech forest scheme cannot vary all that much from Tasmanian operations; it will still cost about as much to chip a ton of green wood, about as much to transport the wood to the mill and to freight the chips to Japan, and so on. While royalties remain very much a residual (with the profits going to private enterprise), they cannot be high. Nor is it likely (for reasons already given in Chapter 12) that royalties will rise appreciably, in real terms, in the Pacific Basin; so it is decidedly unlikely that the NZ Beech scheme will prove commercially viable. Almost certainly but little expenditure on environmental protection measures to minimize damage (even where these measures do have a prospect of success) will be guaranteed by project revenues, and what measures are tried will have to be covered by further public subsidies.

Despite the large question mark which hangs over the economic basis of the projects, an attempt has been made to persuade New Zealanders that the projects will provide substantial benefits (see e.g. NZ [3], NZ [4] and press statements by A.P. Thomson, Director-General of Forests). Probably there would be more opposition still, were it realised that the projects, in addition to 'savaging much of the remaining beech forests', have a poor commercial basis and will require substantial public support. Yet the balance of trade situation in NZ (which has worked in the past as an argument for much industrial

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1 Cf. Hanson and Leslie [1], p.100: 'One of the reasons commonly cited in New Zealand for the failure of the government's scheme to encourage farm forestry to the extent envisaged, is the low stumpage rates prevailing in that country.'

exploitation and subsidization) is, manifestly, no longer so serious as to justify the setting up of export industries which are not commercially viable without substantial public support.

The Environmental Impact Report (NZ [4]) which recently further cleared the way for all the projects to commence provides a good example of the uncritical acceptance of the commercial viability of forestry proposals.[1] Although this study was supposedly not concerned with the economics of the projects (p.1[2]) it in fact maintained, in conclusion (p.57), that 'socially and economically the schemes are important to the areas concerned' and assumed (in the section, Part III, on the Social Environment, surely an economic issue?) a number of benefits (such as keeping open uneconomic railways, stemming population drift, provision of employment) which could only be counted as genuine benefits if the projects *were* commercially viable since otherwise these benefits would not be benefits paid for by the projects. If an industry itself requires heavy public support and special concessions, elimination thereby of other forms of support such as for railways, can scarcely be regarded as a clear benefit, since it might in fact be cheaper to support the railways directly than to do so indirectly through subsidization of the industry. Furthermore the study makes a number of claims, such as that great hardships would ensue if the projects were not proceeded with, which assume that such benefits will not be bought at too great costs – something which in the absence of economic data cannot simply be assumed.

In short the terms of reference within which the Report was produced, and indeed the whole two stage approval to the evaluation of the Beech scheme, an environmental stage succeeded by an industrial stage, are loaded in favour of the development. The picture – given unconfirmed commercial advantages do the environmental costs block the scheme? – is entirely wrong; it is not enough to consider whether the costs are not prohibitive in this ideal developmental setting, but rather whether given the benefits, and their distribution, should the costs be incurred? The result of isolating environmental from commercial issues in this way emerges clearly in the welfare picture; the environmental factors, primarily intangibles and easily underestimated, are spread over the whole population, whereas the commercial advantages, mainly assessible in hard dollar terms, are concentrated; with the outcome, which the isolation helps to force, that environmental advantages are seriously underestimated and environmental costs too cheaply dismissed or minimized (cf. Barkley and Seckler [1] on collective goods).

Although the study has bent over backwards to admit a number of dubious benefits, its attitude to costs and risks is quite different. The rigorous approach towards costs which assumes that the onus of proof to demonstrate a cost is on the opponents of the project, contrasts strikingly with the sympathetic approach to benefits and to measures claimed to eliminate costs. Risks appear to have been largely ignored, likewise an unsound procedure. The result is that a great many apparently rather serious probable costs are

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1 An acceptance encouraged by foresters who are, for the most part, readily persuaded of the positive contribution that any project which increases wood production makes to the local economy. A recent example is provided by the Environmental Impact Statement prepared by the WA Forests Department, WA [1], p.9.

2 Page references in the remainder of the section are to NZ [4].

mentioned only to be in effect dismissed (or counted as zero), when it comes to the issue as to whether the scheme should proceed, mostly on the grounds that some ameliorative measures *can* be taken – without however any attempt being made to demonstrate that these measures reduce costs sufficiently or to an acceptable level.

For example serious soil erosion and stream sedimentation – already well-known, not to say notorious, features of forestry and agricultural activities on the steep, high rainfall areas of NZ, where the soils are mostly highly erodible – are not regarded as imposing any reason for delaying implementation of the scheme. 'The committee sees the key to the question of safeguarding water and soil values as consultation and supervision' (NZ [4], p.15), which simply assumes that the associated costs can be reduced to acceptable levels (and partly by talk at that!). The committee accepts the forest service statement (p.14) 'that changes in current forest management or logging practice for reasons of soil conservation or water management should be made whenever the benefits exceed the costs', which really implies that such non wood-production values will fit in where they can, where their amelioration does not interfere with 'economic' logging. There is no attempt to work out what erosion levels are acceptable, whether these can be met, or how much they will cost. Likewise soil nutrient depletion is dismissed, although the soils involved are generally of only medium to low fertility, on the ground that 'there are no serious soil limitations . . . which cannot be overcome by fertilization and other management practices' (p.21). However the predominantly podzolic soils will be subject to heavy nutrient drainage since there may be a delay of three years after cutting before beech regenerates (p.21), and in some cases the American pattern of regeneration failure may be repeated; and despite the committee's (scarcely well-founded) confidence that regeneration of beech is practicable (p.21, 8.8 but compare 8.10), it earlier noted (p.17; also p.6) 'that eucalypts will only be planted in those areas where beech regeneration cannot be adequately secured'. Again the committee simply assumes that any deleterious effects of pines on already podzolic soils can be offset by fertilization, despite the rather extensive evidence (assembled in Chapter 7) that damaging changes eventually occur when pine monocultures replace hardwood forests under such conditions. The committee seems to think that the fact that pines have grown for 20 years near Reefton, part of one rotation only, is evidence that pines can be grown successfully (something that is refuted by the German experience); but in the end they are prepared to abandon rational decision-making, which would try to assess probable costs, and to punt on pines: 'The real test of the ability of West Coast soils to grow exotic trees will however be provided by the trees themselves' (p.21).

Similarly instead of providing a realistic assessment of the likely pollution from pulp mills and associated development, in terms of the levels of control obtainable without rendering operations quite uneconomic, the committee piously recommends that 'the effluent from any processing plant pass through a treatment plant to remove *all pollutants* such as organic matters, heavy metals and other chemicals' (p.19, our italics; also recommendation 21, p.20). The projects can proceed forthwith because in the ideal forestry world where intensive forestry has no adverse impact on the environment processing mills also run pollution free; unfortunately for the committee this ideal situation is far removed from the actual case where pollution costs cannot be pleasantly set aside.

The committee's attitude to the impact of forestry operations on fauna and wildlife habitat is especially cavalier: the necessary research can be undertaken as the projects proceed (p.27-8). The deplorable consequence is that the requisite results cannot be taken account of in evaluating the projects.

The excessive emphasis on 'minimization' of certain known costs (a common feature of environmental impact studies) means that a major purpose of environmental impact studies, to *assess* costs, is partly defeated, since to assume that the only problem is how to reduce costs to some (often circularly determined) minimum is already to have assumed that the project, if not inevitable, is justified whatever the costs. For example the committee recommends 'the minimizing of all forms of pollution of the environment' (p.25),

the minimizing of soil erosion, and in effect the minimizing of the environmental problems faced by the Beech scheme, just as the WA Forests Department claims (in WA [1]) that they can 'manage' the woodchipped forests to minimize environmental and ecological damage. The issue of setting independent levels to which pollution or other environmental damage are to be reduced is typically evaded; and so then are the costs to the project of effecting the requisite reduction in damage. But it is plain that the effect of setting, for example, maximum tolerances for permissible soil disturbance and compaction and for stream sedimentation (say, not more than a 10-fold increase on normal levels) and nutrient and salinity levels (e.g. at least within US public health standards for drinking water) below logging operations would seriously effect the style of these operations and would rule out unimpeded use of heavy machinery and probably extensive clearcutting, which would in turn substantially influence the commercial costs of wood removal. The *minimization method* on the contrary begins by assuming something like the on-going commercial framework, and then, from this position, makes concessions, usually token ones, to other values. The connected strategy of taking the onus of proof to show likely costs to be on opponents of the development in question (rather than on those who propose to proceed with the development to demonstrate clearly that it is not damaging within clearly and effectively specified limits) also defeats much of the point of environmental impact studies, inasmuch as this was just to shift the onus of proof to the developer to demonstrate that his project was not environmentally damaging.

The New Zealand Report (NZ [4])falls down badly in just this sort of way. There is considerable evidence in the Report that the committee which prepared it (composed of representatives of various government departments, see p.1) made a clear presumption in favour of development, particularly forestry development, and was biassed in favour of the Beech scheme (see especially NZ [4], pp.6-9). This comes out in several ways, but especially conspicuously in the following:

> "What must be appreciated is that the Forest Service proposals call for no widespread and sudden change in land use but involve the gradual alteration of part of the forest area from a virgin or partially logged condition to a regenerated crop and from native to exotic species. . . (p.9).[1]

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1 The committee was however surpassed by the Environmental Council who very naturally won the approval of A.P.Thomson, former Director-General of Forests:

> The Environmental Council, which is obviously a conservation-oriented body, put the matter into far better perspective than Dr Salmon [of the Royal Forest and Bird Protection Society] has done by stating:
>
> 'The proposals are not an attack on a virgin resource but are in fact the continuation of more than a century of timber exploitation. . .' A.P. Thomson, *The Evening Post* (May 1973).

Did the Environmental Council, which is not even semantically a conservation body, deliberately ignore the extent of virgin forest to be exploited? And does it really think that NZ's history of forest exploitation is a proud one, to be continued in these days of reappraisal of past attitudes?

It is singularly unfortunate then that the Government's decision as to whether to proceed to the next stage in the evaluation of the Beech scheme, by calling for specific proposals from industry to put the South Island forests to commercial use, appears to depend on the reaction of the Environment Council to the Impact Report (press statement by the Minister for the Environment, accompanying the publication of NZ [4]).

If clearfelling a forest in units of 300-600 acres is not a sudden and drastic change, if the large-scale conversion of native hardwood forest to exotic conifers is not a widespread change, if the shift from some selective cutting to total utilization of the forest resource is not a sudden and widespread change, it is hard to know what is. Yet such a switch from partial use by selective cutting of part of the forests to total use of forests largely turned over to tree farms is precisely what is being proposed, and the committee argued for the proposal in classical forestry terms (p.6):

> A larger scale planned management, based on total utilization, as would be the case in a pulp or chip mill, and on a perpetual yield cycle, rather than the present small scale operation, would sustain a resource that is currently being wastefully used without planned renewal.

The committee even goes on to defend its position using a variant of the Degenerate Forests Argument (p.6):

> The bulk of the beech in the forests of the project areas is in an over-mature condition. The forest has also been much modified by introduced animals. Planned management coupled with utilization of the timber resource should stimulate a vigorous young forest.

In short the committee has bought the wood production view and its associated terminology for describing forests; so it is not surprising that it 'sees as a major cause for concern the problem of uninformed public criticism'. The committee thinks, exactly like forestry interests, that

> to obviate any misunderstandings [there is] a need . . . for a pamphlet or booklet *for general public information* explaining the proposals, the benefits of the schemes and the environmental safeguards' (p.9; compare similar forestry statements on pages 11 and 211 above).

The committee also takes over intact the standard forestry reaction to criticism of large-scale patch cutting of the sort the NZ forest service plans to apply, namely that the visual impact of forestry operations is really the main public worry, and that this can be met by an aesthetic fix, by strips along main highways, or ridges visible from tourist roads, and generally by retaining a forest veneer. And the committee appears to think that trampers (New Zealandish for 'bush walkers') would actually benefit by having the forests dissected by a heavy network of logging roads (p.12).

Like the NZ forest service, whose approach to conservation the committee approves and follows, the committee adopts the definition of 'conservation' proposed by the Society of American Foresters (already criticised, as in no way excluding undesirably high levels of exploitation, earlier in the chapter); so the committee of course found no problems in reconciling the Beech scheme with conservation of forest resources, and quickly dismissed the idea of preservation of the forests – so quickly in fact that there is no evidence in their Report that they took any account of submissions arguing that natural ecosystems had a value, or that they were prepared to assign a non-negligible value to natural ecosystems or, equivalently, a cost to their elimination. The committee's conclusion that with the Beech scheme 'a proper balance can be struck between the demands of preservation and development' (p.57) depends on their earlier assumption (p.45) that it is enough for preservation purposes to preserve representative samples of each forest type, and its corollary that apart from these samples natural systems have no value. The Proper Balance approach characteristically operates under such an assumption; remaining natural areas are singled out (*not* pre-European forest areas for example), and with respect to these, it is argued, a *proper balance* must be struck between preservation and other values, from which the alienation of much of the natural areas singled out is an inevitable outcome, since a 'proper balance' could hardly reserve them all. Plainly then the Proper Balance approach is a quite inadequate decision-making method: it would alienate natural areas where it may be desirable to preserve them. Once again adequate decison-making can only take place within a much wider economic framework, not one which tries to separate off

environmental questions first before the real business of development is taken up.

To its credit however the committee has recommended 'that the costs of all recommendations made should be regarded as a legitimate charge against the schemes in any subsequent economic analysis' (p.2). It is to be hoped that this recommendation is insisted upon and carried through in a thoroughgoing way; particularly that acceptable levels are worked out for such matters as soil disturbance, flora quality, sedimentation, water quality and habitat preservation, and that the commercial costs considered are for operations which keep within these levels; that government research and forestry supervision, which the committee rightly thinks are vital if the scheme is to proceed (p.57), are costed to the project, e.g. as part of the forest royalties; and that all infrastructure costs and indirect subsidies incurred on behalf of the scheme are billed against it. The upshot should be obvious from Tasmanian and NSW schemes: public costs will far outweigh public benefits unless royalties are sharply increased, and the Beech scheme will be shelved as not economically viable. [1]

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1 For an excellent and detailed discussion of the ecological aspects of the Beech scheme particularly with regard to soil, and as to the shortcomings of the Environmental Impact Report, see NZ Ecological Society [1].

CHAPTER 16

ALTERNATIVE FORESTRY

It should now be obvious (from material set out in preceding chapters) that forestry interests have ambitious blueprints for turning over large areas of Australia's natural forests to the interests of wood production and for intensive management, in pursuance of the ideology of total use and maximal wood production. In fact the plans for intensive use of forests either for woodchipping, as presented in the estimates of NAFTA [1], or for pine planting, as reflected in the Softwood Forestry Agreements Act, are only the tip of the iceberg, since the plans represent only those areas which forestry planners feel, in the light of their optimistically estimated expected demand (both domestic and foreign), they can realistically hope to convert to such projects – not what they would be anxious to see turned over to such uses if some way could be found to fund their activities and to dispose of the resulting products. Thus according to Jacobs [13], appealing once again for *more* special financial and taxation privileges for public and private forestry in Australia:

> Excellent opportunities exist in Australia to achieve a near self-sufficiency in forest products and develop a large export potential in timber and paper . . . [Such objectives] undoubtedly record the hopes and desires of the more progressive people in the Australian forests industries.

As the quote indicates the ambition to set up large-scale intensive forestry industries is by no means limited by considerations of what benefits would accrue to Australians, nor by merely domestic demand and requirements – although forestry industry apologists typically present export projects as having the same basic justification and priority as those which are needed to satisfy urgent and essential domestic needs. However export projects must meet much stronger criteria than projects which deserve special consideration as necessary to meet essential or basic domestic demand, and should presumably enable returns of 10-12% or more; and, considering the risk factor involved in forestry export projects of oversupply in the case of pines and risks to regeneration and elsewhere in the case of woodchip projects, this figure is probably too low. Whatever the case for a heavily subsidized domestic industry (and as we shall argue it is rather poor), there is no case at all, given Australia's present, and likely future, embarrassing excess of overseas reserves, for a heavily subsidized export industry. When the industry concerned achieves its poor rate of return and dubious general benefits at the price of degrading a major public amenity, it is clear that its contribution to welfare is actually negative (and hence it is undesirable).

Intensive forestry export projects, especially if as many of them are set up as forestry interests hope, will affect particularly those areas which are most important, being on the whole the remaining large natural areas in the more densely populated southern coastal strips, and will make a large contribution to wiping out a major advantage Australians enjoy over the residents of less recently settled countries, opportunity to enjoy and easy access to large unspoilt natural areas of great beauty.[1] This is not an advantage to be given away lightly, and certainly not to be given away for benefits as dubious and speculative as those offered by these projects. Yet continuation of the trends and directions described in previous chapters will tend towards precisely this outcome and will lead towards the intolerable situation where only a few national parks preserve with any security a few remnants of the once great natural forests of the wetter parts of Australia. If we want to avoid the slide towards the situation where one of the finest natural features of the country, its remaining areas of unspoilt and impressive natural forest, is destroyed or greatly reduced for negligible or negative economic benefits and in pursuit of an extreme and uncompromising developmental ideology, then obviously it will be necessary to adopt measures to resist or change many things, particularly prevailing attitudes to forests

[1] American provisions for areas of open space near major population centres are already inadequate, as many Americans are now emphasizing (USA [6]).



19. The Greater Glider (*Schoinobates volans*); this gliding marsupial, which is capable of glides of up to 180 ft., is regularly distributed throughout eastern Australia in montane forest, its main habitat. A hollow tree dweller, it is virtually eliminated by clearfelling, whether for pines or woodchips. (ANU photograph by Ivan Fox).





20. (a). Forestry assists decentralisation. However the quantity of employment provided has been exaggerated; for example woodchipping (and subsequent degradation) of half Australia's forests would employ only about 0.2% of the total workforce.

20. (b). Furthermore the *quality* of the employment provided – the crucial consideration in a country with full employment – is poor, in terms of low rates of pay, high accident rates and occupational diseases. Sawmilling village, Monga State Forest.



21. Not a battlefield, a view of the Eden woodchip project. Such woodchip projects have been described by the Minister for Primary Industry, (K. Wriedt) as 'preserving and improving the environment'. This project will 'improve' over half a million acres of coastal forest, much of it wilderness. Many woodchip projects will involve even greater destruction of natural values, approaching the order of the pine program. (Photo: John Turnbull)



22. Destruction of native eucalypt forest by the root-rot disease, *Phytophthora cinnamomi*, near Buchan, East Gippsland, not far from Eden. Many woodchip projects present virtually explosive situations for the spread of this disease; particularly where quarantine regulations are not observed.



23. The Eden area has one of the highest run-off percentages in NSW, and is subject to severe rainstorms, on average frequency twice a year. Up to 17" may be received in 24 hours. Fish breeding grounds and abalone fishing at Mallacoota Inlet have already been seriously affected by silt washed from the chip operation.



24. 'Unimproved' area, Eden. Although it is often claimed that areas to be woodchipped at Eden are 'degenerate' and 'defective', by no means all the franchise is in such a condition. The attractive Mountain Grey Gum and Messmate alliance shown here does not appear to regenerate satisfactorily after clearcutting. (Photo: John Turnbull)

and pressures for the use of intensive forestry technology. We now consider some steps which are a necessary – but by no means sufficient – part of any adequate policy designed to halt the impending degradation of much of Australia's forests.

One of the urgent needs is to greatly increase the amount of research on matters not affecting wood production, including both detailed biological and ecological surveys of areas so far unsurveyed and thorough research programs on the affects of forestry projects on wildlife and other environmental features. Such investigations cannot be set up and completed in a matter of months, but commonly take several years to perform. Even so the carrying out of such research is an absolutely necessary condition for assessing the environmental impact of projects. Obviously such research should be completed *before* new projects are even considered rather than after commitment is made to the projects, so that the results of research can be taken into account in prior economic evaluation of the projects. It should not be left until contracts have been signed (as in WA) or clearing is in progress (as suggested in NZ[4]); otherwise a quite essential set of considerations cannot have been taken into account in arriving at a decision. Furthermore since such environmental factors have not been taken into account in assessing projects already established, and the decision-making for which was therefore faulty, consideration should be given to halting at least some of these projects until research is completed, particularly in Tasmania where the extensiveness of woodchip areas poses a serious threat to wildlife and other natural features. Forest services themselves bear a large share of responsibility for the absence of such research, not only because they failed to carry it out themselves prior to commencing projects, but also because in the past they attempted to prevent, or at least discouraged, other interested organisations from undertaking research into the effects of forestry activities, presumably fearing that unfavourable results could present some of their activities in a bad light. Moreover the secrecy surrounding such projects greatly hinders the undertaking of the necessary research. A welcome corollary, then, of the requirement of undertaking appropriate research well in advance of project evaulation, would be the dispelling of the secrecy which presently surrounds projects under consideration. The present situation is that normally the first official information made publicly available on planned projects is that the contract has been signed. The secrecy is perhaps at its worst now in Queensland, where there are a great many specialised environments and habitats which would require special and careful work to assess likely effects of both pine planting and woodchip projects, but where, despite the very ambitious plans for projects on the part of the Queensland Department of Forestry (revealed in Chapter 9), no official information can be obtained as to where proposals are located. But particularly where special environmental considerations have to be taken into account, proposed projects would need to be publicly announced and the necessary research undertaken well in advance.

In order to ensure, what is quite essential that the necessary research is carried out objectively and away from organisational pressures, that it is not ideologically directed or oriented to minimizing or playing down costs of intensive wood production activities, and that it is made fully publicly available even it, as seems very likely, it is unfavourable to proposed projects, such research should not be placed under the direction of forest services or their allies but under the direction of suitably qualified independent groups such as CSIRO, or perhaps preferably, since CSIRO is also subject to secrecy and cannot be relied upon to allow public release or discussion of material, university research teams, which are not so inclined towards censorship. Such research should not be directed merely towards 'minimizing' the supposedly inevitable costs of forestry progress but also towards evaluating the costs and assessing whether or not such projects really are progress. For economical research in forestry, like ecological research, tends to be avoided where the results give promise of being unfavourable to forestry plans.

The research into clearfelling and the other effects of forestry activities must be regarded as part of the cost of the projects concerned. After all much of this research would be of a quite specialised nature, which would otherwise be unnecessary, and which is necessitated only by the projects themselves. There is no reason why such specialised

research should be publicly financed, and, if it were, it would represent yet a further form of unwarranted public subsidies to forest industries, and particularly to the export woodchip industry (and of the same order as supplying publicly funded roads, wharves and railroads primarily to serve that industry). A portion of the royalties of existing projects which cannot be stopped should be directed to funding the thorough and expensive independent research which is necessary, possibly in the form of grants to fund university research programs. This measure will of course make existing projects even more uneconomic and will cut into what slender profits forest services show; however if the woodchip industry is unable to bear the cost of basic and essential research into the effect of its activities this demonstrates as clearly as anything that it is not economically viable, and depends upon substantial hidden public subsidies, ignoring environmental costs and cutting environmental corners at public expense.

It is not however enough merely to step up concern for and research on non woodproduction matters and to ensure that it is thorough, independent, not tied to the interests of industry, and not solely a burden on the public purse. It is also important that each forestry project, and particularly each export project,[1] should be the subject of an independent and publicly available cost-benefit study of at least the standard now expected in the case of Commonwealth expenditure for water conservation projects – a positive result from such a study to be taken as a minimum or necessary requirement only, and by no means as sufficient for demonstrating acceptability without at least consideration of environmental factors. An essential ingredient in undertaking a proper cost-benefit analysis would of course be an assessment of the full costs to forest services of growing timber, something forest services have shown remarkably little interest in adequately determining, as reflected in the paucity of studies on even such simple candidates as pine plantations. However this is only one factor to take account of in a cost-benefit study considering optimization of public welfare rather than optimization of forest services' organisational interests. Appropriate cost-benefit studies would take account not only of the cost of growing the material and the revenue of forest services, but also of such factors as infrastructure costs borne by the public – which may include costs for use and upkeep of roads, harbour facilities, water storage facilities, railroad construction – of decreased amenity due to heavier use of roads, conflict with other industries, and of opportunity costs in terms of the relative net benefit which may be obtained from investing public money in alternative ways. An adequate study considering a long period of time would of course take account also of risks and uncertainty, and a range of possible outcomes, not merely the most favourable one. Such full and publicly assessible cost-benefit studies, with visible accounting which reveals subsidies, should be an integral part of environmental impact statements, and the attempt, criticized previously, to separate environmental and economic considerations – for example by presenting a picture of unlimited economic benefits and assuming that the burden of depriving one of these hypothetical benefits rests with the assessment of environmental impact – should be resisted.

A concomitant of such full cost-benefit studies would be the removal of the present disgraceful bias in woodchip export contracts towards the purchaser. New contracts should be negotiated, and existing ones renegotiated, to remove this bias, not only in the inadequate prices (already documented), and failure to meet infrastructure and other costs, but also in the structure of contracts; for example in view of the possible environmental impact of the industry, woodchip contracts should be of far shorter

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1 It is particularly important that such estimates be made in the case of export projects for the obvious reason that, whatever the case for subsidizing the domestic timber user, it scarcely extends to subsidizing or not caring about subsidizing exotic timber users; and whatever the case for assisting overseas nations, there are better objects for one's charity than Japanese pulp and paper companies.

duration and more flexible, e.g. contracts should allow for more variation in volume requirements, and should not extend for more than 5 years. As well contracts should be subject to *continuing* evidence, based on *continuing* research, that no ecological damage is occurring, or damage to non wood-production values, the degree of continuing research required being in proportion to the degree of uncertainty remaining after the initial research program (suggested above) is complete, the continuing research to be funded by a surcharge on royalty payments additional to the cost of material. Existing contracts seem in all these respects to have reflected the interests of overseas purchasers of woodchips at the expense of Australian producers and owners, in particular the Australian public, in a way which appears to have no reasonable justification given Australia's comparative wealth and the lack of urgency or clear benefit in exploitation of this type.

In a similar way royalties for export woodchip projects appear to have been set largely in the interests of the processing and extracting industries and to have ignored the interests of the nominal owners of these areas to be exploited, namely once again the Australian public, and the environmental damage resulting from different operations. For example Eden royalties (as Appendix 4 reveals) are set in such a way that royalties are actually lower for steeper slopes despite the fact that there is strong evidence that environmental damage and non wood-production costs to the public or non-timber users are accordingly greater. The rationale for this has been that extraction costs on steeper slopes are larger; but this demonstrates quite plainly that the general interest is being regarded as secondary to the interests of extractors and processers. Contracts which considered general interests would not only eliminate these unwarranted inducements for damaging practices but would be set in such a way as to discourage damaging practices such as logging during wet periods, logging steep slopes, and creating large logging dumps. This can be achieved by differential royalties rates penalizing rather than encouraging damaging practices, for example by higher royalties to be paid for logging over 18^{o} slopes, for billets split on site thereby creating extensive compacted log dumps as opposed to whole logs delivered at the mill gate, for machinery operations during wet periods which result in greatly increased soil disturbance and compaction, and finally, in view of the damage to non wood-production values involved, by higher royalties for material obtained by clearcutting.

Similar principles on setting of royalties to reflect environmental damage and public costs could very profitably be applied not only to export (woodchip) projects but also to royalties on forest products produced for domestic consumption. For likewise in the domestic case, it is quite unacceptable that royalties should, as at present, simply reflect contractors' extraction costs, processers' costs and the interests of the timber user, and take no account of the degree of likely damage from various operations and of the interests of the public or the non-timber user of forests.

One necessary condition for multiple use – where this consists in taking proper account of the interests of *all* appropriate users of the forests – is that royalties should be set in such a way as to take account of all such interests, not merely those of the timber extractor, processer and user. Clearly in this sense multiple use is not being practised at present, and the situation with regard to royalties, where the interests considered are those of the timber user, processer and extractor and those of others are ignored, is a good illustration of the more general situation – that forest services are traditionally prepared, not only in the setting of royalties but also in economic and management planning, to give quite excessive weight to the interests of the wood-user over the non-wood user of forests, the latter being either penalised or ignored.

This practice is assisted by the insistence on regarding the wood-user as representing "the public" and the non-wood user as representing some special, indeed freakish or selfish, minority or subset of the public. But in fact insofar as environmental damage from wood-extraction operations is a cost to the public (e.g. as the nominal owner of forests, and through damage to basic productivity, soils and watersheds), it is the non-wood user who is "the public" and the wood-user who is a specialist sub-group, already heavily subsidized and unjustifiably favoured from a purely commercial viewpoint. And even where the non-wood user of such forest benefits as recreation and natural values cannot be considered as

"the public", the class must, as we have argued, be treated as a very much larger class than the widely assessed class of overt users or "visitors", once account is taken of choice and other factors on spreading such benefits and diminution of choice in spreading costs over a much larger set. Clearly the existing privileged position of the wood-user over other forest users is inequitable and the continued narrow orientation of forest services and their ideological mentors to the interests of wood-users over the public interest and the interests of other forest users is no longer acceptable.

The wood-user whose welfare the forest services are concerned to promote is not, of course, primarily the *consumer* of forest products (although this is the rationalisation) – primarily it is the forest industries, as the services' repeated advocacy of continued high tariff levels and self-sufficiency, factors which work against the interests of the consumer of forest products and for the interests of local industries, clearly demonstrates.

A further necessary condition then for the acceptance of forestry projects, both export and domestic, and broader orientation would not only be a greatly increased amount of independent research on impact of forestry operations on non-wood-production values of forests and alternative methods of timber production which would maintain non-wood-production values and optimize benefits, but also, as an essential part, a moratorium on further major forestry projects or commitments, particularly woodchip export projects or further pine planting, until detailed biological and associated taxonomic surveys of proposed areas, and preferably of the entire forest area, have been completed and assessed. Such surveys should consider the suitability of forest areas, particularly those proposed for intensive export projects, for national parks and wilderness areas. The provision of areas adequate for future population for national parks, and wilderness, and the provision of other forest benefits, should take precedence over the development of unnecessary and doubtfully beneficial export projects.

National parks – an impractical dream?

There are two issues of especial importance for the future of the forests on which the forestry authorities will try to pre-empt future options. One is the question of the fate of the remaining 30 million acres or so of uncommitted Crown land in Australia which carries real forest, the other is the matter of turning the natural forests over to intensive management (which is what its proponents are usually referring to when they talk about 'improvements' of natural forests), something that will require massive Government financial assistance. We shall consider first the planned take-over of remaining Crown land for the forest industries.

A prime objective of forestry planners is the expansion of the territories under forestry control. The expansion is proceeding rapidly. The forestry empire has increased significantly in the last 20 years, the area in state (but not territory) forests rising from about 20 million acres in 1953 through 25 million acres in 1963 to more than 30 million acres in 1973. With the advent of vast woodchipping and pine planting schemes the increase will accelerate; it will *have* to accelerate if the plans forest services cherish are to be carried out on lands appropriately under forestry administration.[1]

The expected signs of a forestry grab for remaining Crown lands are there. The Tasmanian Select Committee simply stated the view of the Forestry Commission when it recommended (Tas [4], p.24) that

> the present policy of progressive dedication of Crown lands as state forests be pursued vigorously;

and Jacobs has stated the view of the forest industries (in [13]):

> The forest industries believe that much of this latter area [i.e. uncommitted Crown lands] should be proclaimed state forest. The industry holds the view that there already exists sufficient suitable land for agricultural purposes.

There is, of course, no mention of parks and reserves. Yet if the forestry lobby succeeds there will be almost 70 million acres of Australia's real forest in state forest (or equivalents

1 Recall, e.g., that some of the land NSWFC requires for its pine schemes it does not even have access to and that much of what it 'has access to' is Crown land.

such as timber reserves or territory forests) but only about 3 million acres of it in the park system.

But the proposal that more of remaining Crown lands should be dedicated as parkland is greeted with horror by the forest industries, who typically respond with alarmist propaganda as to how a crippling shortage of timber for housing *may* even ensue if more Crown land under real forest, what we shall call *Crown forest,* is so dedicated. Thus, for example, T.R. Brabin, president of the Victorian Sawmillers Association, claims[1] that the dedication of more Victorian forest for parks

> could have drastic repercussions on the timber and thus housing industry . . . If more forest is earmarked for national parkland, the resultant drop in the supply of timber could again lift prices and could even create a serious shortage of timber for housing.

There is no basis for such claims (as Chapter 4 reveals): per capita consumption of sawnwood continues to decline, even if there are short-term fluctuations at times when there is a high level of demand for housing, as in mid-1973. Moreover such claims forget that imports can be purchased, and neglect the extent to which forests are harvested not for sawnwood but for pulpwood; and in the exceedingly unlikely event of a shortfall forest resources could be re-allocated in favour of those deemed necessary. Many of the Crown forests that could well be reserved as parks have never contributed to the log supply; so it should be evident (from Chapter 7) that there is little justification for further enlarging the areas of state forest in terms of likely Australian domestic requirements, either now or in the foreseeable future, and little justification for taking over untouched Crown forests for wood production. The myth of a severe local timber shortage appears to a local variant of the US forest industries myth of a national housing shortage (advanced, e.g. in USA [1]), a recent argument aimed at forcing (panicking) the US federal government to release old growth national forests as a source of cheap raw material for the forest industries. However the real motivation soon became apparent; and American conservationists pointed out that not only were local materials and imports plentifully available (at a marginally increased price) but that the alleged shortage was difficult to reconcile with increasing US exports of wood products. As the eminent American forester A.W. Bolle explained in sketching the view of the Bolle Report (USA [3], and also Metcalf [1]) on the anticipation of a timber famine or rapidly increasing demand for timber (as presented, e.g., in the Mayo Report of the President's Commission on softwood supplies and needs):

> We don't see the increasing demand . . . We see no signs of rapidly increasing timber prices in the long run. Perhaps there may be some short run fluctuation and perhaps some high prices in the immediate future, but no long term trend which would be the case if there was a large unsatisfied demand, or if demand were increasing . . .

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1 In 'Bonanza in timber but Govt. is not smiling' (Kohler, [1]). In the same vein, Jacobs, speaking on behalf of the forest industries, predicted that there would be severe shortages of timber and increased housing costs if conservationists had their way and reduced the softwood planting program, *The Australian,* June 19 (1973). Likewise people who wish to see a more restrained exploitation of forests, in the interest of other values, are accused of being extremists who want to bring forest industries to a complete halt (cf., D. Cromer, *The Australian,* June (1973)); but the claim is false since conservationists, and even preservationists, generally have no desire to block the use of state forests; and the contrast made presents yet another false dichotomy.

Brabin's attitude to conservation, and some of the forest industries' political strategies directed towards retaining and expanding 'the forest resources available for extraction of forest products', are spelt out in detail in the revealing 'Conservation and Hoo-Hoo — The Victorian Scene'. VNPA [1].

> *lumber and other timber product prices have been unrealistically low* (even subsidized) – reflecting barely the cost of manufacture and marketing – but *not including the cost of growing trees.* Such depressed prices certainly do not suggest a large unsatisfied demand for wood (e.g. the utilization of dense hardwoods for paper, recycling of paper and other wood products); and we do see substantial changes in the overall market (e.g. high rise apartments, mobile homes, changing urban building codes). . . The forest service has continually warned us about the impending shortage of wood – but it has never occurred. But, shortages of forest values (wilderness, quality water yield, wildlife habitat, etc.) seem to be very real possibilities to many Americans, and the forest service did not warn us or act very aggressively in these cases . . . We do not see a critical shortage of timber – certainly nothing that would justify large expenditure on *marginal* forest land, or that would excuse timber practices that seriously impair other benefits or uses of land. (USA [2], p.180; main italics ours)

Bolle added, under questioning, 'Timber famines have been far more often predicted than realised' (USA [2], p.175). One can easily see why. Such predictions of shortage are a convenient way to disguise the take-over and use of excessive areas of land for commercial forestry under the cloak of necessity and urgent national interest. Just as the Red Menace served to justify the disproportionate allotting of resources to military interests, so the Impending Timber Shortage is supposed to justify the disproportionate allotting of resources to forestry and wood production interests at the expense of more worthwhile concerns.

When the local timber shortage argument fails, the forest industries resort to instilling panic into the public by announcing a world-wide timber shortage. But short-term shortages of important commodities, due to the fluctuation of the world economy, are commonplace, e.g. presently (late 1973 and early 1974) steel is in short supply along with timber and certain other building materials, due to a surge in building demand with which supply has not yet caught up. Such short-term fluctuations are adequately handled by the price mechanism, along with subsidies and tariff reductions where need be. (Thus the recent 25% uniform tariff reductions should help ease the already improving timber situation, especially as milled timber, with a former average effective tariff of 22%, uses all of its effective protection.) But short-term demand shows nothing about longterm requirements, as the Bolle Report indicates. It would be completely *invalid* to infer from a current (temporally-local) surge in demand for sawnwood that the pine plantation program designed to meet requirements 40 years and more ahead is essential. Since at most a low level of imports will be wanted to meet Australian future domestic requirements (as explained in earlier chapters), there is no cause for the alarm forestry authorities and industries are trying to engender.

The forest industries have a second chain to their saw. They contend that Crown forests may as well become state forests since state forests are practically as good as national parks; they too 'belong to public' and provide the same sorts of facilities as parks. In what respects are these claims true? In what sense are the state forests *public?* This does *not* mean, as we have seen, that they are managed in the long-term public interests rather than for sectional interests; nor does it mean that public has any voice in decision-making concerning these forests, or even that they can obtain information about decisions that have already been made; it does not even mean, in some states, that they have free and legally guaranteed access to the forests: all it really seems to mean is that the public is expected to foot the hefty bill which forest services succeed in building up in the process of providing cheap wood for the private forest industries. Indeed the public is expected to do this even in the case where they obtain no benefits but only costs in the shape of a degraded environment, and the products are exported: this is the situation, for instance, in Tasmania.

In view of the poor economic performance of forestry, there is no justification for assigning to forest services more forest than is needed to meet reasonable requirements; and they have more than enough for these purposes already. There is, then, no case, in terms of necessity to provide for future domestic requirements, for the further expansion of the forestry empire by the acquisition of Crown forest. Nor is there any commercial case, in terms of public financial benefits, for increasing the area of state forest; and unless there are far-reaching changes in the direction of multiple value management of the state forest estate, there is no more general economic case in terms of welfare. Because of the pressure by forest services to put to use for wood production land allocated to them, increased land allocated to forest services will inevitably mean heavily publicly subsidized economically unviable export industries. Indeed if a more satisfactory pricing system were adopted there would, with the ensuing decline in demand for wood products, be a case for reducing the extent of the state forest, for contracting the forestry empire. For similar reasons there is no case – to say the very least – for extending the practice, adopted in Victoria, of leasing Crown forests (very cheaply) to major industrial companies for conversion to softwoods.

Not only should Crown forests not be ceded to state (and territory) forest services, or leased to private industry, for the most part they should not be left as Crown forests – under their current legal status – for two main reasons. Firstly, as Crown forests, the forests are in large measure under state forest control even though they are not part of the state forest estate. But the control of all timber on Crown forests (and indeed on Crown lands generally) is vested in state forest services as are other features of Crown forests of less moment. There is in fact nothing to stop relevant forestry services from clearfelling a Crown forest should they decide upon it; and in fact many of the forests committed for woodchipping both in Tasmania and also on the mainland are Crown forests. Secondly Crown forests may be degraded and their wilderness value destroyed, by council roading, by a network of fire trails, by regular 'control' burning and by mining activities. In sum, Crown land status, which never was an insurance against mining depredations, is no longer a safeguard against the erosion of environmental values of a forest by a host of other encroachments and invasions. The only status that at present offers some safeguards and limits activities by forest services, lands departments, shire councils, bush fire brigades, mining companies, and so on, is national or state park status.[1] For these reasons, remaining uncommitted Crown forests should be reserved either under some new legal status or as (undeveloped) national parks. But whichever of these courses is taken, it appears better to retain many Crown forests in a revised status which prohibits interference and degradation than to destroy their integrity by carving them up. For there is, it seems no substantial advantage in releasing these forests to other divisive uses at present, and it appears best to keep options to retain the areas intact open; if it is decided eventually to alienate some of these forests, then at least the prospects of reaching a better decision are enhanced. There

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1 Even status as a forest park, flora reserve, and such like, is not an adequate guarantee in some states because unless the reserve or park is controlled by an unusually strict working plan, its status can be revoked by a forest service decision. In some states in fact park status is an insufficient guarantee of integrity; so it is to be hoped that the proposed system of national parks under joint Commonwealth and State legislation and financial arrangements, and requiring approval of both parliaments for the amendment of working plans, will soon be implemented.

is no virtue in using every piece of forest; it may be best simply not to use some forests (and no longer to generously concede to that 'non use' is a further sort of use). One of the usual troubles with land use (and resource allocation) committees is that they are committed to a total use principle: they regard an area as having to be divided up completely between competing uses, whether worthy or not. The result all too often is that areas are unnecessarily, or unwisely, fragmented and that evey inch of land is assigned for some use. Yet many Crown forests are best simply reserved (from use), not used for human ends at all.

But the transfer of some Crown forest and some state forest to national parks is of utmost importance (and not all forest in national parks need be used). For time is running out for the creation of an adequate national park system, with far better representation of forest than at present, and particularly of first-class forest. (Crown forest is generally only first-class when inaccessible, almost all the remaining accessible high-class forest having been dedicated as state forest.) Australia has a national park system which is not only inadequate for the future population, but which does not even meet the needs of the present one once allowance is made for the likely disappearance of areas now under native forest that are not in national parks. It is well known that there is already too much pressure on some parks, especially those in the vicinity of Sydney and those that can be reached on a weekend from Melbourne. In the past state forests have provided valuable adjuncts to national parks, much as in USA where national forests have relieved some of the pressure on national parks. With the advent of new forestry plans and practices, state forests can no longer be counted upon to supplement national parks in the multiple roles these parks have. Yet forest is particularly poorly represented in Australia's lopsided park system (much of which consists of largely inaccessible desert country, e.g. the extensive Tanami Desert Sanctuary), especially considering its importance and its attraction to many people. It is a tragedy that so little of Australia's forests, and particularly high quality forest areas, which at their best are certainly among the most beautiful forests in the world, are so inadequately represented in national parks. There are no large parks which, like the Redwood National Park in USA and a number of others, preserve in virgin state a large area of the finest forest; it is especially bad in Australia's case that there are no large reserves of the majestic mountain ash, although they rival the redwood forests in height and certainly in beauty. The largest remaining mountain ash, some of them more than 300' in height, grow in the magnificent Styx and Florentine River Valleys in Tasmania; and a sizeable portion of the Styx Valley at least (including the tallest eucalypts) should be dedicated as national park. However the whole area lies within a pulpwood concession, and, while the paper company which has the concession has reserved stands of the largest trees for the time being, these reserves are so small that sooner or later wind, fire or other phenomena will damage the big trees (so that the Breedens [1], p.248, give these trees a further life of only 60-70 years). This shabby treatment for Australia's tallest forest in part reflects the continuing undervaluation of the native vegetation and forests, part of the Australian cultural heritage which despite recent improvements has certainly not disappeared. The Alpine National Park proposed for Victoria, which would preserve a large area of quality virgin forests, would do something to correct the deficiency in large high quality forest parks. As we have explained, there is no doubt that the reason for the inadequate representation of high quality forests in the national park system is pressure against reservation of the areas from logging by forestry interests. The point is well illustrated once again by the present opposition of Victorian forest industries (at the instigation of the Victorian Forests Commission) to the proposed Alpine National Park; and also by the unsatisfactory boundaries imposed on most national parks in forest areas of NSW by the demands of forestry interests that they retain or acquire crucial areas of adjoining forest land for state forests. Similar battles were of course fought against forestry interests for the great forest parks of USA, e.g. for Olympic and Redwood (the battle for Redwood NP is documented in Dasmann [2]).

The difference is that in USA forestry interests did not always win the day and Americans owe some of their finest parks to this piece of good fortune.[1]

Not only should there be many more national parks but those that there are should have their boundaries improved where these have been spoilt by refusal of forest services to cede crucial pieces of land needed to obtain satisfactory boundaries and a sufficiently large undisturbed area. Examples of this in central and southern NSW are the Boyd Plateau, which should be added to the Kanangra-Boyd NP, and state forests intruding into Murramurrang NP and far into the Deua-Tuross-Brogo NP (where Badja SF and part of Dampier SF are needed for the creation of good park boundaries, for the integrity of the park.) It is quite intolerable that forestry interests with such an enormous monopoly on the forest area should, by refusing to cede small areas in crucial positions, effectively spoil those national parks that it has been possible to wrest from them in forest areas.

A stock objection to the conversion of state and Crown forests to parks is that such a move is very expensive, a luxury that the nation cannot afford. However the picture we are usually given (and which is frequently painted by forestry interests) of national parks as an extravagant luxury and of the reservationist or national park proponent an impractical idealist whose dream of a large park system would involve great financial sacrifice by the community and would substantially lower living standards by removing large areas from forestry use, is a completely false one. The picture, although completely false, has unfortunately been widely sold and has been bought even by many unwary conservationists who feel that they must apologise for requiring even quite small parks in commercial forest areas. The true picture is very different as Table 19 shows. Whereas state forest services usually make substantial losses, national park authorities, which generally operate on tiny budgets, commonly have revenues which exceed expenditures. For example whereas, in simple budgetary terms, the practical down-to-earth state and territory forest services cost the taxpayer more than 30 million dollars net for the financial year 1971-2, the impractical luxurious national parks cost the taxpayer little in comparison. Moreover this figure neglects the very substantial support costs for forestry involved in financing such institutions as the Forestry and Timber Bureau (more than 2 million dollars in 1971-2) and university forestry departments; there is no comparable set of costs in the case of national parks. Of course there are other costs that are not taken into account in this simple assessment, e.g. opportunity costs on land, but these apply equally to state forests as to national parks. Arguments against national parks based on the assumption of a high opportunity cost[2] (i.e. of the foregone benefits of the best alternative) characteristically ignore the crucial question of the distribution of benefits. For example, the opportunity costs of parks in terms of mining are usually exaggerated by considering too short a term and by the fact that main mining profits and employment benefits accrue to a small group whereas national park benefits go, in principle, to everyone.[3] Seen in this light the opportunity costs to the *public* of a

1 However, the trend is changing and these days, in the battle over the remaining forest wilderness, US forestry interests appear to be winning: see e.g. USA [2].

2 There are opportunity costs not only on the ecological systems (reduced to costs on land in the usual economic assessment) but also, what is different, opportunity costs on capital.

3 In the past the true costs of mining ventures have generally not been taken into account in assessing the ventures; for example the general costs of the mining at Captains Flat – where slag heaps are still polluting the river (which flows to Canberra) more than 30 years after operations ceased, and will disfigure the landscape forever – are rather large and may well outweigh the short-term profits of the operations. The same applies of course to some forestry operations. A striking example has been provided by the effects of roading construction and clearcut logging on the aquatic habitat of the South Fork Salmon River, Idaho (detailed by Platts in

TABLE 19

THE COST OF NATIONAL PARKS IN FOUR STATES
(as reflected in park authority revenue (R) and expenditure (E)).

STATE-AUTHORITY	YEAR	1967-68	1968-69	1969-70	1970-71	1971-72	1972-73
NSW-National Parks and Wildlife Service	E	.98	1.64	2.10	2.27	2.76	3.32
1. General purposes account	R	1.11	1.68	1.96	2.30	2.81	3.28
2. Total accounts	E	1.04	2.34	3.07	3.44	4.28	5.73
	R	1.31	2.65	2.94	3.43	4.42	6.14
Victoria-National Parks Authority (National Parks Service since 1971)	E	n.a.	.42	.56	.46	.56	n.a.
	R	n.a.	.42	.57	.47	.58	n.a.
SA-National Parks and Wildlife Reserves Commission	E	.183	.19	.23	.29	.55	n.a.
	R	.179	.21	.23	.28	.52	n.a.
WA-National Parks Board	E	.31	.32	.346	.396	.428	.488
	R	.30	.33	.349	.396	.426	.489

Notes: As in table 2, p.6, with which this table should be compared, expenditure and revenue figures are in millions of dollars, and E/R ratios (which are readily calculated) provide comparisons in real terms. It will be found that whereas state forest services typically have high relative losses (with E/R ratios much greater than 1), park authorities break even or better (with ratios about 1 or less than 1).

In the case of park authorities, however, the E/R ratios are not an accurate indication of the extent to which national parks are supported (and for this reason the ratios are not shown in the table). For example, in 1970-71 the revenues of the park authorities in the four states shown were assisted by grants from consolidated state revenue totalling about $2 million (of which $1.37 million was contributed by NSW which has the most extensive park system). It is evident nevertheless that state grants to park authorities are very small in comparison to the budgetary deficits of forest services (in 1970-71 amounting to more than $20 million) that the states are obliged to meet.

A comparison of the 1972-73 budgets of the NSW National Parks and Wildlife Service and the NSW Forestry Commission indicates that on a per acre basis the cost of supporting the national park system in NSW is far less than the cost of supporting the state forest system in NSW.

Sources:

Vic: National Parks Authority (Service) Annual reports

NSW: National Parks and Wildlife Service, in Reports of the Auditor-General

SA: 1967-8 to 1970-1 figures are from National Parks Commission Annual Reports. 1971-72 figures are from the Report of the Auditor-General.

WA: National Parks Board, in Reports of the Auditor-General

proposed park, such as Cooloola or Myall Lakes, in beach-sand areas, are small since beach-mining returns negligible per capita amounts in the long-term to the public purse. If the opportunity cost argument carried any weight in the national parks case it would count even more against such desirable public amenities as suburban parks, public libraries and museums; the benefits of these are recognised as well outweighing the alternatives.

National parks are not the hopelessly extravagant dreams their opponents are pleased to make them out to be. More often the real contrast between forestry and national park status (or subsidized agriculture and park status for such areas as Queensland's Wallum or Victoria's Little Desert) is between a form of use for the areas which involves heavy public subsidies, reduces the amenity value of public resources and concentrates benefits in the hands of a small group on the one side, and on the other a role which does not involve heavy costs (for such areas if not interfered with are largely self-maintaining) or even heavy opporunity costs (since many areas highly suitable for parks are often not developed precisely because it has not been economically attractive to do so), and which distributes benefits more equitably at least in terms of increasing opportunities, over the entire population. At least in terms of maintaining or opening choices national parks resemble libraries and museums; but they generally cost much less and of course offer a different range of choices and advantages. The welfare advantages of national parks (in terms of recreation, wilderness values, scientific interest, species preservation, as genetic reservoirs, and so on) are of course well-known; but these advantages have often, quite mistakenly, been thought to be more than offset by the economic disadvantages of parks.

The picture of either having national parks or improving the welfare of the disadvantaged, but not both, is similarly a false one[1] and is defeated by the same set of considerations. Even apart from the misrepresentation of the true financial position involved in this picture, the argument is just as defective as the argument that a suburban park system will divert valuable resources from improving the welfare of the disadvantaged. Alternative forms of use for potential national parks (such as forestry or subsidized agriculture) would divert more resources and return fewer benefits to the disadvantaged. An equally silly but recently fashionable related accusation levelled against national park advocates is that parks cater only for the interests and aspirations of the affluent or the middle class (accusers don't seem to have made up their mind about which of these different classes is the villain), and that such matters are of little or no interest to the less affluent (or bourgeois) groups. Even if obvious counterexamples to the latter claim are ignored, it cannot be claimed (what is clearly taken to follow) that if a certain group is not vocally opposed to some development it is not adversely affected thereby. Everybody (not just affluent groups) loses when valuable publicly-owned amenities are impoverished or alienated; in fact the argument in question turns the true situation on

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1 (Continued from page 163)

USA [2], p. 113), where restoration of damage caused by timber extraction, in the form of heavy siltation and destruction of habitat is estimated to cost about US$5 million, vastly more than the net returns from the timber sold.

1 It is often part of the larger false picture which presents development for undiscriminating economic growth, as essential to improve the welfare of the disadvantaged. Actually it is far from essential (in contrast to selective growth), and without substantial redistribution characteristically succeeds in making many of the disadvantaged worse off (e.g. in USA inequality in income distribution is increasing).

its head in that those groups which stand to lose most from the impoverishment of public amenities are precisely those with the smallest private resources to provide alternatives, that is less affluent groups. The case is clear enough for public education and transport and libraries and parks – the affluent man with the extensive private book collection does not need the library, nor the man with the 10 acre garden the park (to take an extreme case). Similarly for national parks – the director of the sand-mining or woodchip company can live in delightful surroundings far from the scene of the crime and take his holidays in Bora Bora, but less affluent citizens will find their lives and choices far more seriously affected by the results of his company's activities. Nor is there any class or income bias in the activities catered for by national parks (with the exception of snow sports and luxury accommodation), except that many cannot be reached without private transport; but access to private transport can scarcely be regarded as out of reach of all but the privileged classes. The same sets of points apply to the notion that concern with preserving amenity value of forests is exclusively that of affluent groups and that it furthers their interests to the exclusion of others, and more generally that the degradation of the environment and publicly-owned resources such as air and water is exclusively the concern of affluent groups.

Another argument from the same family is that national parks and wilderness areas (and state forests managed to preserve natural values) will benefit only a small minority, namely nature-lovers and wilderness lovers (similarly presumably public libraries, suburban parks and playgrounds benefit only small minorities, namely book-readers, park freaks and children respectively). But again not just those who actually use the amenities benefit; eveyone benefits from the enlargement of the range of choices, particularly important ones, and everyone loses when important choices are reduced. Further, not all choices are equally important (choosing one's marriage partner is a more fundamental choice than choosing the colour of the wedding dress), and the relative importance or depth of choices or options (and the benefits provided by their existence) cannot be assessed simply in terms of the number choosing to exercise them. National parks, wilderness areas and access to beautiful uncrowded natural areas provide for a very fundamental set of choices.

It is ironic, in view of the plans forestry interests cherish for the forests of the future, that one of the reasons frequently given for rejecting national parks proposed for forest areas has been (as in the case put up for dedicating Crown forests as state forests) the claim that such areas would equally retain their attractiveness and character and preserve ecosystems if retained (or dedicated) as state forests, which would equally belong to 'the people' and would furthermore 'pay their way'.

Why have all that material going to waste in parks when it could be used in state forests for benefit and profit? This common forestry approach presupposes a quite different financial picture from the real one. Once the true financial position is realised of course, a proper question is not this at all, but rather the question: 'Why should one (be expected to) pay to have the forests messed up and to have their value for a great many people and many important purposes greatly reduced or removed, particularly where it is not necessary for basic domestic purposes?' The forestry approach also presupposes that all use is use for commercial or industrial purposes and the material not being used in these roles is going to waste. It presupposes as well a strange doctrine to the effect that it is better to use resources (in the narrow construal of use as use for commercial purposes) *at a loss* than to leave them alone. This strange doctrine expresses an almost obsessive concern with use (narrowly conceived) which cannot be justified on any normal welfare grounds.

There is a second reason – apart from the fact that state forests no matter how carefully managed to preserve important natural values could never fill the same function as national parks simply because the amount of roading and interference they are subject to – why the attempt to represent state forests as as good as and more useful

than national parks breaks down. Much of the land under forestry control must be regarded, from many points of view, as just as thoroughly alienated as land turned to private interests for agriculture, with no legal guarantee of public access, and with just as little certainty under present policies of retaining much of its original cover and natural ecosystems. Much of the land in forestry services' hands must then be regarded as having been obtained on false pretences if it is in fact to lose its attractiveness and character and be managed for the narrow purposes of maximum wood production. For the justification for making over such large areas of land to forest services was generally the assumption that they would be managed along conservation lines and that wood production would not be the dominating or sole consideration; but now that it is evident that they are not and that the only thing at all likely to be conserved in many forests is the wood producing capacity, there is no ground for turning such large and important areas of prime forest over to such narrow goals as wood production at great public cost. The case for retaining even the present area in forestry control, then, depends upon changing current forestry attitudes and directions.

As state forests are not substitute parks, there is an overwhelming case for placing far larger areas of good forest (not just areas that forestry doesn't want) in national parks, e.g. some of the Otway Ranges and much more of the Queensland rainforests. Nevertheless there is an important place for carefully managed state forests, managed to preserve important natural values.

The requirement that 10% of the land area of a continent be set aside for national parks has been suggested (e.g. by the United Nations) as desirable, with 5% as the minimum. However, there is a good case for extending this condition, as far as possible, to particular broad vegetational classifications, thus ensuring balanced representation for different types and avoiding the situation where most of the area allocated to national park is desert or semi-desert, a type with little or no value for other purposes and allocated as park largely for that reason. Application of the requirement would, then, lead to the requirement that 10% of the total area of real forest should be reserved for national park, with a minimum of 5%. Actually, in view of the fact that forest areas have a particularly high value for national park, and in view of their appeal to many people, their proximity to the main populated areas, and the richness of their ecosystems, there seems to be a case for reserving more areas of this type as park than many *other* areas, just as there is with the important areas of the coastline. However since applying this quite reasonable condition would involve placing an area of 9 million acres of forest or more in national park (compared with our present tally of roughly 3 million acres), it is obvious that it would require that forest services give up substantial areas of their land which are particularly valuable for these purposes, particularly where forest land adjoins important population centres and has greater value for other purposes than wood production, or where it is needed to provide satisfactory boundaries for existing or projected parks. In Australia the real forest area is decidedly underrepresented in parks, because at present only about 3%, a lot less than the 5% minimum, is parkland.

It would be a mistake, however, to think that even if a generous system of national parks were obtained, it would be satisfactory for the land controlled by forest services to be managed with wood production as the overriding consideration. The dichotomy between complete preservation, or museum status, and the 'open go', i.e. a situation where environmental costs and the role of forests in retaining many things of value is largely disregarded, is clearly a false one. Not all natural areas need to have wilderness status and many that do not can still be highly valuable, and beautiful, provided they are appropriately managed to take these values into account. State forests appropriately managed to take account of relevant values, could still play a valuable part in supplementing national parks and providing for a number of demands which often cannot be met by national parks without spoiling them, e.g. those of people who want to drive right through them, or to walk on made trails. State

forests, with their roading systems, can be used for amenity and other functions while preserving many of the features of natural ecosystems,[1] and still provide *reasonable* quantities of wood under careful logging plans.

Many state forests have provided such benefits in the past, not so much because they were not managed primarily for wood production, or because they were *deliberately* managed to take account of such values, as because the wood production methods then employed were far less destructive of these values than the intensive methods presently coming into vogue. Many people, who are unaware of the change in forestry technology and its increased destructiveness of non wood-production values and of the extensiveness of forestry plans for the use of these methods, mistakenly believe that State forests will continue to provide the same range of benefits as in the past. However they will only do so if there is a drastic change in direction; it will be necessary to follow sounder decision-making procedures and to deliberately plan for and to accept substantial restraints on wood production methods and yields to maintain benefits which in the past were taken for granted or provided accidentally. But to do this will require a quite drastic change in forestry ideology, attitudes, political orientation and decision-making methods. The alternative will see native ecosystems and other benefits of state forests gradually receding to the national parks, until finally only they preserve them, and no matter how generous the park system, that will be a tragedy.

Changing the ideological commitments

The most basic change required is a change in forestry orientation and ideology — in particular that forest services give up using the state forests in the interests of the forest industries, as a source of cheap raw material, and that they cease to regard the provision of this raw material as the most important role of the forests they control and one that overrides all other roles. There are few areas where the management of a nominally public resource, heavily publicly financed, in the interests of particular industries to the virtual exclusion of other interests, and the very close identification of public servants charged with administering a public resource with the industries and groups which stand to benefit financially, would not be regarded as an abuse. The abuse becomes important particularly where, as in the case under consideration, there is a substantial conflict between the interests of the industries concerned and, arguably at the very least, the public interest and the interests of other groups, with just as much claim to consideration.

One thing which could be taken as a token of good faith of forest managers, with respect to turning away from serving this set of interests, and the narrow interests of wood production and its associated pressure groups, in favour of a broader set of goals, is the abandonment by forest services of the policy of secrecy and of refusal to disclose information to interested members of the public who are not members of the forest industries lobby. The contrast between the contempt for the public, as indicated in the refusal to publicly disclose adequate information on proposals in advance of commitment (thus rendering impossible adequate public checks, assessment and discussion, and excluding the

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1 There is a case, then, for including the state forests within the national estate of Australia; for this would at least limit the alienation of further forests by forestry practices which irreversibly modify the forest ecosystems. Strictly, there should be no alienation of natural forest for plantations or the equivalent without an independent environmental impact assessment. Legislation along these lines is by no means unprecedented; and in 1972 the Labor Party, in conjuction with the DLP, succeeded in the Senate in amending the Softwoods Forestry Agreements Act in a way which incorporated such a requirement in the case of softwood plantations (see Comm [5]).

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public from decision-making), and the privileged position of forest industries and the substantial role allotted them in decision-making (which is well displayed in the Forwood conference program), illustrates as well as anything this unsavoury protection of forestry interests at the expense of more general interests. This culminates in the appalling situation where information as to areas likely to be exploited in future woodchip concessions, which is deliberately withheld from Australian citizens, is freely available to interested overseas companies and on the Japanese market.

This situation is of course explained in the familiar paternalistic style by the claim that only forest services have the relevant expertise (and information !) to decide the fate of the forests and that only they can be relied upon to determine the true interests of Australia with respect to forest management. To recapitulate on some of the defects of these paternalistic doctrines:— forest services do not have the relevant expertise in general ecological matters or in subjects other than wood production, and they are not (nor is anyone else) experts on, or arbiters of, values;[1] yet decisions on forest use cannot be made independently of assigning values to various features of native forests, and judgements about which values have more weight clearly will differ greatly. In a situation where forest services stand identified with a very particular group and a particular set of values (and one which has a direct financial interest in the outcome), expertise is used as a cover for interest and in order to foreclose value judgements. The relevant change in orientation, then, would require at least the abandonment of these paternalistic and secretive attitudes in favour of a more open set of attitudes and the severing of the present over-strong links with forest industries and other groups with a direct financial interest in the relevant resources. Forest services are not a production part of the forest industries, and they should cease to regard themselves as such.

What is undoubtedly more fundamental than the abandonment of direct links with such commercial interests is the abandonment of the ideology on which these commitments are based, most importantly a swing away from the narrow goal of maximum wood production, and a rejection of the aim of total use of the forest crop. The three main ideological commitments – (1) maximum wood production, (2) total use of the forest crop, and (3) cheap wood for industry and for the populace – all of which will have to be abandoned, are logically intertwined. These principles can in fact be fitted into a deductive system, and in more than the way we sketch, depending on which principle is taken as fundamental.

A fundamental ideological commitment of mainline forestry has been, and remains, that to maximum wood production, subject to financial and other constraints, such as wood type and quality. An extreme (and unlikely) form of the maximum yield principle omits these qualifications: in Henry's terms ([4], p.67), part of the cultural heritage of forestry is the doctrine of absolute value according to which 'the best timber ouput is

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1 Likewise 'The role of the professional . . . is to provide the basic information to help society set its goals and then apply technical skill in the attainment of these goals, but the professional is no more competent than the public to decide what uses or services it wants from forest lands.' (USA [2], p.18). Hence, Bolle rightly concluded, it is false that professional foresters are competent to set goals for the public. But the foresters' assumption that they are competent has assisted some very unfortunate policies, as Bolle went onto explain; e.g. that wood production, per se, regardless of market conditions and other values, is the goal, that old-growth forests should be removed, and that multiple use is a mere concomitant of wood production management. As well the competence assumption has led to satisfaction with an 'ignorance of normal business practices and investment decision-making' (USA [2], p.181).

the maximum timber output, regardless of quality or economics'. It is this maximum yield principle that has led to the, also independently motivated, principle of total use of forest areas for wood production (since in this way, with no wastage of forest land, greater wood production is achieved) and to the commitment to intensive forestry methods (since these maximize on wood production in the shorter term). Conversely the total wood use principle implies the maximum yield principle on accepted efficiency assumptions, since efficient production (which is best) should, within recognised constraints, aim to maximize yields. From these primary ideological principles other facets of the forestry cultural heritage (e.g. of Henry [4]) emerge, either as consequences (e.g. the doctrine of timber primacy, according to which wood production values dominate over other forest values), as underpinning arguments (e.g. the thesis that forest products are an essential commodity, a necessity of the people, and hence that forestry demands special financial consideration), as guaranteeing smooth flow of maximized output over time (e.g. the cheap wood thesis, since production would be curbed if the commodity could not be disposed of, and the idea that forest services should promote the consumption of wood products).

All these principles are unacceptable, for reasons we have already outlined, and ought to be abandoned. Forests have other roles, roles that are often more important than, and frequently incompatible with, wood production and wood use values. Quantity production of a commodity, whether of wood, wheat or warheads, is a quite unacceptable goal, even on narrow economic views; production as such is not desirable, it may lead to a reduction in other values such as net welfare, and it may be obtained at the expense of more valuable alternatives. To obtain worthwhile changes in the management of Australian forests, it is crucial that these ideological commitments be abandoned. So at the risk of labouring the point, we reassemble some of the objections to the main commitments.

The maximum yield doctrine, that it is the responsibility of forestry authorities to produce from land under their control the maximum quantity of wood which is technologically feasible and whose production can somehow be funded, is completely unacceptable. It is presumably the responsibility of forestry authorities, just as with the case of other public authorities, to manage the land under their control so as to maximize public welfare, which no doubt includes providing for reasonable requirements insofar as it is in the general interest to satisfy these requirements domestically. But there is no reason to suppose that local production of large quantities of wood products does increase general welfare, and reason to think, as we have argued, that it decreases it.

But if what counts is maximizing long-term welfare then clearly it will be necessary to compromise on wood production levels and especially on export levels. If the forests were managed on a maximum welfare basis then wood production would have a quite subservient role, and not the dominating one currently assigned it. The notion that the production of large or maximal volumes of wood is a good thing, *regardless of commercial viability or welfare,* is an example of the application of technological development as an end in itself. This comes out fairly clearly when it is claimed, as in Jacobs [13], that Australia should convert its natural forests to intensive eucalypt plantations because high yields are being obtained in this way in poor countries of the 'Third World':

> Many Australians regret that other poorer nations have surpassed our production of the wood of our own trees . . .

In short, the maximum yield doctrine is underpinned by an obsolescent production and development ideology which is incompatible with welfare and all too frequently has undesirable environmental consequences.

Similar criticisms apply to the total wood use principle, the idea that a tree not used for wood is a tree wasted. Total commercial use of the forest crop is quite undesirable, since it excludes other important forest values. A major indication of the undesirability of total wood use is that it decreases general welfare, essentially by charging the public

for the destruction of the forest environment.

According to the commonly advanced cheap wood doctrine, it is the responsiblity of forest services to produce large volumes of cheap forest products, allegedly again for the benefit of the consumer of forest products. There are several objections to this view. First, the idea that the material is being produced cheaply is an illusion, for it depends upon ignoring both public subsidies and environmental costs (which are another form of public subsidy). For the material is not so cheap if it is produced with a large public subsidy; and insofar as the consumer is also a member of the public then he is paying in any case but in a hidden way to finance his own 'cheap' consumption and the rest of the public is paying too. If the consumer is not an arbitrary member of the public (i.e. he is instead a member of some special subgroup) then some clear argument has to be presented to justify heavy public subsidization of his consumption. Although public subsidy has one advantage, namely the redistribution of the cost burden towards upper income groups, these advantages can be achieved in other ways (see below); and it can be argued that such hidden costs are quite pernicious, because they inhibit choices and prevent proper decision-making based on priorities. For example, the consumer who does not realise what he is really paying for items such as packaging and other paper products, can be prevailed upon to consume a good deal more than he might otherwise do were the costs reflected in prices and not deliberately disguised, and is unable to make choices which more accurately show his real preferences and priorities.[1]

And apparently cheap wood products are not cheap either when they are produced at the expense of destroying much of one of the most rewarding features of the natural environment, namely remaining forest areas, or degrading or reducing the amenity value of a public resource, namely state forests. Once again the cheapness is a pernicious illusion. The same considerations which apply against disguising the real commercial costs of forest products apply even more strongly to the disguising of environmental costs, and thereby of the full *economic* costs, by failing to make them part of the price.

Insofar as the consumers are a clear subset of the public, or only an aspect of the public, it could justifiably be claimed that it is objectionable that forests should be managed in their interests. For to claim management primarily is to serve the consumers of forest products is just an indirect way of putting wood production first and everything else a very bad last. Moreover if the preceding argument about the subsidies is correct, then it cannot even be claimed that the present economic arrangements are in the interests of (all) the consumers of forest products. Yet shouldn't the market at least enable the consumer to reflect his real wants in his purchases? To the extent that his consumption depends on hiding the costs, they do not reflect his true preferences. One might very well ask in whose interest is the production of cheap forest products, if not the consumers? The answer once again is: the forest industries, who are enabled to maintain unrealistically high consumption levels for forest products without any costs to themselves, by a generous public subsidy which disguises the true costs from the consumer (and thus inveigles the consumer to spend more); and thereby also the forest services who are enabled to expand their wooden empires.

Changing the ideological commitments implies changing forest service organisation, since forest services pursue goals which cannot be attained if the commitments are sacrificed; in the pattern of the large organisations discussed by Galbraith ([1] and [2]), a forest service aims to maximize, plainly not its profits nor public welfare, but its own organisational interests, namely, in some combination, the area it controls, its own growth and therewith the opportunity of the administrative hierarchy for new respon-

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1 Thus a further effect is to disguise the real conflict of interests between different groups, notably between consumers and the forest industries.

sibility and power and for promotion and pay increases of its members, the number of private firms it influences, its security and autonomy, its reputation for technical achievements, and its public prestige.

> . . . these goals . . . differ from the aggregate of individual goals. Individuals are then accommodated to these goals, not the reverse. This normally will involve persuasion. But it may involve resort to the state or, in the manner of a utility marching its lines across the countryside, it may involve power that is inherent in its institutional position. (Galbraith [2], p.76).

Similarly forestry ideology and associated goals, which ride roughshod over social welfare, are put into practice through the machinery of the state; and the organisational growth of forestry services is virtually assured by their powerful and well-entrenched institutional positions. The only way forest service organisation can be changed is, it seems, by breaking forestry sovereignty, especially in the management of state forests; and this will mean removing power from the forest services. New forestry legislation is thus inevitable if ideological commitments are to be changed. Apart from stipulating new forestry objectives, one worthwhile direction the legislation could take would be to specify that a committee with informed but predominately non-forester members, a committee which answers back eventually to the community, be elected to direct forest service policy, in place of the present government-appointed forestry commissioner.

A corollary of such basic but highly desirable changes in forestry ideology would be something of a revolution in forestry research and education to ensure that forest managers are appropriately trained in and appreciative of forest ecology and are weaned from regarding wood production as the main role of foresters.

It would be naive to imagine that such a traumatic ideological conversion could occur easily or overnight; but until it does it would be prudent to adopt measures other than simply trusting forestry authorities to ensure that land under forestry control is not managed in accordance with the old, pernicious precepts using the newer heavy technologies.

Multiple values, partial use, and restrained yields

Although the conflict between total utilization of forests for wood production and widespread use of intensive methods on the one side and conservation on the other is inevitable — because, in particular, intensive methods are completely incompatible[1] with many important forest ideals — the conflict between forestry and conservation is not.

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1 Whether the incompatibility between such forest values as timber production and wilderness is a logical one or not turns on such fine points as to the sense of 'wilderness'. In an ideal forestry world where trees grow very rapidly and such effects of logging as roads disappear equally rapidly, say overnight, wilderness and logging could co-occur if 'wilderness' were to tolerate occasional logging discontinuities. However whether or not the same forest can be both logged and wilderness in ideal forestry worlds, such worlds are empirically impossible *and* plainly far removed from the actual one. Similarly other important forest values are at least empirically incompatible with wood production. Ideal forestry worlds which can be logged every week without any environmental costs, though empirically impossible, should play an important part in forestry semantics.

The complete empirical exclusiveness, i.e. the empirical 'trade off', of such forest values as volumetric production and wilderness implies that forests will have to be classified into regions, unless at least preservation areas such as wildernesses and protection forests are, quite properly, removed from state forest systems to parks or reserves. Otherwise there will have to be a segregation of facilities; a classification of forests would be required. Some such classification of forests is adopted in NZ in USA, and even in NSW there is

How does one provide conditions of adequacy for the management of forest areas, conditions which guarantee the maintenance and enhancement of all worthwhile values — not merely their survival through accident or in cases where they do not conflict with wood production, but in a planned and regulated way? Frequently an attempt is made to do this through the notion of *multiple use,* the most conspicuous one being the US Multiple-Use Sustained-Yield Act of 1960. But the term 'multiple use' is somewhat vague and there is substantial difference in interpretation (even of the notion as sharpened in the American legislation) so that there is an unfortunate tendency for disputes about the adequacy of forest management to get sidetracked into basically insoluble differences about whether something is or is not multiple use where the slogan 'multiple use' is interpreted in incompatible ways. What must the term 'multiple use' mean if the claim that an area is managed along multiple use lines is to provide any sort of guarantee of adequacy of management planning and decision-making? The literal interpretation of 'multiple use', taken out of special contexts such as the American Act, is simply that of having several uses, at bottom more than one use, as contrasted with single use, being used for a single purpose. But not only is this, as we shall argue, quite different from the meaning assigned to it under the relevant act; it is also, and more importantly, not a sense in which 'multiple use' provides any sort of guarantee of adequate management or decision-making. If having more than one use provides a criterion of adequacy for the management of forest and other areas then we would have to say that the often-deplored Australian habit of the littering the country, and particularly the bush, with beer cans and other kinds of rubbish actually represented a virtuous example of multiple use, that is of using the land for more than one purpose (not merely as a forest or national park, but also for the purpose of garbage disposal). Those who wish to see garbage disposal confined to small intensively used areas would then be attached to a misguided single use doctrine for land use, thus, according to the current myth, advocating a bad management decision. Clearly use for more than one purpose is not of itself a good thing. This example, of a case where activities are better concentrated into small single use areas and not combined, presents a clear counter-example to the notion that use for more than one purpose is a guarantee of adequacy. However even ignoring activities of this type (which nevertheless share factors with logging) and counter-examples stemming from them, there are still conclusive grounds for rejecting the criterion of use for more than one purpose as any sort of guarantee of adequacy. 1) The mere fact that an area has more than one use provides no assurance that all relevant or important values have been taken into account and given full weight and that some relevant values have not been omitted; e.g. from the fact that a farm runs cattle and sheep and grows poplars one would scarcely be entitled to infer that the farmer has dealt adequately with soil erosion. 2) It does not follow from the fact that something gets a certain use that that use is considered in the decision-making and is

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a precedent for some classification of state forests, e.g. the Forestry Act specifically allows for flora reserves (though these reserves can be logged and their status revoked at any time), and a small area of forest, the 'Kioloa ring of forests' is said to be zoned (but the classification is far from satisfactory and was only introduced as a holding manoeuvre designed to prevent the release of this forest for Murramurrang NP). However zoning is often undesirable, e.g. the American 'dominant use' zoning system now applied in US forest management plans should plainly be eliminated in favour of multiple value management for these areas (Stoddard in USA [2], p.137).

not merely coincidental, in fact the use could occur despite or contrary to planned activities for the area. It does not follow either from the fact that a certain use occurs that optimum or even adequate provision is made for it. 3) From the fact that something has more than one use it does not follow that the priorities between these uses are properly allocated, that due weight has been given to even those which are considered (cf. Bolle in USA [1], p.184). 4) The terminology rather strongly suggests, what is false, that the value of an area for a particular purpose can be assessed in terms of the volume of overt use. Similar points apply against this as against the doctrine, criticised elsewhere, that the importance of a choice can be assessed in terms of the number of persons selecting it. What is important is value, not the amount of use something gets, e.g. an area may have a high value for recreation or beef-raising even if it is not at a given time or at present or ever used for it. 5) Use for more than one purpose as a criterion of adequacy is virtually vacuous and excludes nothing.[1] It is hard to envisage any sort of forest that does not have several potential or occasional uses, e.g. for wood production, walking, for study, for hunting, and even for the occasional bird. Appropriately located farmland might have all these uses except that 'wood production' gives way to some sort of farm production. But since the criterion excludes nothing it has no force and provides no guarantee of adequacy. These six points refute the view that use of an area for more than one function, or an area's having more than one use, provides any sort of guarantee of adequate management. If multiple use is taken to mean no more than this it does nothing to show adequacy or meet criticisms; and it imposes no requirements at all on forestry management.

Yet this seems to be the sense in which much current forestry applies the term 'multiple use'. Thus, for example, it is often claimed that grazing of forest areas provides a good example of multiple use. The ACT pine forests are now taken as a model of multiple use (e.g. by Forwood [1]), because a few picnic tables have been erected in clearings and the public is not discouraged from using the forests for recreational purposes (a case which thereby illustrates many of the points above, since the forests are not managed to take account of a range of other values). Thus too NSWFC (in NSW [11], p.7) asserts that wilderness parks are single use areas (with wilderness *and* recreation uses however) as opposed to the Commission's own virtuously multiple use areas, so contrasting single use with multiple use in a way that would only make sense if multiple use were perversely taken to mean having at least one *commodity* use. But even wildernesses can be used for commodity purposes such as beekeeping. In any case the NSWFC redefinition is open to the objections already made, especially 5), arbitrariness, since one would have thought that national parks in fact represent a number of clearly distinct uses, some of them commodity uses, e.g. recreation, tourism, nature conservation and watershed protection, and substitute additional roles such as maintenance of wilderness and scenic values for the omitted wood production, thus achieving a total of at least as many uses, and possibly more, than production state forests. The same attempt to exploit the arbitrariness in what counts as a single use to justify their own activities reappears in the Tasmanian account, according to which multiple use is satisfied if 'the same logs supply the raw material for several purposes' (Tas [5], p.254).[2] Hence multiple use is achieved by

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1 It is also vacuous because what counts as a *single* use is quite arbitrary, and, insofar as the criterion depends on the countability of uses, whether or not something falls under the concept is virtually untestable (and hence, on verification grounds, meaningless).

2 According to Tas [5] 'the problem of possible overtaxing of existing resources has been met partly by [such] multiple use': but that there are several end uses does nothing to prevent overexploitation and may, as in Tasmania, even encourage it.

dividing the one log into three parts, the first being used for clothes pegs, the second for floorboards, and the third for pulp. Indeed as thinnings from pine plantations are used for particle board, pine forests are in Tasmania managed along multiple use lines: indeed *any* (pine) forest whose products were processed at an integrated mill would be managed in accordance with multiple use on the Tasmanian account. This account not only effects a rather neat *reductio ad absurdum* of the concept and a convincing demonstration of the utter vacuousness of the multiple use concept so interpreted, but also achieves the ultimate in double-talk in an area where it is not in short supply. Multiple use has thus become an empty slogan whose main purpose is for propaganda designed to lay a semantical disguise over the fact that state forests in Australia are managed for wood production.

The usage embodied in the above exercises, and many others that have now become fashionable, is quite different from what appears to have been intended, though unfortunately not so clearly laid down, in the 1960 American Act where multiple use is *not* contrasted with single use in such a way that any area used for more than one purpose could be taken to satisfy the description of multiple use. The intention was to contrast multiple use management and decision-making with management directed solely or even heavily to wood production, and to require that not just wood production but also a further range of specifiable values (not just any two values) should be considered, and that management of forest areas should be directed to maintaining or enhancing all of them. According to section 531(a) of the Act

> 'Multiple use' means: The management of all the various renewable surface resources of the national forests so that they are utilized in the combination that will best meet the needs of the American people; making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions; that some land will be used for less than all of the resources; and harmonious and coordinated management of the various resources, each with the other, without impairment of the productivity of the land, with consideration being given to the relative values of the various resources, and not necessarily the combination of uses that will give the greatest dollar return or the greatest unit output.

This definition leaves a great deal to be desired; e.g. 'multiple use' cannot be defined in terms of best meeting the needs of the *American* people, and it ought not to be defined in terms of total human use or needs; and the definition leaves the issue as to how uses are to be ranked and combined excessively vague, and does not even exclude dominant use, if 'needs' are interpreted as wood product needs, since it only asserts the modal, 'not necessarily' maximizing wood production values. However the Act[1] has the virtue of indicating that multiple use would involve at least management to take

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> Although we do not endorse very much of the Act or even its key definitions, the Act is a big improvement on Australian forestry legislation, and would provide a worthwhile preliminary model for hopefully more enlightened legislation in Australia, e.g. for local Multiple-Values Restrained-Yield Acts.
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> It is worth emphasizing that 'sustained yield' as defined in the American Act (section 531(b)) is intended to mean: sustained yield of multiple values (as the Bolle committee suggests), not what most foresters (including the US forest service and the Society of American Foresters) mean, namely: the wood yield a forest can produce continuously at a given, or maximal, intensity of

account of the value of the forest for values such as recreation, nature conservation, watershed and soil protection, and that management should be directed to maintaining *all* of them. It also suggests explicitly that multiple use management may (it should say: should) involve some reduction or restraint in wood production, first in terms of area used for wood production and extent of wood production and second interms of returns from wood production, in order to provide adequately for these other forest values. The attempt to use 'multiple use' in the way outlined earlier represents a substantial shift away from the original sense the Act tried (unsuccessfully) to capture, in which it was taken to provide a guarantee that management would not be purely or even heavily directed to wood production.

The reasons for the attempt on the part of forest services and industries to redefine the notion in a far weaker way are not difficult to find. With the new technology of intensive forestry, with its blatant disregard for and bad effect on non-wood production values, the practice of managing the forests for wood production can no longer be disguised, as it was in the past, as multiple use in any sense in which it provides a guarantee of adequacy or gives a guarantee that non-wood production values would be respected and maintained. In short if we stuck to the intended sense it would no longer be possible to claim that forestry activities satisfied multiple use. Forestry interests therefore meet the challenge of this discrepancy between ideals and practice with their usual resourcefulness — not by modifying their practices at all but by a little semantical fiddling with the term 'multiple use'. Since the low redefinition of 'multiple use' is so weak that it rules out practically nothing, it is much more convenient for forestry interests, and can be quite adequately satisfied by opening areas to the public or installing a few picnic tables in suitable areas in the tree farms, while of course continuing to manage the forests entirely or overwhelmingly for wood production to the detriment of other values. Indeed the terminology has become little more than an instrument of propaganda (as revealed by the use NSWFC makes of the notion in [11]).

Since the multiple use terminology has been so eroded and abused by forest interests the best course seems to be to abandon it to them, and to adopt some new terminology which is less open to semantical erosion and misinterpretation and for which conditions are more clearly specified. After all what is important is not the terminological issue — whether or not forestry interests can succeed in torturing the terminology 'multiple use' into covering any wood producing activities they choose to undertake — but whether their decisions and management of an area fulfil conditions for adequate practices and decision-making, which take full account of the values of forests for purposes other than wood production.

Some worthwhile alternative terminology, namely 'multiple values', can be gleaned from American foresters, particularly the Bolle committee who write of multiple values

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management. The latter, sustained yield *timber* management, a fundamental forestry dogma, has been devastatingly criticised by the Bolle committee, and shown to rest on such insupportable assumptions, under Australian as well as American conditions, as a high absolute demand for wood products and a basic scarcity of land (see USA [2], p.181-2 and Metcalf [1]).

The account developed in the text agrees in principle with the American Act insofar as the objective is the optimization of multiple values in the long term, something both sections 531(a) ('the best combination') and 531 (b) ('a high annual or regular periodic output in perpetuity of the various renewable resources') obliquely propose.

and advocate a sustained yield of multiple values (USA [2], p.183), but also Minckler who prefers to replace 'multiple use' by 'integrated values' (USA [2], p.82). What is involved in multiple value management and decision-making is recognising that the land or system under consideration has values for a number of different purposes, that is a number of different values, and that its value for wood production is only one and not even necessarily a very important one of the full set of values. It is not merely a question, as with the corrupt form of multiple use, of recognising *some* value other than for wood production or of allowing some other form of use; all relevant values must be given weight and the omission of any relevant value renders the procedure unsound as a case of multiple value management. Relevant values which must be taken into consideration and given non-zero weight include values of the forest for the following purposes: watershed, recreation, wildlife, flora protection, wilderness, scenery and other aesthetic matters, soil fertility and forest revenue (where, as usual, the value for purpose v is alternatively described as forest value v, so that the value for watershed purposes is the watershed value). What was implicit in the original notion of multiple use, and is indicated in the American act, is that not only wood volumetric production (per unit area) and profitability are not the only values assigned weight, but also that non wood-production values may have and often do have values as high or higher than wood production values both singly and in combination; so that wood production and other commercial values do not swamp or overwhelm other values (cf. the part of the American definition which runs 'not necessarily the combination of uses that will give the greatest dollar return or the greatest unit output'). Unfortunately the American legal definition failed to give any clear notion of the relevant weights to be assigned to different values, and the extent to which wood production values counted, a source of frequent criticism and misinterpretation of the Act. With multiple values, although the *weighting problem,* the problem of specifying exact weights for different factors remains (as in the cost-benefit analysis given on p. 84a, and as with the common problem of assignments for externalities), what is important is that many non wood-production values will be assigned substantial weights, in some cases possibly outweighing wood production and commercial values, and that none will be assigned zero or negligible weights (i.e. for weight w_i relevant to value v_i $v_i w_i \gg o$). There is *no* assumption, however, that weights are all equal in value (and the assumption of an equal allocation sometimes made in interpreting the American Act should be rejected: the alternatives, equal priorities versus dominant use for wood production, present a false dichotomy) Operating with the multiple value concept and recognising and giving weight to this range of values is not a merely verbal matter in the way that operating with multiple use has become, nor is it just some largely unobservable psychological event such as recognising or valuing something; rather it commits one to certain fairly specific methodological procedures for sound decision-making in such a case. The problem, which belongs to optimisation theory, is that of determining optimum solutions (not necessarily unique where they occur) where one has a set of (not necessarily independent) variables $v_1, \ldots v_n$, and an optimum solution is obtained by maximizing the sum of the weighted values subject to constraining relations between variables, i.e. one maximizes

$$E = \sum_{i=1}^{n} w_i v_i, \text{ subject to constraints (C)}$$

[with the m functional relations on variables taking the form, for some m:

$$\left.\begin{array}{l} G_1 \ (v_{i_1}, \ldots, v_{i_{j_1}}) \\ \vdots \\ G_m \ (v_{i_m}, \ldots, v_{i_{j_m}}) \end{array}\right\} (C)$$

where $(v_{i_1}, \ldots, v_{i_{j_m}}) \subseteq (v_1, \ldots, v_m)$]. A crucial issue, especially clear given this

modelling, is the question of the constraining relations between variables, and particularly whether wood production values are independent of other values. It has been a major theme of the book that high value assignments to wood production variables, especially volumetric production per unit area, inevitably diminish the value assignments for many important (i.e. heavily weighted) non wood-production variables (e.g. regular clearfelling which yields high wood volume diminishes water catchment values at least temporarily and values for wildlife conservation permanently); and at high value assignments for wood production variables, these variables and conservation variables tend to vary inversely. The main forestry assumption and line of argument has been, however, that high value assignments for wood production variables have no effect on, or at least cause no reduction important to non wood-production variables (i.e. that there is no conflict between wood production and other values, or equivalently that they are compatible); but the assumption is supported neither by common sense nor, as we have been at pains to argue, empirical evidence.

An alternative way of seeing the model is as optimising over the utilities or welfare of different classes of users or would-be users of the forest (some of whom will be subsets of the public), the different values corresponding to different classes of users and the weighting corresponding to the different utilities of each class. Indeed the formalism can simply be reinterpreted in this way. Conflict will then appear as conflict between different classes of users, and the assumption of negligible weighting for non-wood values will appear as a decision to ignore the interests or welfare of non-wood users. Whether or not it is satisfactory to adopt such a picture depends upon how widely the notion of "user" is interpreted. But it seems that if it is to be satisfactory it must be interpreted very broadly (e.g. by the use of an appropriate choice operator which enlarges the class of users) and it is then reasonable to conjecture that if this is done there will be an isomorphism between the two interpretations (See also Appendix 1).

The model may not at first seem particularly illuminating or useful, particularly in the absence of ranges for variables, details of weighting, and more specific forms for constraining relations; but in fact this is not so, and even without specific data of that sort indicated, the model has a number of very important consequences simply given general assumptions of the kind we have already argued for; particularly the assumption mentioned above that the variables are not independent and that a high value assignment for wood production variables depresses many non wood-production variables, and the assumption that some non wood-production variables so affected are important, i.e. have high relative weighting (under these conditions).

The most important consequence is going to be[1] that high assignments to wood production variables will not provide an optimum solution, and hence that maximizing on the wood production variables will not give an optimum solution. Optimum solutions will be obtained, where they exist, by obtaining much smaller values for wood production variables in order to enhance or avoid depressing non wood-production variables. This of course is the explanation behind the victory for the selectively managed naturally-regenerated eucalypt forest over the pine plantation in the sample cost-benefit assignments of Chapter 8, and again reinforces the point made there that the result does not depend on arbitrary representative value assignments but on the more general points which are elucidated by the multiple value model. The immediate outcome from the fact that optimum management does not maximize wood volume production, is the *principle of restrained yield,* that less than maximum possible volumes of wood should be produced; and probably volumes of wood well below maximum possible short-term levels should be produced, the exact reduction depending on the level at which wood volume production ceases to depress other variables significantly.

1 Intensive forestry (with respect to a given forest area) can be characterised as forestry (practices) aimed at optimizing value assignments of wood production variables, especially per unit volumetric production (with respect to that area). It is quite unsatisfactory, however, to (endeavour to) define 'intensive forestry (practice)' as the US forest service does, following the Society of American Foresters (see USA [2], p. 703), as 'the practice of

Since intensive forestry[1] management maximizes, or aims to maximize, wood volume production (per unit area), intensive management, despite its appeal to the technologically and production oriented, also does not provide an optimum solution, unless at the very least intensive management is restricted to a limited part of the forest area. The optimization issue arises not merely for units, or forests, of a system, but also for the system as a whole, for the total state systems, or, much more satisfactorily, the Australian forest system; and the issues are interdependent. The question as to how best to distribute particular values over units of the system, here over forests of a system of forests, so as to obtain the relevant optimization over the whole system (the *distribution* problem) is discussed later.

Maximizing on wood production variables, particularly through intensive management, is not in accord with multiple values and is not good decision-making. But since it is precisely this that forest services are doing, or attempting to do, it follows that they are not operating according to the multiple value concept, and therefore are not employing sound decision methods. There are three explanations as to why forest services are pursuing a course of action which is decidedly not an optimum one. The first is that they are simply employing outdated decision methods which do not take account of sufficient variables, and in particular do not take account of more than the wood production and commercial variables (or equivalently assign zero weight to other variables), but carry out their assessments as if they were each simply a private (non-profit making!) firm and not managing a large public resource. This anachronistic application of neo-classical micro-economics and neglect of non wood-production variables is a special case of the ignoring of externalities, a method of economic assessment and decision-making common for private corporations but now increasingly widely rejected, and regarded as particularly undesirable in the case of public authorities supposedly pursuing the public interest. Most detailed forestry economic assessments and occasional cost-benefits analyses remain, perhaps not surprisingly, confidential; nevertheless what evidence is available strongly suggests that they have followed the above course and assigned no weight to non wood-production factors and particularly environmental factors in economic assessment of various alternative courses of action.

The second possible explanation is that forest services are not totally ignoring non wood-production values but that the weights they assign to these variables are negligible or very small when compared to those assigned to wood production or commercial variables. The evidence is, furthermore, that where forest services do take account of these variables at all they assign them negligible values, i.e. substantially underestimate their importance. It is no good pretending that weights assigned for given variables are completely empirically determinable or that they do not reflect in part at least individual or group value systems or preferences; nevertheless there is sufficient evidence that forest services are assigning negligible weights to features that a significant and increasing number of Australians value highly. The procedure is only marginally better than the first case.

The third possible explanation is that forest services are assuming that wood production variables are independent of non wood-production variables. This is the com-

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forestry so as to obtain a high level of value and quality of outturn per unit of area, through the application of the best techniques of silviculture and management'. For to *describe* something as intensive forestry is not to evaluate it as applying the best techniques. To so describe it is to single it out, all too often, in order to criticise it as a case of bad management. Clearcutting and terracing at Bitterroot NF *was* intensive forestry, but decidedly *bad* intensive forestry. It is quite unsatisfactory for a 'definition' of something to write in a separate positive evaluation in this way. The 'definition' makes the claim that intensive forestry used bad techniques, even sometimes (as at Bitterroot) *inconsistent!*

1 Unless very special conditions, which we can afford to neglect, obtain.

monly employed compatibility or no conflict assumption. On the optimisation model the third case reduces in practice to the first. If forest services are employing any of these procedures, and the evidence is that they are employing every one of them, as suits the case at hand, then their methods are thoroughly objectionable and by no means measure up to multiple value management.

In criticising these forest service procedures we have at the same time criticised management according to dominant use for wood production, since this amounts to giving non wood-production variables such weights that they are always jointly dominated by wood production variables, something guaranteed by assigning non wood-production variables negligible or zero weights. Since multiple value management entails that at least some non wood-production variables have appreciable weights, the notion of multiple value management is inconsistent with dominant use for wood production (as the Bolle committee claimed, USA [2], p.184). Thus the familiar forestry claim, that forests are managed both according to dominant use and satisfy multiple use, either is inconsistent, if multiple use implies multiple value management, or employs the weak and eroded sense of multiple use in which it is little more than an empty phrase. The recent NSW amendment to the Forestry Act, which has been described by Henry [1] as prescribing dominant use, is slightly different from dominant use characterised as assigning negligible or zero weights to non wood-production variables: the recipe is that other variables be taken into account in so far as they are compatible with wood production variables. It follows that in no circumstances should wood production values be reduced in order to maintain or enhance or in order to avoid depressing non wood-production values; so it is permissible to take account of other variables only when doing so has no effect on wood production variables. Thus these variables are effectively independent, and optimum solutions will maximize wood production variables. But a simple argument shows that this is equivalent to assigning practically no weight to non wood-production variables. Where non wood-production variables are not adversely affected by wood production variables, i.e. they are compatible, no action to maintain them or avoid depressing them is required: however in this case action is permitted (but budgetary considerations preclude much in the way of enhancement). Where non wood-production variables are adversely affected, modification of wood production activities, presumably requiring a reduction in wood production, should be required; but in this case it is not permitted (except in the empirically impossible case that there is an alternative solution which equally maximizes wood production variables but which does not have these effects). In sum, in the only cases where action is required to avoid reduction in values it is generally prohibited. In any case, as we have argued, high value assignments to wood-production variables are incompatible with maintenance of non wood-production values; but since wood production variables are maximized their values are high; hence non wood-production variables are discounted, that is the Act requires that they be treated as if they had zero weights in this case, that is always. The NSW Forestry Act appears to be an ingenious way of mentioning non wood-production values without allowing them to have any real weight.

It is a consequence also of the multiple value model together with the general assumptions mentioned that total use of the forest crop for wood production is very far from being an optimum solution. The general adoption of total wood use in a system of forests is incompatible with multiple value management being employed in that system. According to the restrained yield doctrine it is necessary to reduce wood production values to obtain an optimum, and particularly to reduce volume production; however there are a number of possible ways in which this reduction would be effected. But given previous data outlining the importance of the mature tree habitat and other types of forest habitat, an important ingredient in the measures required to modify wood production so as to avoid depressing non wood-production values, is the avoidance of total or virtually total utilization of the forest crop. It is not simply a question of even-aged stands versus uneven-aged stands of trees; for the habitat requirements of that proportion of wild-

life that requires mature trees could only be met over the long term if an appreciable proportion of the trees were not used for wood production (at least until they are very old and probably no longer worth using). It is not a question of a few small ameliorative measures, e.g. refuges, but of substantially modifying the degree of wood utilization, i.e. the extent to which the forest is used for wood production. Nor should the trees not used for wood production be regarded as unused or wasted since they are being used to maintain other important forest values in accordance with multiple value practice. There is nothing outrageous either about the suggestion that an appreciable proportion of the forest crop should be used for purposes other than wood production — except to those who have grown accustomed to an unjustifiably dominant position for wood production over other forest values. If wood production is only one forest value among many, then it cannot expect to obtain more than a proportion of the forest crop (unless it were to leave other forest values unscathed). Although maximal and excessive use of the forest crop for wood production is ruled out under multiple value practices there is no reason why the forests cannot continue to supply, as in the past, *reasonable* quantities of wood consistently with maintaining non wood-production values and optimizing on all variables in combination.

We have argued that some appreciable reduction of wood volume production will be necessary to optimize on all variables, but reasonable (and adequate) volumes of wood should still be producible without markedly depressing non wood-production values. But it is often claimed in support of clearcut intensive methods that they are essential both for reasonable yields and for adequate regeneration; and this is frequently supported by the claim that the older selective logging methods, which were less destructive of non wood-production values, have 'run the forest down.'[1] Are these claims justified or are they simply further attempts to set up a false dichotomy between intensive use and no sustainable wood use at all? The claims depend upon the adoption of excessive standards for what count as 'reasonable yields' and 'adequate regeneration', which effectively apply some criterion approximating to maximum stocking for optimum wood development, standards which could not be adopted as the norm under multiple value management but only under intensive wood product management. These excessively stringent criteria are not reasonable or conducive to optimization over all variables, and presuppose excessive weights for wood production and the preferability of wood production tending to maximum. But there is evidence that once these over-demanding and loaded standards are abandoned, quite reasonable and adequate regeneration and stocking can be obtained with methods that are not intensive and do not employ clearcutting, and more generally with partial use methods that do not seriously diminish non wood-production values. There are methods of forest management which, although not usually improving the forest environment in quite the way that forestry mythology has it, would at least hold environmental costs to acceptable and reasonable levels and still enable reasonable quantities of quality wood to be removed. But these are not maximum wood yield methods or methods involving virtually total use of the forest crop for wood production. A comparison of clearcutting with alternative methods with a much less drastic effect on the environment (namely single tree selection, group selection, small patch cutting or a combination of these methods) is made for the American case by Minckler:

> Clearcutting is a silvicultural tool that should be used with great discretion in eastern hardwoods, and only for well-defined objectives.

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1 However the evidence on even this point is far from conclusive and it is quite unclear that forests which have been logged by this system are substantially worse stocked than unlogged forests — as appears to be indicated by the present stocking of older logged forests as opposed to virgin forests. A connected local myth is the myth of even-aged stands, that Australian hardwood forests are largely even-aged.

The arguments against it are many and valid. Ecologically it is a major disturbance. Silviculturally it must be complete; i.e., all cull trees, unmerchantable poles, and large saplings left standing should preferably be killed with herbicides. This is costly. If left these trees will develop poorly. If cut without killing stumps a high proportion of undesirable stump sprouts will develop. In the Northeast, pioneer species may invade clearcut areas. There is no doubt that clearcutting and logging large areas increases to undesirable amounts the silt and nutrient levels of streams receiving the runoff. Unless great care is taken debris can clog steams, erosion can occur on the watershed and stream water temperature can be excessively increased. Modern heavy logging equipment is not designed for the gentle treatment that is essential in dealing with steep mountain slopes. Clearcutting is an immediate aesthetic disaster and full recovery is slow. Furthermore, clearcutting excludes recreation from large areas of land and tends to produce relatively uniform forests lacking the diversity needed for a good mix of wildlife. Wildlife requires several kinds of habitat but not large uniform areas.

It is simply not true that clearcutting and even-aged management is necessary to establish more intolerant and valuable timber species such as ash, cherry oak, and yellow-poplar. My research has shown clearly that this can be done by group selection or by cutting small patches. This system maintains a continuous forest on the area, preserves integrated uses, and at the same time encourages desired reproduction. The openings may be one-fifth acre or larger until the system merges with patch cuttings of a few acres. In Northern hardwood forests single mature trees may be harvested in regeneration cuttings. In Appalachian and Central mixed hardwoods the diameter of openings should be at least equal to the height of adjacent trees. Logging is light, soil disturbance is minimized, and branches in tops can be lopped close to the ground for quick decay and better appearance. (USA [2], p.63;[1] similar points are made by other American foresters, e.g. Robinson and Stoddard, USA [2], pp.99-100 and p.135.)

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Minckler also meets several objections that have been made to his proposals:—

'What are the disadvantages of selection silviculture? Selection silviculture requires more technical skill, it may be more expensive in some cases, and the forest control and record keeping is more difficult. Yet, logging costs per thousand board feet might be less than clearcutting, and provide higher stumpage prices, because the average size of cut trees is usually much larger. Some opponents of selection silviculture have made a big point about the effect of the perimeters of openings on increased sprouting from tree boles and waste of space around the edges of openings for timber growing. Waste of space does not occur after the trees reach pole size because tree spacing is normal when crowns touch; i.e., the spacing is related to width of crowns. Also, the perimeter trees take advantage of the extra light and soil moisture. Extra sprouting on perimeter tree trunks sometimes occurs on weaker trees but this is usually minor and it is an excellent trade-off for a continuous diversified forest with integrated values. Logging damage to remaining trees, can be avoided by experienced loggers who are properly motivated. We made partial cuttings on the Kaskaskia Experimental Forest for nearly 20 years, without undue logging damage.'

That similar sorts of methods can be successful under Australian conditions in obtaining satisfactory regeneration of intolerant eucalypt species in small patches is indicated by some of the work of Florence ([6], p.53), from which it is rather plain that giant clearcut coupes of hundreds of acres or even, as in Tasmania, a thousand acres in size are completely unnecessary for regeneration purposes. The main requirement for sufficiently dense regeneration of favoured shade-intolerant eucalypts, such as resilient ash and eastern blue gum species, appears to be bared soil seed-beds: these can be achieved in small patches either by burning (the ash-bed method promoting rapid initial growth, through nutrient release), or by mineral soil disturbance which can be produced by tractor activity, or by mechanical devegetation without such soil disturbance[1]: thus there are several viable alternatives to the costly and environmentally-risky American practice of spraying with herbicides. Small patch cutting in a forest is highly flexible, and can be combined with almost any degree of utilization of the forest crop; most importantly it can be combined with partial use of the forest areas, e.g. with use of 50% or less, simply by not having patches treated link up, thereby ensuring that the important mature tree habitat necessary for so much Australian wildlife is maintained and eventually replaced. The method does not exclude some genetic improvement by seeding or planting patches, nor does it exclude the introduction of new species into the forest mix. Among the areas left untouched could be – as well the mandatory steep slopes and borders of regular water courses which should never be logged – some fern and rain forest gullies, other areas with outstanding vegetation, and areas of special scenic or other interest. Forests managed so as to use only 50% or so of the forest area, the amount depending on features of individual forests, with regeneration in small patch areas of ¼-2 acres (the larger areas being required for tall ash and blue gum forests), could presumably, with careful operations, eliminate or greatly reduce almost all adverse effects on non wood-production values including aesthetic ones, a striking contrast with the conditions under clearcutting. Although some costs will be increased on uneven aged forests so managed, e.g. transport costs, because of the wider distribution of activity and greater care required, other costs such as logging and landscaping costs can often be reduced, with the result that clearcutting methods are often more expensive than timber extraction by either heavy or light selection methods. Even where slightly increased commercial costs are incurred by avoiding clearcutting, these are more than compensated for by greatly reduced environmental costs, and if sound pricing procedures were adopted there is no reason why these costs should be a large public burden (as we shall argue). But the reduction in volume of forestry production would, on the present commercial structure, simply have the effect of reducing the size of losses. Nothing could more clearly demonstrate a totally unsound economic basis (or underlying forestry attitudes) than the claim that an industry which already receives such heavy public support cannot afford to adopt environmentally sound methods which maintain public amenity. And the argument that an industry cannot afford to pay for adequate environmental procedures is like the argument that it cannot afford to pay adequate wages.

Despite the obvious advantages and ecological advantages of such restrained methods local research on such methods which respect non wood-production values is strikingly lacking and is not encouraged, because it is in opposition to the prevailing ideology of official forestry. It is difficult to avoid the conclusion that the forestry position, that heavy-handed intensive methods are required for adequate regeneration, is

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1 Thus in the case of species such as karri producing the less spectacular, because less dense, 'weak regeneration'. Such methods may however prove sounder from the long-term environmental viewpoint (e.g. retention of topsoil and soil nutrients) than the more spectacular and rougher methods which the main commercial species so far tolerate. Moreover though such methods mostly will ensure generally good regeneration, they do not have to succeed always, any more than regeneration practices after clearcutting have always to succeed. The success rate of regeneration after clearcutting is in fact not nearly as high, even in Australia, as pronouncements of its proponents would suggest (for some details see USA [2] and, in the Australian case, Korven-Korpinen and White [1]), and it may well turn out that the success rate of small patch cutting is better. Where it fails it can be followed, like regeneration failure after clearcutting, by planting (again probably with a better success rate).

without any sound empirical basis but is put about for propaganda purposes in order to underpin intensive forestry and as part of the attempt to have wood production dominate all other values, and thereby to serve the interests of forest industries, and to hide the fact that there are quite practicable alternatives which enable optimization over all values and accordingly better serve the public interest – yet another clear indication of whose interests forest services are actually serving. With the regeneration question as elsewhere, mainline forestry is trying to represent what is but a short-term commercial advantage as a biological necessity. It should also be obvious that frequent attempts on behalf of apologists for the forest industries to claim that those who wish to see more restrained exploitation of forests are impractical idealists anxious to phase out forestry altogether are simply attempts to set up a false dichotomy between all-out wood production with total disregard for other values in accordance with current ideology and *no* wood production at all.

The switch from clearcutting to small patch methods of the sort described[1] is by no means only way in which logging practices can be improved and their impact on the forest environment substantially reduced. An important independent development is aerial logging by helicopter, or environmentally better, by balloon; for such methods, which enable roading and snig tracks to be largely avoided, can slash the impact of logging on soil and water.

> logs can be plucked out of the canopy without disturbing the topsoil, without building fringes, without logging downhill, and without tracks or cuts down these. It can be done, . . . and now we are getting in the ball park with the economics (Ray in USA [2], p.311).[2]

It seems, then, that various non-intensive wood production methods and light carefully-conducted logging can have a fairly small adverse long-term effect on many non wood-production forest values, except for values such as wilderness and scenery, which have to be catered for in separate areas. (Of course careful logging excludes, by definition, logging into permanent streams, on steep slopes, etc.). However even assuming that adequate wilderness and scenic areas have been set aside, the question arises, particularly if it should be the case that even light logging has some adverse effects, of whether an optimum for the entire forest system would be (better) achieved by having a large area lightly exploited for wood production or a much smaller area more heavily exploited, perhaps even intensively managed. This problem, the *distribution problem* – which arises when and only when some restraints on yield are accepted in the interests of total optimization of multiple values – is that of how best to distribute the wood producing function over the system of forests to obtain an optimum.

Obviously a lot more information, particularly about the environmental effects of different levels of exploitation for wood production and effects on different forest types, is required before much progress can be made on this problem; and this information like so much else is not available, because the current ideology of maximizing on and dominant use for wood production means that the problem does not even arise. However even without this data, some general points are clear. For example, there is good reason to think that there is in general no *unique* optimum solution, but rather a number of equally good possible distributions. One reason for supposing that optimum solutions are not unique is that various intersubstitutions can be made preserving values overall; for example some

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1 The advocacy of small patch cutting in place of the increasing turn to clearcutting for eucalypt forests is in no way intended to replace the careful selective logging systems required to maintain certain forests which are cut. For example, subtropical rainforest, which can be maintained under selection logging, may degenerate, for example into lantana thickets, even under patch cutting : cf. Webb et al [1], and Fraser and Vickery [1], pp.149-152.

2 Aerial logging is also important because, in conjunction with careful small patch cutting, it goes a considerable way towards determining the environmental cost of alternative logging practices such as surface clearcutting for soil and water values.

large non-intensively managed areas can be exchanged for smaller more intensively managed areas or even for some considerably smaller intensively managed areas (assuming that there is some reduction in non wood-production values from even light wood production), or a larger area of lower values for non wood-production purposes could be exchanged for a smaller area with a higher value for (say) wildlife. In general there seem to be infinitely many solutions, but of course it would be a mistake to assume that no solutions are excluded as non-optimum – plainly infinitely many are.

It is sometimes suggested that a small intensively managed area, with many forests left as wilderness, would provide a better solution than more extensive distribution of wood production activities. However unless wilderness areas are inadequate (something they need not be given the redistribution of real forests into reserves that we have argued for), and more wilderness areas are wanted along with a certain log requirement, it is quite unclear that this distribution provides the optimum solution. For if wood requirements can be satisfied with no depression of other values by distribution over a larger area and there is, as we have argued, some definite benefit and role for non-intensively managed forests *once* wilderness requirements are adequately met, it may very well not be an optimum solution. And the concentrated forestry is certainly not optimal unless the intensively managed areas are permanently sustainable (intensive forestry has to be much better and more stable than shifting agriculture). To admit that a small intensive area (if permanently viable), enabling complete preservation of remaining forests, could be an optimum solution, is not however to concede any virtue to current intensive forestry programs such as pine programs, which are certainly not set up with a view to concentrating damage or lessening exploitation of remaining areas (and which fail to take any proper account of the non wood-production values of the areas to be converted), but which, if anything, are regarded as releasing many remaining areas for even heavier wood production exploitation, for export purposes (as explained in Chapter 9).

It would require a revolution before Australian forest authorities abandoned their devotion to maximizing wood production yields from the maximum area of forest which can be obtained, and accepted the principles of multiple values and restrained yields -- on which the assumption of intensive areas *releasing* other much larger areas for little or no exploitation is based.

Multiple value management should not just be practised, something that would be reflected in the reallocation of forest service funds; the proper adoption of multiple value principles should be acknowledged in legislation which specifies state forestry objectives and enjoins multiple value management. Accordingly regressive state forestry legislation in Australia should be repealed, and new legislation brought down which requires management of state forests, timber reserves and Crown forests along environmentally sound restrained yield and multiple values lines. As the American scene shows, however, legislation alone is not enough; there have to be independent checks to ensure that multiple value management is indeed practised and the legislation properly enforced,[1] as with pollution where useful legislation is often not enforced. As with pollution there will have to be independent inspectors or watchdog committees to police the legislation.

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1 See especially Chapman in USA [2], p.111-2: 'Present multiple-use plans are not meaningful. These are largely window-dressing because of inadequate inputs on the part of resources that are inadequately financed . . . Multiple-use plans have been an excuse to do just about anything the ranger desired. Almost all such plans were written and approved with tongue in cheek as the writer knew that none of the conditions specified would [or indeed could] be met'; but also Stoddard, p.134: 'Specific requirements on multiple use are clearly absent in timber contracts'. Chapman also makes the valuable suggestions that timber sale contracts (and special licenses) need additional standard clauses with a view to protecting non wood-production values (see also Ray, USA [2], p.309) and that these values may be better served by having forest services carry out logging as well as roading activities (where this is not already done).

Environmental pricing and decision-making

It is obvious from our earlier argument that public production forestry in Australia is decidedly uneconomic. The real solution to the problem of the present uneconomic, indeed uncommercial, nature of production forestry is not the one which mainly appeals to technologically-oriented forest services, namely that of introducing intensive methods such as high-yield plantations to maintain a supply of cheap wood and to improve yields and profits by methods which cut environmental corners and decrease the amenity value of public forests. These methods only *look* more attractive and efficient because the environmental costs and risks, which are greatly increased by these intensive methods, are ignored; the methods enable an apparent improvement in profitability by offloading the cost of the direct obvious subsidy of a forest service onto the environment, and they decrease the obvious financial subsidy at the expense of increasing non-obvious hidden environmental subsidies. One patent advantage to forest services of this is that it involves a move from an overt, tangible, objectively and publicly assessible set of subsidies to a non-obvious, intangible and not easily assessible set of subsidies, whose actual value can be made the subject of endless disputes but which nevertheless probably involves far greater public costs in the long run than what it replaced. A similar point about the off-loading of costs onto the environment (or equivalently of neglecting biological costs) is made by Commoner [1] for the somewhat similar case of intensive agriculture in the American mid-west, where apparently greater profitability is commonly achieved at the expense of heavy environmental costs which are not taken account of properly and which are borne by the public sector. That the offloading of costs onto the environment is what is in fact occurring with intensive forestry emerges clearly as soon as explicit (non-negligible) values are assigned to various environmental factors (as in the cost-benefit analysis of pine planting in Chapter 8): as the intensiveness of forestry practice increases so do the environmental costs, and so does the diminution in amenity value of the public forest.

This *Intensive* Solution to the economic problems of production forestry has been strongly advocated in Australia by J. Henry [4], NSW Commissioner, following influential American foresters (e.g. Fedkiw [1]),[1] and foreshadows the likely fate of many NSW forests. The Intensive Solution is the mainstream forestry solution to its economic problems. But an alternative more enlightened solution is sometimes canvassed, namely that of allowing that some conservation demands could be met but insisting that there should be no increase in the price of the resulting product despite the extra expense of production, thus accepting an increased public subsidy and further forestry losses. The public must pay more to allow for the extra expense incurred by adopting methods of production which do not adversely affect the environment. This ***Expensive*** Solution, which now has wide support among American foresters (see Harkin [1]), is advocated by Florence [5] (and elsewhere, e.g. [6]):

> Society cannot expect that the costs of preserving and enhancing the values it wants in its forests should be borne by the timber consumer alone. It is going to cost more to grow wood in a carefully managed multiple use forest, and the greater part of the additional cost must be met by the public purse.

But Florence fails to distinguish costs which may be incurred in maintaining and ***enhancing*** non wood-production values, *quite independently of wood production,* from the costs

1 According to Fedkiw, 'Forestry will have to go all-out for genetically superior trees, fertilization, improved stocking and weed control, highly intensified utilization and other technologies', to which Henry adds 'In future management or silvicultural prescriptions, more importance will be attached to (a) the encouragement of vigour at the probable expense of form; (b) thorough site preparation and fertilization to achieve full stocking and shorter rotations; (c) heavier thinning or thinning to waste to achieve growth in remaining trees. [There will be] a swing to plantations instead of natural regeneration in indigenous hardwood areas to ensure full early stocking of fast-growing species. This will mean more positive planning of silvicultural programs in indigenous forests. . . . these are the trends. ([4], p.70).

incurred in protecting other values from the otherwise adverse effects of wood production. Examples of the first sort of cost include the cost of picnic facilities, park areas and special amenity plantings, nature walks and forest paths (as in Victorian Forest Parks), nursery services for the public, and research undertaken to enhance non wood-production values and having no connection with the effects of wood production activities on them; very little forest service expenditure in Australia is of this type. Examples of the second type of costs are all those expenditures undertaken to avoid reducing or destroying other values as a direct result of wood production or to counteract or modify the effect of wood production on other values; expenditures of this class are, overwhelmingly, those in question. Whereas it would be unreasonable to expect the consumer of forest products to pay for the first set of costs, it is certainly *not* unreasonable to expect him to pay for the *second.*

To adopt the Expensive Solution is to adopt the view that the consumer of forest products must have his products just as cheaply as at present but the public must pay more to preserve the amenity value of the forest and protect it from the effects of his consumption. The alternative to having the public pay more is that an important public amenity is to be reduced in value, allegedly so that a particular group of people, consumers of forest products, can continue to have their products at an unrealistic price, (but really so that the larger forest industries suffer no reduction in their organisational objectives). The equivalent of the Expensive Solution in terms of pollution would be the Pollution Pays principle, that if the public want clean waterways it is their responsibility to provide and operate at public expense purification units to purify effluent from factories, or to subsidize the factories to do so – and the only alternative is to put up with the pollution. But of, course it is now regarded as completely unacceptable – because thoroughly inequitable – that it should be a public expense and responsibility to restore or protect public resources from damage to them done through private consumption. Even conservative economic organisations such as Treasury (Comm [7], p. 19) and the OEDC (and the intergovernmental consensus it represents) now reject this principle, called the 'public purse' principle in the narrower case of pollution.

The economic picture then confirms the sociological and political evidence that 'public' forest services in Australia are largely concerned to further and speak for the interests of the larger forest industries (domestic and foreign) even where these conflict, as they frequently do, with the long term public interest. The insistence on keeping unrealistically low price levels, in order to maintain and even increase consumption in the interests of the forest industries, has meant that forest economists have in practice been prepared to consider only these two solutions, the Intensive and the Expensive, to the current economic difficulties with production forestry (although often a combination is advocated, as e.g. by the US forest service).

The third and most obvious solution to the problem however – obvious once the approach of feather-bedding larger[1] forest industries, and subsidizing all forest product consumption by maintaining unrealistic prices, is dropped – has not been seriously considered: that *the prices paid should* in general *reflect the true costs, including the environmental costs, of production.* For it is obvious that the forest industries, and ultimately the consumers of forest products, are not meeting the true costs of producing forest products either in conventional commercial terms (as shown by forest services losses) or, more importantly, in terms of meeting this conventional cost plus the environmental cost of production. Nothing could more clearly illustrate this fact than the comparison of budgets of National Parks with those for State forests.

It must of course be admitted that there are cases where public subsidies of particular forms of consumption (e.g., education) may be desirable, and of course it is naive

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1 Some of the smaller forest industries, e.g. small sawmills, do not receive such kindly treatment, and there is constant pressure to have them amalgamated in the interests of efficiency.

to assume quite generally that a public utility must operate at a profit (e.g. communications and transport); but where such a public subsidy of particular forms of production and consumption does exist there must be a strong case that it is in the public interest to subsidize and thereby encourage the relevant production and consumption. But in the case of forest products there is, as we have already pointed out, no case for a general or blanket public subsidy for all forms of consumption of forest products. Whatever the case may be for a subsidy for sawnwood, it does nothing at all to assist the case for having the taxpayer heavily subsidize the production and consumption of paper products used in packaging and advertising, both major parts of present production. But this is what is presently being done. Not only is the taxpayer heavily subsidizing all forms of forest products, he is subsidizing most heavily that which is the least worth of subsidy, namely paper products. For since the royalties paid for pulpwood are only a fraction of those paid for sawlogs, and it is scarcely less expensive to produce, especially in plantations, the public subsidy for this product is correspondingly the greater.

The fact of the matter is that pulpwood royalties are only in the order of a quarter or less of those paid for sawlogs; yet the increase in unit costs through growing sawlogs rather than pulpwood is less than 20% (on a calculation for radiata plantations, given in Hanson [6], p.43), so the royalties should be in the order of four-fifths of those of sawlogs, not a quarter. Thus pulpwood royalties would have to be increased by about 320% just to match those for sawlogs, were production costs taken seriously in royalty assessments; and they would need to rise vastly more again in order to remove all subsidies and fulfill the requirement of a reasonable rate of return (of at least 12%) to forest services for efficient production.

But no case has been presented — and as far as one can determine there is *no case* at all — for the general public subsidization of production and consumption of pulp and paper products, most of which go into packaging and advertising, and only a tiny proportion of which go into such worthwhile end products as books[1] and writing paper. There is no reason to regard it as important to keep up consumption of most paper products (except the illegitimate one of maintaining the privileged position of paper and packaging companies). For such packaging makes little *overt* contribution to welfare, to enriching people's lives and enlarging their significant choices (unlike some other basically environmentally damaging items such as the motor car). When its small (or negative) overt contribution to welfare is balanced against its very heavy environmental costs to obtain a measure of its *real* contribution to welfare and enlargement of choice, it is clear that it represents one of the most vicious industries of modern economies. Yet not only is it not discouraged by discriminating extra taxes, the Australian public at present heavily subsidizes it in at least the following four ways:—

(1) by bearing much of the commercial costs of the production of raw wood for the industry.

(2) by bearing the environmental costs of the production of raw wood for the industry.

(3) by bearing the pollution and other environmental costs involved in the manufacture of paper — either by putting up with reduced public amenity as a result of pollution or by *paying* to clean it up.

(4) by bearing the cost, both commercial and environmental, of the disposal of resulting products.

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1 Books would, in any case, be only marginally affected by increasing paper prices substantially, since only a fraction of the cost of a book is due to the cost of the materials; and any increase could in any case be remedied in an appropriately selective manner by an increase in the book bounty or some such measure, and in the case of approved periodicals by concessions on postal charges.

Whether or not there is an ultimate need for extra discriminatory taxation against such industries, a sound initial environmental policy must involve the removal of this completely indefensible set of subsidies for pulp and paper products. Even if it could be claimed that discriminatory taxation over and above the real and full costs of production and disposal (which is what paper companies attempt to paint the ending of their privileged position as amounting to) is an unwarranted interference with freedom and consumer choice, such a claim certainly does not hold up for the removal of these subsidies. Removal of subsidies is not unwarranted interference with freedom of consumer choice, nor is it discrimination, for the consumer has no general right to public assistance for his consumption.

The favoured treatment for pulpwood production over sawnwood appears not only in the setting of royalties but also in the setting of tariffs (the average effective tariffs before recent tariff reductions amounted to 37% in the case of paper and paper products but only 22% in the case of milled timber). Again the highest protection and assistance is being accorded to the form of production which is the least needed, the most polluting, and the most destructive of forest and other amenities for the least reason. This is indefensible, not merely on an environmental pricing policy, but on far weaker grounds.

It will of course be argued that these proposals would lead to big price rises in a range of commodities, but this is misleading.[1] It is rather that the person who pays for the commodities is shifted, so that in the case of paper, for example, the taxpayer pays less and the consumer pays more. Naturally increasing the price of packaging could help generate a consumer revolt against a product which there is every evidence that consumers don't choose and don't want and which would add substantially, if they paid the true price, to the cost of their purchases. For it will become plain to consumers how much they are paying for packaging — of course they are already paying these sorts of costs for packaging, but the subsidies are well hidden. A consumer revolt against needless packaging, once the real costs of its production are no longer disguised, shouldn't be regarded even by economists[2] as a bad thing, since such packaging is a clear example of something that increases a trivial set of choices at the expense of destroying a far more fundamental set of choices. And such a rejection would be an example of consumer sovereignty, but, for a change, working for rather than against the environment, and against rather than for the industrial status quo.

The usual justification offered for charging less for wood products than it costs to produce them, that is for providing a large public subsidy for all wood production, is the use of timber in dwellings and particularly basic low-income housing. We have argued that this provides no justification whatever for extending such a subsidy to raw material for pulp and paper (which is almost one-third of per capita consumption in Australia and the main growth area), let alone for providing a specially large subsidy for this type of material as is done under the present pricing system; and that continued subsidies for pulp and paper are completely indefensible. However even the case for a blanket subsidy for all forms and uses of sawnwood is unconvincing when closely examined.

(i) If the use of sawnwood in dwelling construction is intended to provide an historical explanation of the subsidies for forest products, it is historically inaccurate. The unrealistically low level of royalties charged for forest products is not the result of a deliberate decision to subsidize wood production because of its importance in dwelling construction; it originated largely because the sole objective of early royalties was to provide revenue rather than make a realistic charge for the product (cf. Hanson and Leslie [1], p.96). There has been no appropriate adjustment in the method of setting

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1 A large rise in pulpwood royalties does not entail a large rise in the price of finished products. In fact the small rise in cardboard prices resulting from a substantial increase in pulpwood royalties could dampen demand without being inflationary.

2 See Appendix 1, and also Chapter 7.

royalties (except to link the revenue raised to the selling price of finished goods as a residual value), although it is based on a 'free-good' approach to public resources, which is now untenable. The appeal to the importance of low cost dwelling construction as a justification for unrealistic prices and large public subsidies, is a recent rationalisation concocted to vindicate continuation of this anomalous and no longer acceptable pricing system.

(ii) Subsidies of the sort in question are not provided for other components of dwelling construction which normally make up a far greater part of the cost, for example, labour or bricks and tiles. The procedure of having the community meet half the cost of producing brick and tiles or a third of bricklayers' and carpenters' salaries is not a generally accepted and practised method of maintaining low cost housing; but doing these things would be no different in principle from heavily subsidizing sawnwood in order to continue low cost housing, and there appear to be no grounds that warrant differential treatment for sawnwood.

(iii) Only about half of total per capita Australian consumption of wood products, that is about 23 cubic feet, goes into building and construction and of this probably less than half again goes into basic housing for low income groups. Not only has no case been provided for a public subsidy for that portion of consumption which does not go into building and construction; there seems to be no justification even for a general subsidy for all uses of sawnwood in building and construction. Why should a public subsidy be provided for the sawnwood in an insurance company's tenth office building, in second houses for high income groups, or for the lavish timberlined board room in the tenth office building? Yet it is precisely these sorts of uses, feature timber walls and extensive wooden decking, that are being most heavily promoted by the timber industry. The situation is that a large subsidy is being provided for the *whole range* of wood products in order to lower prices for that *fraction* of consumption for which a public subsidy may be warranted.

(iv) Clearly there are far more efficient and effective ways of providing assistance for low income housing than a blanket subsidy of all forms of forest products, ways which do not carry the disadvantages of general subsidies (e.g. encouragement of irresponsible use) discussed in a previous section of this chapter. The blanket subsidy is a very blunt instrument indeed, and if the subsidy for the unwarranted cases were dropped, far more assistance could be provided directly for low income housing with the same resources than is at present the case. The harmful effects of selling forest products well below their true cost (and the consequent pressure to cut environmental corners) in any case far outweigh any slight advantage which presently accrues for basic housing, since the cost of sawnwood is only a small part of the total cost of dwellings and realistic prices would make comparatively little overall difference.[1] The selling short, environmentally, of forest products includes failure to allow in prices for adequate regenerative methods; and insofar as the forests have been run down by logging operations this is one of the prime reasons for it. This degeneration of forests under logging is quite wrongly attributed by forestry authorities to their operating on shoe-string budgets: it is however due to inadequate royalties which do not cover the costs of the careful logging and post-logging regenerative procedures foresters should have insisted upon.

There is then good reason for withdrawing blanket public subsidies for the production of sawnwood, and an overwhelming case for withdrawing them in the case of pulpwood production.

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1 It cannot be cogently argued that the result of abandoning the blanket subsidy for sawnwood would be that wood products would give way to environmentally harmful materials such as aluminium, because if an adequate environmental pricing policy were adopted such materials would carry a corresponding environmental loading. In any case the extent to which wood products compete with aluminium has been exaggerated.

But the case is not just that the producer, and ultimately the consumer, should pay the full commercial cost particularly in the case of paper products, but also that the producer should pay the environmental costs of production. The principle which should be applied then is that of environmental pricing (and costing), that in general the full environmental cost of an item should be included in its cost structure and so typically in its price — a principle which is a generalisation of the widely accepted 'Polluter Pays' principle. The principle has been accepted in principle by the Government and in a restricted form by the Treasury (Comm [7]);[1] but once the principle is extended beyond the industrial waste disposal issue one winds up with the principle of environmental pricing. One is almost inevitably led to the broader environmental pricing principle from the Polluter Pays principle, since there seems no good reason for singling out pollution from other environmental costs or taking it as so exceptional that it should have its own special economic laws. Rather it is just *one* among environmental costs and the Polluter Pays principle a special case[2] of a more general environmental cost principle. It is clear

1 But unfortunately the Treasury appears to identify environmental problems with the disposal of industrial waste, not surprisingly therefore reaching the conclusion that these problems are easily solved or at least reduced to what are called 'acceptable' levels by a little more expenditure. But this is far too narrow. Once one turns one's attention to larger environmental problems, e.g. agricultural pollution, the despoiliation of wilderness by mining, the problems are far from easily solved. For instance, in the agricultural case charging for water pollution, and thereby reducing fertilization, would lead to substantial increases in the price of foodstuffs, and GNP would be reduced in a fairly drastic fashion. It would mean widescale disruption of the present industrial system (as Commoner [1] has realised). Such major changes would have to be introduced slowly, and with a corresponding reduction in population (since reduction in fertilization reduces yields), to soften the impact. The prevailing forestry attitude which simply assumes that subsidies for sawnwood are warranted (on the mistaken ground that sawnwood is always an environmentally immaculate commodity), presents yet another case where the Polluter Pays principle is paid lip service but is not really applied, and where the real potential for change of the principle is underestimated.

2 Unless of course one construes 'pollution' in the manner of the US President's Science Advisory Committee of 1965 (USA [4]), i.e. so widely that (almost) any environmental cost counts as 'pollution'. But this usage is not merely (in terms of standard usage) anomalous, but also highly misleading, in that it encourages ambiguity and the assumption that all environment problems are 'pollution' problems in the narrow sense.

The President's Committee defines 'pollution' thus: 'Environmental pollution is the *unfavourable alteration of our surroundings,* wholly or largely as a by-product of man's actions, through direct or indirect effects of changes in energy patterns, radiation levels, chemical and physical constitution and abundances of organisms . . .' (our italics). The definition, though superior to such patently inadequate definitions as 'matter in the wrong place', is overly evaluative (because of the key term 'unfavourable') and is plainly insufficient; for chopping down a forest, being overweight, flooding a lake, a mining a scenic limestone bluff, do not automatically provide cases of environmental pollution. Pollution is rather a matter of the disposal of waste material or energy products, characteristically of human activities, so as to interfere with the environment, especially air and water, in a way which reduces life-support capacity. Central material examples are provided by cases of mercury, lead, sewerage, DDT and smoke, central energy examples by levels of heat and nuclear radiation; and a perhaps less central example by noise disturbance.

that the changes resulting from a switch to environmental pricing will not be trivial (as the Treasury seems to think), but nevertheless the changes are a fundamental part of any sound long-term environment policy.

Environmental impact statements are necessary, but by no means sufficient conditions for a satisfactory environmental policy, and they are no substitute for a sound environmental pricing system. For first, they apply only to a few specific projects and do nothing about day-to-day environmental damage; and secondly, where they do apply, they give only an all-or-nothing decision for projects considered and provide no gradation in penalty for those environmental costs which may still be incurred by projects approved. Furthermore environmental impact controls do not achieve the restructuring away from less desirable forms of production and consumption that environmental pricing, with its graduated effect, does. Then there is the holistic or cumulative effect. Environmental impact controls are compatible with gradual environmental degradation, because damage may be a result of cumulative effects from a number of enterprises, each of which is reckoned environmentally acceptable.[1] Further, like any measure that depends heavily on administrative evaluation, the results are heavily dependent upon the people involved and their personal value systems, which often tend to place little weight on environmental costs. As recent impact studies such as NZ [4], WA [1] and that for Black Mountain tower in Canberra show, it is all too easy for them to become environmental whitewash studies which airily dismiss quite serious costs and risks, often on the grounds that these can be 'minimised', i.e. that some measure is available which could possibly reduce them to some extent, while giving quite unwarranted weight to debatable or undemonstrated economic benefits (e.g. not closing down an almost defunct railroad). It seems that all too often they will provide no weigh-up of costs and benefits, e.g. through a cost-benefit analysis which takes adequate account of environmental variables and other economic factors; that all too often they will offer no proper assessment of costs (NZ [4], already discussed, provides an example). Another related objection is that frequently such studies attempt to consider economic and environmental issues separately, a division which is neither practicable nor desirable since a crucial issue is: can this degree of environmental damage and other costs be justified for the benefits involved. Thus even a small amount of damage might be unjustifiable without sufficient corresponding benefits.

Environmental pricing, although not without difficulty, faces none of these objections. The major difficulty for environmental pricing is of course the problem of the assessment of comparative ecological rankings or environmental costs of different commodities in the economy at various stages of production, consumption and disposal, and the issue as to how to impose corresponding taxes or charges to reflect these costs or rankings.[2]

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1 To illustrate: consider a 500 acre nature reserve where over a period of time there are 200 projects each of which involves alienation of 1 acre. For each project considered in isolation the effects might be reckoned acceptable, but the effects of all projects taken together unacceptable. Nevertheless if projects are spread over time there is no alternative but to consider them separately. This is the process, well known to defenders of reserves, of 'nibbling'.

2 One method of implementing an environmental pricing policy, discussed by Victor [1], p.217 ff, is a system of differential sales taxes, designed to influence the demand for commodities and thereby the environmental impact of the economic activity involved in producing these commodities. However, in order to apply the method, information as to the environmental impact of the production of each commodity in the economy is required; and though such information could eventually be supplied for the Australian economy by an appropriate economic-ecological input-output model, of the sort Victor elaborates, given appropriate environmental monitoring and record keeping, a detailed modelling adequate to base such a tax system upon has still to be devised.

There are of course several ways of maintaining relativities between competing materials with different environmental impacts, by subsidizing more environmentally desirable materials or by penalizing less desirable ones or by some combination of these. Penalizing less desirable materials fits in with the Polluter Pays principle, which aims to enforce relativities by having the polluter pay. However the extent to which a material is environmentally undesirable depends heavily on the particular methods of extraction and processing used in producing it. Thus it is quite naive to assume that sawnwood is *always* an environmentally desirable material, for whether it is or not depends very largely on extraction methods. If lumber is obtained in such a way as to permanently destroy valuable forest, deforest catchments, cause floods, landslides, serious river pollution, laterize soil, or destroy the long-term productivity of the area it is obtained from – and none of these consequences of timber getting are unknown – it is *not* such an environmentally desirable material. A similar point may be made about material obtained from clearcutting or pine planting. But even if it could be shown that timber, properly obtained, is much more environmentally desirable than its alternatives it would not follow that the best way to favour it would be to subsidize it, as foresters so frequently assume. Indeed once again, application of the generalised Polluter Pays principle would lead to contrary conclusion, namely that relativity should be maintained by penalizing material whose production pollutes (or causes environmental degradation) to the extent that their production does pollute. However there may arise special circumstances where it is desired to distribute the cost burden for certain materials such as lumber; and in such cases a combination method of penalizing alternative construction materials such as aluminium together with some subsidizing of sawnwood could be considered. But it needs to be stressed that a case for special subsidies of this sort for sawnwood does not extend to pulp and paper products.

Despite the difficulties of applying environmental pricing principles to every commodity of the economy, there is not much difficulty in seeing how these principles would operate in the case of forest operations or forest products (in the special case of non-renewable resources, cf. Coombs [1]). One application of this pricing principle we have already suggested, that is through differential royalties which discriminate against more environmentally damaging operations, such as extensive clearcutting, logging on steep slopes, under very wet conditions, and so forth. But they may also be applied differentially to distinguish between end products with different social and environmental costs, for example between pulpwood and sawnwood which involve different levels of pollution in processing and disposal. The consequence of applying these pricing principles to different Australian forest products would be as follows:

(1) The royalties paid to forest services, at least for pulpwood and timber destined for export (and probably generally, since what subsidies are needed can be more effectively and sensitively applied at other points), should cover the full cost of production and enable a competitive return of at least 10-12% (for moderately efficient production) since there is no need to regard the production as a public service requiring only a return of a low rate of interest.[1]

The principle proposed, that royalties (i.e. stumpages) should cover the full commercial costs of production, including regeneration costs, is only one among the usual principles considered for the assessment of royalties; and it is the one that is not at all commonly adopted. The other main principles are those of revenue raising and of residual value (cf. Hanson and Leslie [1]). The revenue raising principle, the historical source of royalties, arose out of a system of licences to remove timber from specified areas (such a system of licences still operates in Selangor, for example, where no royalties are charged for sawmill offcuts and wastes which are removed for chipping). The revenue principle depends on the anachronistic 'free good' appraisal of forest products and considers neither the costs of production (or

1 Any proposal that royalties be increased is of course going to encounter stiff opposition from the forest industries. Hanson's arguments (in [6]) in favour of increasing stumpage charges on pulpwood met just such opposition.

what production would have cost in the case of virgin forests) nor the selling price; mostly it amounts to a straight, and unacceptable, case of depleting biological capital without replacement. The residual value principle, which relates the price of raw wood to the market value of resulting manufactured products as a residual when the costs of transport and manufacture and a manufacturer's profit margin (of 15% in the case of sawnwood[1] and much more in the case of pulpwood) are deducted, is the main principle applied not only in Australia but also, for instance, in New Zealand and USA (where however the principle operates in the context of a timber auction system). In NSW for example, royalties for sawlogs are worked out, according to a complicated (but somewhat arbitrary) formula, as a residual value, as what is left when loading, freight and processing costs (including a profit margin) are deducted, a recovery factor (to take account of mill wastage) is applied, and finally variations are made to allow for species and size of timber (for some moderately detailed examples, which however offer no proper breakdown of processing costs or profit margins, see NSW Sawmilling [1] and [2]). Even fewer details are available in the case of raw pulpwood royalties, which appear to be worked out in an even less satisfactory way. Apparently pulpwood stumpage prices in Australia are arrived at by 'bargaining' between the companies concerned and corresponding forest services, the royalties being largely determined on the quite inadequate basis of what is the going rate in other neighbouring places. Domestic pulpwood royalties remain however a close secret: the confidential nature of royalties is just *one* of the very unsatisfactory aspects of the commercial management of public forests. Another is the fact that manufacturers can too easily hide their true costs from forest services, e.g. by writing off equipment rapidly; and that forest services appear to have a quite inadequate idea of, what ought to be essential information for setting royalties as residual values, the true costs of the manufacture of pulp and paper products. However it is hard to know why public utilities should just get what is left over from the use of a public resource after a private producer has taken an almost guaranteed profit, of 20% or more in the case of pulp products (for some profit percentages see Hanson [6], p.43). It is harder still to know why companies processing pulpwood should be assured of a larger profit margin than sawmillers, especially as pulp companies, with a higher value per unit of output, have greater ability to pay for the raw material. The answer once again lies in the forest service desire to keep up consumption and hence to keep down market prices in adherence to the cheap wood doctrine. The main argument for the residual value principle is supposed to be that

> forest owners should get as much as they can for their product, and that this price limit which is the maximum that purchasers can afford to pay, is set by the price of the end products. . . . for Forest Services the argument is justified on the grounds that public assets are *otherwise* sold at less than their true market value, not for the benefit of consumers but for the benefits of the milling industry. (Hanson and Leslie [1], p.98, our italics).

But the argument is quite unconvincing: there is no such maximum on what purchasers can afford to pay, but how they allocate their incomes and what price they pay depends at least on the quantity available and alternatives offering; and hence forest owners only get as much as they can if the quantity produced *at least* is fixed. But by cutting less, forest services should be able to earn more. Public assets can be held and not marketed (so the 'otherwise' clause is mistaken), and it is often in the public interest to do just this, e.g. where the royalties paid would not cover the costs of production of the assets sold. It is not in the public interest, only in the commercial interests of the forest industries not to decrease quantities of timber cut but to foster the consumption of wood products.

Nor do Hanson and Leslie really accept their argument; for they go on to claim that royalties should cover the costs of growing the timber (p.100) and to consider seriously the

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1 'My understanding of the systems adopted in calculating sawmillers' costs for stumpage appraisal purposes is that a profit of 15% is allowed before taxation and without any provision for reserves.' (Hanson, [7], p.168).

alternative of a reduction in the quantity of timber supplied to a point at which the cost of production can be recovered (p.102; the alternative they contemplate of generally subsidizing timber we have already rejected); and they conclude by tentatively recommending that

> forest authorities recognise that the primary function of their timber sales policies should now be to recover the full market value of their publicly owned assets. [They continue:] At present it seems likely that the way in which royalties are assessed subsidizes the wood using industries . . . certainly at the expense of the taxpayer and probably at the expense of competing industries. Under the high level of economic development that Australia has now attained, the justification for continuing such a policy needs a careful re-examination. (p.103-104)

(2) The producer should pay the environmental cost of eliminating natural forest, and reducing the attractiveness, diversity and amenity of the public forests *where* this occurs in the production of the raw material for his product. An allowance for this cost should be included in the royalty paid for the product. One way of estimating the cost loading required is, as in the case of pollution, in terms of the cost of alternative methods of production which avoid the undesirable consequence; in this case a minimum cost would be given by the alternative of siting the plantation on already cleared land. Thus if this loading were incorporated it could no longer be claimed that planting on cleared land was too expensive. Among the other consequences of including environmental costs as part of royalties would be that it would not be cheaper to plant pines than to husband eucalypt forests (because of considerations like those represented in the cost-benefit analysis of Chapter 8), and that environmentally sound methods such as carefully conducted small patch cutting would not be uneconomic for pulp production in comparison with clearcutting (since the apparent economy of intensive forestry methods depends on neglecting environmental costs).

(3) The producer should pay the full costs of the pollution involved in producing paper products, costs equivalent to the installation and maintenance of plant which largely removes the pollution (and *at least* reduces it to 'acceptable' levels). At present Australian manufacturers of paper products do not pay these costs (see Chapter 12).

(4) The cost-structure should also include an allowance to cover the cost of disposing of the items particularly in the case of disposable paper products; for these costs are at present a burden on the public purse. The relevant redistribution to local collecting authorities who collect the refuse could be achieved by way of a tax on the products. For this purpose it is not of course enough simply to increase the royalties on pulpwood; a tax to cover disposal of the commodity after consumer use should *not* be paid, through royalties, to forest services. As the cost should be fed back to council refuse disposal services, a more equitable method of exacting the disposal charge would be through a sales tax on paper products met by their consumers and returned to disposal agencies.

(5) As a corollary of the preceding conditions, royalty rates and other relevant details must be publicly available and assessable. The present situation is that the royalty rates, and pulpwood royalties, are often secret despite the fact that they are payments for exploitation of a publicly owned resource and that there appears to be public loss and private gain.

The matter of assessing royalties could be accomplished in Australia by a federal board, set up somewhat along the lines of the Tariff Board (for royalties, as a tax, have several features in common with tariffs). An early task for the now established Australian Industries Assistance Commission, could be the matter of publicly scrutinizing forest revenues, and of providing, preferably in collaboration with the Department of Environment, a federal (non-forestry) committee to assess forest revenues and to determine, in conjunction with tariff arrangements, the extent to which royalties should be raised.

These principles should be introduced in a graduated way to avoid dislocation of local industry, beginning at once in the case of produce destined for export, likewise at once as far as commercial production costs and pollution costs are concerned, and as part of a more general system of environmental pricing in the case of further environmental costs for domestic products – since it is only fair that competing materials should be similarly subject to environmental pricing, i.e. though wood products should not be vastly favoured as at present, they should not be unduly penalised.

Among the consequences of such a system of pricing are several concerning Australia's position in the international forest product market. For it is not just *local producers of raw forest material* who *are selling their product for less than the true cost of production,* even the most efficient producers are losing in real terms. The disease, and it is a disease from an environmental viewpoint, of selling raw forest products at far less than their true costs to local producers is an international one. The situation has partly arisen from heavy exploitation of, and competition with, virgin forest resources which were regarded as free goods, and some of which were in the process of being eliminated, royalty charges for which were simply designed to raise revenue rather than to cover the true value – for permanent forests, the true value being the cost of raising an equivalent replacement. The prices charged have never managed to reflect more realistic evaluations linked to true values, but continue for the most part to reflect the anachronistic 'free good' notion. The fact that the whole international wood product market is one in which producers are competing to sell their material at far less than its real value or true cost of production, has a number of important consequences, particularly when combined with the suggestion that Australia should act, unilaterally if necessary, to adopt an environmentally sound policy and charge the true cost of production (or, that royalties should reflect the true costs) both for the domestic and the export market. The first consequence is that, assuming tariffs do not rise appreciably, it would open the door for a large number of imports. However given the international market situation outlined, it would be an economically sound policy to admit these imports; for from a simple national advantage viewpoint (which, even if narrow and inadequate, is the usual basis of international trade) it would clearly be sensible to take advantage of the preparedness of other countries to heavily subsidize their forest product exports. The point applies both to commercial costs and to environmental costs, both of which are borne by local people if the material is produced locally, but neither of which are borne in full if it is purchased from overseas sources. In this sort of international market it would be economically irrational to produce locally products which could purchased on such advantageous terms from elsewhere. It is a corollary that Australia's very complicated set of tariffs (especially those of Chapter 48, Division 10 of Australian Customs Tariff), designed to protect local producers particularly of pulp and paper products, against general overseas competition and dumping, act to prevent Australia taking advantage of a very advantageous situation. The second consequence is that, were the true cost of production charged, export activities would be seriously curtailed, since products so priced could not compete in a market where no other state was charging the true cost of production. But because the international market is a highly advantageous one for buyers, not only are import replacement activities clear folly, the deliberate fostering of an export industry in the area is even greater folly. It would be entirely irrational unless one was in great need of foreign exchange, employment, etc., to attempt to enter as a producer a market so disadvantageous from the producers' viewpoint.

The obvious result of raising royalties to cover costs and lowering tariffs would, in the absence of action by major exporting countries to place their forest industries on a sounder footing, be that local industries could not compete with imports. But whatever the case for attempting to protect (at least temporarily) *existing* forest industries and associated employment, it clearly does not extend to sanction attempts to *expand* these forest industries, to achieve self-sufficiency or develop an export trade, or to sanction the expansionary projects and attitudes we have been primarily concerned with. At most one might for the sake of employment and other benefits have to bear with and protect such an uneconomic industry by protection up to present production levels or thereabouts; but plainly given

Australia's employment and trade situation there is no case at all for attempting to expand such an industry either for the domestic market or for export. The third consequence from the international market situation involves a moral for the prediction of a great future shortage, with consequent price rises. The moral is that prices fall so far short of reflecting true costs of production that they could rise substantially and it would still be more advantageous to import the material than to produce it locally once the full local cost of production is taken into account. But a lesser price rise would suffice to reduce demand and competition for the products and hence to resolve the shortage (since shortages of available goods are relative to prices).

The adoption of the (five) pricing principles outlined, or of ones with similar aims, can be regarded as a test of the preparedness of a forest service to manage its resources in the public interest rather than in the interests of the forest and wood-based industries. It can also be taken as a test of the Commonwealth Government's and Treasury's willingness to accept the extended 'Polluter Pays' principle, that appropriate recasting of royalties be made a condition for further Commonwealth export licenses and financial assistance for the forestry projects, just as environmental impact studies are supposed to be in the case of export projects and should be in the case of domestic projects.

The more general problem which may be remedied partly in the same way, by appropriate Commonwealth influence, is the revision of forest service planning which still operates on the naive assumption that air and water, soil and nutrients, and flora and fauna are free goods which are expendable, and takes no proper account of environmental costs and risks and loss of amenity values through their operations. Forest service analyses do not take sufficient account of these relevant factors in their studies or planning, and even when studies are called cost-benefit studies they do not take account of factors other than fairly narrowly commercial ones. It is not surprising that so much energy is put into arguing, for example, that there is no adverse environmental effect when a rich, natural ecosystem is eliminated in favour of a monoculture; for only in this way can the failure to take account of these effects be justified. Forest service standards for decision-making do not meet accepted conditions of adequacy for making decisions on behalf of the public they are supposed to serve.

Were adequate account taken of environmental costs in forestry decision-making we would not have the overestimation, the exaggeration of demand, etc., exemplified in the pine program, nor the claim that it is always uneconomic to plant on cleared land to provide for future paper requirements; nor should we have woodchip export projects, for if any adequate account were taken of environmental costs and risks in woodchipping and allowance made for these in pricing, the price would rise to a point where overseas buyers would cease to find Australian chipwood of interest. One point which indicates clearly that Australia is not making a proper charge for environmental costs is that the Japanese prefer to buy local material rather than to use their own forests. This common objection is not just a gratuitous piece of xenophobia; it reveals that a proper charge is not being made, because if Australia was making a full charge for environmental costs there would be no advantage to the Japanese in purchasing local forest material rather than using their own, or in relocating their pulp mills here. In short, if environmental pricing were applied, Australia would not have woodchip export projects, and would not have intensive forestry generally.

Despite the great destruction of much fine forest, and particularly rain forest, and the great reduction in forest area in the last 200 years, the wet forest, of all the main original ecosystems, remains the one which has suffered least, as reflected in the fact that its fauna, unlike those of the others, is still largely intact. This contrasts with the ruthless destruction of original grassland and woodland ecosystems often for dubious short-term economic reasons and for sectional benefit. The destruction of these areas has given Australians the doubtful distinction of having eradicated more natural systems over a larger area and in a shorter time than any other people in history. Now it is the turn of the remaining forests, the richest and most rewarding of the systems. But perhaps in this case there is a chance, now that some other features of Australian society seem to be changing, that this sad tradition also can be laid to rest.

APPENDIX 1

The economic framework and underlying economic issues

Although most of the economic considerations and arguments presented in the text fit readily enough into a liberal framework of so-called 'positive' economics (as presented, e.g. in elementary form in the latest editions of Samuelson [1] or Lipsey [1]), and almost all fit better still into the more generous framework of welfare economics, they do not mesh quite so easily with more conservative economic theories (as outlined, e.g., in earlier editions of Samuelson and Lipsey). For it was argued that it is not always desirable to meet consumer demand, and that certain sorts of consumption, e.g. of packaging, and certain sorts of production, e.g. by polluting paper mills, are undesirable – in the welfare picture because they decrease welfare – and therefore that the maximization of undifferentiated economic growth, of its indicator GNP, or of throughput to which such sorts of consumption and production of course contribute, is not only not a major economic objective, but is positively undesirable. Such points can be cogently argued for within a welfare framework (for details see, e.g. Barkley and Seckler [1] or Mishan [2]). One important reason for preferring a welfare approach is that, of the established neo-classical theories, it offers a far better treatment of public goods and resources, such as state forests and national parks, than its more market- and production-oriented rivals.

Our aim in the main text has been, then, to convince the reader of our points in terms of fairly standard assumptions of welfare economics, and not on the basis of (what we occasionally adverted to) a more general system of values. However in order to deal adequately with wider ecological issues the economic framework has to be enlarged – in a number of directions, to which we turn in succeeding sections.

Environmental economics

> Economics . . . in its most honoured modern formulation . . . is defined as the [discipline] that studies choices made among alternative and competing ends (Barkley and Seckler [1], p.2).[1]

The definition, though defective because it omits the classical concern of economics with wealth, its production and distribution, has the merit of emphasizing that economics is essentially a branch of the theories of choice, preference and values (since choices between situations are ranked and evaluated). What characterises *environmental* economics is that environmental factors play a significant part in the way choices are made and assessed, and enter essentially into decision-making and not merely peripherally as externalities; and that valued environmental items such as wildernesses, forests, wild animals, lakes and cliffs, that have in fact cost nothing to produce and involved no labour (and have not become private property), are assigned non-negligible initial values, and have non-negligible prices. It is quite unsatisfactory to define environmental economics, as Barkley and Seckler do ([1], p.4), as 'the study of the unintended consequences of

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[1] Samuelson's definition ([1], p.5):

> Economics is the study of how men and society *choose,* with or without the use of money, to employ *scarce* productive resources, which could have alternative uses, to produce various commodities over time and distribute them for consumption, now and in the future, among various people and groups in society,

while revealing rather more the characteristic concerns of modern economics, is rather too restrictive. Economics is concerned with all choosers, particulary with choices of persons and groups, and not just with their choices concerning scarce productive resources; more importantly, it is concerned not just with how they choose but also with assessing and evaluating their choices.

choice'. A factory owner who deliberately chooses to discharge the waste he produces into a river at night when pollution is not monitored knows very well what he is about, and producing waste or by-products is not an 'unintended consequence' of industrial activity (though it is an undesirable consequence of it and no doubt factory-owners would choose pollution-free production if they were living in a world where the conservation laws did not hold). Similarly policies where environmental factors are important, such as softwood conversion of native forests, which are a matter for environmental economics, may be chosen with the deliberate intention of removing native forests. But despite their definition, Barkley and Seckler make a valuable beginning on a theory of environmental economics, which does take environmental matters seriously, within a framework of welfare economics which takes proper account of the preferences of many people for valuable environmental items and for environmental quality, protection and integrity.

Welfare economics concerns itself with how the final budget of items (goods and services) produced in an economy can be made to accord, firstly with each individual's preferences for kinds and quantities of goods, and secondly with resulting social wants or preferences.[1] Social welfare is equated with what people want or prefer, and the goal is the maximization of social welfare (as far as the efficient use of resources of the economy permits). Within the fuller picture there are both consumers who consume parcels of commodities and producers who produce mixes of these commodities; the consumer has a predetermined demand function based on his wants or choices, or more generally a preference ranking on packets of goods the economy can supply, and the producer is supposed to aim to maximize profits (or some minor variations thereon) in response to the aggregated demand of consumers. Thus the state of the economy selected, as maximizing welfare, answers ultimately to consumer preferences or wants; welfare, by which is usually meant well-being, is cashed in terms of some aggregation (*which*, is a major problem) of consumers' wants.

The theory is essentially utilitarian, and suffers much the same defects as utilitarian ethical theories (whether act or rule theories, a matter which depends on how the aggregation is accomplished). Firstly a person's, or consumer's, wants may not coincide with his welfare or more generally with what is best for him; e.g. he may lack information, be a poor chooser or indecisive, easily led astray by persuasion, hang-ups, not in full command of his faculties, etc., and felt wants may diverge from real wants. Secondly, there are severe problems as to the choice of the base class, the class of humans, persons, choosers or whatever, whose wants or preferences are taken into account. The common restriction of the class to humans, or more narrowly still to consumers, is indefensible; but every widening of the base class, to persons, to include young persons, or, as some utilitarians now argue, to include at least higher animals, decreases testability of preferences of members of the base class (and testability was one of the initially pleasing features of utilitarian approaches). Moreover, though past people or choosers can be excluded given the reasonable assumption that present and future choices and wants cannot affect what

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1 (Continued from page 248)

Throughout the text economics has of course been contrasted with commerce and economic assessments with commercial ones, economic assessments taking acount of wider choice and value issues, while commercial ones are more narrowly business and trade oriented.

1 Of course the connections between a individual's wants and preferences (as constrained by his income, etc.), which are dispositional, as they depend on what he would choose, and what he actually chooses, occurrences are complex, though they are readily modelled in intensional semantics, what a person wants being a matter of how he chooses in a suitable set of alternative worlds.

has happened and so cannot affect them, future people or choosers cannot, since present decisions do bear on them. But the proper admission of some future items into the base class not only further diminishes testability and accessibility; it also raises the awkward question as to how far into the future base class eligibility extends, or, more sophisticatedly, as to what discount rate should be applied to future items and as to when their preferences cease to count. The forestry case appears to show that people of 80 years and more ahead should not be entirely discounted; how they will react to what current forestry policies do to the forests should presumably be included in a utilitarian assessment of welfare. Incidentally, admitting animals or future items puts the market out of business as a satisfactory way of registering group preference as far as welfare assessments are concerned; for a market registers at most preferences of present participating consumers (and often it doesn't even do this at all well).

Thirdly, there are problems of interpersonal comparisons, of whether some chooser's preferences count more heavily than others, e.g. because he is more valuable, rational, intelligent or just proximate. Though it seems reasonable enough to apply some discount factor to future choosers, and perhaps to children and animals, utilitarianism usually makes the egalitarian assumption that each member of the base class ranks equally, and mainstream economics, following faithfully, does the same, e.g. demand curves of consumers are equally ranked and simply summed horizontally, or vertically in the case of collective goods such as public forests (see e.g. Barkley and Seckler [1], p.69). However, as voting theory shows, such equal weighting (one chooser – one vote) does not always lead to the best results or to results which actually reflect group preferences. Obviously, however, the very knotty issue of the aggregation of the individual preferences of members of the base class depends on the resolution of the comparison problem. It is moreover a common assumption that the aggregation problem admits no satisfactory solution – certainly none better than that provided by the market – because of difficulties such as 'Arrow's paradox'. However, many of these difficulties arise from the imposition of excessive conditions of adequacy on group preference or social welfare functions, notably the consistency assumption, that group preferences must be consistent, coupled with the voter sovereignty principle (the voting analogue of the principle of consumer sovereignty discussed below). But conflict of preferences, and inconsistent desires, can occur even in the case of a single individual; in the case of a group, inconsistency of preferences is not uncommon, unexpected, or always irrational. But of course inconsistent choices cannot be simultaneously carried out, so voter sovereignty too has to be qualified.

Fourthly, even if all these problems as to the determination of welfare in terms of collective preferences or wants of some accepted base class can be resolved, there remains a general objection to the whole approach, to the idea that what is desirable, the objective, is the maximization of welfare so assessed – namely the gap between fact and value, between what is desired and what is desirable. There have of course been celebrated attempts to bridge this gap, e.g. Mill's classical invalid argument that what is actually desired is desirable. Modern economics, still following utilitarianism, attempts to bridge the gap between what is generally preferred and what is desirable by (an evaluative form of) the principle of consumer sovereignty (cf. Barkley and Seckler [1], p.64), or by some generalisation thereof from consumers to choosers, namely that whatever is preferred by the base class of choosers is desirable, a principle which is just tailored to bridge the gap. But the principle, apart from begging the question, is defective (as we go on to argue); for the gap cannot be closed. It is not just that welfare criteria are human or person chauvinistic or base-class chauvinistic, and so open to the objection of species or class chauvinism, that things outside the class may fare badly. The objection is more generally that welfare criteria, especially if future welfare is discarded as untestable, may well lead to undesirable outcomes.

The general unsatisfactoriness of the welfare account as providing a sufficient condition for desirability begins to emerge in welfare discussions of the case for preserving the blue whale, a case Barkley and Seckler try to treat within a welfare framework ([1],

pp.130-132 and again pp.148-150). The existence of the blue whale is brought within the welfare picture by an intensional connection:

> . . . countless millions of people derive pleasure from simply knowing that the whale exists. The thought of these massive yet graceful creatures swimming through the deep creates a nearly mystical sensation. Without the whale, *Moby Dick* would never have been written. Collective benefits flow from the clear existence of such beasts . . . (p.131).

Moreover the collective demand that the blue whale exist will increase since

> as time goes on, more books are written about whales, and more television time is devoted to them. More people are exposed to whales and learn to appreciate them as a collective good (p.132).

Tough luck for the blue whale if no-one knows about it or thinks about it, and for other species that don't get so much television time! But the fact is that whether something is valuable does not depend on such intensional connections. The desirability of the existence of blue whales does not depend on what people (the base class here) know about or learn about blue whales or what they see of blue whales on television; it depends on features of blue whales. As Moore long ago pointed out, a world without people can still be beautiful, or ugly; and likewise a world without people, where blue whales exist, can be better than a similar one where blue whales are extinct.

The welfare method of assigning value to forests and making it desirable to retain forests is similarly feeble. The value of forests does not depend on people knowing they are there, though the saving of a forest from forestry destruction may well do so. The value of forests does not reside in their 'answering back' to human interests, if 'answering back' comes down to some utilitarian or welfare reduction of values to human or base class preferences. Though it is of course true that it is people who assign values and make desirability rankings, it certainly does not follow (and is false) that the values assigned and rankings made somehow reduce to their interests or preferences.

There are many cases where what counts as welfare, as construed in terms of collective desires or preference of the base class, is undesirable. There are, for example, the cases where the base class is selfishly interested in its own welfare to the exclusion of other items. Consider for example typical, though at last changing, human attitudes to animal welfare, where aggregate human preferences tend to mean captivity for battery animals. Or again, human (or base group) welfare may be increased by some drug which can only be obtained by destroying certain marine habitats and thereby undesirably eliminating some generally unknown species of fish. Similarly if nobody does or will care about a remote forest and a group of foresters derives great pleasure from simply chopping down most of the trees to rot on the ground or from infecting the forest with a root-rot disease then though the act is acceptable on welfare and utilitarian grounds, it is a case of wanton and undesirable destruction (as assessed on non-utilitarian grounds). Of course it may be said that there will always be people who care; but there might not (after all there haven't always been) and it ought not to be a merely happy accident that what is acceptable on welfare criteria is desirable. In fact happy accidents are logically inadequate, and do not prevent the construction of counter-examples, of situations where the accident does not happen; for example, situations where only one or a very few people remain in the world and these people have no successors (see the last man and last people examples discussed in Routley [1]). It is easy to devise cases where the preferences or desires of these remaining base class members are satisfied by undesirable activities. Reverse cases occur where there are too many people, the situation we are rapidly headed for, if not already in. Then aggregate welfare considerations lead, as they are leading, to quite undesirable reductions in things natural.[1]

See next page for footnote.

A cheap move to save the connection between base-class welfare and desirability resorts to the evaluative shift which makes welfare into an evaluative notion analytically tied to desirability. But though the evaluative shift is easily made with welfare notions, which already have such roles, it can only be made at the expense of severing crucial connections of 'welfare' with what is desired or preferred by the base class. Hence this equivocation on 'welfare' can be defeated by a dilemma: either 'welfare' is descriptive and linked with preferences, but then the objections already marshalled apply; or 'welfare' is evaluative, but then like desirability it is not guaranteed by the preferences of the base class.

In sum welfare, descriptively characterised, provides neither a necessary and sufficient nor a sufficient condition for desirability; nor does it provide a necessary condition, since (for reasons similar to those advanced above attacking the sufficiency of welfare for desirability) what is desirable, e.g. the preservation of certain species or the production of certain artefacts, may not be selected by welfare criteria.

Just as a new environmental ethics to replace prevailing ethical theories is wanted (as Routley [1] argues), so, for the reasons sketched, an associated environmental economics is needed. For just as prevailing ethical (and political) theories are ultimately inadequate to cope with a range of environmental evaluations, primarily because of their intrinsic chauvinism, so likewise are the economic theories these evaluative theories generate and underlie inadequate, for reasons of the sort sketched. The outlines of a more adequate framework is already available in the work of Aristotle and Mill, *if* however the connections which characterise their theories are broken; that is to say if the equation of the objective, what is good, is cut from happiness, in Aristotle's case, and the objective of maximizing desirability is severed from maximizing pleasure and minimizing pain of some base class (humans typically), in the case of utilitarian theories such as Mill's. Analytically desirability or the good is the main value and the objective is the maximization of what is good or desirable and the minimization of what is bad or undesirable. States of an economy, and in the semantical analysis states of affairs, are ranked for desirability and the best or most desirable is selected. The decision theory principles applied fit into the same framework; given a choice of alternative courses of action in a situation of uncertainty (or what is not sharply separated, risk) one chooses that alternative which maximizes probable desirability.

The problem with this wider framework, about which there can be little dispute in view of its analytical character, comes when one tries to estimate or measure desirability; and it is here that rival valuations, e.g. those of the exploitative and pioneer ethics as against conservation-oriented evaluations, are likely to show through, whereas welfare has the apparent advantage of being more readily assessible and less value-dependent because it can be worked out in principle by counting up welfare of a countable base class. (And the arithmetical opportunities, afforded by utilitarian approaches are certainly very appealing to the mathematically oriented.) However the advantages afforded are only apparent, and

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1 (Contined from page 251)

Of course in such cases the welfare position can be propped up against objections by other principles such as the chauvinistic principle, fostered by many religions, that humans are far and away the most valuable things in the world; for from this it is supposed to follow that deplored reductions in other things natural are not really undesirable. But even if humans are assigned, a priori, a higher value ranking than other items, it does not follow that what they collectively prefer to do is desirable. Value does not reside only in humans and human doings. And the assessed valuation is not acceptable (at least on our value rankings); humans are not far and away the most valuable items in the world, but subject like other items to the law of diminishing returns.

once simplistic assumptions, such as that a person is always the best judge of or best placed to judge his own welfare and that future persons (whose preferences are hard to know) can be discounted, are given away, similar problems as to the estimation and interpersonal weighting of welfare assignments arise – quite apart from the unresolved question as to how group or collective welfare is to be determined, *if* it is some function of individual welfare. For if it is not, as we suspect, then the welfare account is really no superior on this important issue.

Desirability ratings and rankings, when determined, are of course to be reflected in the economy in the way prices are set, prices reflecting as classically values, and environmental price loadings reflecting environmental evaluations. And given prices, the main body of economics built on price theory can be taken over.

But though we would want to fall back ultimately on the wider desirability framework, practically everything we do in the text can also be accomplished within a narrower welfare framework (providing future welfare is taken into account); for example in almost every case where the term 'desirability' (or one of its cognates) is used it can be replaced without upset by 'welfare' (or an appropriate cognate), and decision-making under uncertainty can be seen as maximizing probable welfare.

Although this explains, in a fairly trite way, how the economy should be managed, namely to increase, in the long term at least, desirability, or, as an approximation, long term social welfare, it does little to indicate how the Australian economy, or the relevant parts of it, concerned with forests and forest products, does in fact behave. That there is a serious discrepancy between the ideal and the actual, between the evaluative and the descriptive, between how forests ought to be managed and how they are, has of course been one of the main themes developed. In the case of the management of the public forests, primarily by forest services, a general sociological account of how things do in fact operate has been sketched. As remarked the account is strikingly similar to Galbraith's account of how public utilities in USA in fact function, and much of Galbraith's account can adapted and applied to Australian forest services. For example, what he writes of US weapons interests ([2], p.69) transposes (upon simple substitution) to Australian forestry interests, namely:–

> . . . forest product decisions are taken not by the individual Australian citizen and voter and transmitted to the state and federal government agencies. They are taken by the producers of the forest products, the forest services and forest industries. It is their goals that primarily are served. State and federal governments and the public are then persuaded to accept their decisions.

And the forest industries are about as interested in conservation as the weapons establishment is interested in peace. The Australian Forestry Forwood Conference has provided a classic example of all these forces at work.

Reasonable requirements versus future demand

Admittedly we need to guard against ambiguity in the notions of requirements and shortfall (as pointed out by Weaver [1]). The notion of requirements is ambiguous at least as between, firstly basic needs, second, genuine or reasonable needs, i.e. requirements such that a failure to fill them would constitute a serious problem or would cause a decline in the real standard of living, and, thirdly, 'requirements' in the market sense of demands, which can include what people can be persuaded to consume. The notion of shortfall, being a failure to fill requirements, partakes of the same ambiguities. While forestry planning should attempt to allow for and anticipate reasonable requirements and to avert genuine shortfalls, requirements in the sense of what people can actually be persuaded to consume, and so to 'demand', can, as we have explained, be discounted, and proper planning can ignore them.

It has however been objected that the notion of future requirements is obscure (Parkes [1]), that it is not 'suitable for use as the major component of . . . forest produc-

tion goals' (Gregory [1]), and that insofar as it can be pinned down it coincides with future demand in the standard economic sense (Gregory [1], Parkes [1]).[1] Where requirements are simply reasonable requirements none of these points hold up. Reasonable requirements may of course exceed demand, because of lack of income (e.g. protein requirements in certain countries), lack of education, or just through perverseness of buyers. Likewise demand may exceed reasonable requirements, because demand may be unreasonable — market transactions do not determine what is reasonable. For example the demand for wood products may include a call for paper with which to paper over the Hume highway; but this is scarcely a reasonable requirement. In ordinary OED terms demand is the 'call of a would-be purchaser for a commodity': as such demand is a function, typically of price and income, the value of which (in quantities) provides the demand curve. Since such demand may be by no means reasonable, the curve for reasonable requirements may deviate drastically from the demand curve. It is well-known that demand can be manipulated by advertising, e.g. detergent sales for rival firms producing similar products are practically a function of expenditure on advertising; and demand can be affected favourably or adversely by publicity given to products. For example, demand for redwood timber, leading to pressure on remaining old growth redwood forests, is manufactured by widespread forest industry advertising which tries to persuade readers that they should want to build their houses from redwood rather than any other timber. (When the public responds, it is said that the public wants redwood; so that, it is invalidly concluded, it is in the best public interest that these magnificent trees be felled: on this example of manufactured demand see USA [2], p.128). Nor will it in general be the case that demand as given, in advance of advertising and publicity, however this is determined, coincides with reasonable demand: people even if uninfluenced by advertising of a particular product can still want unreasonable quantities of it.

Thus it is by no means the case that future (reasonable) requirements just coincide with future demand, as Gregory [1] tries to persuade us.[2] The invalidity of Gregory's persuasive argument (in [1]) may be shown as follows. One aims to use reasonable future requirements in order to set supply. But supply differs from demand, and generally the supply curve intersects the demand curve for a commodity at just one point, the price equilibrium point. Hence as reasonable requirements are tied to supply, it follows, by identity laws that reasonable future requirements differ from future demand.

What one wants to forecast is reasonable requirements, not future demand. In responsible forecasting one should ignore the (delightful!) possibility that people may give up buying other commodities to put all their money into wooden houses, or that they insist on triple packaging of their wooden purchases, though conceivably a vogue in wood or packaging could turn demand in these unreasonable directions. For instance, though we extrapolated from present consumption trends we did not allow for future excessive, and unreasonable, consumption of packaging and paper along current American lines. It is, in fact, just the opposing value judgement, that one *should* meet

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1 Similar objections have been made against the related distinction deployed by Galbraith (cf. [2], p.68) between physical and psychic needs. Reasonable requirements would usually be more than adequate to accommodate physical needs, and over and above this demand is a matter of psychic satisfaction. So it is hardly imperative to satisfy demand beyond reasonable requirements.

2 Though Gregory has a case against some of the official reports he examines, where future requirements are characterised in such a way as to amount to future demand.

demand no matter how it arises, that leads to the overestimation method already criticised in the text, according to which supply must be very large, or elastic, since practically nothing is so bad as a failure to meet demand.

On the contrary one needs to determine how to regulate demand in terms of what is reasonable. What we have suggested is this: we project consumption trends making allowance for expected changes, and for reasonable new uses, but discounting excessive and unreasonable uses, to obtain future requirement levels. It is in terms of these reasonable future requirements that supply is primarily set. Supply of wood products is in fact fairly inelastic owing to the long production time, but there is some latitude for variation, for example by cutting increased areas and enlarging imports, or by reducing imports, harvesting smaller areas, and letting the mills run slow. The quantity of demand however can be controlled to match supply, especially as the Australian market for wood products is monopolistic. For demand is a function of at least the following parameters which can be manipulated: prices, taxes, tariff levels, and price of substitutes. For example there is scope for control[1] through the price mechanism by increased prices or by subsidies, through a tax mechanism by a disposal or other tax, through tariff control, and indirectly by encouragement or restriction of substitutes.

It is the more reprehensible that many forestry planners aim to meet and encourage future demand, rather than to meet reasonable requirements, when their product is subsidized. Where a commodity is profitable it is easy enough to see why businessmen aim to maximize its consumption, namely in order to maximize their profits. But where a commodity is substantially subsidized and produced by a public service, this egoistic (or entrepreneurial) argument breaks down. For a commodity should merit a subsidy only for reasonable consumption when this meets criteria for overall social desirability. Where local consumption exceeds reasonable levels the basis for subsidization disappears, and in such cases the subsidy should be withdrawn. But if this happened in the case of forest products, consumption beyond reasonable limits would be economically indefensible, even on the market model. Thus in the case of a subsidized commodity like timber products one is fully justified in supplying no more than is reasonably required.

In any case with very long term planning it is better to try to forecast reasonable future requirements, since advance planning is essential in forestry, than it is to attempt to forecast future demand. For one thing determining a distant demand function, with its heavy dependence on future market manipulation, is not feasible, because of the virtual impossibility of predicting distant prices with any reliability. Being able to estimate distant prices accurately would involve knowing – what is *at least* technically impossible – a fair slice of the relevant future, including new inventions, extent of intersubstitution of materials, and so on. For another, future demand on its own is insufficient for forecasting purposes; a future supply curve is also needed if specific quantities are to be aimed at; however once again not only is little known even in the very short term about the determinants of supply functions for forestry products, but it is technically impossible to forecast with any reliability such supply functions in the longer term – unless supply is deliberately predetermined in terms, for example, of requirements.

These proposals, that supply should be set in terms of reasonable future requirements and that demand be adjusted by monetary and fiscal policies to match supply, are sure to encounter three standard sets of objections which we discuss in turn, first that consumer demand should be unconstrained, second that the proposals violate the doctrine of consumer sovereignty, and third that allowing for reasonable future requirements involves one in making value judgements, of a fairly explicit kind, as to what is reasonable.

The thesis that demand should be unconstrained

The thesis is of course inconsistent with the valuable distinction between demand

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1 Such economic methods, though they include ecologically responsible methods, Gregory [1], a devotee of the market system of valuations, finds 'inconsistent with the economic and social framework'!

and reasonable requirements, since if it were correct there would be no circumstances in which it would be necessary or permissible to make judgements about which levels of consumption were desirable. But it is both necessary and reasonable to reject the thesis that demand should be unconstrained and to distinguish between demand and reasonable requirements in the following cases (which are also cases where one is entitled to or it is necessary to assess desirable levels of consumption): (i) where the goods demanded are publicly subsidized whether through a direct commercial subsidy or more indirectly through the public's bearing the environmental costs of production (i.e. through an environmental subsidy). Where some of the costs of production are borne publicly it is clearly reasonable to require that consumption be reasonable, not excessive or wasteful or used for ends other than those for which the subsidy was provided. Conversely if one is anxious, like many forestry planners, to treat consumption as unrestrained, or even unrestrainable, and also to promote it, then one must be prepared to lose public subsidies, both commercial and environmental, for consumption. What is completely unacceptable is the attempt on the part of some forestry planners (e.g. Jacobs) to have the best of both worlds, publicly and environmentally subsidized free enterprise in wood products (cf. Chapters 1 and 5).
(ii) In planning for future demand there is certainly no obligation to plan for and to make substantial sacrifices now to ensure an excessive supply of future goods, in order that the demands of future people shall know no constraints.[1] If one is to apply rational decision methods to long-term future planning involving uncertainty, it is essential to make assessments of desirable future states, and hence in the cases under consideration desirable consumption levels. Hence the thesis that no such judgments can be made either implies that rational decision methods which require taking account of desirabilities are objectionable or else that application of rational decision methods to future planning is not possible in the area of consumption and demand levels. Both the conclusions are surely unacceptable. (iii) One is entitled to require some restrictions on consumption where there is a conflict between one person's consumption and another person's (or even the same person's) choice or consumption. Since such situations indeed occur the principle that demand should be unconstrained at least as a practical directive must be either abandoned or qualified, otherwise it will lead to inconsistency. Far from such conflict situations being merely remote or abstract possibilities, they are precisely the class of cases in dispute, where environmental costs are incurred as a result of consumption. Where demand is construed widely the cases can be represented as a case of conflict of demands, in the sense that both sets of demands cannot be satisfied in the actual situation. Where demand is construed narrowly to embrace only those commercial goods (and services) that are conventionally included, one has cases where demand conflicts with other important values and preferences. To adopt the principle is to give the private consumption of such goods preference over the other values to which it is detrimental. But there is no political or ethical or economic justification for this at all, it is simply a piece of industrial lobbying masquerading as a value-free economic principle. If, however, the items and values adversely affected (externalities) were not omitted from consideration (by the market arrangement), the unjustifiable nature of this preference given to conventional goods by the principle that demand should be unfettered would be plain. Of course it might be argued that once one has introduced such items into the economy and assigned them a value (e.g. by taxing or pricing), direct restraints on damaging consumption are unnecessary since constraints will be provided anyway. But that is a different issue, not the issue as to whether con-

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1 In fact this is a much stronger principle than the thesis that demand for present available goods shall be without constraint, since it entails the further obligation to make them available even at excessive levels of consumption.

straints on damaging demand are required or justifiable, which is conceded, but the issue of how best to achieve them. (iv) This point is closely related to the preceding one but is more general. One may be entitled to require restraints on consumption and production behaviour just like any other form of human behaviour in cases where it affects, or is likely to affect adversely the welfare, rights or choices of others. But, as we have argued, many of the controversial cases are of precisely this kind, particularly cases where damaging forms of consumption involve serious environmental costs. There is surely no ground for giving consuming behaviour a special position or privileged status and according the consumer of commercial goods and services a freedom to do what he likes without any regard for effects on others, not accorded to any other form of behaviour. (Analogous points apply to producer behaviour.)

The doctrine of consumer sovereignty

Many of the objections to the thesis that demand should be unconstrained also apply to the consumer sovereignty doctrine. This doctrine is not so much a single thesis to the effect that consumers rule the economic system, as a hydra-headed cluster of principles, and it is important in getting to grips with it to separate out the distinct theses and to distinguish different versions in which the doctrine reappears. The simplest form of the consumer sovereignty principle, the basic descriptive form, states that 'consumers collectively decide what industry is to produce. The choice of consumers provides the basis on which business makes its decisions' (Ferguson and Kreps [1], p.80) or alternatively 'what things are produced is determined by the votes of consumers . . . every day in their decisions to purchase this item and not that' (Samuelson [1], 7th edition, p.42) and, one might add, the consumer determines not only what will be produced but also its value since it is his decisions whether to purchase or not which determines the value. In this form the principle has been roundly, and in our view soundly, criticised by Galbraith ([1] and [2]) as ignoring the very important, and perhaps crucial role of the producers in shaping preferences and controlling the range of choices available. Insofar as the basic form is empirically testable at all it is very difficult to reconcile with observed facts such as the extent of consumer dissatisfaction, the objectives of consumer organisation, the extent of persuasive advertising, the absence of feedback from consumers, and the organised resistance of some producers to demands for changes, such as for safer cars, more durable goods, and so on.

Of more relevance for our purposes than the basic principle itself is the way in which it is combined with other principles to obtain the conclusion that demand should be unconstrained (and more generally that free enterprise coupled with the market system produces the best of all possible economic worlds). The first form of argument, (A), which derives from Bentham, is as follows:

A1. Non-constrained demand, i.e. actual choices, reflects consumer preferences or wishes. (This can also be expressed as: people buy what they want, or, much more misleadingly: business delivers the goods).

A2. Each consumer is best placed, through his own choices or preferences, to maximize his own welfare.

A3. Hence satisfaction of non-constrained consumer demand is the best way to maximize welfare, and interference with or constraint on demand interferes with maximizing welfare.

A4. [Evaluative premiss, where needed] Maximizing welfare is a good thing (desirable).

Therefore A5. Satisfaction of non-constrained consumer demand is the best (most desirable) course of action. [Also, insofar as non-constrained demand is required by the free market system, the best course of action is not to interfere with the free market

system]. The second form of the argument, (B) goes thus:

B1. The free market (capitalist) economy operates to provide through production those things which consumers demand (choose, want, prefer).

B2. Therefore, it provides an adequate range of choice and reflects group (or collective) preferences (what people collectively want).

B3. It is a good thing (desirable) that group preferences should be satisfied, or

B3′ It is elitist (undemocratic, totalitarian) to attempt to frustrate or constrain group preferences.

B4. Therefore, it is desirable that demand should be unconstrained, that the free market operate without interference, etc.

B4′ Therefore, it is elitist (etc.) to frustrate the market or interfere with consumer demand.

Of course these principles, which can be extracted from standard texts in economics, are seldom stated in as much detail as this, which is not surprising since when they are so stated it is evident that they are decidedly shaky and open to a number of objections, some of which we now list.

(1) It is false that actual choices always reflect preferences, or what consumers want or prefer. It is not actual choices but would-be choices, that is, what the consumer would choose in the requisite set of alternative worlds, which reflects his preferences, and likewise for his wants or wishes. In short, the dispositional aspects of wants and preferences have been neglected. In general actual choices only provide behavioural indicators of real preferences, wants and values, given first sufficient and sufficiently accurate information about the item chosen and given secondly that the choice is made as a selection from a sufficient range of alternatives. Since neither of these conditions hold generally, the claim that actual choices reflect real consumer preferences is to start with very shaky. The usual economic assumption is based on a naive behaviourism.

(2) The assumption, incorporated both in A1 and B2, that the market system provides an adequate range of choice is open to the objection first that consumers do not necessarily determine the range of choice available and secondly that it assumes completeness, that is that significant choices do not lie outside the market system or what is covered in demand. To the extent that important choices, values, wants, etc. are not catered for, or given a value, in the market framework it does not provide an adequate range of choice, reflect consumer preferences or group or collective preferences. Plainly there are very many important items and values which are not subject to demand in the conventional sense; and not only is there no guarantee that these will be given any weight under a system which regards demand, conventionally construed, as reflecting preference, but there is no guarantee that they will be given their proper weight in cases where conventional demand involves a conflict with these things.

(3) There are a number of well-known counter-examples from decision theory to the thesis, A3, that one can maximize total welfare or utility of a whole group by attempting to maximize the welfare, or utility, for individual members of the group (e.g. Hardin [1]). Indeed it is generally not possible to maximize each person's welfare simultaneously by maximizing individual welfare because, as individual welfare requirements conflict, maximizing some people's welfare will reduce other people's welfare: thus too there are severe practical difficulties in maximizing group welfare, however well-defined it is. But the most that can be assumed about non-constrained demand is that each consumer acts to the best of his ability to maximize his own welfare. Hence it is quite fallacious to assume that this provides a guarantee that total group or collective welfare will be maximized. So if the goal is the maximization of collective welfare the imposing of restraints on individual con-

sumer action is not excluded.

This objection, among others, tells equally against such evaluative versions of the consumer sovereignty principle as that formulated by Barkley and Seckler [1], p.54); 'Whatever contributes to the satisfaction of individual preferences is decreed good, and whatever detracts from that satisfaction is bad'; and indeed it also tells against their qualified reformulation of the principle (on p.58).

(4) A related objection applies to B2. The extent to which demand can be said to reflect 'group' or 'collective' preferences is completely unclear. It certainly does not reflect preference of the majority or even of any readily identifiable group. Since consumers do not have equal votes, because of income inequalities, consumers by no means have equal opportunity. The assumption seems at least to ignore inequality of consumer power due to inequality of income. It is rather difficult to see how a system in which one man with one million dollars at his disposal has more 'consumer votes' than 900,000 men each with only one dollar can be said in any real sense to reflect group preferences. Since there appears to be no identifiable group whose preferences group preferences can be said to represent, the group preference must be regarded as at best an abstract construct. But in that case the thesis that demand reflects group preference runs the risk of becoming trivial. If we ask: Which group are the preferences preferences of, and in what sense they are representative of the group? the only answer seems to be: The abstract group which determined the preferences. So group preferences are simply market preferences, the 'group preference' description is simply a vacuous description designed to give the market system of allocation a spurious air of democratic respectability.

(5) An objection both to A1 and B1 arises from the fact of conflict even within the one consumer's preference system, that is cases where some choices conflict with or exclude other choices. It is in general a mistake to assume, as standard preference theories do, that an individual's preferences are going to be consistent, and that what he wants is going to be consistent; and certainly we would never be able to make such an assumption in the absence of perfect information, which is hard to come by. The cases where undesired environmental costs are incurred by desired consumption present particularly striking cases of such a conflict. Thus a general model for choice and preference, of the sort generally employed in economics, which assumes that these are consistent, is inaccurate in a number of crucial respects; and whereas one may fruitfully employ a model which is inaccurate in minor respects it is scarcely satisfactory to employ one which is inaccurate in major respects. Given a conflict situation some choices interfere with others, so it may be necessary to restrict or constrain some choices in order to obtain a net increase in choice, and to obtain a reflection of real preferences, wants and so forth. If demand is taken to reflect preference or choice in any sense in which it can be acted upon then it must be net preference or net choice; but in fact it fails to reflect even these, as we have seen.

The 'problem' of value judgements

A standard objection is that determination of a demand curve is an empirical matter whereas the determination of reasonable requirements is an evaluative issues. However the relevant question as to whether one *should* aim to meet future demand, especially when it is unreasonable or in part producer-created, is an evaluative one. Thus deciding to allow for future demand, of whatever sort, in wood products does involve value judgement and of a less direct and defensible kind than those made in deciding to allow for reasonable requirements.[1] In short planning to meet future demand is not value-free, and insofar as

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1 Likewise evaluative is the forestry assumption that one should produce 'as much timber as a prosperous people might use if the supply were sufficient to keep forest products available at a reasonable price' (Reappraisal Report of the US Forest Service, quoted in Gregory [1]).

planning for the future is rational it will involve considering, what is evaluative, the desirability rankings of various alternative outcomes. What is generally *not* desirable is meeting future demand, whatever it may be, or meeting maximum future demand – the equally evaluative alternative – that is being canvassed by some proponents of 'positive' economics.

The standard objection is often blown up into the Positive Principle: make no value judgements. The objection and the Principle are likely to be reinforced by appeal to the market system of transactions, to the effect that how demand and supply, prices and quantities operate within the market framework is an empirical (descriptive, or positive) matter. But the market model is not, despite common presentations, just descriptive account of how things will happen, any more than Hobbes' state of nature is a description of the pre-social contract situation. The market picture describes how things will happen *if* one opts for a certain very special egoistic and competitive system of business enterprise, which satisfies a set of special, and in practical cases inapplicable, conditions. In particular economic analyses (e.g. neoclassical analyses) which lead to the market model neglect external effects, so-called externalities, make fairly unrealistic assumptions as to the independence of a range of producers and consumers, and build in optimisation judgements such as that producers aim to maximize their profits (irrespective of the external effects their operations may have) and that consumers spend their whole budget on consumption, on maximizing their consumption of some favoured mix of goods and services. But the assumed maximization of preferred throughput, of production and consumption, irrespective of environmental costs, is like forestry goals of maximizing wood product consumption, a major evaluative assumption. Likewise the question as to which items are assessed in an economic analysis and which are external reflects a set of value judgements. Similarly the general decision, characteristically justified by appeal to economic analyses, to allow such questions as the quantity of a commodity to be produced to be settled by the market system, is a major evaluative judgement. Indeed the judgements that the market system leads to the best results, that growth goals are the objective, that maximization of consumption and producers' profits and increase of per capita GNP are good in themselves, all these are value judgements of a debatable kind. An economic system which incorporates these judgements is only one system among others, and one which will have to be superseded (or substantially modified) if consumption of damaging goods is to be limited and economic growth made *much* more selective.[1]

Restricting market operations

It should be obvious from the preceding sections that the market does not deliver the goods in the sense of providing the best, or even desirable, results. It has been known for some considerable time (at least since Pigou [1]) that the market system of valuations often does not lead to the best results, and that the operation of the market system may produce quite undesirable outcomes. The quality of the environment and of life in various Middle Eastern regions, where the market system has obtained a fairly pure and unfettered mode of operation, shows what we can really expect from the system. Uncontrolled, it is a recipe for disaster – and not just environmentally, but wherever the heavy emphasis the market places on certainty, information and propinquity falters.

However, the numerous cases of market failure were until recently – not surprisingly given business interests – quickly dismissed; and only very recently have the numerous cases of market failure been documented in standard economic textbooks. Lipsey ([1], p.413 ff.), for example, gives a lengthy discussion of cases of market failure, headed 'the case for intervention'; but the way Lipsey presents these cases makes them look a very ill-assorted ragbag, when in fact they are not. The market, like other enterprise systems,

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1 These points are well explained, in much more detail, in Weaver [1] and Galbraith [1].

(allegedly) operates within the framework of a legal system; this fact removes some of Lipsey's cases of failure. Apart from these legal cases, every case of market failure is a case where the market method leads to results which are recognisably undesirable. Especially important among these cases are those discussed at length by Kapp [1] where welfare is affected, where the social costs of business enterprise are recognisably undesirable; but other conspicuous cases which fit into the same general classification are given not only by Lipsey but also by Hardin [1] (who considers cooperative activity in his 'Tragedy of the commons'), and by Pigou who perspicaciously remarks (in [1]):

> It is as idle to expect a well-planned town to result from the independent activities of isolated speculators as it would be to expect a satisfactory picture to result if each separate square inch were painted by an independent artist. No 'invisible hand' can be relied on to produce a good arrangement of the whole from a combination of separate treatment of the parts.

Such examples refute the common, if vague, view expressed by Parish ([1], p.541):

> Markets are not perfect instruments for registering group preferences, but probably run rings aroung most political voting systems.

Indeed were the market theory — to the effect that markets register group preferences better than alternatives or that the free market provides optimal allocation of resources — a scientific theory, then the theory would have been thoroughly falsified. Economic theories based on the market would rank (on Popper's account, [1], p.78 ff., of scientific theories, or suitable modifications thereof), along with astrology and magic, as pseudo-science; and familiar attempts to rescue these economic theories by typical conventionalist strategems confirm this impression. But the market theory is consistent, as welfare modellings of it prove, so it must hold under some conditions — how restrictive are these? The only sufficient conditions so far established, and the only conditions that are very promising, are very restrictive, and probably never obtain. Thus the market theory, insofar as correct, tends to vanish into a mathematical theorem of welfare theory which never actually applies.

However, it is very doubtful that the market theory works (or was always taken to work) as a scientific theory; rather it is, like the received account of firm operation in terms of profit maximization, a prescription as to how the economy ought, by and large, to be managed. It is, in short, as such terminology as 'better than alternatives', 'optimal' and 'runs rings around' indicates, a thoroughly evaluative theory. But as a recommendation as to how to allocate resources, and to escape the problems which otherwise arise as to how to decide priorities, it is not, especially from the point of view of the environment, a good recommendation, since it all too frequently leads to undesirable outcomes. Thus it is advisable, and now commonly recognised to be advisable, to adhere only to a severely restricted market mode of economic organisation.

Restrictions on the market method of allocation are important for many environmental matters, for the rational use of non-renewable resources such as fossil fuels, minerals and potash, and for long-term future planning of energy and forest supplies, because in long-term allocation decisions the market system leads to far from desirable outcomes.[1] The remedy in the case of planning for future wood requirements, so we

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1 Similarly the Pareto optimality criteria only has a chance of being a satisfactory criteria provided it is applied over (ultimately) all future time; but the standard applications of market principles make no attempt to be better than long-term according to business lights, that is up to 15 years at most. Plainly, however, such short stage Pareto optimality may lead, like the market system, to a damaging maximum exploitation of resources over the stage.

have argued, is to plan supplies in terms of predicted reasonable requirements. For short-term allocation of goods the market prescription also fails environmentally through the class of externalities induced; but for short-term allocation decisions the market method can be patched up by changing the pricing system, so that air and water and soil, space and forests for example, are no longer counted as virtually free or very cheap commodities; and more generally by a system of environmental pricing of the sort we have advocated.

GNP, range of choices, and alternative measures of economic growth

By 'economic growth' is normally meant growth of the economy (in question), growth that is assessed in terms of output of the economy. The conventional indicator of growth of output is increase of GNP (or some equivalent measure such as NNP). It is well-known that GNP may be increased by a host of undesirable activities, through social inequity and by environmental decay (see e.g. Barkley and Seckler [1], Chapters 2-4, Comm [5], Chapter 3). Realisation of the shortcomings of such growth indicators as GNP (at constant prices) as indicators of general desirability or net welfare has led to two different attempts to devise superior measures.

The first strategy is to try to replace GNP by a new indicator which does go some way to measuring, e.g., social welfare. So far attempts in this direction endeavour to *modify* GNP so as to take account of negative effects such as pollution, congestion and environmental degradation, thus providing a measure of what has been called 'net economic welfare'. An analogous measure, called 'net social welfare' (NW) is outlined in Barkley and Seckler ([1],p.36):

$$NW = NNP + (B - GC) - AL,$$

where GNP = the total selling price of all goods and services produced in the economy during a year; NNP = GNP minus the amount of capital used up in the year in the production of GNP; B = non-market benefits of economic growth; GC = growth costs. i.e. costs associated with economic growth such as congestion, pollution, information, control; and AL = amenity losses such as noise, smog, smoke, scenery and recreation. The equation well reveals that growth is not free, but may imply important costs and losses which have to be subtracted if anything approaching welfare is to be measured. Of course several of the new factors introduced remain so far fairly schematic; a large part of environmental economics consists in elucidating these factors and providing measures for them. As well it seems that the proposed welfare measure should be still further complicated; e.g. by a distribution factor which measures per capita NW and subtracts a factor whose weight increases as the inequitable distribution of per capita NW increases; and by taking account of the consumption of biological capital (cf. Commoner [1]), something that can be done by including biological capital used up in the production of GNP in the estimation of a revised NNP measure.

The alternative strategy is to try to devise a system of further measures to supplement, but not supplant, GNP as a measure of economic growth. How are the various indices to be combined in decision-making? Any recipe would take us back towards the first strategy; yet without some sort of recipe it is difficult to see how different factors can be weighed up. The reluctance to dispense with GNP is however easily explained: GNP can now be measured, more or less, for many countries, and it does give an estimate of *commercial* growth, an estimate thereof far superior to the estimate it provides of growth in economic welfare; and there are many who would (like to) see economic growth as just amounting to commercial growth. Insofar as economic growth is growth in output of the economy, the equation is alluring.

Naturally, growth in desirability is desirable; and so growth in net social welfare is generally desirable. But commercial growth is often undesirable, as we have seen; and accordingly economic growth inasmuch as it approximates, as growth in output, to commercial growth is to that extent also often undesirable. To solve this problem sophis-

tical semantics is the prevailing strategy; several recent attempts try to persuade us that economic growth is worth having – attempts which typically tend to slide over to the view that commercial growth is also generally desirable – by proceeding to redefine 'economic growth', so that economic growth reemerges as something worth having. A recent fashionable stunt to try to meet criticism of economic growth, or of its prime indicator growth in GNP, attempts to redefine economic growth in terms of growth or increase of choice. Thus 'economic growth can be redefined as increasing the range of choices open to people' (Neutze [1], p.41); 'the most useful concept of growth . . . is the process of expanding the options available to realise society's priorities' (Comm [7],[1] p.46); 'economic growth . . . fundamentally means greater capacity to do what we wish to do' (Parish [1], p.535).

Like most attempts to meet serious factual criticism by redefinition the stunt depends on an equivocation, and the attempt to adopt simultaneously two independent meanings for 'economic growth'. Equivocation here, as elsewhere, can be beaten by a dilemma. For if, in certain not uncommon cases, what normally counts as economic growth does not result in a net increase in choice but in the increase of trivial choices – more of the same or similar goods – at the expense of more fundamental ones, then the definition of 'economic growth' in terms of net increase of choice or options can only be sustained if one is prepared to count as 'economic growth' a range of things different from what is normally so counted (i.e. what is counted as commercial growth). Alternatively, if one is going to mean by 'economic growth' what it normally means, commercial growth etc., then the claim that economic growth always increases choice cannot be sustained.

The basic reason why the redefinition stunt fails is that it fails to take account of conflict (and scarcity), of the fact that some choices exclude others, and that several unimportant choices, like that between several different colours of icecream, may be obtained at the expense of fundamental choices such as being free to go where one pleases, free to obtain information as to government decision-making, and so on. But economic growth has tended to do just this, to expand fairly low level trivial choices at the expense of contracting much more important options, at least once a certain level of affluence has been attained.

It will of course be objected that the ranking notion on choices, e.g. *more important, or fundamental, than,* cannot be explicated except in the context of a particular value system. However, this is not so; the notion can be given a content that is independent of particular value judgments, which is not subjective. For example, we can say that one choice, a, is more fundamental than another b, when a entails b. However, this would only

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1 Comm [7] slips back, however, on p.41 to equating economic growth with growth of output, especially where it reasserts (what is false) that 'there is nothing inevitable about despoliation of the environment arising out of growth of output'. Compare Appendix 2.

According to the Treasury's favourite thesis (Comm [7], p.46, also pp.27-8), economic growth so defined, also 'the process of best achieving the welfare of society from the resources available', 'will normally result in a net growth of the *per capita* output of the economic system as conventionally conceived', i.e. (pp.27-8) of per capita GNP. This is just false. As we explain increase of per capita GNP is neither necessary nor sufficient for an expansion of options available to a person; and it is not even normally necessary (or sufficient), for the connection typically fails in significant environmental cases.

afford a comparison of choices that are (entailment-) connected, which is an insufficient ranking for many purposes. A better account says that choice a is more fundamental than choice b when a is a precondition for more further choices than b, i.e. when a has more choices leading off it than b. The structure so provided is only a partial ordering again, but such an ordering suffices. (The notion should however be situation-relativised because different worlds will give different results. Normally, but not in unusual situations, the choice of a marriage partner is more important than the choice of the wedding dress. For the former choice normally gives rise to a whole range of choices and opportunities, where the last choice is of ephemeral importance.) It might be argued that this method of obtaining numerical values for choice depth is unsatisfactory, because the number of choices which issue from any choice, whether superficial or deep, is always infinite. This objection certainly holds good for possible choices, which are infinite, in the same way that the worlds they select between are infinite in number. But the point does not hold for practical choices, that fragment of choices which are of practical concern. In this case the range of choices is finite, or can realistically be reduced to a finite set, so the criticism does not apply.

More generally the net increase of choice is obtained by subtracting the choices foregone from those taken given a depth ranking of choices. Given the fact of conflict, that choices collide locally, it is clear that what is important, and essential if one is to argue that increases in choices or options is a good thing, is net increase in properly weighted preferences. The mere fact that one choice or other is however added through industrial growth does not, in the absence of a guarantee that other choices are not diminished, provide any guarantee of adequacy or of increase in welfare. And commercial growth all too often expands some relative choices in consumer goods at the expense of removing more heavily weighted choices.

APPENDIX 2

The pressures of growth and development on the environment

Growth is a matter of the increase of a parameter within a given framework or system. Not every sort of growth implies environmental deterioration; some forms of growth, such as growth of knowledge or of education, tend to impede deterioration and would, under certain conditions, assist environmental integrity. But two forms of growth intimately linked to such conventional indicators of economic growth as GNP, namely, population growth and industrial growth (of goods, rather than services) almost inevitably have a progressively more and more damaging effect on the environment. These especially environmentally damaging forms of growth, industrial-technological growth and population growth, we bring together as *development,* since they form the main components of what is applauded as 'development' in its popular economic sense.

Growth in pollution, an important form of environmental deterioration, is the inevitable outcome of population growth and industrial-technological growth (even with pollution controls which keep industrial pollution to 'commercially acceptable' levels). The detailed and complicated interconnections of these parameters (pollution, population, industrialisation) in the world system can be modelled in the systems theory analyses pioneered by Forrester [1] and elaborated by Meadows et al [1]. But one doesn't need the powerful apparatus of systems analysis to confirm most of what Meadows and others assert concerning the bearing of development upon growth of pollution ([1], p.71):

> . . . Most [pollutants] are growing faster than population. Some pollutants are obviously directly related to population growth (or agricultural activity, which is related to population growth). Others are more closely related to the growth of industry and advances in technology. Most pollutants in the complicated world system are influenced in some way by *both* the population and industrialisation positive feedback loops.

Although the modelling of Meadows and others clearly reveals the crucial bearing of development on pollution, it cannot be directly extended by (illegitimately) stretching the 'pollution' parameter[1] to include all kinds of environmental deterioration (or even to include less central examples of pollution such as noise and litter). For example, in the modelling pollution affects life expectancy (through a lifetime multiplier from pollution), but it is perfectly possible that humans succeed in eliminating all the natural areas of the world without this having any bearing on human life expectancy; on the contrary, as natural areas have vanished human life expectancy has grown, and sometimes, as with the vanquishing of malaria, the variations are precisely linked.

However the pressures that continuing development will all too soon impose on remaining natural areas are readily seen by applying systems theory analyses. The preservation of natural areas intact, e.g. as parks, will reduce the numerical values of three important parameters — initial non-renewable resources, land area, and initial potentially

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1 In the style of some economists, who however use this initial stratagem of assimilating all environmental deterioration to pollution in order to avoid, by gradually slipping back to the narrower and familiar sense of 'pollution', assessing other important forms of environmental deterioration caused by development.

arable land — in the world model of Meadows et al ([1], pp.102-3), with the result that collapse of the world system will be induced under normal growth conditions even earlier than in *The Limits to Growth* ([1], p.124 ff). Thus, given that the modelling is reliable in this respect and that, as most of the evidence unfortunately indicates, development will continue, there are two uninviting alternatives: either some reasonable quantity of natural areas is preserved, in which case collapse occurs earlier than other otherwise, or else collapse is postponed temporarily by the elimination of remaining natural areas. Given the power of the human needs argument (to humans), the second alternative will almost certainly prevail, even if the respite so gained is shortlived. Hence *natural areas will vanish if development continues.*

The adequacy and reliability of such systems modellings has however been viciously attacked, especially by representatives of powerful and vested industrial interests. A not untypical example is the review in *The Economist* (March 11, 1972) entitled 'The limits to misconception', which asserts that 'the report represents the highwater mark of an old-fashioned nonsense' — 'pseudo-science as its worst' according to the (London) *Times* Higher Educational Supplement.[1] But while the systems modellings so far devised do have known limitations, some of them due to the serious lack of information of several fundamental matters, the modellings are neither nonsense nor worthless, but are superior to and take account of far more features (even if insufficiently many still) than previous merely intuitive assessments.

Beckermann has objected to this line of argument, namely that even if the 'model is far from perfect it is the best we have' ([1], p.1295), but bases his criticism on the mistaken assumption that the argument 'implies that failure to stop growth *now* will lead to catastrophic consequences in the long run' (our italics). But the argument does not imply this at all; and to 'act on its conclusions,' it would suffice to gradually slow down

1 Beckermann's critique [1] of *The Limits to Growth* provides a fairly representative sample of these tirades; it is largely an assemblage of fallacies. To illustrate: — Firstly, Beckermann criticises the assumptions made concerning the growth of *global* pollution by appealing to local surveys of Britain's air and water pollution (conveniently neglecting for example that some of Britain's air pollution has been exported elsewhere by the new high chimneys and some of the water pollutants simply pumped out into the ocean). Secondly, he tries to undermine Meadows and others' assumptions concerning resource reserves by confusing reserves with *proven* reserves. But of course world reserves are fixed and *finite* (even if we can so far only estimate what they are on the basis of proven reserves), whereas proven reserves may increase with exploration. But proven reserves are a subclass of reserves and are accordingly finite and bounded above. It is thus utter confusion (or obfuscation) to say as Beckermann does:

> what has happened is that supplies of materials have also increased at exponential rates of growth parallel to the increase in demand ([1], p.1294).

Supplies do *not* increase with demand or investigation (and it would take a strong, and false, form of the verification principle to equate supplies with proven supplies). Thirdly Beckermann, like most economists and unlike many scientists, falls for the optimistic assumption that it is technologically a straightforward matter to harness and control nuclear energy and to substitute for exhausted materials (including fossil fuels?), neglecting the principles of rational decision procedure under conditions of uncertainty. Fourthly, Beckermann's discussion of the 'error of the report' concerning the population problem provides a fine example of irrelevance (And the fact that population trends in different countries are not synchronised does nothing on its own to refute, as Beckermann seems to think, the population projections).

industrial and population growth (the most that can actually be achieved anyway in the latter case, short of a mass disaster). Admittedly in decision-making, such as whether to reduce industrial growth, one has to weigh the probabilities of alternative courses of action, but it is quite misleading to say as Beckermann does that 'it only makes sense to give up this output if probabilities of the report being correct about the longer run justify doing so'. For one thing this writes in Beckermann's underlying assumption that industrial growth *is* highly desirable (p.1315). The probabilities of the alternative outcomes, e.g. the report's being correct and the report's being wildy mistaken and the report's being mildly mistaken, have to be considered; even more important, the desirabilities or undesirabilities of the alternative outcomes have to be considered in Bayesian rational decision-making. Much of this Beckermann conveniently overlooks. The report's dire predictions are certainly undesirable and the probability of the predicted outcomes is not negligible (whereas the probability of Beckermann's wild tigers in Boston, p.1315, is negligible). So a wise strategy is to avoid the dire outcome; but it does not follow that the outcome is to be avoided by slamming the brakes on growth at once as Beckermann insinuates: it would suffice to begin the changeover to more selective industrial growth.

A connected line of defence against the predictions of such world modellings is the 'even if it happens elsewhere it won't happen here' line. Plainly, however, if global collapse occurs, the Australian economy will also collapse. What is intended, however, is that collapse will not occur because appropriate counter-action will be taken in advance when it is needed (a none too reassuring line given the current state of knowledge of dynamic macroeconomic behaviour, and that the only measures that can presently be politically effected are short-term improvisations), and that in the interval Australia should continue developing. It is true that there is so far no systems modelling for Australia, set within the world model, which is a pity, as such a modelling would no doubt quickly reveal serious limits on development in Australia, particularly because of limitations in soil and water resources.

But really there is no need to appeal to controversial theoretical features of systems behaviour to show the pressures of development on the environment, or to reveal the pressures on the Australian environment. Evidence of major environmental deterioration in Australia, deterioration caused primarily by development, is already coming in, rapidly. The largest

1 (Continued from page 266)

> Beckermann's views in fact reflect a barely disguised attempt to present as absolute a narrow value system which considers as serious only a limited set of right-wing problems, 'crime, violence, drugs . . .', and according to which environmental matters have little weight and are not important in choice and welfare.
>
> Of course, there will always be someone who can point to some oyster bed having been damaged recently or some reduction in the number of salmon in an isolated stream in Scotland, but oysters and salmon do not play a big part in the lives of the vast majority of the British people . . . ([1], p.1293).

Beckermann's line of argument tries to make out that such environmental damage and decrease in diversity only affects a small and selfish class of overt users. But this (all too familiar behaviouristic contraction of dispositionals into overt uses) ignores the way in which declining choice, and confinement of opportunities to a narrower range, affects, and creates costs for, very many more than just the overt users : it affects everyone. The effect of ignoring choice, opportunities for different experiences, is to obtain an unrealistically narrow assessment of to whom costs accrue, and to underestimate seriously option demand. Thus, in particular, pollution of oyster beds and streams (unrealistic examples seem however to have been deliberately exploited in the quote) which eliminates a range of minority activities, reduces options in Britain, and thereby impoverishes everyone. This reduction in options, of decline in economic welfare, is once again an inevitable outcome of insufficiently selective industrial growth, which has pollution as an inescapable component.

cities are congested and polluted, and the rape of countryside goes on at an unprecedented rate.

A population policy is especially important because pressure on the environment is just the pressure of each person on the environment multiplied by the number of people; and as numbers increase so does the pressure. For per capita pressure does not diminish decisively with larger numbers, here there is no significant economy of scale; on the average each new person eats as much and has at least the same sewerage, paper, housing, transport and recreation requirements, and in some matters such as transport, recreation and paper he has larger requirements than his predecessors. This pressure of numbers on the environment is especially conspicuous where either the environment is fragile, as in central Australia, or where population is growing rapidly, as on the South Coast of NSW where the effects of an almost 4% increase rate are readily observable.

One important pressure to hasten stabilization of population is a reduction of the rate of industrialisation (as Forrester has argued in [1], p.129). The interconnection is obvious in Australia where, because of further industrialisation, business organisations are applying pressure to have the immigration intake enlarged; industrialisation is indeed the main force which keeps the assisted immigration program going. A reduction in the rate of industrial expansion does not mean a rejection of technology. Industrialisation and technology are not inseparable and many of the advantages reached through technological innovation could, it seems, have been obtained without the massive industrialisation that accompanied them.[1] Moreover, as Forrester sets out to show, a reduction in industrialisation (leading to a stabilization of population) has only a slight effect on the material quality of life in the long run where this is measured in strictly commercial terms. In the wider sense of quality of life, which takes account of environmental values, such a reduction in industrialisation means an increased quality of life in the long run.

> If the present rapid rates of economic growth (as conventionally understood) are continued, a 'playboy' world of electronic gadgets and plastic habitat is virtually certain. The natural world will be reduced to a kind of curiosum to be visited occasionally, much as people now visit 'wildlife' in the zoo. . . . The deterioration of the natural environment is not a by-product of economic growth as many believe; rather it is in a fundamental sense a *direct product.* Economic growth is, in most instances, the conversion of the natural state of the world into a man-made state. Society is rapidly approaching the point (if indeed the point has not already been passed) where this free ride from the natural world is over (Barkley and Seckler [1], p.6).

It is certain that more development, with more people and more industrialisation, will further diminish the quality of the Australian environment, and thereby the quality of life of Australians. But it is almost certainly true also that the continent could support, in an inferior style, if not the massive inland populations that developmentalists used to envisage, at least a larger population than it presently has. But there are good reasons not to desire it. What Mill long ago wrote of Europe is apposite for modern Australia:

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1 Thus the industrial revolution is far less important than it has been made out to be, and in very many respects, has diminished welfare rather than improved it; and the main welfare advantages that did result would have followed from a technological revolution. Russell's criticism of the industrial revolution, that it 'caused unspeakable misery in both England and America', though it has a substantial historical basis, especially in popular writings and folk song, has drawn sharp criticism from economists (cf. Samuelson [1], p.756). Samuelson appears to think that the fact that real per capita income increased (hardly surprising in the switch from a peasant economy to an industrial one) is a sufficient rebuttal. But of course it isn't: real income frequently increases in deteriorating environmental and social conditions, conditions under which welfare, opportunities and happiness characteristically decline.

There is room in the world, no doubt, and even in old countries, for a great increase of population, supposing the arts of life to go on improving, and capital to increase. But even if innocuous, I confess I see very little reason for desiring it. The density of population necessary to enable mankind to obtain, in the greatest degree, all the advantages both of co-operation and of social intercourse, has, in all the most populous countries, been attained. A population may be too crowded, though all be amply supplied with food and raiment. It is not good for man to be kept perforce at all times in the presence of his species. A world from which solitude is extirpated is a very poor ideal. Solitude, in the sense of being alone, is essential to any depth of meditation or of character; and solitude in the presence of natural beauty and grandeur, is the cradle of thoughts and aspirations which are not only good for the individual, but which society could ill do without. ([1], p.750).

APPENDIX 3

The alternative of planting pines on cleared agricultural land

Many Australian conservation organisations, wrongly persuaded by forestry demands for immense softwood plantations, contend that the plantations should be sited on cleared agricultural land. Their suggestions, that pines be planted (but, in mixture with other trees) as a crop on suitable cleared agricultural land, and that farmers be encouraged to plant woodlots, have some merit, especially where carefully conducted private silviculture is made economically feasible by appropriate low cost long-term loans and tax concessions – though not by concessions for clearing land, the loans and concessions being conditional on due observation of environmentally responsible practices. The advantages of planting pines on cleared land over clearing forest for pines are plain from Table 9: the wildlife and flora costs of clearing forest are removed and recreation values are increased without incurring new relative costs except for sustainability and watershed costs (given comparable establishment costs for both types of plantation; e.g. supposing that the 1971 market price of cleared land matched site preparation – felling, heaping, ripping and burning – of forested land at $40 per acre: Brown and Hall [1], p.356). However the amount of agricultural land suitable for pine plantation is less than might initially appear, particularly in the tablelands areas of NSW, because of soil and rainfall requirements; and many of the coastal areas (those with a summer rainfall maximum) are not suitable for *P. radiata* but only for lower yielding pines such as *P. elliottii*. Furthermore as a result of the higher rainfall and better soils requirements, plantations would be competing not with sheep farming with which they do not compare especially well,[1] but with more profitable beef raising, with which they compare even less favourably.

In an effort to meet the conservationists, forestry services have proceeded to exaggerate the extent to which they are using and plan to use already cleared agricultural land. Such statements as that 'to no small degree farmland has been and is being used for the planting program' (NSW [1]) are quite misleading, insofar as they are intended to apply to NSW. Contrast the statement in NSW [1], made for public consumption, with the following statement, made at a foresters' school (Henry [6]):

> 'Investigations showed that the target of 1,000,000 acres could not be achieved without the acquisition of land additional to that already held as State Forest.

Footnote on p.270.

> In planning any acquisition, therefore, the Commission has endeavoured to avoid freehold land and concentrate largely on leasehold and vacant crown lands that are at present undeveloped for agriculture.

Only in South Australia, where there is little forest left to clear (yet some of *that* is being cleared), has planting been primarily on cleared land. In Victoria, where the Forests Commission has apparently agreed to plant a substantial proportion of its program, possibly as much as 50%, on cleared land, less than a third of recent planting has been on cleared land (Vic [1]), and the partial recovery of agriculture in the last year will make it difficult for the Commission to live up to its promises. More likely the Commission will return to its old theme: it 'has persistently maintained that very little farmland can be purchased because of the cost' (WVCC [1], p.5). In NSW purchased and resumed land makes up only a small proportion of that planted with pines; and an analysis of the NSWFC purchases and resumptions of land (as reported in their Annual Reports, NSW [3]), made on the basis of prices paid per acre, indicates that less than one quarter of the land so obtained was cleared. Remaining purchases were apparently of privately-owned land largely under native forest cover. It also seems that nearly all the private land

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1 For example, Hoy and Sinden [1] revealed that on the basis of 1968 costs and prices softwood plantation forestry is less profitable (on both land expectation values and benefit-cost assessments) than woolgrowing in the Walcha-Nowendoc region of NSW – despite the fact that the low discount rate selected, 5% unduly favoured forestry in the comparison.

The most detailed and useful economic comparison of forestry and agriculture in Australia, that of Treloar and Morison [1] for three regions in Western Australia, is now rather out of date. In any case, its results did not generally favour forestry, except in the case of the Chapman Forest, on the tip of south-western Australia, where improved management of hardwood species (primarily jarrah, in days before the phytophthora worry) and dedication as state forest was recommended. In no case was pine plantation clearly favoured. Moreover where forestry was favoured this depended upon the questionable procedure of including sawmilling as part of raw forestry (whereas butter factories were not counted as part of dairying). Since the study included areas now contemplated as part of an extensive pine plantation program, it is important that its data and evaluations be revised, improved, and expanded (before too much land in region of Chapman Forest and the Blackwood Valley is committed to pines).

In contrast to Treloar and Morison (and despite the assertion in Forwood [1], p.31), Gilmour and Reilly [1] made no comparison of forestry with alternative forms of land use in their study of degraded lands of the Atherton Tableland (because of insufficient data, p.263). Their results, showing land expectation values at 7% interest of $37 an acre at current log prices, and $–23 at reduced prices (20% below correct prices), and internal rates of return of 7.5% at current prices and 6.7% at the reduced prices for *Pinus caribaea* plantations, reveal that exotic pine plantations are a questionable proposition considered simply as one form of land use for the Tableland. For the financial assessments made take no account of risk, and no account of a range of environmental factors (though the worthwhile object of preventing further degradation of eroded landscapes helped motive the study), and are based on optimistic assumptions about per capita wood consumption levels in northern Queensland at 2000 and 2010. It has been suggested that the land expectation values compare well with the selling prices of agriculture land; but the selling prices of $25 an acre for the poorer areas, were those for 1970 when agricultural land values were substantially depressed and such low rural prices no longer generally obtain. As Gilmour and Reilly say (p.264),

> ...a more detailed feasibility study including all possible land uses should be carried out before investment of any magnitude is undertaken. In such a study values should also be given to intangible benefits and costs accruing from each alternative.

was acquired for the purpose of linking areas of plantation separated by privately-owned land (as at Tumut and Casino) or to ensure satisfactory plantation boundaries, and not with the intention of providing an alternative to planting on native forest land.

Nevertheless planting on cleared land does appear to provide an attractive method of overcoming, to some extent, the problem of how to provide for genuine future domestic requirements without further environmental deterioration – provided that such planting *replaces* the removal of natural forest areas for pines and reduces the area of native forest to be converted to pine, and does not merely add to it or release other areas for export projects. There are however several different ways in which the goal of planting an increased proportion of the requirements for softwoods on cleared land might be achieved. One of these is by having the states, presumably backed with Commonwealth finance, purchase suitable areas of agricultural land in areas sufficiently close to those major plantations it is decided to continue with. Unfortunately with the substantial rise in farm incomes and rural land prices in 1973 this solution, proposed during a period of agricultural recession, would appear to have become a very expensive undertaking, for the time being at least; and the opportunity presented during 1970-2 to add significant cleared areas to the public forest estate appears to have been lost. The responsibility for this state of affairs lies primarily with the Treasury; for it was not the provisions of the Softwood Forestry Agreements Act which precluded such purchases of cleared land, but the administration of the Act by Treasury:

> Under the Act there is available to the State each year an amount of financial assistance related to the target plantings for the year in question. . . . At the outset, *arrangements* were made with the States which were *aimed at discouraging excessive purchases of land in advance of immediate requirements.* In practice, it has been found that purchases of land have been within the limits under those arrangements. (Letter from R.V.Garland, Minister assisting the Treasurer April 27, 1972).

In other words, the Act (the loan funds of which provide an effective subsidy of $168 an acre; Hansard [1], pp. 1801-2) is so administered financially as to effectively prevent forest services from purchasing large blocks of cleared land at times of low land values for future use.

Since present high land prices would presumably make plantation establishment on repurchased cleared land decidedly unattractive commercially, a proposed Commonwealth financed purchase program would appear to represent a substantial increase in the level of public subsidy for production forestry. While this would return corresponding benefits to the community provided it reduced the extent to which native forests were exploited for wood production or replaced by pines, it should be clear that the call for and justification for Commonwealth finance of such purchases, made in order to reduce the area of native forest converted to pine, is not a call for or justification of Commonwealth financing for purchasing land for (and hence subsidizing) pine planting for a doubtfully desirable export program or level of unreasonable domestic demand for packaging etc. Otherwise the proposal would appear to be just a further form of unwarranted subsidy for rural industries; and although the basic motivation for such purchase programs is supposed to be a conservation one, it would not be a conservation measure at all unless there were a worthwhile reduction in forest clearing.

One alternative, or additional, measure which avoids some disadvantages of a large-scale Commonwealth financed purchase of land for forestry (e.g., such as the inflationary effect on rural land prices, and the diversion of scarce resources in the initial purchase prices) is that of encouraging owners of suitable private land to undertake forestry. This can be achieved through taxation concessions, by low interest loans, or by a guaranteed price scheme. These amount to subsidies or concessions to ensure a reasonable return to the grower. The necessity for such incentives is by no means entirely due to the disadvantages of the long-term nature of the investment but again demonstrates clearly the basically uncommercial nature of present production forestry and the fact that royalties, particularly for pulpwood, are insufficient to cover the cost of production. It is not easy however to see why the public should be expected to provide a general subsidy for private production forestry, particularly where it is export-oriented (*Pinus radiata* grown on private land is after all just another crop) – unless it does so for the purpose

of reducing the necessity to clear native forest for basic future domestic requirements, or to reduce the pressure on native forests and thereby to halt the decline in their amenity values, or for other community benefits, such as reclamation of degraded land.

There is a real danger then that such moves may turn into a large-scale (and still further) public assistance program for large packaging and paper pulp companies with extensive private plantations, which (unless they and their subsidiaries are somehow excluded) will benefit heavily from such subsidies and incentives for private plantations. It appears that the forest industries may be attempting to turn the conservation-inspired demand for incentives for private planting on cleared land to provide for future essential needs and reduce the environmental costs of eliminating native forests, into a program of further large-scale public subsidy for the often basically anti-conservation activity of producing pulp and pulpwood for the export, packaging, and advertising markets.

There is also a grave danger of such incentives, unless very carefully conceived, actually *adding* to the rate at which natural forest on private land is cleared, not for agricultural purposes, but for the plantation of exotics, e.g., for export; this danger is particularly apparent where (as in Tasmania) woodchip schemes are available to reduce the initial cost of clearing native forest and to encourage re-establishment with exotics. One measure which could counter this influence is the setting up of separate incentives for retaining natural forest cover on private land, with these incentives not to apply generally for monocultures or exotic plantations but only to areas with appreciable conservation value. Such incentives could be achieved for example through taxation concessions, or better, given a scheme of direct Commonwealth assistance to local government, through reduction in land rates for areas of private land retaining natural forest cover or other valuable natural areas.

A much more desirable but largely ignored solution for encouraging private forestry, farm woodlots, etc., which escapes many of the difficulties of the two earlier alternatives, would be provided by the increase in royalties we have already advocated on independent grounds. Realistic prices for the raw material, reflecting actual production costs, would ensure a reasonable rate of return to the producer, without the same need for substantial incentives and subsidies. The states are in a unique position to ensure a pricing policy which guarantees reasonable returns to the small private producer, since they not only (through the forest services) set royalties, but are also the major source of supply. Naturally this latter type of solution scarcely appeals vastly to the forest industries which are anxious to maintain and if possible increase the level of public subsidy for the production of their raw materials.

There are two basic problems for private production forestry for small producers who are not engaged in manufacturing; *firstly* the uncommercial returns to the producer due to competition both with resources from public forests sold below cost and also, to a declining extent, with virgin, "free-good", resources; and *secondly* the disadvantages of the extremely long-term and correspondly uncertain nature of the investment. The second set of problems can be combatted by fairly straightforward measures; first by the modification of measures penalising long-term investments such as the current probate requirements, and secondly by positive incentives for planting, e.g., by a system of state grants for private forestry allowing advance royalty payments, to yield continuing returns or help with establishment costs, or by allowing for the possibility of capitalisation on a woodlot at a guaranteed rate of return through the opportunity to sell to the state before the crop matures. Such measures – which would enable the government to take the risk, or act as insurer, for smaller growers while providing through capitalisation an advantageous cushion against fluctuations in rural incomes – could provide sufficient inducements. Moreover such measures, designed to overcome, for the smaller grower, some of the disadvantages of the long-term nature of forestry investment, can be combined with either of the methods of guaranteeing a satisfactory return from plantations, namely through subsidies or through, what we have argued is decidedly preferable, more realistic royalty rates. Were such measures adopted there would be good reason to hope that a higher proportion of Australia's future wood product requirements would be produced from formerly cleared agricultural land, thus, assuming the abandonment of large export ambitions, relieving wood-production pressures on public forested lands.

APPENDIX 4

Further details of the Eden woodchip project, including data underlying table 12, p.127

The NSW Forestry Commission sells wood products to Harris Daishowa under a special licence, in force from January 1, 1970 to December 31, 1989. A special licence, as explained in section 26 of the Forestry Act of NSW

> authorizes the holder . . . to take timber or products . . . on land within a State Forest or timber reserve, or on Crown land, whether such land is or is not under lease or licence from the Crown.

(Thus NSWFC is legally entitled to sell standing timber on areas of Crown land proposed for park dedication, such as lands in the Brogo river area adjacent to Crown lands described in the Harris Daishowa Licence, and, as already mentioned, there are precedents for such sales.) The Harris Daishowa Licence lists state forests and other Crown lands by defined zones for the purpose of royalty determination. However according to the Commission (Henry [2], p.4)

> It by no means follows that all the lands listed will be logged. In fact many of the areas listed may never be logged because of forest type, forest management requirements and the Company's input. Conversely it may be desirable at some stage to make sales beyond the specified area because of forest management requirements and the volumes thus obtained would be debited to the annual quota.

There are 4 zones specified in the Harris Daishowa Licence, the zoning being based primarily on distance (and accessibility) from the Twofold Bay chipmill site at Edrom near Eden. The state forests, timber reserves and Crown land forests of Zone A lie approximately within a 12 mile radius of Edrom, the Zone B forests lie next within a radius of about 15 miles direct from Edrom, the Zone C forests fall within an annulus of between 15 and 18 miles radius, and the Zone D forests lie beyond that extending to a radial distance of about 23 miles from Edrom, and as far north as Bermaguee SF north of Bermagui, and east to Glenbog SF and the Crown lands of Werriberri in the north and to Bondi SF in the south.

Forestry revenue

Forestry Commission revenues at Eden derive primarily, but not entirely, from royalties paid for green round or split eucalypt wood. Royalties paid are based on the tonnage of the green wood, weights being assessed at a weighbridge located at the point of entry to the chipping plant at Edrom. The royalties paid at Eden range from $1.50 to $2.25 depending on (i) the zone from which the wood is extracted, i.e. essentially on the haulage distance to the mill, (ii) the log volume per acre (with lower volumes a lower price is paid because more work is required in extraction), (iii) the gradient of the slope on which the wood extracted stands (because extraction costs are higher on steep slopes).

The detailed recipe for determining royalty rates applicable to Zone A is as follows (Henry [2], p.2-3):

> (i) *Areas of greater volume*
> The rate of two dollars twenty five cents ($2.25) per ton shall apply to areas of forest carrying the following volumes of pulpwood per acre:–
> (a) 15 tons or more on slopes of up to 18°
> (b) 25 tons or more on slopes between 18° and 24°
> (c) 40 tons or more on slopes of 24° and over 24°

(ii) *Areas of lesser volume*

The rate of one dollar fifty cents ($1.50) per ton shall apply to areas of forest carrying the following volumes of pulpwood per acre:—

(a) Less than 15 tons on slopes of up to 18°

(b) Less than 25 tons on slopes between 18° and 24°

(c) Less than 40 tons on slopes of 24° and over 24°

(iii) *Areas carrying mixed volume density*

An average rate of royalty shall be assessed by the Commission for such areas in accordance with the following formula:—

$$\frac{225X + 150Y}{X + Y} = Z$$

where X equals the estimated total weight in tons of pulpwood on all those portions of forest which meet the prescription of 'areas of greater volume';

where Y equals the estimated total weight in tons of pulpwood on all those portions of forest which meet the prescription 'areas of lesser volume'; and

where Z equals the average rate of royalty payable in cents per ton.

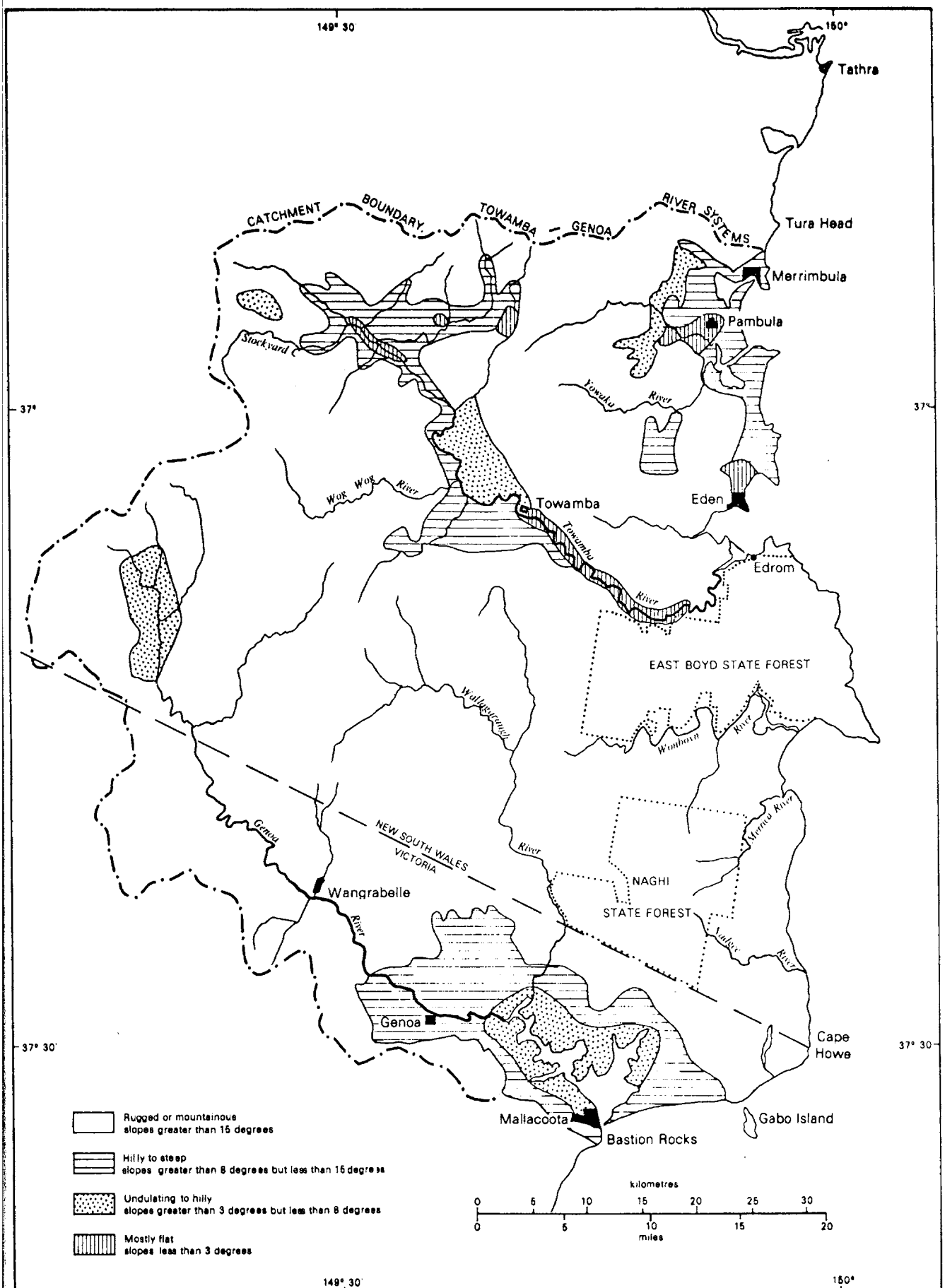
The maximum rate reduces in Zone B to $2.10 a ton, in Zone C to $1.90 a ton, and in Zone D to $1.65 a ton.

The quantity of pulpwood sold together with its royalty value since the Eden operation began is as follows:—

Year	Quantity	Royalty
1969/70	27,826 tons	$ 60,941
1970/71	79,996 tons	$ 170,666
1971/72	225,169 tons	$ 499,298
1972/73 (to 31/12/72)	147,101 tons	$ 320,860
Total	480,092 tons	$1,051,765

It follows that the average royalty paid has been $2.19 a ton. It is obvious that this high average figure cannot be sustained over the rotation since more than half the forest lies beyond Zone A and average royalties for Zones B, C and D cannot exceed $1.90 a ton.

Thus too average royalties over a rotation cannot exceed much more than $2 a ton. In fact there are good grounds for supposing that the average royalties paid at Eden over a full rotation will be less than $2 a ton, namely the extent of forest that lies in Zones C and D and offers average royalties of less than $1.90 a ton, and the amount of low-yielding forest that occurs on steeper slopes and accordingly only fetches the base royalty of $1.50 a ton. As map 4 reveals, most of the land in the Eden woodchip franchise ranks as rugged or mountainous, with slopes greater than 15°. But the steep upper slopes of the area, which typically exceed 18° in slope, characteristically carry lower-yielding dry or intermediate sclerophyll forest dominated by silvertop ash: the high-yielding wetter forest normally occurs on the less precipitous lower slopes and in valley bottoms. Upper slopes of more than 18° slope may occupy as much as 20% of the land area, and, going by the average yields recorded to date, many of these steeper slopes would yield less than 25 tons to the acre. Thus it seems that at least 10% of the area may rank as areas of lesser volume. If these areas are logged, average royalties are likely to fall to something more like $1.90 a ton. But whether the practice so far adopted, in order to maximize royalties, of largely shunning areas of lesser volume, can be sustained over the full rotation is not known. There are in short many uncertainties (some due to lack of quantitative information as to slopes, yields, etc., but others due to the indeterminacy of future forestry



Map 4. The Eden district: land slopes for the Towamba and Genoa River Valleys. Source: NSW [9]

practices) as to average royalty rates. Accordingly we have carried in our evaluation, what we take to be the maximum likely average figure, the most favourable figure NSWFC can expect, namely $2 a ton, along with a more realistic average royalty figure of $1.90 a ton.

Logging operations were, until late 1973, almost entirely confined to East Boyd SF and Naghi SF, both in Zone A, and areas of lesser volume in these forests have, as the average royalty figures indicate, been largely avoided. According to our information the average yield at Eden to date is 30 tons an acre (East Boyd SF 26-28 tons/acre; Naghi SF 37-40 tons/acre), and the range is from 8-60 tons an acre. However there are grounds for thinking that the average figure of 30 tons/acre, regularly cited by foresters, may be a little optimistic; for example, even if the acreage logged in 1971-2 was but 9,000 acres, the average yield would only amount to 25 tons/acre, and were the yield really 30 tons/acre only 16,000 acres would have been chipped from the time the project began in 1969-70 up to the beginning of 1973 (and in fact average yields of figures of less than 30 tons/acre have been cited by the Australian manager of Harris Daishowa).

Given the average yield at an average royalty of $1.90 a ton, it follows that an annual cut of 10,000 acres will earn a revenue of $570,000. Later it is apparently intended to step up the annual cut to 14,000 acres at Eden, a move that will marginally increase NSWFC's revenue/expenditure ratio.

During the first rotation royalties will also be paid to the Commission for sawlogs taken. But sawmilling activities are not really a part of woodchipping. Sawmilling has been going on for a long time in the Eden district as an independent activity, and it is only likely to be disrupted eventually by woodchipping. It is true that the new roads will open up new areas for sawlog removal, but, what will more than compensate, chipping operations will remove many trees that would before too long serve as logs.

In case it is mistakenly thought that sawlog royalties should be included in assessing the (direct) returns from the Eden woodchip project, we give some estimates of likely royalties, to show that these do *not* improve the financial picture substantially. On Tasmanian figures (Tas [1]) sawlog royalties can be expected to be $2-3 a ton, say $2.50 on the average, and a site yielding 30 tons an acre of chipwood can be expected to yield 4-12 tons of sawlogs. It is known that the level of sawlog extraction at Eden is low, perhaps 5 tons an acre (again figures are confidential and not known to the public). If so, the sawlog royalties amount to $125,000 – which hoists the revenue less initial expenditure to the still meagre return of about $21 an acre, but which does not clear the net loss when essential re-establishment costs are included.

The combined revenue of $695,000 from chipwood and sawlog royalties coincides with the NSW Commission's figure, according to which the revenue from Eden provides about 8% of the NSW Forestry Commission's revenue (Henry, SMH [1], January 3, 1973).

Forestry expenditure

Many of the figures cited in Table 12 were supplied by foresters at Eden both to us and to other visitors inspecting the project at other times in 1972-3, in particular figures for roading, regenerating heavily compacted areas, culling standing trees, and for number of administrative and supervisory staff fully engaged in the Eden project.

It is planned to make 1 mile of road for every 500 acres of forest;[1] and there is more than 1 mile of road for each 500 acres of forest so far cut over. These roads were at first

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1 In US forestry operations roading density is sometimes as much as 4 times higher, with 5 miles of road to each square mile. However there is some openness as to what counts as a road.

constructed to a standard of $4000/mile, which included making cuttings rather than following the contours of the land. As those standards were found to be 'excessive' — really the roads so made were found to be too expensive — standards have been reduced, so that roads, all of which are gravel surfaced, now follow contours and cost on the average $2,000 a mile. At least this is so where cheaper construction is feasible, as, of course, on more precipitous terrain it is not, since logging jinkers have to get through. But as usual we have given NSWFC the benefit of the doubt and used the lower figure.

It is worth noting that the roads constructed for the Eden project, as well as the new super-roads being constructed for many NSW logging operations, are generally environmentally inadequate, for example by US standards for low impact logging roads (as set out in USA [5]). Local roads fail to measure up to environmental standards for several reasons, most notably because of deep, vertical road cuts, uncontoured, unplanted and often churned up road verges, and poor bridging practices.

When expenditure figures are difficult to ascertain, as in the case of entries (2) and (3) of Table 12, conservative estimates of expenditure are deliberately adopted in order to meet in advance accusations of prejudice. Thus, for example, low average annual salaries have been assumed for the 50 or so persons employed on the Eden project, and a very low figure of $10,000 only has been allowed for office and other equipment, postage, administrative transport and so forth.

The most difficult estimates to obtain are those for fire and accident control. Actual fire protection costs quoted by Australian forest fire control organisations range from more than $2/acre a year for intensive protection of inflammable pine forests to about 3 cents/acre each year for a very low level of protection of native eucalypt forests; e.g. in South Australian fire protection costs for the State's pine plantations average about $2/acre. Even on 1964-65 figures NSWFC spent an average of 7 cents/acre on direct protection costs for forests protected; as well as 90 cents/acre on fire suppression for protected country burnt (see FTB [4] , Tables 12 and 13). However since 1964-65 fire protection costs in Victoria have risen from about 6 cents/acre to about 9 cents/acre; and given a comparable rise in NSW as indicated by the expenditure on fire protection listed in NSW [3] , fire protection costs would average about 10 cents/acre. It seems fair to assume that the better forests NSWFC is aiming to make for the future have a more than average level of fire protection, especially as the Commission has made much of the amount it is spending on fire protection and control at Eden, and as one of the major forestry complaints about the present 'inferior' forests is that they are fire ravaged or fire derelict. Our conjecture is that fire protection costs at Eden are at least 20 cents/acre. Fire costs do not stop with protection; every few years there will be heavy costs for suppression and for losses in areas burnt. Annual figures can be obtained in various ways, e.g. by averaging suppression costs over several years, or by estimating fire losses in terms of the cost of annual fire insurance. Unfortunately figures on which to base such calculations are lacking; as Comm [8] explains:

> The damage resulting from bushfires in Australia is difficult to estimate. Eucalypts, which comprise the main forest species are seldom killed by fire, and damage estimates frequently involve the complicated question of loss of increment and degradation of timber quality. It may be conservatively estimated that damage to forest values lie between $2 and $4 per acre burnt per year and that over the last ten years the average value of forest fire damage is of the order of $4 million a year.

If the $4 million loss is spread over Australia's real forest area then it amounts to slightly more than 4½ cents/acre annually. Suppression costs are still more difficult; figures as high as $15,000 a day are sometimes cited for the cost of fighting major fires, but no breakdown is ever given as to the extent of new expenditure. It seems however that at least once in 10 years a sum of at least $35,000 will be spent on fire fighting, in which case the annual cost is at least ½ cent/acre over a forest area of 700,000 acres. Combining

protection, damage and suppression costs gives a lower limit of 25 cents/acre over an Eden woodchip concession area of 700,000 acres. (We contract the area since not all of it may be protected). That the figures allowed are quite conservative is plain from McGrath's remark that a $2/acre annual cost for fire insurance, fireline maintenance and general caretaking is 'a fairly normal figure' (Brown and Hall [1], p.363). The resulting annual fire costs at Eden are then, on our estimate, at least $175,000. In addition a sum of $100 per employee is allowed for annual accident control and insurance, once again a very conservative figure considering the remarkably high accident rate of forestry workers. The resulting sum of $5,000, added to total fire costs, explains entry (3) of Table 12.

Details of expenditure under entries (4) and (5) was supplied by foresters at Eden, while that under (6) was furnished by NSWFC head office (see Powis [1]). It is fairly easy to see that thinning and weeding costs cannot be reduced to much less than $25/acre even by using prison labour on steeper slopes and by adapting machinery for the task on flatter sites: (consider, e.g., the time a man takes to remove one stem, the number of stems he has to remove, maybe 3,000 or more an acre, and the cost of his labour). The culling of 'unsuitable' trees under entry (5) consists primarily of felling those useless trees, left standing after logging, whose tops project over adjoining ridges and so constitute a fire hazard. Were it at all economically feasible the chief forester at Eden would like to see all 'useless' trees left standing after logging felled in this culling operation.

Technical paper no. 22

This paper (NSW [12]), entitled 'A financial analysis of the Eden hardwood project', contends that 'each dollar of investment will yield a return of nearly two dollars', and might therefore appear to refute our claims concerning the financial viability of the Eden woodchip project. We outline a number of reasons however why this is not so.

In fact, despite the misleading title, the paper does not provide an analysis of the woodchip project at all but rather concerns the operation of the whole south-eastern forestry district, including not only hardwood sawlogs used for domestic consumption, but also expected returns from 100,000 acres of pine currently being established in the vicinity of Bombala. No data is given (or available) which enables a separation of these activities which one wants to be able to evaluate separately, though the computer routine used is designed to handle subprojects as well (see the preliminary model description provided in NSW [13]). Hence the paper does not enable an assessment of the export woodchip project per se — a substantial defect since, as already pointed out, the case for subsidizing a domestic timber industry does not extend to subsidizing an exotic one; an export project, which lacks whatever welfare basis there is for domestic supplies, must meet more stringent economic criteria, and hence should be separately assessible.[1] Also since the environmental effects of each of these types of operation — pulp export extraction, selective sawlog extraction, and pine planting on the escarpment — are all quite different and all separable, and their economical and social costs and benefits and their justification and respective desirability, are likewise different, there is clearly a strong case for considering these projects separately,[2] or at least providing sufficient data to allow a separate evaluation of each portion. It is tempting to interpret the failure to do so to a desire to obfuscate, and to confuse the distinct issues of the justifiability and desirability of the different activities.

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1 One is after all not questioning the necessity for or desirability of some sawmilling in the area for domestic consumption. A similar point counts against attempts to improve the financial image of the Manjimup scheme a little by throwing in sawlog royalties. Once again one wants to be able to assess the desirability of the chipwood scheme without confusing it with sawlog extraction.

2 Similarly that the combination of a pine project with city real estate investment can (under current conditions) return 8-9%, the sort of combination exploited by some private forestry companies, does nothing to establish the economic viability of pine projects.

The data sketched, however, which is supposed to presage a benefit-cost ratio of about 1.8 : 1 shows nothing at all about the profitability or adequacy of return for the woodchip project per se, since it is quite consistent with the woodchip project making a yearly loss (of the sort we estimated), the combination of woodchipping and sawlogging breaking even on a yearly basis (a quite plausible assumption given the estimates above and appropriate postponement of thinning costs) and thus in effect cancelling out, and the result being obtained solely from the benefit-cost ratio furnished by the pine plantation section of the combined project. Alternatively the result is compatible with the combination of woodchipping and sawlogging making a small loss on the first rotation, and a small profit on the second rotation, and the benefit-cost ratio again reflecting largely the returns from the pine section — and so on for an infinite range of similar hypotheses. This supposition — that the favourable result predicted depends upon the returns of the pine scheme — is a quite plausible one in the light of the fact that a benefit-cost ratio of 1.8 : 1 would be a not unexpected one for a pine project employing woodchipping and sawlogging returns at the clearing stage to reduce establishment costs, and in fact benefit-cost ratios of this order have been obtained elsewhere for this sort of reduced-cost pine project.

A similar result could be achieved by a transfer of funds at other appropriate points from one project to another. Once again the result would show as little about the profitability of Eden woodchipping as a separate and distinct enterprise as the profits of a group of companies with fund transfer arrangements show about the profitability of the individual companies concerned. It is clear from NSW [12], p.17, that such fund transfers from one project to another have been exploited and that since thinning costs on regrowth woodchip areas have been postponed to year 15 (also p.17), the small yearly profits from the continued woodchip and sawlog operations could be transferred to reduce the establishment costs for the pine plantation. After 15 years, returns from thinnings from the pine plantation could in turn be used to help meet the deferred thinning costs for the regrowth woodchip areas. If this manoeuvre were used (a manoeuvre that the project evaluations would connive at) the resulting benefit-cost ratio would show only, what is already well known, that if establishment costs for pine plantations can be sufficiently reduced, more attractive returns can be achieved; again it would show little about the profitability of the woodchip project per se.

However such fund transfer manoeuvres, which can create one profitable enterprise from three marginally profitable components, succeed only by increasing uncertainty and risk. For a small loss or reduction in profitability which causes failure at one of the crucial transfer points can spread through all component projects and can cause losses and reduction in benefit-cost ratio far out of proportion to its actual size. Thus such a benefit-cost ratio can be far more sensitive to small variations at crucial points than is normal.

The way in which the amalgamation of the projects into one financial unit increases risk would be brought out rather more satisfactorily by alternative (but standard) forestry methods for evaluating the project, e.g. by the computation of a land-expectation value on an average per acre basis over the project acreage.[1] A failure at one point in the amalgamated projects (e.g. a major fire in the pine plantation, spread of phytophthora in the

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1 It is a serious defect of benefit-cost ratios, as sole indicator of financial worth of a forestry (or mining) project which assigns zero value to land, that ratios are not affected by ecological disasters resulting from the project provided that there is more land to move on to. In other words such financial assessment methods embody the anachronistic free good approach to forestry and natural systems (cf. pp.201-2). In contrast, land expectation value assessment, or *full* cost-benefit assessments, can take account of such important matters and of ecological systems, especially if ecological systems (not just land either) are assigned non-negligible values.

woodchip region, a switch by Japanese buyers to synthetic papers in preference to renewing woodchip contracts at higher chip prices) would then affect costs over the whole combination, because fund transfers would break down, and accordingly land expectation values would fall sharply; and the fall would be greater than that in separately evaluated projects should failure occur in one, thus revealing the way amalgamation can increase profitability at the cost of increasing risks.[1]

In view of the lack of data in NSW [12] on either the separate contribution of the woodchip project or the effect of project amalgamation on increasing risks that should have been evaluated in the assessment, it is scarcely necessary to consider the study further since it does nothing to establish the financial viability of the Eden woodchip project. However there remain a number of other defects in the study that are worth exposing.[2]

The assumption made in NSW [12] that both the general price level and the stumpage price level will rise over the next 100 years at 3% per annum is clearly a very arbitrary one, which involves a very high degree of uncertainty. Confidence in these assumptions is not increased by the way in which they were arrived at. For example, the assumption as to the general level of price increases was extrapolated from the long-term average rate of general price increase for all commodities over 1952-1972; however royalty rates, which are crucial to the evaluation, were estimated only on a 10 year base, 1961-1972, when they increased at an average rate of only 2%, not 3%. Nonetheless it has been assumed in the estimates that royalties will increase at 3% annually. If the 1952-1972 base used for the general price level had been used to assess royalty increase, a lower average figure than 2% would have been obtained. No adequate basis for raising the figure to 3% is given, and this sort of juggling with extrapolation bases (which are in any case too short for 100 year projections) leaves a good deal to be desired. Since prices tend to rise faster than raw material costs, it seems extremely unlikely that royalties, which enter as general costs in wood commodities, are going to increase at the general price level, as has been simply assumed.

The degree of *uncertainty* and *arbitrariness* involved in assuming that both costs and prices will rise uniformly at 3% annually over the next 100 years needs to be stressed. In order to cope with the uncertainty arising over such a long period it is necessary to consider a range of the more likely assumptions as to rates of price and royalty increases, and to show that the result is *sufficiently stable* over the range. This has not been attempted; so it is impossible to tell how far the results depend upon the special selection of parameters.

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1 As enterpreneurs such as A. Barton have made plain.

2 The basic methodology of the Eden project modelling is also open to criticism. The approach adopted is a representative or model acre one, but in this case the model acre has to represent a great many different acres, some with pines, some with eucalypts and some without vegetation, some with roads and some without, and so on. Thus the theoretical limitations are rather more severe than is made out on p.3. Moreover it would seem dangerous to establish a standard figure for expenditure and revenue per acre, which is going to vary according to the total size of the project (given apportionment of some costs), when the project size may itself vary. In a case where total costs are known or can be computed, it is difficult to see why the modelling could not examine the overall system, falling back on a set of different representative acres where need be. It would seem, in short, that systems analysis methods would be decidedly preferable.

Given that the analysis is based on a planning period of 100 years it is surprising that the study failed to consider in any detail the effect of uncertain future markets and the genuine possibility of future oversupply, or, connected with this, the real possibility of replacement of some woodchip products by synthetics, and a consequent fall in real chipwood prices (on the increasing substitution of plastics for wood pulp products, see Runeberg [1] [1], and on the long-term uncertainty of the woodchip export industry because of the cost of long distance chip haulage see FAO [8]).

The many risks and uncertainties of the project, of which NSW [12] takes no proper account, affect not just the prices assumed but also the costs of the project, especially the environmental costs. For example, the study makes no allowance for diminishing yields on the second rotation of pines (see p.4), yet the probability of declining yields on the relevant soils cannot be neglected. Despite the fact that intensive clearcutting methods operate under both management strategies considered in NSW [12], no account is taken of the attendant risks on soils, water systems, as to phytophthora spread, and so on.

More surprisingly, the fire risks, though well enough known, are not adequately costed, in spite of the frequent claim that foresters are improving run-down forests, among other things by vastly increased and more expensive fire protection. Though the study allows the credible amount of $180,000 for expenditure on fighting fires in severe fire seasons, estimated to occur on average every 13 years, it allows for annual direct outlays of only $4,000, i.e. of rather less than one cent an acre! Either there are substantial *indirect* outlays which should be included in the full assessment of the project, or the region, so far from receiving 'a level of fire control that had not been feasible until the woodchip projects started' (Forwood [3], p.29), is in fact going to get much cheaper fire protection than pretty much anywhere else in Australian commercial forests (see p.277-8 above). Even the 100,000 acres of pines near Bombala, protected on the cheap at 25 cents an acre, would cost $25,000 annually. A mere $4,000 is barely going to cover the servicing of machinery and spares on equipment, and would not extend to new plant or such expenses as (aerial) control burning. The matter of annual fire costs is especially important, because the only major discrepancy between the figures provided in our (earlier) analysis of the Eden woodchip project and those furnished in NSW [12] lies in the recurring fire protection costs. If NSW [12] can be shown to be severely underestimating costs on just this point, then our figures are confirmed, and our case is largely made.

NSW [12] also confirms what has been one of the more vexed issues in our costing, the matter of precommercial thinnings (p.17):

> With present harvesting technology, non-commercial thinning will be required to induce an adequate piece size after a forty year growing period....in the present analyses, thinning at age 15 at $30/acre was allowed for.[2]

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1 Runeberg also tries to counter the received, but ill-founded idea, that in relation to environmental conservation and pollution issues wood pulp products are far superior to plastics:-

> ...There is no reason to suppose that, in relation to the question of environmental conservation, the plastics industry and plastic products in the future will be in a worse position than the forest industry and forest products. (Runeberg [1], p.63.)

Runeberg's remarks lack, however, the documentation they deserve.

2 According to Squire [1], however,

> Economic analysis indicates that at a discount rate of 6% per annum the maximum allowable investment in thinning at age ten is $21 per acre. Heavy precommercial thinning costs more than this, so cheaper alternatives have to be sought.

But the cheaper alternatives, which treat only stems in the periphery of final crop trees, while they may work in the case of heavy thinning for sawlogs, are not applicable in the case of pulplogs. It is not obvious that the conflict between Squire's work and NSW [12] can be resolved in terms of the differences of the cases, thinning at year 10 instead of year 15, and thinning from an average of 3000 stems an acre to 50 an acre instead of from an average of 3000-4000 stems to 300 or so.

There remain, moreover, several important respects in which NSW [12] fails to provide sufficient data or assessment of alternatives, for an informed and honest opinion as to whether the amalgamated Eden project is worthwhile. In particular, benefit-cost ratios, in the absence of data on the extent of capital expenditure required, do not give sufficient information to enable a decision about whether the project is a worthwhile public investment (i.e. one which produces an optimum result) in comparison with alternative investment opportunities, because (as stressed on p.90b) it is necessary, in order to obtain an optimum, to consider not only the rate of return but also the level of funding required and the extent to which the investment draws on available funds and excludes other projects. Although technical paper no. 22 does not furnish this information, some of it can be computed from the table of NSW [12], which displays the anticipated financial returns from the Eden project, as the following table, adapted from table 1, reveals:-

Table 20: Financial Returns from the Eden Project according to technical paper no. 22.

Discounting interest rates (%)	Current	4	5	6	7	8
	Real average	0.97	1.94	2.91	3.88	4.85
Net Discounted Revenue ($ million)		46.2[45.6]	31[30.5]	22.3[21.8]	16.9[16.4]	13.5[13]
Benefit-cost Ratio		1.89[1.88]	1.9[1.87]	1.91[1.86]	1.91[1.85]	1.91[1.84]
Discounted Revenue ($ million)		98	65	47	36	28
Discounted Expenditure ($ million)		51	34	25	19	15

Notes: (i) The figures supplied are those for management strategy 1; some of those for strategy 2 are shown in square brackets. In strategy 1 there is progressive clearcutting on a face of old growth forest, while under the somewhat sounder strategy 2 there is a reduction of coupe size and distribution of the coupes clearcut as in planned pattern harvesting.

(ii) The basis for the computations of discounted revenue, discounted expenditure and real discount rates are shown in the attached note[1].

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1 Let $R_{\underline{p}} = \sum_{i=1}^{n'} R_i (1+p)^{-i}$ and $E_{\underline{p}} = \sum_{i=1}^{n} (1+p)^{-i}$, where $R_i[E_i]$ is the revenue [expenditure] in year i, n is the number of years in the planning period, i.e. 100 years, and p[$\underline{p}$] is the discounting rate in per cent [absolutely]. Thus $R_{\underline{p}}$ [$E_{\underline{p}}$] is the present discounted revenue [expenditure]. Net discounted revenue (NDR) = $R_{\underline{p}} - E_{\underline{p}}$, and benefit-cost ratio = $R_{\underline{p}}/E_{\underline{p}}$ (both these equations are incorrectly formulated in NSW [12], pp.20-1). Now by table 1 of [12], $\frac{R_{\underline{6}}}{E_{\underline{6}}} = 1.9 = \frac{R_{\underline{8}}}{E_{\underline{8}}}$ (approximately), $R_{\underline{6}} - E_{\underline{6}} = 22.3$, and $R_{\underline{8}} - E_{\underline{8}} = 13.5$, a set of solvable equations in $R_{\underline{6}}$, $E_{\underline{6}}$, $R_{\underline{8}}$, and $E_{\underline{8}}$. Similarly we can solve for remaining discounted revenues and expenditures with a good measure of accuracy, owing to the fortuitous fact that benefit-cost ratios are stable over variations in discount rates.

The real average discount rates are computed using a (modified Faustmann) formula

$$r = \frac{c - f}{(1+f)}$$ — where

r is the real rate, c the current rate and f the rate of inflation (in this case .03) — argued for in Parkes [3].

The claim (p.10), reflected in the table, that the project can be financed at 6% discount rate, to yield a net discounted revenue (over 100 years) of approximately $22 million, and at 8% to yield about $13 million, is suspect. Firstly the suggestion that all discounting is carried out at the rates discussed (4-8%) is suspect, since presumably the pine planting project at Bombala, for which *no* financial details are given, makes use of long-term Commonwealth loans at an average interest rate of 3% (and interest-free for the first 10 years).

Secondly, the real discount rate has to be so assessed as to allow for the background movement in prices. But the discounted interest rates apparently make no allowance for the background price (and cost) movement of 3% annually, which effectively deflates the discounting rates employed. When the adjusted rates are used the results obtained no longer look impressive, the best rate considered being not 8% but only 4.85%, and the median rate being not 6% but only 2.91%. To obtain a real rate of 8%, a current discounting interest rate of 11.24% (i.e. slightly more than 8% + 3%) should have been applied, for the reasons Parkes [3] gives. Whether satisfactory benefit-cost ratios would then have been obtained seems decidedly unlikely. Though NSW [12] supplies no details as to the returns obtainable at real interest rates of 7-12%, the figures for discounted revenue and expenditure permit extrapolation so as to give some impression of the effect of adopting these more realistic rates — for the project is not a socially or an environmentally beneficial one, yet as a public project manages to avoid company taxation.[1] The results of the continuous curve extrapolation displayed in the following graph, chart 5, show that at more realistic discount rates the integrated Eden project operates at a loss.

Even if the Eden project of NSW [12] should somehow be granted social discount rates, the benefit-cost ratios, then claimed, of 1.8 or 1.9 to 1, though they compare with ratios obtainable for conventional private agricultural enterprises, are not especially impressive when compared with those obtainable for public investments elsewhere, for less risk, and over a much shorter time span. For example, there is a range of public investments which should yield benefit-cost ratios of 4 to 1, or better, at *real* discount rates of 7% or more, and which would provide much more in the way of social benefits than the Eden projects. The following examples of benefit-cost ratios for Australian urban transport systems are drawn from BTE [1].

	Mean value of benefit-cost ratios (with costs at 1)		Project
Discount rate	7%	10%	
	4.0	2.6	Track additions in congested sections of urban railway
	4.8	3.7	Bus and car interchanges at selected points on efficient rail systems
	7.0	5.1	Separate busways
	4.9	3.6	A ferry service

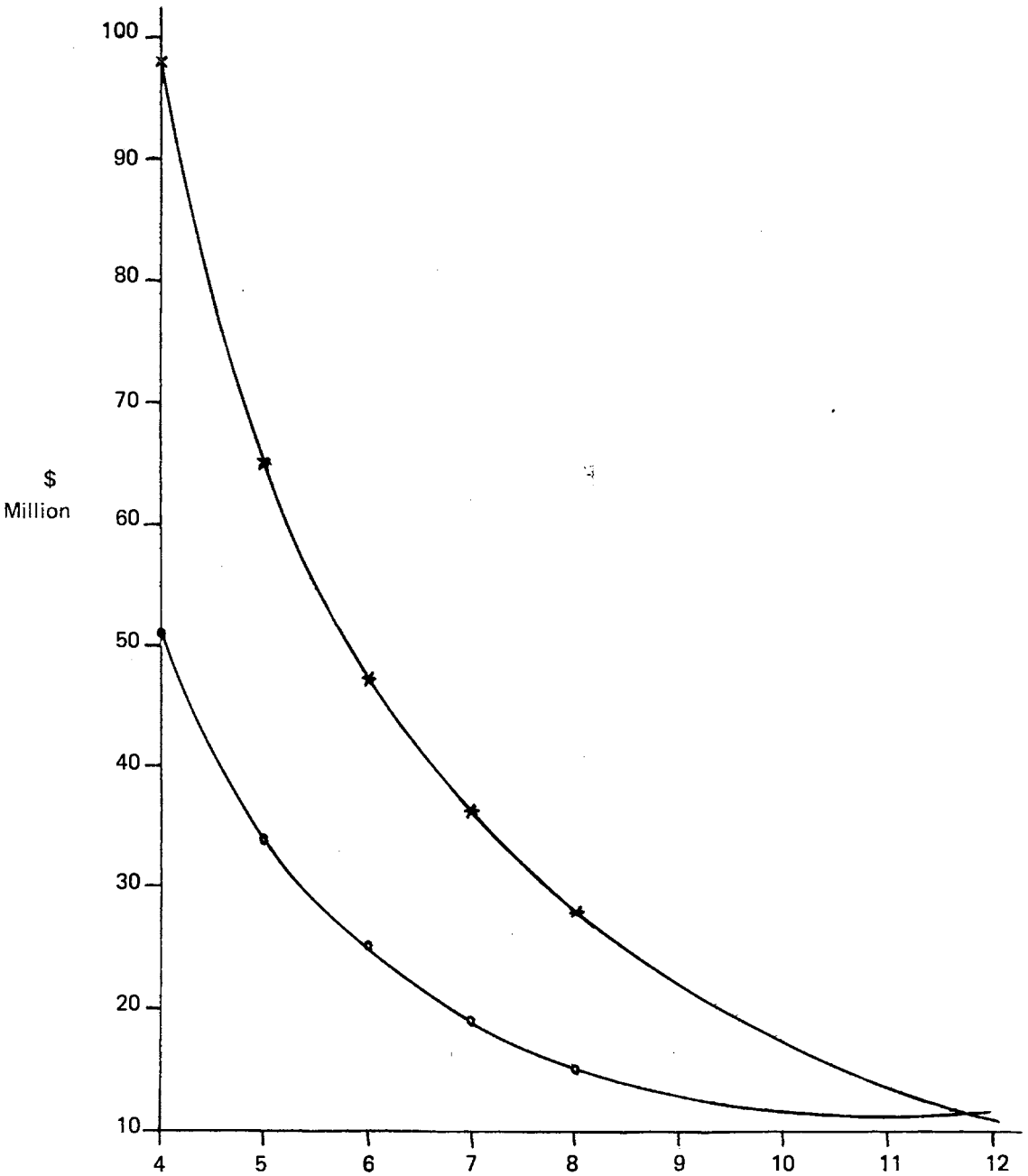
The expenditure incurred in establishing a Sydney — Melbourne expressway is, according to Fitzwarryne's study [1], of an order similar to that to be incurred in the amalgamated Eden project (though the expenditure and revenue flows are very different), but the expressway project provides a benefit-cost ratio of 4.7:1 when discounted at 8% real rates. It is rather evident that the amalgamated Eden project is not a particularly good public investment.

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1 Hence the case for charging discount rates of at least the order a private operation would have to bear has to be taken seriously: on the matter of these interest rates see, e.g. Forwood [1], p.28, Krutilla and Eckstein [1].

CHART 5

EXTRAPOLATION OF DISCOUNTED REVENUES AND EXPENDITURE FOR NSW [12]'s 'EDEN PROJECT', TO TAKE ACCOUNT OF A 3% INFLATION RATE



Since a benefit-cost ratio provides, according to NSW [12], p.21, a measure of investment efficiency, and the benefit-cost ratios of the Eden project rise at increased discount rates (on management strategy 1; on strategy 2 they only decline marginally), there would appear to be a good case for charging the NSW Forestry Commission maximum rates (at least 8%) for any money lent for the Eden project, including pine planting near Bombala to encourage project assessment using high discount rates, since in this way efficiency can be improved along with better interest returns on public investment. In short, NSW [12] would, if correct, show the inadvisability of continuing low interest loans to pine planting projects that can be combined with woodchipping schemes (e.g. all projects in Tasmania, and most proposed projects accessible to the coast).

A financial analysis such as NSW [12] does not pretend to take account of environmental factors: it is based on narrow accounting methods which should be an anachronism, at least in the case of the evaluation of forestry projects. The penalty for its narrowness is that it does not provide an adequate basis for decision-making: that is to say, even if good benefit-cost ratios where obtained at worthwhile discount rates, this fact would not provide an adequate basis for deciding to proceed with the project; for the significant neglected factors would remain to be reckoned with. Many of the important environmental factors, neglected in NSW [12], are included under that carryall term, 'land', in the standard economic division into land, capital and labour; and 'land' which includes forests and their ecosystems and communities is assessed at zero value in NSW [12]. However, given a net discounted revenue of $22 million over 100 years, then, for a project of 600,000 acres, the annual value of the 'land' works out at 37 cents, scarcely enough to pay land rates in the area, and but a mean assessment of the forests impoverished by the project.

Even if a significant range of environmental factors, which should have been included, and would have a bearing on project costs are ignored, still the financial assessment of NSW [12] considers an inadequate range of parameters from the point of view of a public evaluation of the amalgamated project; in particular, the costs to other industries such as fishing and tourism are not considered.

It is because a range of costs of the Eden project, environmental costs, social costs, and benefits and costs to surrounding areas and other industries, are excluded that the analysis of NSW [12] is at best a financial analysis in the narrow accounting sense, not a proper economic analysis. The sole objective is the maximization of the returns to the NSW Forestry Commission and the other values and the welfare of the community are ignored. This is the very negation of what should be happening in the case of projects based on public forests.

The planned expansion of Harris-Daishowa's operation

Harris-Daishowa's special licence authorises the licensee to obtain a maximum volume of up to 500,000 tons annual volume of green round or split timber', and 'if it proves feasible the company is required to construct a pulpmill in the general area, having a capacity to produce 500 tons of pulp per day by 1977' (Henry [2], in March 1973). Exactly two months later (May 1973) Harris-Daishowa was announcing to its employees (Harris-Daishowa [1]) that official approval had been given to expansion of the company's Eden operations to export 900,000 tons of chips annually, the total consisting of 750,000 tons of chips to be processed at Eden chip plants together with 150,000 tons of sawmill waste chips (largely from Victoria). A new chip plant is supposed to be erected during 1974, with full production to begin in January 1975. Then 'bush contractors will need to increase pulpwood requirements to about 3,700 tons per day and road transport requirements will provide work for upwards of 70 trucks'. Official approval had indeed been granted, probably in April, both for expanded chip exports and for a pulp mill, though no environmental impact study had been undertaken. In reply to the question

> What is the nature of the export licence permits that have been granted to each company which are still in force and what conditions attach to such permits?

it was said

Harris-Daishowa has approval to export up to 750,000 tonnes [about 738,000 tons] green woodchips annually until 31 December 1976, conditional upon the installation of a pulpmill on or before 1 January 1977, of a minimum capacity of 510 tonnes [500 tons] of woodpulp per day and provided that the company keeps the Government fully informed of its plans relating to the pulpmill. (Hansard [2], p.691.)

Export licences can only be granted by the Commonwealth. The franchise arrangement, however, has been granted by the NSW Government on its own, and not in combination with the Victorian Government, i.e. the increase to 750,000 tonnes is independent of Victorian supplies.

> The NSW Forestry Commission has issued Harris-Daishowa with a Special Licence ... to obtain a *minimum* annual volume of 457,000 tonnes [about 450,000 tons] of green round or split timber per annum (Hansard [2], p.691, our italics).

Nor does Harris-Daishowa intend to limit its expansion to 900,000 tons annually.

> Harris-Daishowa currently has a submission before the Australian Government to increase its existing export permits. ...[The] submission was received in early April 1973 (Hansard [2], p.692).

APPENDIX 5

The 'objective' assessment of non wood-production values

How are the non-commodity values (e.g. the non-wood-production, non-forage and non-water-supply values) of forests to be objectively assessed? The question is commonly taken to be part of a more general question as to how market or exchange values are to be assigned to 'intangibles'. In the forestry case, for which we shall mostly take the Forwood papers (Forwood [1] and [3]) as a working example, the methods that have been proposed follow those that have been considered in the more general economic case, in particular the reduction of non-commodity values to uses, e.g. visitor uses of a forest, or the assessment of such values through various willingness-to-pay criteria.

The model for non-commodity values of forests that underlies the Forwood papers, and which is applied in reaching the basic assumption, is however naive: it is supposed (i) that non-market values of forests reduce to psychic benefits of users, and (ii) that these psychic benefits can be cashed behaviouristically, e.g. through the willing of these consumers to pay for their use.

> In the case of recreational use of a public resource there are two potential sources of benefits. Firstly there are financial revenues derived from admission charges, which are easily ascertained. Secondly, and more importantly, there are so-called psychic benefits derived by those people who use the resource for recreation. This latter can be measured in terms of the consumers' willingness to pay, but this is far more difficult to ascertain. (Forwood [3], p.22.)

Similarly the value of retention of an area as wilderness is reduced to the psychic benefits of wilderness use, but

> no one has succeeded in measuring the psychic benefits of wilderness use as yet. (p.23.)

This is evidently a 'gap in our knowledge' that will have to be eliminated before 'sound objectively based decisions on forest land use' can be reached (Forwood [1], p.34). The simplistic Forwood assumption is that such gaps can be eliminated and reliable measures

provided through recreational surveys (e.g. Forwood [3], p.37, Forwood [1], p.40) —in short that the 'spiritual and social' values, the psychic benefits, of forests can be adequately assessed in terms of overt users of forests, in fact essentially through tourists uses.

The antiquated psychologism of Forwood's first reductive assumption (i) scarcely calls nowadays for detailed criticism, nor does the proposed behaviouristic explication (ii) of internal psychic or spiritual phenomenon. Most simply, in order to have a value an item does not have to answer to a narrowly conceived set of interests, psychic or otherwise, of users, which is one of the assumptions behind the 'psychic benefits' model.

The proposed reductions of values to uses

What does call for assessment, however, is the basic assumption that the value of a natural area can be assessed in terms of its volume of overt use, which is independent of the Forwood model. A familiar strategy is used in reaching and justifying the basic assumption, which is then claimed to be somehow 'objective'. The first step is to identify the value of something with its use (or utility), as in Forwood [1] and [3]. This step often appears harmless enough because there are extremely broad concepts of use which appear to be such as to make the equation, value = use, analytic (or a little more accurately, as we suggested in chapter 16, an isomorphism) — so that for example if (preservation of) an item is judged valuable, it is therefore said that it (its preservation) has a use (namely the use of preserving a valuable item). What it is crucial to notice however is that this equation (or isomorphism), insofar as it is a purely analytic or semantically-dictated connection, depends absolutely on this extremely broad (and not so commonly encountered) sense of 'use', and fails entirely when the concept is narrowed[1] to mean commercial use or some sort of overt physical use by humans to extract goods or services. When the concept is narrowed in this way the connection no longer becomes the simple semantical transformation that it was with the very broad use of 'use', but becomes at best an extremely debatable and highly rejectable value assumption, namely that only that from which some sort of (semi-marketable) goods and services can be, or are (depending on the interpretation), extracted (for humans) has any value, (an assumption written in, e.g., to the schematic cost-benefit model of Forwood [3], p.23), and that anything which fails this criterion has zero value, i.e. is valueless.[2]

The strategy of the argument then is the classic one of first assuming the equation of 'value' with 'use' for a very broad sense of 'use' and then progressively, and without notice or warrant, narrowing the sense in such a way as to make the equation a very suspect hidden evaluation. It is a serious defect of accounts of the value of natural areas or other items, given in terms of such words as 'use', 'resource', etc., that the terms lend themselves so readily to this sort of slipperiness, and the ease with which the moves are made provides an excellent reason for avoiding the terms 'use' and 'resource' in such a connection in favour of an account in terms of *value* and *role*, e.g. a 'range of values' instead of a 'set of uses', 'land roles' instead of 'land uses'.

Having persuaded us to accept them, often without bringing the assumptions out, the equation of value with use or one of its variants, e.g. 'answering to interests', the strategy is progressively to restrict the term 'use' (or the cognate term employed, e.g. 'utility' or 'interests' or 'welfare') — first of all by identifying use of an area with potential usefulness for physical extraction of some set of goods and services, secondly,

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1 Similar elasticity appears in such notions as *utility, benefit* and *welfare.*

2 The equation of *zero value* and *valueless* is an assumption which holds for the contexts concerned, but not generally.

and more narrowly still, by identifying the use of an area and thereby the value with the actual use it receives over a given time for an even more narrowly construed set of uses, usually taken as involving some sort of physical presence of people counted as users in the areas in question in the case of non-wood production values. It is precisely this sort of extraordinarily narrow account, which makes no concessions even to potential uses or off-site users, that the Forwood papers generally adopt. Thus in the questionnaire sent out to forest managers to ascertain recreational values – the only non-commodity value that Forwood recognises – the questionnaire exhorts them, in the notes on question 4, to take account only of actual use by visitors;

> We would ask that you base your assessment on *present use.* You may control the most fantastic scenery in Australia, but if no one can visit it, its present recreational rating is 0. (Forwood [3], p.65.)

Thus the class of *users* or beneficiaries of non-wood features of the forests is very seriously underestimated. Such criteria apply standards for valuing which are far more stringent than those adopted in the case of marketable products of the forest, most notably the wood; for demand curves involve consideration not merely of actual users but of potential users. The user of wood is not required, in order to count as a user, to actually visit the site, though the user of non-commodity aspects is; and no one suggests that trees that are not actually cut and in use or at the market at a given time do not have a wood value. (Compare: 'you may have the best wood in Australia but if it is not actually at the mill it has no value'.)

Values through visitors, and recreational forestry

The equation of the value[1] of a natural area with *narrowly-construed* use should of course be rejected. The identification of the non-commodity value of a natural area with the actual use it receives for *visiting,* picnics and so forth, which is the way actual non-wood non-water use is commonly construed and is generally construed in Forwood – through the dual theses that all non-commodity values can be reduced to human uses or even recreational use, and that these uses reduce to visiting use – is not an objective assumption, but a disguised and highly objectionable value assumption. The evaluative element enters in at least through the assumption that the value is the value for visiting and that all other value determinants can be put aside, or given zero value, and in the consideration to count among the uses, the possible ways in which an area may be used, only overt on-site use by visitors. It is rather evident that it is unnecessary to make such an assumption, and possible also to count a natural area as having a value and broadly construed use for a wide range of other ends, e.g. for maintaining provision of choice and opportunity, for maintaining points of contact with pre-European nature, and just for maintaining what many people would regard as highly valuable without actually visiting it (or needing to), namely the original systems and richness of the area. All

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1 There are those would reduce all non-market values of natural areas essentially to recreational value, e.g. Forwood [3], Coomber and Biswas [1], and those who rightly would not.

Coomber and Biswas [1]'s argument for doing so rests on a false dichotomy, that if one does not accept the (crude and unsatisfactory) market-based procedures they outline and the reduction of the value of area to its value for visiting, one is engaging in obscurantism and in effect must be assigning natural areas an *infinite* value. For of course one may have, or devise, other ways of assigning values or a band of finite values, and assign a finite value without reducing the value to value for visiting.

these features, since they are completely left out of account in the use-for-visiting criterion and its improvements such as willingness-to-pay-to-visit or compensation-for-foregoing-visiting criteria, and accordingly in the proposed evaluation methods of counting visitors' heads or costs or compensation, are in effect allotted zero value -- which is to make an evaluation: namely, that these features do not need to be taken into account. It is thus apparent that a major evaluation is smuggled in though the number of parameters taken into account in assessing the uses which (are supposed to) determine the value, or alternatively through the narrowing of the class of value-determining uses to visiting (or its elaborations), and that the claim to objectivity of such criteria is spurious. The criteria should be rejected because, as we indicated earlier, they do not reflect quite common judgements about what items are valuable both in the case of natural objects and in areas other than environmental ones, e.g. where libraries or works of art are concerned. This is particularly clear when the use-for-visiting criterion is conjoined with its usual development, namely that the degree of valuableness can be measured by the volume of use for visiting.[1]

Where the reduction of social and environmental values to recreational values, and the assessment of these through numbers of users, can lead emerges in the plans now proposed for recreational forestry:-

> There are two main components of environmental forestry -- the development of recreational facilities and the management of landscape. In the first field, I suggest that it is high time for foresters to take the initiative in providing for the mass enjoyment of forest areas. (Richardson [1], p.58).

Richardson goes on to outline what happens to forests when the numbers game is really pursued, under mass entertainment forestry. The model is Denmark,

> the country in Europe from which we can best learn the fundamentals of recreation forestry . . . In the 2000 hectare Jaegersborg forest on the outskirts of Copenhagen, for example, the State Forest Service maintains a deer park containing 2500 animals, two hotels, six camp sites (utilized to the extent of 300,000 person-nights in 1968), several restaurants, a golf course, a race-course, an old peoples' home, and a 10 hectare amusement park modelled on the lines of the famous Tivoli gardens (and capable of absorbing 60,000 visitors at a time). Apart from the roller-coaster which is owned by the Forest Service, the facilities are operated by concessionaires, who pay a percentage of their turnover ranging from 2 per cent for tobacco sales to 35 per cent for gambling halls. The park contains all the delights of an old-time fairground, as well as theatres, casinos, and, even, strip-tease shows. (Richardson [1], pp.158-9.)

1

Just such an assumption is made in Forwood.

> One strong recommendation from the Panel would be that urgent steps should be taken to carry out a national survey *to determine current levels of use* of forested areas of various types for outdoor recreation, to provide a basic picture of the *relative importance* which the community attaches to various forms of outdoor recreation . . . (Forwood [3], p.18; our italics).

Such surveys will provide measures in terms of numbers (see Forwood [3], p.37). The same assumption, that importance or degree of value can be assessed through surveys of numbers and types of forest users, appears in Forwood [1], e.g. p.40.

Similar assumptions underlie such assessments of the non-commodity values of UK forests as UK [1] and Duffield and Owen [1]. The further amenity benefits that Duffield and Owen (as contrasted with UK [1]) wish to distinguish from recreational benefits are still to be assessed in terms of regional visits and axle counts in the vicinity of forests.

Fortunately this is not a real possibility for more than a small part of the forest area. Such recreational forestry (though inviting for forest services with sagging finances and empires) has little more to do with conservation of natural values than the operation of Disneyland has. As regards environmental values and also many social values, the proposal to switch from resource to resort management of forests offers little prospect of improved environmental management and presents what is an obvious false dichotomy – the wood factory versus Disneyland.

It is enough to remark on the unacceptable consequences of applying such volume of visitors criteria elsewhere, e.g. that overcrowded facilities are less valuable than crowded ones, that facilities of only minority group appeal (e.g. the university library), receiving only a comparatively low volume of use, are of little comparative value and could be better replaced, or eliminated with but little loss, e.g. eliminating a rare book section of a library and replacing it by a bar, replacing a quiet uncrowded area by a resort area (as envisaged in the mass entertainment forestry of Richardson [1]). The numbers-game criterion makes it impossible to say, what many of us would want to urge, that an area may have had its values destroyed by heavy use, or that the value of some areas or things lies precisely in the low level of human interference or the low volume of physical use they receive, i.e. in terms of *fewness* of numbers of physical users, and in the opportunity the area or things thereby provide for other ends, e.g. for being alone, out of contact with other people, or in contact with natural things, with items whose value resides in the fact that they are independent and not created by or just for human use, and not controlled or fashioned just for a fairly narrow set of interests.

The deficiencies of attempting to assess value in terms of or as a function of numbers of visitors using an area are easy to see on even a welfare picture of value, according to which value is given in terms of contribution to welfare, or 'welfare-use'. The welfare picture shows at once why crude criteria such as visitor-use are neither necessary nor sufficient for value. On the one hand welfare may be enhanced for a number of people who do not visit the area by its being maintained. On the other hand many of those who visit may not have their welfare enhanced, e.g. because the values the visitor seeks have been destroyed, for instance by too many visitors. To elaborate the first point, benefits provided, or increase in welfare, may accrue to a much wider class than those who visit the area, e.g. maintaining choice and opportunity to visit areas of an interesting type, choice and opportunity to escape from other people, for solitude. It may be important to people, both to individuals and to social groups or whole communities, that these choices are available even if the options are not often, or ever, exercised.[1] The contemplative opportunities afforded by a natural area provide yet other ways in which welfare may accrue through non-visitor effects. The choice and opportunity aspects then provide one very important way in which the volume of visitors criterion for value and its elaborations give a completely false picture. The maintaining of choices and opportunities for minorities is not necessarily selfish (without much distortion of the notion of selfishness[2]), particularly for significant choices.

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1 A good example, which demonstrates clearly that one cannot assume that because a choice is not often exercised it is of no importance and can well be eliminated (leaving only those choices with a large number opting for them), is provided by various political activities such as voting, e.g. one cannot conclude that because not many people vote for a communist party or some other minority party when given the option, that the option to do so can be eliminated without loss. Similarly for the right of minority parties or individuals to stand for political office.

2 The selfishness accusation, introduced in Forwood [1], p.36, usually seems to operate from a straight numbers assumption. For a sound critique of low redefinitions of

The total inadequacy of narrower use criteria emerges in the treatment it forces one to accord to wildlife values, resulting in the evidentally ridiculous conclusion that wild animals have a value just when they are seen by visitors (or visitors are willing to pay to see or shoot them) and not otherwise, that animals found in zoos are more valuable 'wildlife' than the irregular and unreliable native performers in the natural habitat, and that wildlife values would be much improved by taming wild animals to appear on demand and by the introduction of carefully contrived clockwork (or these days electronic) specimens whose performance would take in the mass of visitors. A contrary view would hold that much of the value of wildlife (and of natural vegetation and of scenery) lies precisely in the fact that it is *wild*, that it is apparently unreliable, etc., and that it has other related important properties which are a feature of its being independent of humans and not answering solely to their interests.

To sum up, the non-commercial values of natural areas can not be captured or assessed just in terms of their volume of human visitors, or the proposed elaborations of such criteria: on the welfare picture, people can derive benefits, possibly of a very significant kind, from areas and items which they do not overtly use in any physical or other obvious way, e.g. by visiting (or even potentially visiting). People may benefit (and therefore, 'use' in a wide but somewhat unnatural sense) who do not visit. In the limit it could be argued that benefits accrue from the maintenance of *all* the values outlined above, e.g. from the maintenance of an interesting and diverse world[1] which retains significant areas relatively free from human interference and by avoiding a situation where everything which does not answer to an obvious set of human interests is eliminated. To put the same point in a slightly different way, if 'use' is expanded on the welfare picture so that the provision of benefits counts as a use, and if all those who *may* benefit are counted as users, as they must be if the use criterion is to be at all adequate, then it is evident that use has to take account of a much wider class of uses than simply visiting (*or* its elaborations), and therefore that forestry proposals to assess these benefits in terms of volume of visitors (or a standard elaboration thereof) are excessively crude and narrow. Again it is evident that the assumption that the procedure involves, that only those who visit (or *may* visit) the forest benefit, is highly rejectable and by no means value-free, and hence not 'objective' in the intended sense.

Of course in criticising these volume-of-use and kinds-of-use accounts of value, one is not denying that data on volume of use and kinds of use by visitors and visitors' preferences, is not highly relevant and has an important bearing on *how best to cater for* certain groups of visitors, and therefore has a bearing on at least one of the non wood-production values of the forest. What one is objecting to is the attempt to use such criteria to suggest that, or justify the assumption that, areas receiving little or no visiting use have little or no non wood-production value (other than for water production). A high volume of visitor use may sometimes be enough to establish a high value but it is by no means necessary (nor is it sufficient as disaster areas, such as dust-bowl and fall-out national parks reveal).

(Footnote 2 from page 290 continued)

selfishness, which would show that a great many activities that are not normally counted as selfish are really selfish, see the discussion of egoism in Nowell-Smith [1].

The accusation of selfishness and elitism is familiar from other philistine contexts as a way of discrediting many extremely valuable items and activities which do not enjoy a high level of popular patronage, eg. in the arts, and educational contexts.

1 At one point, inconsistently with its main themes, Forwood [3] virtually concedes this (p.20): 'the more essential it becomes to manage the whole forest ecosystem in a condition of maximum diversity'.

In short, empirical data of this numerical sort must be treated rather carefully and can easily be misused. It is so misused by Forwood which suggests throughout that some such criteria are to be taken as establishing non-wood values, that little visited areas well away from major cities have little non-wood non-water value (i.e. little non-commodity value) except perhaps for the small sample areas of curiosities to be reserved for scientific reference.

Values through willingness of users to pay

We have argued (both here and in the Forwood supplement) that it is a mistake to identify the non-commodity values of a natural area with its uses for visiting or its recreational value. However it is important to be able to assess recreational value, and attempting to do so does not involve one in the identification fallacy just mentioned. Even so the usual assessments of recreational value in terms of visitor evaluation methods do involve serious difficulties, even where these methods are taken simply as providing measures of (some sort of) recreational value. Indeed many of the same criticisms which apply against sample visitor surveys tell against attempts to measure specifically recreational values in terms of such assessments of consumers' or users' willingness to pay as consumer surplus, total trip costs and monopoly revenue measures. The methods (alluded to in Forwood [1], p.38) are explained, and also severely criticised, in recent American literature (see e.g. Barkley and Seckler [1], Coomber and Biswas [1], Pearse [1], Beardsley [1]). Not only are the methods criticised for methodological bias, i.e. for failing to provide an accurate approximation to what was supposed to be measured,[1] for providing only demand curves not matched by corresponding supply curves, and for failing to provide estimates which are applicable in wider decision-making contexts (because of methodological assumptions made in obtaining the estimates), but also they provide widely divergent results (e.g. in Beardsley's study [1] total annual recreation value in thousands of US dollars was 12.7 according to consumers' surplus method but only 4 and 5.3 respectively by monopoly revenue and visitor survey methods).

Without going into detail as to the local adequacy of these methods for what they are intended to reflect, usually market demand for recreation, the general assumptions underlying the equation – presupposed in Forwood – that such methods will provide a satisfactory objective measure of the non-commodity value of forests, and also of the 'social value' of national parks, have to be rejected. Firstly, and obviously, these economic methods do not measure (and in the economic literature generally do not claim to measure) more than recreational value – more accurately they provide measures of varying adequacy, of *tourist* demand. This demand may fail to reflect even the *recreational* value of an area; for one can pay (the tests all go back in one way or another to paying to visit) to go and see or visit something not because one *values* it, prefers it (for recreation, say) or admires it at all but for some quite different reason, e.g. because one is curious, wants to see how much of a mess it is, has a research project there, sees a possibility for business investment, etc.. In many of these cases a visit is not even *sufficient* for setting any enjoyment value on it, and the methods do not even establish, without qualification, a *minimum* value for the individual visitor's preference for the area (e.g. for recreational purposes). An underlying assumption then of the method is that visits are for the purpose of enjoyment, which may not always be true. For if it were merely numbers of visits and value of trips which counted one could argue that

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Thus, for example, the total trip cost method typically overestimates tourism demand by failing to allow for the fact that the visit to a given site may be part of a visit to several sites, and underestimates by including only motorised visitors, etc. Consider e.g. total trip cost measures of the recreational value of surburban parks which most visitors reach on foot.

hospitals and court houses had a high recreational value because they receive large numbers of visitors who may have to spend substantial sums to get there. Strictly speaking one should winnow out initially visits not undertaken for purposes of leisure and possibly distinguish within that class visits undertaken for the purpose of enjoyment. Even so the economic methods could be refined to determine present recreational, and not just motorised tourist, demand. The essential point however, is that these economic methods applied to forest areas do not measure, and mostly do not purport to measure, the social values or the values of social benefits of forests – as Forwood [1], pp.38-40, and Forwood [3] would have us believe.

Next, the best such economic methods can do is to put a current *market* value on present recreational benefits of an area. But even if it is worthwhile obtaining a market valuation, it does not follow that only those items with a sufficient market valuation should be retained. The fact that the free market fails to provide an adequate range of choice and opportunity is now well recognised in the cultural and educational spheres, and the desirability of government intervention to support many activities which adherence to the market would eliminate is also well recognised. However the recreational case would appear to resemble the cultural and educational one, in that it is an area where the provision of a sufficient range of choice and opportunity is extremely important, and accordingly in which there is probably a similarly good case for supporting activities the market would eliminate. One reason why inadequacy of strict market valuations in public and social spheres is increasingly recognised is that these are open to serious pluralist objections. For example, the market system of valuations does not provide adequately for options and choices, for individual differences and minorities in cultural and educational cases, and has not just to be interfered with as a means of allocation, but largely replaced, as happens in the case of public education, broadcasting services, subsidised cultural activities, etc. From the point of view of assigning social values to public forests, public libraries and city parks and community centres provide superior models to private consumer goods such as new and used motor cars where market values are rather more adequate reflections of value. Public forests are all too likely to get the same shabby deal under the market system of evaluations that other public items receive (see Barkley and Seckler [1], and Galbraith [1] on such topics as private affluence and public squalor).

For the most part Forwood hopes to escape such objections by the assumption that values and social priorities can be reliably and objectively determined through the market mechanism. The assumption that there is a single objective system of value quantitification underlies Forwood (e.g. [1] and [3]); it is simply as Forwood [3], p.1, puts it that there are

> very great difficulties in the light of present knowledge in quantifying some of the values involved. (Cf. also [3], p.23, p.38.)

The idea that there is a unique objective system of values which only lack of knowledge prevents us applying, surfaces also in Forwood [1], e.g. p.39:

> Sound objectively based decisions on forest land use . . . will be reached only after these gaps in our knowledge have been eliminated.

Forwood's discovery of a unique, objectively-determinable value system, will be news to many social and political thinkers, and must rank as one of Forwood's major theoretical contributions to social theory. It is commonly recognised that the empirical facts, which can be determined objectively and where scientific expertise is relevant, do not on their own entail how to act or what policy to adopt.[1] The Forwood position betrays a serious lack of

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1 To suppose, otherwise, that evaluative judgements, e.g. precriptions, policies, obligation statements, can be entailed by descriptive or empirical statements is to commit the prescriptive fallacy (see e.g. Nowell-Smith [1]). A related fallacy, the naturalistic fallacy, that of trying to define or explicate evaluative notions in

understanding of the relation between empirical facts, valuations, and decisions or recipes for action. The empirical facts alone do not tell us how to act, although they are *relevant* to decisions for action. In order to formulate a policy or recipe for action one must have assumptions as to what to aim for, what states of affairs are desirable, i.e. value judgements, and about these there can of course be informed and legitimate disagreement.

The case of decisions on matters concerning forest products provides an example. One can either come to such a decision without taking account of non wood-production and non-commercial matters and natural features (which is tantamount to assigning these *zero* value), or one can assign them some weight in formulating plans and decisions. In either case one has made a valuation, and in either case it is an illusion to believe that these can be determined with no room for disagreement as to values and policies. (See also Appendix 1 and the Forwood supplement.)

The Forwood assumption, that values assigned through the market for public forests are reliable, is a value judgement, and is widely rejected; and therefore the Forwood assumption of an objective measure of social values to be obtained through such methods is mistaken. Market assessments of values are no more objective than various other assessments. The ideaiof an objective assessment is a myth.[1] Non-commodity values cannot be objectively determined: nor can commodity values. Certainly there is nothing objective – in the sense[2] which implies value-free – about the value assessments that Forwood has made or the methods that it proposed. The objectivity ploy is simply an attempt on the part of Forwood, and of associated forest industries and forest services, to take over decisions about forest mangement for their own market-directed ends. The *fact* of the matter is that the Forwood procedure is hitched to a narrow – and now widely rejected – conception of value, that of reducibility to a market-based system of values, and thereby to a correspondingly narrow set of largely industrial values.

(Footnote 1 from page 293 continued)

descriptive terms, e.g. desirability in terms of what people actually want, underlies the Forwood procedure, where it is assumes that what is socially valuable in a forest can be explicated in terms of empirical features of users of the forest. Indeed Forwood's objective assessment of values depends upon committing the naturalistic fallacy, upon identifying facts and values.

1 It would take us too far afield to try to demonstrate this formally. But the general reason why supposedly objective assessments can be always be rejected may be illustrated through the way in which ethical models currently favoured as holding out hope for an objective ethics may be disputed. A main assumption, required in order that such super-concepts as justice or fairness (with respect some favoured base class of creatures) can be put to work, is that each element of the base class meets certain conditions of rationality. Not only is this no guarantee of adequacy of treatment of items beyond the base class, but more important a large, and disputable, value assumption is made in applying the model: namely that people should act rationally. More obviously, a policy decision is made in deciding to manage ethical matters according to such 'fairness' considerations.

2 In other senses of 'objective', value judgements are objective, as distinct from subjective, e.g. they are not subjective in the sense of being statements about or expressions of given subjects' feelings, emotions, experiences, psychic features or whatever. The opinion that value judgements since not objective (in the value-free sense) must be of this subjective character either trades on this

Finally, the basic assumption of the economic methods for determining recreational values, that recreational value can be assessed through willingness to pay, is open to serious question. Forwood makes the more sweeping but common enough assumption, that *the value of an intangible,* not just recreation, *is a function of users' willingness to pay:*

> The basic principles in the evaluation of intangibles will usually involve some form of estimation of users' willingness to pay.
> (Forwood [1], p.38. Cf. also Forwood [3], p.223.)

There are several questions to ask about this basic willingness to pay principle.

Firstly, paying for what? The way in which the principle is usually expanded in assessing recreational and social values, namely as paying to visit, is inadequate. It has to mean as well 'willingness to pay to *keep* the area', i.e. to maintain it rather than lose it. For visiting (or planning to visit or even potentially visiting) is neither necessary nor sufficient for valuing highly social or recreational features of an area (unless 'recreation' is deliberately narrowed to visiting, to exclude looking at pictures of, reading about, thinking of the area, etc.). For example, people are prepared to pay (through taxes, dearer commodities, even voluntary contributions) to keep items such as tropical rainforests or blue whales, which they do not expect to visit or ever see. In this way *these* items have an indirectly assessible minimum social value.

Secondly, who are the users or those willing to pay? The common restriction to visitors, or consumers, is unsatisfactory. As we have seen, the class of those whose interests are affected, particularly when *options* are taken into account, is much wider than the narrow class of users who *would* visit (and it is this class that should be considered in the case of *willingness* to pay to visit). In welfare terms those who benefit from (having or keeping) an item comprise a larger class than those who visit or see it (or would do so). Taking the beneficiaries (or users in the wider sense) to be visitors is like taking the beneficiaries of university libraries to be just readers or borrowers, of cultural facilities such as concerts just those attending or listening. But in fact options and indirect benefits are provided for a much wider class than simply the overt users.[1] Accordingly the argument that if the willingness of overt users to pay to use a facility is less than the cost of the facility, then it is not worth having, is invalid. The amount that overt users of a university library would

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(Footnote 2 from page 294 continued)

> confusion of senses of 'objective' or else depends on a mistaken analysis of value judgements (which commits the naturalistic fallacy).
>
> 'Objective' does *not* mean 'assessible within the market system,' though economists are inclined to twist the sense in this way. If it were to come to mean this then of course there would be nothing value-free, or ethically indisputable, about such 'objective' judgements.

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> The way considering only the class of overt users contracts on the class of beneficiaries, can also be seen in terms of the underlying theory. The basic principle for individual a is:
>
> (1) a values y at $n iff a is willing to pay $n for (to visit) y.
>
> Assuming simple aggregation, then, over each individual in the community or group:
>
> (2) the community values y at $n+ iff the community is willing to pay $n+ for (to visit) y.
>
> But what happens, illegitimately, is that the community is restricted on just the right-hand side of equivalence (2) to a narrower class of users. Nor is the summation method uncontroversial.

be prepared to pay for the privilege (over some fixed term) would generally be far less than the cost of establishing the library; that a broader community deems the library worth having indicates that the narrow market assessment in terms of overt users will seriously underestimate the value of the facility, just as and connected with the way it underestimates the class of beneficiaries.

Even when the basic willingness to pay principle is reformulated in terms of the willingness of beneficiaries to pay to have, keep or visit, the principle is still inadequate, not just for the general reasons we have already lodged in discussing welfare principles, such as that the base class has to include some future creatures and that the analysis of willingness has to be dispositional in terms of what one *would* pay under given conditions, but because the principle fails on distributional grounds. For it fails to consider not only the question as to people's different abilities to pay and generally limited financial means but also the question as to whose responsibility it is to pay. The second matter becomes very conspicuous in the case of environmental matters such as pollution. Indeed the dressed-up willingness to pay principle is inconsistent with the polluter pays principle (and more generally with environmental pricing principles). For example, one may value clean waterways but not be willing to pay to keep the waterway clean, because one considers that it is the responsibility of the polluter to pay. In short, one may value an item highly but not be prepared to pay for it, believing the obligation to pay for it falls elsewhere. There are difficulties then about applying the principle to obtain a preference or value ranking. The dressed-up willingness to pay principle apparently will require at least modification in the case of environmental values of forests as well; one may value wilderness, wild animals and plants without being willing to pay or contribute oneself because one believes the responsibility to ensure that these are not destroyed or degraded lies elsewhere, e.g. with governmental organisations such as forest services.

Although there are many serious difficulties about the use of these willingness-to-pay criteria to give even bounds on recreational value and they cannot be used at all satisfactorily to arrive at a value for the natural features and systems of a forest area, it should certainly not be concluded that the natural features should not be assigned a value in a cost-benefit analysis — failure to do so being equivalent to assigning no value, which is clearly incorrect. The positive value of such natural areas cannot be catered for simply by the preservation of small sample communities for educational and scientific purposes. A separate positive value over and above recreational value must be assigned to features of natural forest areas, and to their inhabitants and diverse natural communities, to reflect the high value now commonly placed on these items. (This would be a generalisation of the wildlife and fish value allowed for in Alston [1], this category being too narrow.) A cost-benefit analysis for forest land allocation and multiple use which neglected to do this would be inadequate.

An 'opportunity cost' argument against forest reservation

As part of its proposal for the objective assessment of non wood-production values and land use allocation Forwood proposes that cost-benefit analyses be carried out before any future reservation of land to national parks. Since Forwood acknowledges difficulties in assessing non wood-production values objectively it proposes to use as an alternative an 'opportunity cost' argument to assign a minimum value to both national parks and unlogged water catchment forests. It is argued that the opportunity cost, assessed in terms of the timber royalties, would have to be exceeded by the values of the 'intangibles' provided by national parks in order to justify the allocation of forest land to national park rather than to forestry. The argument is as follows:—

> A National Park contains a zone of 10000 hectares which carries prime timber forest with an average merchantable volume per hectare of 500 cubic metres with a net royalty value of $10 per cubic metre. It could be inferred that the community value of the social benefits of the scenery, recreation, education and scientific reference of this 10000 hectares is not less than $50 million. (Forwood [1], p.38, example 2. Cf. Forwood [3], p.23.)

Again of course no value is allowed in the proposal for the undisturbed natural ecosystems and features, which the allocation of the land to forestry provides no guarantee of retaining. Likewise it is not enough for the *net* returns from logging a forest to exceed what those who use the forest (in the ordinary narrower sense of 'use') are prepared to pay for their use; for this neglects for example what those who do not visit the forest, both present and *future*, are prepared to pay to retain the forest unlogged. However the most objectionable feature of the argument is the way in which the value is assessed simply against the revenue from the royalties, a quite unsound procedure, which would however have the desired effect from the forestry point of view of making a national park appear an enormous financial liability which is rarely worth undertaking. What this neglects is the *costs* of extraction, production and restoration. The case resembles that of a beach mining company which claims that it has deposits worth $50 million dollars but forgets to include the costs of extraction and restoration of the area mined. The comparison with royalties similarly neglects the costs of the extraction, which partly fall on the community and the costs of replacement to an acceptable standard, and demonstrates a free-good approach to forests quite in contrast to the continued extolling of forests as a renewable resource. What must be assessed are at least the net financial benefits to the community from one form of forest allocation rather than another over a sufficient period. An assessment of the net financial benefit from allocating the land to forestry would, assuming that destruction of forest is no longer acceptable, have to deduct at least the cost of replacement to acceptable standards. Given that royalties are set at cost or less (see the Forwood supplement), it is rather evident that the net financial benefit to the community from allocating the land to forestry will be at best $0, rather than the fabulous sums arrived at by considering only the revenue. A similar 'opportunity cost' argument, taking timber to be a free gift with no costs of extraction or replacement, is foreshadowed and used elsewhere as a way of assessing the relative weighting of some values over others in multiple use (many-use) evaluations (e.g. Gilmour [2]). If such a way of assessing opportunity costs is considered legitimate and used in the case of national parks, it will be similarly used elsewhere to overstate the value to the community of extractive forestry by intensive methods such as clearcutting and to provide a high opportunity cost for alternative methods of management which take less timber than the maximum that is available and have a less deleterious effect on other values. The effect of the application of such arguments is to vastly overstate the value of logging and make it difficult to justify less ruthless methods and to greatly overstate the importance of logging in relation to non-wood-production values. Since it is proposed that the relative importance of values in multiple use be assessed in a cost-benefit analysis, it is to be fervently hoped that less objectionable and unfair methods of assigning relative weights to the different values in the cost-benefit assessment will take full account of the *costs* as well as the benefits of timber extraction and ideally will give due consideration to a range of other values including a distinct value for the natural diverse ecosystems. But there is not too much ground for confidence.

APPENDIX 6

Unifying economic and environmental objectives through optimisation and decision modellings

The problems presented by multiple values in forestry are a special case of those presented elsewhere in case of decisions in what is sometimes called 'multi-objective decision-making', and insights obtained in the forestry case can profitably be transferred to the more general case. Thus, for example, the management of an economy, where both commercial and environmental factors should be integrated in decision-making, can profitably be modelled in terms of such a multi-objective situation. The forestry case can be pictured as a miniature economy in which wood production replaces GNP, non wood-production values the broader range of values and choices not represented in GNP. Thus too features of the forestry model may cast some light on the more general difficulties and disputes with respect to economic objectives, particularly with respect to economic growth.

Alston's forest model

Alston's model, labelled FOREST, for forest service management objectives provides both a useful working example of the form forestry management plans, aiming at harmoniously integrating economic, environmental and social values, may take, and also a specific basis of comparison for the more general issues. According to Alston [1], p.37, the US legislative mandate requires the US forest service to

> maximize the total weighted value of the National Forests, always keeping in mind the requirement that all of the renewable resources are to be managed on a sustained yield basis without impairment of the productivity of the land.

In more detail the goal (as apparently stipulated in the US legislation) is:

$$\text{maximize } [f\,v(F) + o\,v(0) + r\,v(R) + e\,v(E) + s\,v(S) + t\,v(T)]$$

subject to site productivity, sustained yield and budgeting constraints, where the factors considered are represented by capital letters, their respective values through a function v, and their weights by corresponding lower case letters, e.g. t is the weight given to the timber factor T. The factors Alston considers, derived directly from US legislation, are these: F is fish and wildlife, 0 outdoor recreation, R range and forage, E environmental amenities, S soil and watershed, and T timber. Then v(F) is the value of fish and wildlife. Alston thinks of the value as 'derived from the actual physical output [or use] multiplied by a unit market price or some other estimator' ([1], p.39), but evidently the value need not be so narrowly construed. In its turn f 'indicates the weight or premium placed on values derived from use or production of fish and wildlife'.

The constraints Alston presents (none too exactly or satisfactorily formulated, but valuable as illustrations) are as follows:—

1. Site productivity.
   Total overall productivity of the forest at $(t + 1) \geqslant$ total overall productivity of the forest at t, where t is a time or time interval (the current time according to Alston).
2. Sustained yield, for each factor.
   Net periodic increment of the factor at $(t + 1) \geqslant$ net periodic increment of the factor at t $\geqslant$ periodic harvest of the factor.
3. Budget restrictions.
   total actual expenditure on factors $\leqslant$ total budget allotment on factors.

It is important to observe that the sustained yield is a sustained yield for each factor (a sustained yield of values as Bolle [1] explains). It is almost immediate that conversion of natural forests to pine plantations and that large-scale clearcutting are ruled out as

objectives, because they fail to meet the constraint of sustaining yields of wildlife values (see the data referred to on pp.69-70).

The model has a number of shortcomings, some of which Alston is aware of; for example, the set of factors, which is simply legislatively-determined, does not include wilderness (which is not adequately reflected through the values that are considered), or flora; no adequate allowance is made for natural, largely undisturbed ecosystems and their features; and factors such as soil and water which should be distinguished, because they conflict (e.g. water yields may be improved under conditions which impair soils such as forest removal), have not been separated. Nor do the constraints Alston proposes take adequate account of the conflict between timber values and other forest values.

It is intuitively obvious (but may be proved by way of hypothetical examples) that an optimum cannot in general be achieved by simply maximizing on each value independently, that an overall optimum will sometimes require the reduction to less than maximum levels of some value, e.g. the value of timber. In the same way it can be demonstrated that the best combination is

> not necessarily the combination of uses that will give the greatest dollar return or the greatest unit output,

as the US Multiple-Use Sustained-Yield Act recognises, and that multiple value management will very often require restrained timber yield.

A similar modelling for the goals of an economy, which takes account of environmental or social factors as well as commercial ones, indicates (indeed shows given that simple models of a forest economy are applied) that an optimum for the economy may require less than maximum growth of output or GNP, in short restrained, and hence selective, growth of output.

Synthesizing the economic and decision models

The economic models relied on throughout, e.g. cost-benefit analyses, rational decision-making procedures, opportunity cost considerations, and various optimisation models, may be unified under a *general* optimisation model.

The main problem of economics is that of value theory — making choices of targets, of plans, between alternatives, etc., in the light of constraining conditions, e.g. the alternatives are exclusive, targets are limited by scarce resources (see p.248). The problem is an economic one where the choice concerns economic matters. The solution to the problem, analytically, is to make a *best* choice, a best decision. But a best choice is an allocation which maximizes on expected values in the light of the constraining conditions. Hence the main problem of value theory is theoretically resolved through a general optimisation model.

Suppose there are n *factors* (or *objectives*) $a_1, \ldots, a_n$ to be taken into account in the decision-making situation, in determining the goal or objective Σ to be pursued or selected. $a_1, \ldots, a_n$ may be any items, e.g. they may be a set of alternatives, they may be the components characterising a system, they may be the worlds used in semantical evaluations, they may represent such items as wilderness, fish, GNP, percentage of unemployment, etc.. The parameter n need not be finite, but in most of what follows it will be assumed finite. To arrive at the required expected value of each factor, measure functions pr and v assigning to each factor a_i a probability $pr(a_i)$ and a value or allocation $v(a_i)$ are appealed to. The probability function pr satisfies recognized conditions, e.g. $0 \leqslant pr(a_i) \leqslant 1$; in contrast the value function v, which gives variously the worth or price of the factor or the quantity of it allocated, may give either positive or negative assignments.

The general model takes the form:—

$$\text{maximize } \Sigma = \sum_{i=1}^{n} w_i \, pr(a_i) v(a_i)$$

under the j constraining conditions

$$R_1 (a_{i_1}, \ldots, a_{i_{m_1}})$$

$$(R)$$

$$R_j (a_{i_j}, \ldots, a_{i_{m_j}})$$

where $\{a_{i_1}, \ldots a_{i_m}, \ldots, a_{i_j}, \ldots, a_{i_{m_j}}\} \subseteq \{a_i, \ldots, a_n\}$.

The *goal* is to maximize Σ, by varying each factor a_i. A *best choice* is that allocation of factors (if there is one) which gives a maximum. The weight w_i is the weight of the i^{th} factor or its value. The weights are assumed given and do not vary in the variational form Σ. This model generalises on the model used previously, e.g. in the assessment of multiple value objectives, in explicitly including probability assignments, and thereby expected values (but of course a weight w_i could have been considered complex and to include a probability factor). The relations (R) may include relations not just on the factors, e.g. a_i, but on functions of these, e.g. $v(a_i)$, since a relation on functions of factors is a (another) relation on factors. Hence the general optimisation model includes earlier optimisation models (unless absorbed in w_i, $pr(a_i) = 1$ in earlier models, for each factor a_i).

It remains to show that other decision methods also fall under the general model. Consider first Bayesian rational decision-making. In this case the constraining relations (R) ensure that $a_1, \ldots, a_n$ are an exclusive and exhaustive set of alternative outcomes (e.g. either a_1 or $a_2 \ldots$ or a_n happens, and if a_i happens a_j does not for $i \neq j$); and each weight $w_i = 1$. The optimisation model instructs us to maximize the sum of the expected values of alternatives. In view, however, of the conditions on the alternatives this can be achieved and only achieved by selecting that alternative with the maximum expected value. But this is precisely the recipe for the rational (best) procedure under the Bayesian model. The derivation at the same time justifies the Bayesian model.

The way in which cost-benefit analyses are very special cases of optimisation analyses is explained below (p.336), but it is worthwhile providing a different exposition of the inclusion. The main recipe we considered in cost-benefit analyses was to maximize on net benefits (i.e. benefits less costs, or equivalently the sum of benefits for each factor less costs) over the exclusive alternatives examined. As in the Bayesian model this will be accomplished by selecting that alternative with the largest net benefit. As in the Bayesian case weights are set at unity (or + 1 for benefits and − 1 for costs, if net benefit is analysed), but unlike the Bayesian model the probabilities are also set at unity (though a more complex cost-benefit analysis which takes account of probabilities can easily be envisaged). The factors that are taken into account in a cost-benefit analysis are those to which values, i.e. net benefits, are assigned in the cost-benefit table or matrix, e.g. in the analysis set out on p.84a the factors are timber production on EL, timber production on PL, watershed in EL, recreation in PL, etc. The value function assigns a value in dollars to each of these factors. Alternatively, but equivalently as far as the best choice is concerned, a pair of functions b and c, which represent respectively benefit value and cost value, may be assigned to each factor; these valuations are displayed in the cost-benefit table on p.84a. For each factor a_i, $v(a_i) = b(a_i) - c(a_i)$. In case functions b and c replace v, the weights are altered, c assignments always being given weight −1, that is while one maximizes over benefits one minimizes over costs. The constraining relations ensure that the columns in the cost-benefit table (EL and PL in the example) each act in concert (i.e. all the benefits and costs of EL are incurred if any is) and are exclusive (e.g. recreation in EL excludes recreation in PL). This entails that maximization guarantees selection of one of the columns intact, not, for instance, of some factors in EL (e.g. wildlife in EL) and some on PL (e.g. timber production on PL). The maximization then provides best choice of those factors that act in concert (in the example those on EL). Of course the method only provides best choice from those factors taken into

account, and in a cost-benefit analysis there is no exhaustiveness requirement, e.g. perhaps better alternatives for a forest such as clearance for agriculture or dedication as national park may have been left out of consideration.

The general optimisation model not only includes as special cases the main decision models we have considered and, as we shall see, models for management of a (world, national, regional, urban or local) economy (discussed briefly on p.262 ff.), but it furnishes a formal model for the best, and worst, operation of a system, taking in thereby such diverse systems as an urban transport network, a goods distribution system, a communications system,[1] a firm, a voting system, an abstract ethical system, a social welfare system, and a regional resources system.

The rational operation of organisations and firms (touched on above, pp.221-2) fits into this pattern. It is usually assumed in microeconomics that the objective of the firm should be – very often, as we know from empirical studies, it is not – to maximize its profits, that is, its best choice of operation takes account of just one factor, firm profits. But this standard account is even more unsatisfactory than the account of the objectives of a national economy which take GNP as the sole factor or indicator. In fact firms do, and should, take account of further factors. A large firm, as Galbraith has pointed out in his examination of producer sovereignty ([1] and [2]) takes account *not* of consumer interests such as the quality, durability and safety of the goods the firm produces, but of its own organisational interests, which embrace, as well as profitability of the firm, such factors as its output of goods, its growth, the opportunities for promotion and pay increases of its members, its security and its public prestige. Optimisation over such factors as these, in some weighted combination, subject to the constraints the factors impose on one another, is what the firm sees as its best procedure. Needless to say it may not be what outsiders see as the best choice of practice – which points up the extent to which evaluations enter into the selection of factors and their relative weightings.

The utilitarian recipe for best course of action (cf. p.252) also fits into the same pattern. Bentham's formula for best course of action, for example, boils down to maximizing net pleasure, i.e. pleasure less pain, over some population or base class. The factors we are directed to take account of are the pleasure (pl_i) and the positive pain (pn_i) of each element i of the base class C, where C has n members. Suppose, as the utilitarians do, that the values of these factors can be measured in some common unit, utiles say. Then Bentham's formula is:

$$\text{maximize Utility} = (+1)\sum_{i=1}^{n} v(pl_i) + (-1)\sum_{i-1}^{n} v(pn_i) = \sum u(i) + d(i),$$

where $u(i) = v(pl_i)$ and $d(i) = -v(pn_i)$ give the utilities and disutilities respectively. The recipe is intended to apply in each situation where a best choice of behaviour is to be made, and the pleasures and pains are those aggregate ones for each base class member which relate to the situation concerned. Each base class member is equally weighted. Of course there are constraining conditions, e.g. pleasure and pain (are taken to) exclude one another, and one creature's pleasure may interfere with another's or cause another pain, in which case there are intercreature exclusion relations. Rather plainly Bentham's recipe is insufficiently pluralistic: far too few factors are taken into account.

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1 Optimisation theory in the standard sense originated in the analysis of such systems and networks, in engineering design concerned with selecting the best system.

General systems, and goals and best choice in economic systems

The constraining conditions (R) are strictly part of the background system to which factors $a_1, \ldots, a_n$ belong. This accounts for the very general form of the relations given, which is apparently more generous than that of usual optimisation models which consider at most conflict functions of certain fixed forms (typically equalities and inequalities). By reformulating the optimisation model so that the constraining conditions become part of the underlying or background system the logical features of the model become clearer and it can be seen that the relations (R) given have complete generality.

A *(general) system* S is represented by a relational structure or model $S = \langle K, \underset{\sim}{R} \rangle$ where K is a set of elements and $\underset{\sim}{R} = \{R_i\}$ is an indexed class of relations where each relation R_i with index i is a relation on K, i.e. a general structure is effectively a set with a batch of relations on it (cf. Bertalanffy's 'sets of elements standing in interaction', [1], p.38). Thus algebras, which are sets with certain two-place relations defined on them, and geometries, which are sets with three-place relations such as betweenness on them, are systems. The expressive power of systems is rich, e.g. whatever can be said in quantificational logic, and more, can be expressed. Many familiar notions can be defined for systems, as work in model theory reveals (see Bell and Slomson [1], p.73ff.). In particular $S' = \langle K', \underset{\sim}{R'} \rangle$ is a *subsystem* of $S = \langle K, \underset{\sim}{R} \rangle$ iff K' is a subset of K and $\underset{\sim}{R'}$ consists of the restrictions of the relations of $\underset{\sim}{R}$ to K'. Thus every subset of K generates a subsystem of $\langle K, \underset{\sim}{R} \rangle$, e.g. a subsystem may be based on a set F of factors of K.

General systems theory, as envisaged by Bertalanffy [1], can take off at this stage. Some of the main distinctions Bertalanffy is concerned to emphasize can be developed almost at once. For example, an *unorganised system* is a system such that the (extensional) properties of the system can be derived from the properties of (proper) components of the system (given just intersystemic relations such as spatio-temperal ones and general laws). An *organised* system is one that is not thus unorganised, i.e. where the whole is more than the lawlike consequences of the distributed components. It is immediate that an organised system cannot be deductively reduced to features of its components. If, as appears certain, organised systems actually occur then deductive reductivism (the main form of mechanism) is doomed to failure.

The systems commonly considered in system theory, e.g. input-output models, automata, feedback models, formal systems, equational models are all special sorts of systems obtained by considering certain specific relations, e.g. input and output functions, derivability relations, etc.. Decision theory and optimisation theory, branches of general systems theory, also usually begin with a much more specific structure. And *some* structural elaboration is essential in order to introduce optimisation notions. A *(general) optimisation system* OS is represented by a structure $\langle K, \underset{\sim}{R}, f \rangle$ where $\langle K, \underset{\sim}{R} \rangle$ is a system and f is an n-place function (the *objective function* of OS) defined on a subset $\underset{\sim}{F}$ of K. The *objective* in OS is to maximize $f(x_1, \ldots, x_n)$, for $x_1, \ldots, x_n$ in F. In decision theory the problem is usually more circumscribed, in the way now indicated.

An *(elementary) economic system* ES is a structure $ES = \langle K, \underset{\sim}{R}, F, v, pr, w \rangle$ where $\langle K, \underset{\sim}{R} \rangle$ is a system, F is a non-null subset of K, v, pr and w are the following numerical-valued functions on F:

(i) v is a value, pricing or allocation function,

(ii) pr is a probability function;

(iii) w is a weighting function which assigns to each element a_i in F a fixed weight $w_i = w(a_i)$.

The functions are also assumed to satisfy further conditions, e.g. pr as a probability measure is a real-valued function such that for each a in F, $0 \leqslant pr(a) \leqslant 1$. ES is *finite-factored* iff F is finite. Typically of course *economic* systems will include characteristically economic elements or relations, e.g. producers, consumers, commodities, savings or investment functions, etc..

The *goal* in a finite-factored [1] economic system ES is to maximize $\sum_{i=1}^{n} w_i \, pr(a_i) \, v(a_i)m$ where $F = \bigcup_{i=1}^{n} \{a_i\}$

Obviously ES will have to satisfy a set of conditions for there to be maxima, and further conditions still for a unique maximum. A *best choice* in ES is that assignment of factors (in quantitative terms) which realises the goal. The constraints are now simply those of the background system ES with respect to which the goal is set.

Every optimisation problem (in OS) can be reduced to the form: determine the maximum of $f(a_1, \ldots, a_n)$ where $g(a_1, \ldots, a_n) = 0$, for $a_1, \ldots, a_n$ in F. For let the function g be a characteristic function of the subsystem of OS based on F, that is $g(a_1, \ldots, a_n) = 0$ when all the relations of OS (including those concerning f) hold for $a_1, \ldots, a_n$, and $g(a_1, \ldots, a_n) = a$ otherwise. The problem further reduces to that of determining the maximum of $F(a_1, \ldots, a_n, \lambda) = 1$ $f(a_1, \ldots, a_n) - \lambda g(a_1, \ldots, a_n)$ where λ is a Lagrange multiplier. However classical methods fails — the set of equations $\{ \partial F/_{\partial a_i} = 0 \}$ for critical points, is not well-defined since function g is not continuous and hence not partially differentiable with respect to factors — and the problem is apparently not generally solvable. The mathematical problem of maximum determination is however solvable in many important special classes of cases, the known solvable cases accounting for the organisation of textbooks on optimisation theory (see, e.g. Beveridge and Schechter [1] or Pierre [1]).

The goals of an economy

Many familiar economic positions and arguments can profitably be clarified or explained in terms of the decision model outlined, e.g. such notions as *opportunity costs* and *comparative advantage* can be defined and standard arguments using them justified in terms of the theory (cf. p. 90b). The theory can also be applied to elucidate issues concerning the goals of an economy.

An economy is the economic system of a community or organisation. Thus an economy may be local, regional or national or even global, it may be agricultural or industrial. The structure of actual economies is hierarchical, with each economy a subsystem of the global economy. Much as a multiple value model may determine objectives for the management of a forest economy, so optimisation models may integrate goals for the management of other economies, e.g. of a national economy (to take an example we shall pick up from p.262).

Thus instead of taking Σ as a measure of combined forest values, Σ is taken as some measure of the performance of a national economy, e.g. it may be variously construed as (in the narrowest case) a measure of industrial output or throughput, as (a measure of) net social welfare (on a welfare picture of economic objectives), as a measure of net choice, as a measure of 'quality of life', or as a measure of net rational desirability integrating both economic and environmental factors. A broad classification of the measures of the performance of a national economy parallels a broad classification of measures of forest values, as the following indicates:—

	National economy measure	Forest measure
i)	Commercial or industrial, such as GNP or net output of goods and services.	Wood production output.
ii)	Industrial together with social factors such as amenity factors.	Wood production plus recreation.

1

In certain more complex cases where ES is not finite-factored the goal is to maximize the (bounded) Stiljies integral $\int w_i \, pr(a_i) \, dv(a_i)$.
In general, however, there is no reason to expect that the function $f(a_i, \ldots, a_n)$ to be maximized will take a linear form, such as Σ, or a continuous extension thereof.

iii)	Industrial, social and environmental factors integrated.	Timber, social and environmental facts amalgamated as, e.g., in Alston's model.

It has been supposed, for simplicity in what follows, that these measures are inclusive, that iii) includes ii) which includes i), and that a measure does not consider just environmental factors (say) without industrial ones. Thus timber will figure in each forest measure, and in each economic measure GNP (or some analogue such as NNP) will be among the factors considered.

More generally the various positions we have considered in the case of overall forest management objectives present an interesting comparison with those which appear in the disputes and different positions with respect to rational economic objectives. For example, the wood production ideology with its aim of maximizing on a single variable, wood production quantity (or sometimes output and profitability), corresponds in the broader case to the insistence on no-holds-barred growth of GNP. The dominant use philosophy corresponds to the objective of growth in GNP as the dominant aim with other aims allowed a minor role insofar as they do not interfere, i.e. there is no conflict with the major objective (thus yielding a qualified form of laissez faire capitalism). The dominant use-concessional position corresponds to an economy set up to aim primarily for GNP growth, but which makes concessions, usually of a fairly minor kind to some further values, to compensate for the ill-effects of growth in excessively depressing other values. (Formally this amounts to assigning pretty low weights to further values.)

Measures of economic performance that are applied in setting national economic goals are rarely restricted nowadays to case (i), but typically include some factors that would commonly be accounted as social, such as percentage levels of employment (E) and of inflation (I). The goal of an economy which (shortsightedly) took account of just these factors would be to maximize S, where S = [gGNP + eE - iI], the lower-case symbols representing weights — an example falling under case (ii). It should be evident however that several other social factors (whose values can be roughly estimated) should be considered as well, e.g. quality of employment, noise and pollution factors, and so on.

In so determining goals, where several factors have to be taken into account, constraints on values make it improbable that optimisation will result by maximizing on values considered separately. What several economists have conjectured, that the values integrated in S, for example, cannot be separately maximized to obtain an optimum (and therefore that the problem of inflation cannot be solved in a system which insists upon maximizing commercial growth in a full employment economy) can be established through simple hypothetical examples just as in the parallel forestry case (but the examples are quite specialised).

The conflict between industrial and environmental factors, which arises in case (iii), and is illustrated by way of Alston's model, is much more conspicuous, but the objection — that separate maximization of industrial objectives generally does not lead to an overall optimum[1] —

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1 Given the widespread (but decidedly questionable) assumption that the market is the most efficient way of allocating goods and services, unfettered operation of the market is the best procedure if, and only if, the goal is maximization of NNP. A corollary is the market displacement argument: that the unrestricted operation of the market is permissible only where there are no other significantly-weighted values in the set of factors to be optimised than those maximized by operation of the market, or where the contraining relations are such that other values are independent of NNP.

applies also in cases much more sympathetic to the mainstream position (i). A further objection applies as well in the latter cases, that the assessments omit significant factors. Thus, for instance, the dominant use case, industrial growth with frills, fails to produce an optimum both because it fails to take sufficient account of conflict, and because it fails to make *substantial* adjustments to accommodate other values. The concessional or ameliorative approach, the best mostly achieved so far with social welfare economies, which essentially has planning aimed at GNP growth but makes small modifications as the occasion arises, fails to provide an optimum because, though it gives some consideration to other values, it fails to give *due* consideration. Its patch-up approach corresponds to the forestry concessional method of leaving strips along streams and highways. But just as one should not, given an appropriate multiple value approach, set forestry objectives just in commodity terms and then make ameliorative or compensatory moves, so given the features of the model set out for economic goals one would not determine economic goals in terms of industrial growth and make ameliorative moves aimed at reducing the damage. Given the model of aiming for an integrated maximization over a range of objectives, one would not aim primarily to maximize GNP with compensatory concessions (to compensate for the bad effects or by-products of ill-selected goals), but to obtain an integrated maximum taking account of all significantly weighted values at every stage in planning and economic decision-making. And then one would *expect* some reduction in the growth of GNP in order to attain an optimum.

In addition to these interesting parallels, the formal forestry optimization model also sheds some light on the different notions of economic growth discussed in appendix 1. It shows, as noted, why, if one has taken Σ to depend on more values than industrial values, as in cases (ii) and (iii) above, maximization of Σ cannot be obtained in general by maximization of GNP. For GNP will only be *one* value among a set of values with constraining relations between them, and typically the restraining relations will provide conflict functions so that a maximum cannot be obtained by maximizing each variable independently. For similar reasons one can see why it is a fallacy to take GNP as an index or *indicator* of quality of life or of welfare; namely that given a conflict it will not be even an indicator and may be inversely correlated in certain cases (e.g. where growth in output in junk is inversely correlated with environmental quality).

The model provides a framework for a superior account of multiple but integrated national economic objectives to the modified GNP models proposed in Barkley and Seckler [1] and Samuelson [1] (ninth edition). Barkley and Seckler's model, discussed in appendix 1, p.262, is a very special case of the general optimatisation model with but four values NNP, B, GC, AL, the weights being the fixed constants +1, +1, -1, -1 respectively, and no constraints being specifically imposed, the constraints having gone into values such as GC and AL, thereby leaving no proper scope for formal expression of these required constraints. In addition to the fact that it leaves no formal scope for expression of the conflict function without modification of the model, the variables other than NNP are not specified in the model except as growth benefits and growth costs, whereas of course one may wish to include among the range variables representing values (such as quality of employment) which are not related by restraining relations to NNP itself but may be related to the other variables. Including only variables related to NNP as growth benefits and growth costs is a compensatory approach which considers far too restrictive a set of values, and is far too growth-of-NNP oriented. It corresponds to taking the goal as that of maximizing timber production less costs, a highly compensatory position, as opposed to specifying a positive set of objectives or values over which one aims to obtain an optimum. Taking account of growth costs presupposes that one has a set of further values in view which have not been taken account of properly, and it is these that should appear in the fuller model. In fact the Barkley and Seckler model tends to suggest that the aim of maximization of economic objectives can be achieved by continuing with GNP

growth-oriented decision-making and throwing in some minor compensatory measures, such as environmental impact statements, designed to reduce the costs incurred. But this (we have seen, e.g. p.202) is not adequate for integrated planning, and will in general lead to suboptimal results.[1]

The point is perhaps made more clearly if the optimisation model is taken as one for maximizing sets of choices with the values representing sets of choices associated with economic objectives. The optimisation model, as opposed to an industrial growth plus environmental impact assessment scheme, enables one to take account of both conflict between these choices, the way in which increasing some choices decreases others, and of weighting on choices in terms of some being more fundamental than others, and so on. (In this way the model also provides a formal scheme for what we have set out less formally on p.264.)

Bringing out underlying evaluations through rival optimisation models

All important in applying an optimisation model is the preliminary determination, firstly of the factors or objectives to be considered, and secondly of the weights to be assigned to the factors selected. Weights overtly reflect values. For instance, the different weightings of a professional forester, who assigns negligible weights to non wood-production factors, and an environmentalist who assigns higher weights for non wood-production factors than to wood production ones, reflects their rival evaluations. As Alston [1] points out final weight setting is largely a political process.

The fact that determination of weights may eliminate factors from consideration (through the assignment of negligible weights) indicates that the choice of initial factors is not value-free either. There are several, partly evaluative, problems concerning the factors selected, in particular that enough of them have been taken account of, and that the factors that are considered do not lump together diverse factors that should be separately evaluated.

Thus it is important to supplement the general decision-making model by a set of criteria for when a set of objectives is satisfactorily treated as a case or unit from a decision-making point of view. It is obvious that if a factor is alloted zero weight, then it is indifferent and can always be omitted (e.g. items which are not scarce, such as the overall quantity of sand, which ones does not care about diminishing somewhat). More important than the class of factors that are included but could have been omitted are those factors that should have been included in a decision-making case but are omitted (i.e. from among the set of factors over which it is satisfactory to maximise Σ .) A criterion which suggests itself is that where a non-negligibly weighted factor omitted from the decision case is such that its value is strongly affected by the courses of action relevant to maximizing the objectives considered in the case, it should be included in the decision unit. In such a case a relevant factor has been omitted from consideration, rendering the class of factors taken into account inadequate. The more highly weighted the relevant but omitted factor is the more unsatisfactory its omission. An excellent example is the effect of the Manjimup woodchip decision case on the highly weighted fresh water factor. Another example is the failure of forestry planning to take account of effects of forestry operations on fauna and flora, other industries such as bee-keeping, fishing and tourism, etc..

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1 Likewise optimisation over subsystems of a given system will not in general lead to optimisation over the factors of the system though the factors of the subsystems exhaust those to be considered. Thus, for example, separate assessment of commercial and environmental factors (where overall financial constraints of the full system are neglected) will generally be inadequate.

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Having arrived at a set of factors to consider, normally a political matter, the question arises: How satisfactorily can certain of the factors be amalgamated, and should some single factors be broken down into several separate factors. Some criteria for satisfactory amalgamation of factors or values suggest themselves, e.g. that it is only satisfactory to treat two factors as one where firstly they are highly positively correlated under most of the conditions likely to be encountered and where secondly a course of action which tends to maximize or produce a high value in one would tend to maximize or produce a high value for the other and vice versa. These criteria would indicate first that soil and water, combined in Alston [1], should in general be considered as distinct factors, and even more clearly that recreational and natural values should not be amalgamated. For example, recreational and natural factors are not highly correlated, since areas with a high recreational value may not have a high value through their natural ecosystems, and there are many areas where natural values are very high which have at best a low recreational value. Moreover it is very plain that courses of action favourable to the one are not necessarily favourable, and may even be unfavourable, to the other.

Similarly factors that are introduced as single factors should be separated if the amalgamation tests reject the amalgamation of the separated factors. There is a decisive case for such a procedure, namely that there may be a case for separately weighting the factors, something that is precluded if they are amalgamated. For example, we have argued for distinct weightings for sawn timber and junk paper products, but the simple factor NNP precludes such a separate weighting. Our amalgamation criteria thus suggest breaking down NNP into several distinct components, one each for each differently weighted class of goods and services. Nor is it difficult to rate various goods and services differently. Victor [1] provides a beginning on the task of ranking commodities. Evidently the ranking would want to take account of the environmental production, distribution and disposal costs of the commodities in an economy, as well as such other estimates of desirability as essentialness (as e.g. basic foodstuffs), positive contribution to welfare (as e.g. medical supplies), etc. Such a segregation of commodities could be a key step in the way, already argued for, to selective economic growth; for growth of more heavily weighted commodities would then be encouraged, in optimising, at the expense of less heavily weighted commodities.

However such a ranking of commodities is not the only, or the most efficient way, of ensuring more selective economic growth. An alternative, which does all that such a ranking does, and more, is the method of environmental pricing discussed in chapter 16. Plainly whatever is achieved by adjusting the weights in the measure of the economy can be taken up by defining a new valuation function. (For each factor a_i, where w_i is the original weight of factor a_i, w_i' the new or adjusted weight, and v the original pricing function, reflecting values, $v(a_i)$ is defined as $(w_i' w_i)\, v(a_i)$.) Then the evaluation of commodities is taken up by the more sensitive method of having prices of commodities reflect a *wider horizon* of the costs they incur and benefits they confer, than under the usual restriction largely to producers' costs. The difference between the usual, narrowly determined price of a commodity and its environmental (and social) price will reflect inversely its commodity ranking.

Weights could, in principle then, be eliminated by adjusting valuations, but this would have several drawbacks, e.g. it would not allow readily for adjustments to counteract the bias in a given pricing system, e.g. in favour of commercial interests, nor could it enable the disagreement between groups with different evaluations who are prepared to accept a common pricing system to be brought out sharply in terms of their similar objective, namely optimisation, but different choice of weights. That is, the political process, which the modelling can help to elucidate would be obscured by the suppression of weights.



28. Even where regrowth is satisfactory (i.e. neither excessive nor too sparse), as it seldom is, areas subjected to this treatment will be greatly, and perhaps almost permanently impoverished from the point of view of wildlife, and will often have their soil fertility and other values diminished. (Photo: John Turnbull)



27. The greatly increased density of roading involved in a woodchip project provides a permanent source of erosion and aesthetic affront, particularly where roads are as badly designed as this one. (Photo: John Turnbull)



26. A fine 'degenerate' Mountain Grey Gum (*Eucalyptus cypellocarpa*), Eden. Much of the Eden woodchip franchise area was recommended for reservation as a national park. Instead it is to be woodchipped. However, forestry activity has little to recommend it economically, and national parks involve less public cost and provide more public benefits. (Photo: John Turnbull)

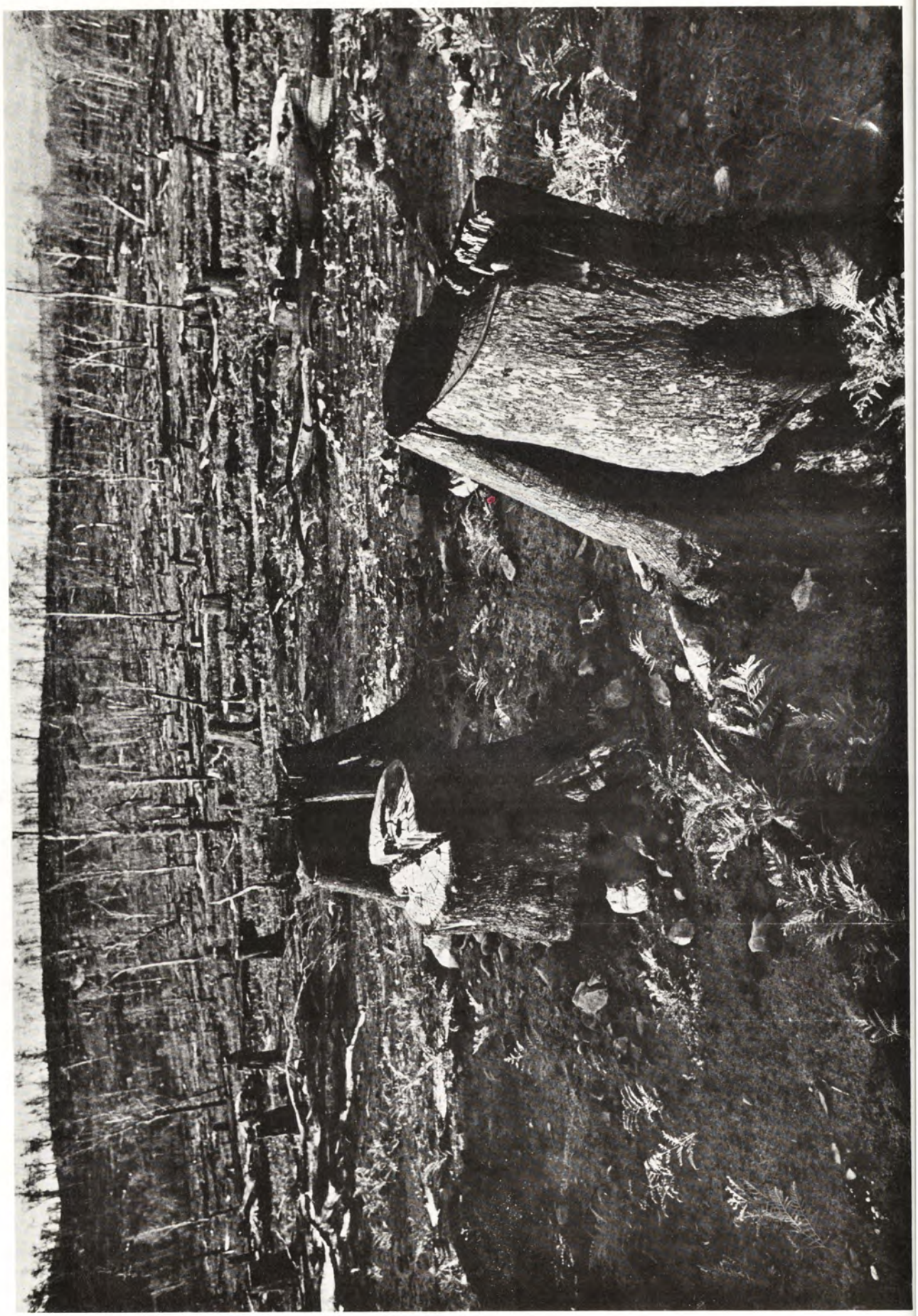


25. Eden soils are shallow podsols in which nutrients are concentrated in the shallow top layer, and slopes are severe; under such conditions nutrient loss and loss of topsoil through erosion are matters for serious concern. (Photo: John Turnbull).



29. Woodchipped area, Tasmania.

'In this context, of course, the use of the word "devastate" or similar expressions is quite unacceptable' — the then Deputy Prime Minister, L. Barnard, on the subject of woodchipping in Tasmania in his address opening the Forwood Conference, 1st April, 1974. (Photo: Geoff Parr)



30. Woodchipped area near Buckland, Tasmania.

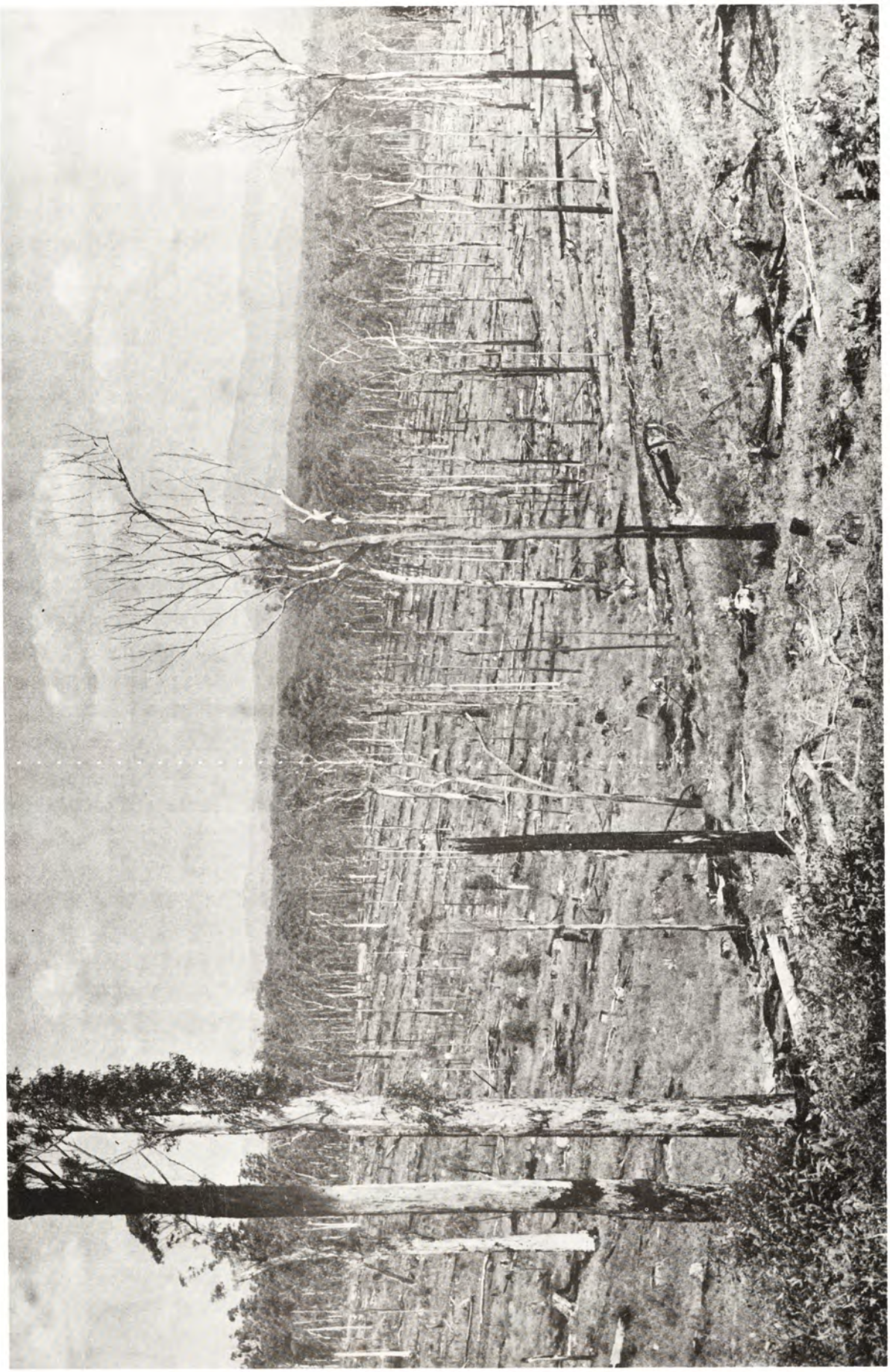
Only a small proportion of Tasmanian forest now remains outside woodchip concessions. The Tasmanian Forestry Commission has admitted that the royalties it obtains from woodchipping do not cover regeneration costs. (Photo: Geoff Parr)



31. Part of TPFH concession area, Tasmania. Standard practice in Tasmania is to follow cutting of 1000 acre coupes by burning, and reseeding, often with a few favoured species. Added to the usual costs and risks of large-scale clearcutting will be loss of biotic diversity, widespread loss of habitat, loss of wilderness, and a substantial loss of temperate rainforest. (Photo: Geoff Parr)



32. Nearly a third of Tasmania's forest is privately owned, and it is expected that much of this will not be reforested after woodchipping. This loss of native forest is officially assisted by advice to farmers on the virtues of woodchipping as a preliminary to conversion to pasture. (Photo: Marion Hardman)



33. 'Multiple use' in operation in Kioloa State Forest on the south coast of NSW. The use of clearcutting and intensive forestry methods is not confined to export woodchip schemes and plantation schemes, but is becoming increasingly widespread in the ordinary management of native forests, and will become general if the native forests are turned increasingly to pulp production, as envisaged by Forwood. (Photo: John Hill)

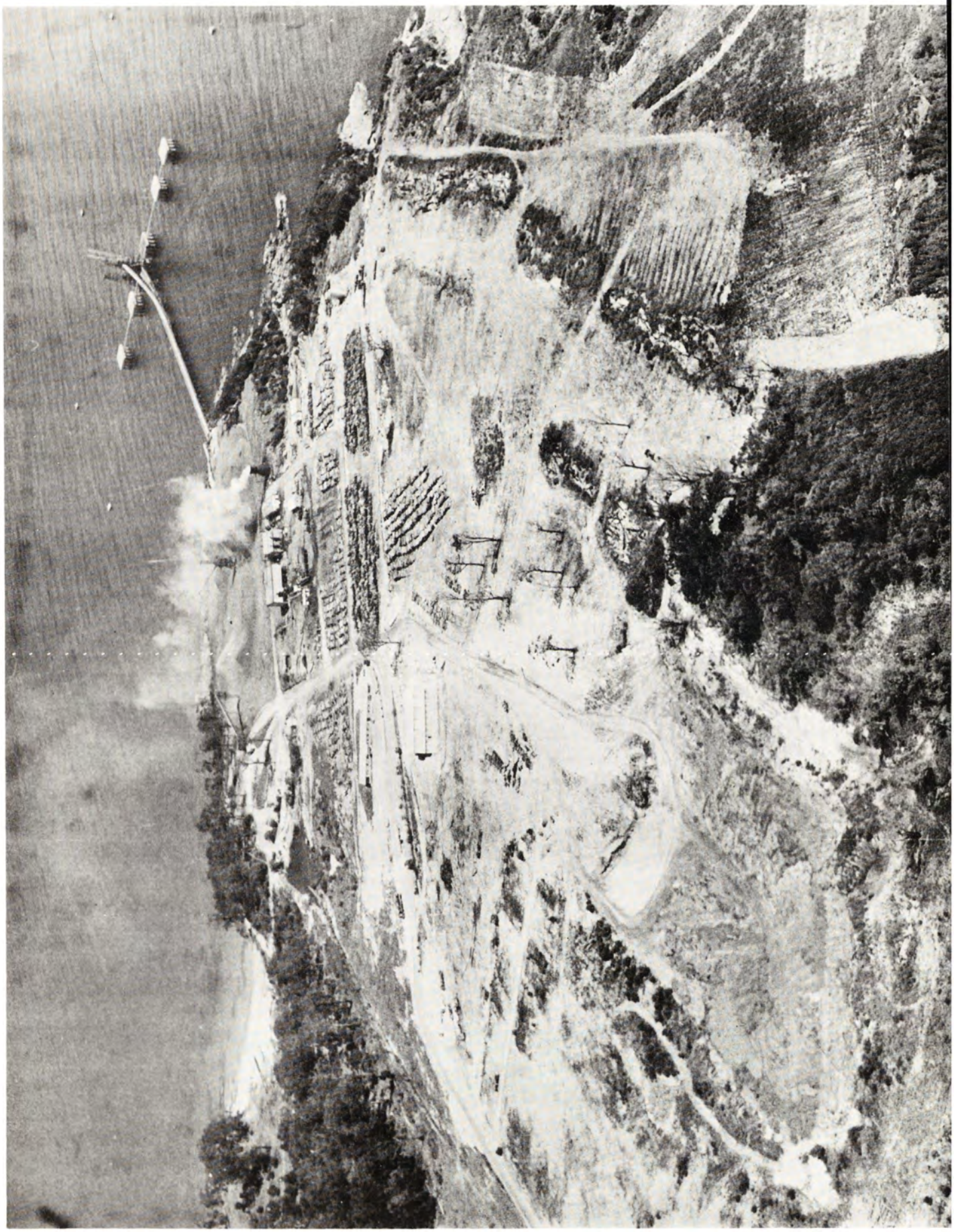


34. A more recent view of a part of the Eden project cut some time ago. The legacy of such woodchip operations is an area of even-aged and impoverished forest lacking in diversity, heavily laced with roads, in which log dumps and snig tracks persist to disfigure the landscape and create erosion and siltation. (Photo: John Turnbull)


SANCTUARY
PLEASE PRESERVE YOUR NATIVE ANIMALS
AND PLANTS AND DO NOT CARRY FIREARMS
ON THIS STATE FORIST.
PENALTIES ARE PRESCRIBED IN RESPECT OF
OFFENCES COMMITTED ON THIS STATE FOREST.



36. Woodchipping at Eden. The Eden project is cited as an example of multiple use management in Forwood's Panel 3, 'Multiple Use of Forest Resources'. 'Multiple use' so construed excludes very few forestry operations, and provides little guarantee of the maintenance of non wood-production values, except accidentally. (Photo: John Turnbull)



37. A view of the Eden chip mill. Chip mill capacity at Eden is being doubled and approval has been granted for the construction of a pulp mill. Pulp mills are major water polluters. Eden is an important fishing port and effluent from the mill will be a hazard to important fishing and spawning grounds off Eden. (Photo: John Turnbull)

FORWOOD — A CASE STUDY OF THE INDUSTRIAL LOBBY AT WORK:

We devote this supplement to the consideration of papers (Forwood [1]-[8], Survey [1]-[2], and ancillary papers) prepared for the Forwood Conference (full title: Australian Forestry and Wood-based Industries Development Conference, 1-5 April, 1974). The Forwood Conference is the most detailed and comprehensive exercise in forestry planning of recent years in Australia, and according to its organisers the

> final recommendations for the Forwood Conference will be the basis of future government policies over the next fifty years or so. (Forwood News [1], p.4. Cf. also p.1.)

Forwood presents a blueprint for an expanded pine program and for the turning over of the native forests largely to woodchipping.

Forwood is of interest not only from the point of view of the likely effect of its recommendations on the forests, but also because it provides an unusually clear example of producer sovereignty at work and an illustration of the way in which a powerful industrial lobby manages to influence the political decision-making process and of how its interests are furthered by the public service, the universities, and the entrenched methods of economic assessment that they apply.

Despite the fact that the aim of the Conference was to plan the future management of a large public resource of major importance for conservation and for Australian quality of life, and that it was organised by public servants allegedly safeguarding the public interest, representation of private societies and individuals on the panels was drawn overwhelmingly from the forest industries, with extremely poor representation both from independent scientists in environmental areas and from conservation groups, unions and consumer groups.[1] Thus of non-official bodies represented on the panels, 45 were from private industry and there was one conservation group, the Australian Conservation Foundation, which subsequently withdrew in protest at the imbalance. This imbalance was not, as the organisers have now claimed, unintentional and due to the fact that it was not realised that forestry was a conservation issue. At several forestry conferences during 1971 and early 1972 concern was expressed about the 'environmentalist threat'. Conflict with conservation groups had already appeared before 1972 when the panels were set up (e.g. over the proposal to clear the Boyd Plateau for pines), and by mid-1972 the defeat of the Softwood Forestry Agreements Act (by the unusual circumstance of the ALP and DLP joining forces to defeat it in the Senate) made it quite plain that opposition to the pine program was considerable and widespread. In the later part of 1972 a number of conservation groups concerned about the forests but of an apparently unacceptably critical cast wrote to the organisers of Forwood requesting representation. This request was not acceded to, although it is now clear that at this time membership of panels was not immutable and representatives of private industry were still being invited to join them. Several scientists with important specialised knowledge of the effects of forestry operations received similar treatment. Some representatives of forest services expressed apprehension lest 'emotional conservationists' should attend the public conference and divert it from its real business, i.e. wood production. Accordingly it was suggested that this difficulty could be overcome by isolating conservation and environment issues in the Multiple Use panel — thus ensuring that the 'real business' of the conference could proceed undisturbed by such considerations. (This recipe has clearly to a large extent been followed.) Many of these points emerge in minutes of early Panel meetings (Minutes [1]).

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1 Although consumer groups were absent, Consumerism was well represented, and surfaced in such observations as that Australia is a serious underconsumer of forest products — a good example of advocacy of consumption for its own sake or for the purposes of keeping up with the international high consumer set.

It comes as no surprise then that it is the Australian forest services and larger forest industries whose interests are represented and furthered in the papers and recommendations. Not only do the conference papers continue the tradition outlined earlier of excessive collaboration between the forestry services and forest industries to the exclusion of other interests, but also there is continuation of the associated ideology and of familiar techniques such as the overestimation of future populations and future requirements and the passing off of consumption of huge quantities of junk paper, in the form of packaging and disposables, as quite as environmentally benign as sawnwood and as equally inevitable and essential.

When courses of action are under discussion the ruling consideration is nearly always the effect on the 'healthy growth' of the forest services and industries, and the wider social and environmental implications of the various alternatives under discussion are typically ignored or discounted, as are options which fail to promote the interests of these organisations. This emerges clearly in what discussion there is of royalties, tariffs, self-sufficiency and setting market requirements. Forwood is an outstanding example of the sort of decision-making and public policy making that ought to be avoided.

Predictably the conference material and discussion, although purporting to be representative of all interests, was used as a forum to attack opponents of forestry objectives and ambitions, critics of present forestry practices, and other favourite targets (e.g. national parks, NAFTA, water boards and in particular the Melbourne Metropolitan Board of Works,[1] and an unnamed and sinister group variously referred to as 'some environmentalists' and 'some persons'), and to deliver the usual self-congratulations and praise for forest services and large private firms, about whose activities scarcely a critical word appears, and who are represented throughout as selfless servants of the community.

Forwood also presents a picture of the forest industries as a struggling and underprivileged group, deprived of its rightful share of recognition and public assistance, e.g. of the order given (in the past) to the agricultural sector. This picture of deprivation is a little difficult to reconcile with the character of private industry represented on the panels; representation, particularly on the panels concerned with paper and packaging, drew heavily from some of the largest and wealthiest Australian firms or their subsidiaries. For example the following firms were represented on the Marketing Panel (Forwood [6]):
Australian Paper Manufacturers (APM);
APM Wood Products (subsidiary of APM);
Associated Pulp and Paper Mills (APPM);
Australian Newsprint Mills (ANM);
Bowater-Scott Aust. (50% Bowater Corp. of Aust. (U.K.); 50% Scott Paper (US));
Pyneboards (50% CSR; 50% APM);
Hardboards Aust. (50% CSR; 50% APPM);
Burnie Timber (subsidiary of APPM);
Burwood Timber Mills (subsidiary of A.V.Jennings);
Koppers Australia (subsidiary of BHP);
Millars WA (subsidiary of Millars Australia);
Chas. Geddes & Co.;
Carricks Ltd.;
Bowen and Pomeroy;
R.A. Edgcumbe;
Smorgon Consolidated Industries.[2]

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1 Despite much pressure, the Board has consistently refused to permit logging of its forested catchment areas. Cf. Forwood [3], p.28.

2 Subsidiaries are as shown in Jobson [1] and the Company Red Manuals [1].

A majority of these firms or their parents then are found in a recent listing of the wealthiest Australian companies in terms of market capitalisation, and the paper sector is entirely dominated by a few such large concerns.[1] Some of the largest companies were represented on the Panels not just once but many times over through their various subsidiaries, and the most consistent and strongest presence over a range of Panels came from the big paper companies.

The underlying ideology and the sociological picture[2]

It can fairly be claimed then that the organisation of the Conference and Panels is thoroughly in accordance with the basic ideological assumptions outlined earlier in this book, of public forests as primarily supplying a publicly supported source of raw material for the forest industries. The assumption that the forest industries are to have the major role in planning forest use also emerges more or less explicitly in the statement of the Minister for Primary Industry, K. Wriedt, that the purpose of the Conference was

> to bring all sectors of forestry and the forest industries together in an attempt to plan the rational growth and utilisation of Australia's forest resources up to the early years of the Twenty-first Century. (Forwood [9])

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1 According to the listing of the *National Times,* June 24-29, 1974, for that week, the larger companies represented ranked as follows: BHP, 1; CSR, 7; APM, 16; Brambles, 65; APPM, 68; ANM, 82.

2 The mainstream forestry position, underlying and motivating Forwood, can be revealingly captured in terms of a sociological model, designed along the lines of the new philosophy of science (as variously expounded, e.g., in Kuhn [1] and Toulmin [1]). The prevailing forestry ideology, the wood production ideology, already criticised in detail, can be recast as a theory, and this theory can be construed along the new philosophy of science lines, as a sociological phenomenon which not only has an internal structure, but also governs research, experimentation, observation and even terminology. Formally its internal structure is like that of a scientific theory (as detailed, e.g. in the old fashioned exposition of Nagel [1]). Its assumptions include both the leading theses of the wood production ideology (sketched in chapter 1 and detailed in chapter 16) and also the standard developmental theses of the prevailing 'positive' economics (as discussed in appendixes 1 and 2). For the wood production ideology is part of the larger developmental-industrial ideology; and most of the forestry economic assumptions follow from the combined theses. This can be seen in the economic analyses sketched in Forwood papers which simply assume throughout that commercial growth — growth of output as indicated by growth of GNP, sales and profits, and especially in the case of input-output analyses growth in sales — is, at least in the case of forest products, always desirable.

An ideology differs, however, from a scientific theory in that whereas the non-logical assumptions of a scientific theory are empirical the premisses or axioms of an ideology (in the sense of an ideological theory) include evaluative (or political) assumptions; the inclusion of such evaluative assumptions is in fact what distinguishes an 'ideology' in the usual sense from a strictly scientific theory the internal part of which is value-free.

What is not essential to an ideology, but is always imputed by Marxist-Leninist criticisms of ideologies — and does hold in the case of the wood production ideology — is that an ideology is a 'misleading and illusory' theory, a false facade providing a rationale only for the application of the evaluative principles espoused, and normally as a front for economic or class interest.

The working of an ideology can be of much sociological interest, especially as group behaviour can often be explained in terms of a group ideology. The wood production ideology appears to have just such explanatory power in accounting for and predicting forestry group behaviour, procedures, projections, arguments and even vocabulary. The ideology also has the same sort of powerful influence that deeply entrenched theories exert on observation (thus forests are described in wood production terminology), on research and data collection (both are ideologically directed and restricted), and on education. Needless to say, the ideology controls the attitude to other values, e.g. wood production values dominate, and other values, such as environmental values, fit in where they can. (There are regular attempts to increase the extent of fit by pretending that conflicting values do not conflict.)

Corollaries of this basic ideology also appear more subtly in a number of general fundamental assumptions underlying Forwood, which are nowhere clearly brought out or defended, but which are so crucial in that the procedure and structure of Forwood is built heavily on them, that their rejection would demolish much of the structure. These assumptions are highly questionable, and they should be rejected. They are:-

1. That the production goals for public forests can and should be set in terms of anticipated consumption of wood products.
2. That it is the role of public forests to guarantee the supply of all, or almost all, this anticipated consumption, or what industry believes it can market.
3. That the continued growth of all sections of the forest industries is something which is desirable and which ought to be given various forms of encouragement and assistance, either continued or further encouragement.

The first assumption should have no place in genuine multiple value planning. Given multiple value aims (as explained in Chapter 16), targets for forest production cannot be set just in terms of industrial and consumption goals, but only adequately in terms of an integrated picture considering all values and what the forests can supply without excessively depressing other values or creating environmental damage. In short, on a proper multiple value approach anticipated demand for forest products would be a *relevant* consideration, but not the sole or major determining one, as Forwood takes it to be.

Once the industrial crop picture is rejected the second assumption becomes quite questionable. Although there is a case for saying that public forests should plan to supply reasonable future requirements, there is no reason why they should be expected to supply *any* industrial demand, particularly for undesirable or junk end uses one does not wish to encourage, beyond this level. (The demand that the public forests should supply anything industry requires appears to be behind the accusation that those who wish to see a more restrained use want to 'lock up' the forests. Forwood [1], p.14). There seems no good reason why it should not be required, for example, that the raw material for the large quantity of packaging and disposables Forwood anticipates should be produced from paper companies' own private plantings on purchased cleared land, thus allowing a free market to operate for commodities over and above reasonable requirements and removing one source of unwarranted public encouragement for such undesirable end uses.

The third assumption is an unselective growth assumption which should no longer have any place in planning which is supposed to have rejected the assumption that increase in GNP represents increase in welfare. It is particularly unacceptable for that substantial portion of the forest industry which is engaged in producing junk paper material of questionable benefit to the consumer and of unquestionable cost in environmental terms. Yet this fundamental assumption is unchallenged throughout Forwood and no attempt is made to assess whether the expansion of this part of the industry is desirable or to formulate or apply more critical and selective criteria for encouragement and for concessions to industries, to ensure that encouragement is provided only for those industries whose expansion really is in the public interest.

The really large and controversial assumptions of Forwood are never clearly stated or brought out for discussion and assessment, but are buried in the structure. These features (both the organisation and these crucial underlying assumptions) ensure that despite the surface appearance of objectivity and discussion conveyed by the mass of data assembled, Forwood was largely a promotional exercise for the interests of forest industries and forest services. That despite the mass of data collected the Conference was largely a piece of industrial lobbying – with many of the public servants involved apparently every bit as anxious to promote the forest industries' interests as the industries themselves – is also well illustrated in the heavy slant in the presentation of data, the omission of unfavourable facts, and the careful assemblage and presentation of data favouring the case of industrial expansion and assistance – all matters we shall document. The Conference was not an honest attempt to admit or assess the costs and risks of the forestry projects proposed and types of management and greatly increased production proposed, or to evaluate fairly the real justification for and likely advantages to the community of the expansion of consumption anticipated, but was an

attempt to promote and justify cherished projects and plans for expansion.[1] This aim appears to have influenced even the presentation of statistics, for example those on national parks in the Forest Resources Panel [2], which are repeated elsewhere, e.g. appearing in a Forwood supplementary document somewhat misleadingly entitled 'Forestry Facts'.

Forwood [2] has lumped all the areas of forest permanently reserved for non-timber use in together under a heading which is most misleadingly called 'National Park' (e.g., in Forestry Facts, and Forwood [2] p.10) to obtain a claimed total of about 5% or 1,829,600 hectares in this category. In fact the area cited in hectares is less than 4.3% of the total area of Forwood-forest but has been rounded up to 5% and includes areas in aboriginal reserves, water catchment reserves, and forest parks, as well as national parks and reserves. This is an attempt to give the impression that the minimum standard of 5% of area in national park has been met in the case of forest, when in fact on our estimates only between 2 and 3% of the total (old) forest area is in national parks. However minutes of the Panel meetings clearly show that separate figures were obtained for each of these categories of non-timber use and were used in compiling the total figure. There is no clear statement anywhere of which reserves are included in the category, although the key (Forwood [2] p.8) shows that all the abovementioned things were. As there are substantial differences between the various non-timber uses, and the issue of the adequacy of the existing area of forest in national park is a contested issue, the failure to give a proper breakdown and the lumping of so many other uses under 'national park' is highly objectionable. The procedure adopted must be regarded as an underhand way of attempting to make the area in national parks appear larger than it is, e.g. by including extra areas with no clear breakdown, or statement of what is considered, with a misleading title, and with a figure rounded up from 4.3% to 5%. Evidently the presentation of statistics has here been slanted in an attempt to obscure and mislead on this important issue.

Similarly national parks get short shrift in the Land Use Panel (Forwood [1]), which, despite the fact that is was required by its terms of reference to 'investigate and recommend on the values of forestry compared with other land uses', largely ignored national parks as an alternative form of land use in the economic comparisons, prefering to concentrate exclusively on comparisons with agricultural uses. There is no suggestion either of further research to determine relative benefits of production forests as compared with parklands or wilderness reservation. The Land Use Panel has however recommended (Forwood [1], p.19)

> That proposals for reservation to non wood use of areas containing substantial areas of commercial forest be subject to benefit-cost study....

This in effect imposes a condition on reservation of forest for national parks and for non-wood use which is far stronger than most commercial forestry projects are required – or are able – to meet (e.g. Manjimup project of more than 1 million acres). Certainly there is no recommendation in Forwood to apply such conditions to all wood production projects. Where they are not ignored, the panel evinces a consistently hostile attitude to national parks and wilderness areas, blandly presenting them (especially in Forwood [1] p.37 ff) as of interest only to a small minority (although what the empirical data is on which this claim is based they do not say), as a heavy financial and social burden depriving the community of essential materials and forcing the use of more expensive or environmentally damaging materials, and so on. Thus Forwood [1] p.37, states:

> If the land base of commercial forest continues to be eroded by reservation to non-wood uses, foresters will be presented with a tremendous challenge to maximize wood production on available land.

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1 An example of the way in which Forwood could have presented and considered various different major policies is provided by Alternative Futures [1].

This warning of dire consequence if more forest is reserved in national park should be contrasted with Forwood [4], p.5 and p.30

> ...surplus pulpwood will be exported

and Forwood [3], p.15, which implies that a plantation of some 1.8 million ha. could meet estimated domestic consumption by 2010, as well as Survey [2] p.29:

> The balance excludes approximately 3 million cubic metres of pulpwood from north Queensland, Northern Territory and Western Australia considered to be not economically available for domestic consumption.

and the statements (quoted in the footnote on p.324) revealing a substantial amount of additional pulpwood considered available and earmarked for export in south-eastern Australia. It suggests ([1] p.37) that the establishment of national parks and wilderness areas should be confined to land of no value for commercial forestry, to 'avoid conflict'. The claims as to the essential nature and vast economic and social benefits to the community of all forest production and consumption simply do not stand up to empirical examination — empirical examination of these claims of course being carefully avoided in Forwood. And when more than 5 million acres of forest is given over to export woodchip projects, the forest resources of WA, NT and north Queensland are earmarked largely for export, and huge potential resources in NSW and Queensland are designated for future export, the claim that the community cannot afford, without dire consequences, to reserve more land for non-wood use in national parks can only be described as hypocritical.

Survey [1] p.11 also informs us that national parks are single use areas, the single use being recreation (with, it is conceded, possibly in some cases a catchment value), while Forwood [1] (p.16, 24) provides as one of its criteria for land-use that 'decisions should ensure that multiple use should be applied wherever possible'[1] — from which two propositions it clearly follows that national park reservation should be avoided wherever possible.

Forwood consistently attempts to play down any likely adverse impact of the proposed expansion of forestry activity on the existing forest area or on the environment. Thus the Forwood papers continually stress (e.g. Survey [1] p.9, 'the important facts are that...') that pine forests will represent only 3% of the total forest area, a figure which fails to give an accurate picture of the actual destruction of forest in populous south-eastern Australia, where the NSW program of 1½ million acres under pine, for example, will entail destruction of nearly 20% of the existing state forest area, or about 11% of the better publicly owned forest on Forwood's figures (i.e. excluding class III), and involving the destruction of nearly all the mountain forest outside national parks. Even under Forwood [2]'s figures the area under pine will comprise almost 8% of the better Forwood-forest[2] (rainforest and productivity class I and II forest plus plantation) — a more relevant comparison than the total forest (and woodland) area since that is the class affected by pine planting. The area in national parks in the better Forwood-forests is considerably less than this figure, yet Forwood does not regard the area in national parks as insignificant, nor, plainly, would it be happy to see this area increased to the 8% of the better Forwood-forest regarded as so insignificant in the case of pines. The impact of the destruction cannot however be assessed in terms of area percentages. Neither the local impact on certain regions, nor the significance of the conversion of areas such as the Boyd Plateau adjoining parks, can be assessed in such a fashion. The impact of the elimination of a big percentage of mountain forest (since the program will hit particularly hard the forests of the Dividing Range), can no more be captured by expressing it as a percentage of total forest area than the impact of greatly reducing the area of rainforest (4% of

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1 A principle which is however contradicted in Forwood [3] (p.2 and p.55).

2 We use the term 'Forwood-forest' to designate forest as estimated in Forwood [2]. Forwood-forest includes substantial areas previously counted as woodland. The characterisation of Forwood-forest is given in Forwood [2] p.8 as 'native forest with an existing or potential stand height of 20 metres or cypress pine forest currently in commercial use regardless of stand height' or plantation. This should be compared with the ecologically based definition on p.2.

the total[1]) can be captured in terms of its percentage of the total. These points are quite well known and Forwood's persistent stressing of the 3% figure is part of its determined refusal to recognise any costs to the pine program or any other forestry operation. In addition to total failure to recognise, and indeed attempt to disguise, the fact that the exotic pine program will make a significant incursion into the native forests of southern-eastern Australia, the discussions, e.g. in Survey [1], p.9, continue the misleading statements about the extent to which cleared land[2] has been used and will be used for the program, describing such areas as catering for 'much of the present and future planting'. Insofar as this claim is not completely false (see Appendix 3) in that only a fraction of land use is cleared land, i.e. land from which the native forest cover has been largely removed, it depends upon confusing land from which the native forest cover has been cleared with privately owned or leasehold uncleared forest land or forest land which was once leased for grazing, which may of course carry native forest (NSW [1] well exemplifies the confusion). The discussion of the effect of pine plantations on fauna and flora shows an equal determination to play down costs.

> Pine plantations provide a completely different plant and animal habitat from any occurring naturally in Australia. Interestingly enough, many Australian species of animals and birds have adapted to this exotic environment and have colonised the pine forests. (Survey [1], p.12)

Naturally the fact that a very much larger number of Australian species are adversely affected by the extensive clearing of mountain forests for pines was not interesting enough to remark on. Nor is any consideration given to the possibility that some of the wood end uses might be unworthy and inessential. The discussion of the ecological effects of the pine program, like the discussion of clearfelling, is not an honest assessment of costs, risks and advantages and options, but a careful attempt to promote cherished forestry programs.

The inconvenient facts of pollution from pulp mills, documented in Tas [3] and SA [2], are likewise carefully skirted, a somewhat surprising fact in view of the substantial expansion in paper production and milling activity envisaged and planned for by the conference. The very substantial problems of water supplies and waste disposal systems for the inland industrial complexes, such as those planned at Tumut and at Oberon are not even touched upon. Nor is there any recognition of the contribution of the packaging industry, so well represented at Forwood, to city garbage disposal problems, though paper products make up a very high percentage of city garbage, an increasingly serious problem for the future.

Yet Forwood envisages a large expansion of consumption by 2010, the major part of which comes from expansion of consumption of paper and paperboard products, especially disposable items; that is, the expansion envisaged is mostly that of the junk-producing part of the pulp and paper industry, and it is partly on the premiss of expansion of this type of forest product that the case is built for the 3.45 million acre pine program called for and for the need for expanded production from the native forests. But just as the costs of these proposals are not honestly assessed, neither are the advantages to be gained from them and the necessity for them. Despite the fact that consumption of such paper junk is planned to account for more than a third of per capita consumption of forest produce at 2010 and total paper consumption is nearly half the total, the production of this material is throughout presented as quite essential, and the Survey paper ([1], section 1.5) dishonestly attempts to present the production of all forest product material as environmentally admirable through misleading use of results such as Dane [1] (which merely compares other construction materials with lumber; see p.75 above). It attempts to use such results to argue that no reduction in the consumption of junk forest produce can be or ought to be contemplated, and even to argue that its consumption ought to be increased:

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1 According to Forwood [2] and 'Forestry Facts'. However the extent of remaining rainforest appears to have been exaggerated in these estimates by mixing in climax classifications, that is counting as rainforest certain areas of high rainfall mixed eucalypt forest where the climax forest would be rainforest.

2 The small exceptions are South Australia which is forced to use cleared land since so little native forest remains and ACT which has now adopted a long overdue policy of planting further pines on cleared land only.

...rather than limit the use of forest produce, every effort should be made to utilize it further. Survey [1], p.7.

What is ignored in the discussion and the endorsement of increase in such junk paper production are the costs on forests from more severe exploitation, the heavy pollution costs in production, the real cost to the community of junk disposal, and the very minor or questionable welfare benefits to be gained from the use of the material, the lack of necessity for much of it and the fact that there is the real alternative of not encouraging such production (which is not merely that of using more damaging alternatives). In the light of the fact that more than a third of consumption at 2010 will, given Forwood's estimates, be of these sorts of junk products and nearly half in paper products, the discussion in this section (Survey [1], section 1.5), and the attempt there and throughout Forwood to represent the consumption of forest produce as always necessary, environmentally admirable and to be encouraged, and to obscure the option of ceasing to encourage it, can only be described as thoroughly misleading.

Another indication of the infiltration of industrial values, interests and aims in Forwood is that even the forest resource itself is no longer classified in a biological way using purely biological distinctions,but in terms of its industrial capacity and potential, as is evident from the classification of Forwood [2].

In addition to the acceptance and subtle promotion of industrial goals, which one comes to accept as normal in forestry literature, Forwood has a number of features which make its assumptions and proposals especially favourable for the forest industries. The three basic assumptions (outlined above) are important here, particularly the commitment to meet industries' requirements (which Forwood predictably sees as Australia's requirements) from public forests. This commitment to meet industrial demands for raw material can be seen in the fact that there is no consideration in Forwood of the extent to which the private industries – whose marketing demands form the basis for 'prediction' of future requirements – can reasonably be expected to provide much of this raw material (especially for unnecessary end uses) themselves from their own resources by the purchase of private cleared lands on which to establish plantations[1]. Were demand for the material as strong, certain and insatiable as the Forwood Reports suggest, and were the production of the material as beneficial financially as is claimed, then it would be difficult to see why these private companies are not anxious to undertake such measures to supply their future needs themselves. Instead of requiring that the industries largely producing junk paper guarantee the supply of a substantial amount of the material for these unnecessary commodities from their own resources, and coordinating planning between public and private sectors on an equitable basis, the Forwood Conference, true to the ideology of public forests as a cheap industrial crop and public forest services as socialising the raw wood part of production, has simply undertaken to meet nearly all industrial demands from public forests and in effect simply handed the industries an open go on an important public resource. Despite the fact that the capacity, of the paper part of the industry especially, to provide much of its own future requirements by planting on purchased cleared land, appears quite considerable, Forwood suggests that insofar as they are expected to provide their own requirements they should be leased, what it is pleased to call 'idle Crown land', to plant pines, or gain government assistance to purchase marginal farmland. The latter suggestion, unlike the former, might at least have some merit in reducing the amount of bush cleared for pines, but suffers a number of obvious disadvantages including the one that there is no guarantee that the material so provided, being privately owned, would be used to meet domestic requirements[2] if it becomes more advantageous to export it (as it could do in the shortage situation Forwood envisages).

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1 Except for a suggestion that a research project might investigate production of material from public forests with the alternative of *subsidising* private forestry.

2 Forwood's failure to consider this as a possibility in the case of such privately owned resources makes an odd contrast with its discounting of NZ's available surplus, on the grounds that NZ could sell the material elsewhere; so could Australian firms.

To complete the picture, the private industries have been allowed to stipulate what they believe to be their (maximal) future 'requirements', and forest services have obligingly undertaken to produce the material cheaply for them, without any proper consideration of whether the production or consumption is advantageous or beneficial, and to whom it is, or of the equitability of producing the material from public forests. There has been no real attempt to assess whether or not the growth of some of these forest industries, particularly parts of the paper industry, i.e. the portion which produces disposable items, excess packaging, etc., is really necessary and genuinely in the public interest.

The implicit procedure of the Marketing Panel (Forwood Panel 6), charged with estimating what Forwood variously describes as future 'requirements' and as future 'demand', was to consult industry as to what it believed its output would be under the most favourable conditions with respect to prices, tariffs and supply. The figures so obtained were subsequently taken over in determining what is claimed to be required production from public forests.

Not surprisingly, the result of the dangerous procedure of giving forest industries the opportunity to specify 'requirements', to be produced from public forests, at 2000 and beyond, is considerable overestimation, particularly of requirements of paper products, and disposable paper goods and packaging sections particularly. For the forest industries can maximize their organisational interests by overestimating 'requirements' — an understandable enough aim on their part — by estimating requirements hopefully or as slightly higher than the largest levels they consider consumption may reach, since forest services have undertaken to produce the raw material they request from public forests at cost or less. For if demand does reach these high levels then they will be able to supply it, given appropriate ancillary conditions such as tariff protection, cheap supplies, etc; while if it does not reach these levels then even so they have lost nothing since the risk in producing the supply is not theirs and they will still be able to take best advantage of the situation. For as the forest industries are not producing the material themselves, the interests of forest industries cannot be damaged by, and can only be furthered by, oversupply, since resulting losses from depressed prices for raw material will fall on the public sector and the advantage of depressed prices will again favour the manufacturing sector which will be able to obtain raw material at low prices and still maximize consumption.

Because they can increase consumption due to the final price being lower where there is an oversupply of raw material, but without decreasing their share of profit from the final price, sales must be increased and profits thereby increased. Oversupply is, in short, in the interests of the larger manufacturing industries given that the raw material oversupplied is produced by the public sector, for these industries can thereby maximize their profits and growth. Asking industry would only be an acceptable procedure if industry were to produce the raw material and take the resulting risk themselves.

All this is rendered possible by the assumptions made by Forwood that the public forests will supply, at cost or less, the bulk of the raw wood fibre for private industry.

There are three further conditions for the Forwood conference being the large forest industries', especially the paper industries', blueprint for paradise, apart from the preparedness on the part of the forestry planners to have public forests produce what industry demands; namely, the abandonment of the proposal that royalties cover the full costs of production of raw material and allow a reasonable return to forest services; secondly the strong advocacy of the maintenance of protection, e.g. through high tariffs designed to protect industry from competition; and thirdly the advocacy of the policy of self sufficiency, so that raw material production is not interfered with by realistic estimates of material available from elsewhere, and a guaranteed market for the industries' finished products is available. Yet none of these central assumptions receives adequate exposure or scrutiny in the final reports.

The uncritical acceptance of forest industry growth objectives together with the biassed representation of the conference, the case-making in favour of industrial interests and for cherished projects and against other interests such as national parks, and the recommended handouts (listed below), shatter any claim that Forwood has adequately considered community interests, and make it plain that it is largely a sophisticated piece of industrial lobbying conducted under the auspices and with the assistance of several government and university

departments. It might be argued however that it is a *harmless* piece of industrial lobbying, and that no damage would have been done had it been honestly presented as an attempt by the forest industries to plan their own growth rather than as fully representative of all community interests. On this picture the most the Forwood organisers could be accused of is a certain degree of harmless misrepresentation. For in the currently approved economic arrangements one cannot blame private industry for attempting to further its organisational interests, and in a well-regulated economy there is not necessarily anything dangerous in its doing so when given such a golden opportunity. The matter becomes more serious however when industry is helped in such lobbying and even excelled at times, and uncritically assisted in its expansionary aims, by public servants who are charged with adequately safeguarding the public interest in an important public resource, but who have plainly in this case failed to do so and who have also assisted to pass the whole exercise off as an adequate piece of public policy making. Similarly it is not just a harmless case of an industry planning its own future growth as suggested by some government ministers, e.g. the Minister for Primary Industry; for because of the extent to which it relies on public forests (as well as other public amenities such as water and roads), it is at the same time being given the right to plan to a large extent the use of an important public resource, with government assistance and help – and the planning no matter how well packaged is plainly to use this resource essentially in its own interests. The claim that it is simply a case of industry innocently planning its *own* growth assumes, what is plainly false, that the wood production goals set, the volume and kind of wood production activity planned, etc., are independent of and have no significant repercussions on non-wood production or public amenity values of forests or on other groups with an interest in these aspects.

Free enterprise at work: more public money for forestry

The major concessions to the forest industries, which were assumed in the structure and procedure of the conference and Reports, and which nowhere appear clearly for proper examination and discussion, are the implicit assumption of the desirability of growth of the industry and the implicit assumption that it is proper to set production goals for public forests in terms of forest industries' predicted 'requirements'. But, in addition to these crucial implicit concessions, there is an explicit set of recommendations for public assistance, which helps to confirm the character of the conference as primarily an exercise in furthering the interests of the forest industries. The recommendations form an impressive list. Among them are some valuable suggestions (put up, one notices, where they do not conflict with the interests involved, e.g. for the removal of taxation concessions for the clearing of private forests, for purchase of some cleared land by the Crown for forestry, and for a code of ethics for afforestation companies), together with some of an apparently harmless sort, a number of an evidently objectionable nature, and some very significant omissions. The general character of the recommendations, as oriented to promoting industrial and production forestry growth, rather than as oriented to sound ecologically-directed, restrained multiple-value management of the forests, is rather plain.

The recommendations for public assistance to forestry, most of which would benefit if not directly at least indirectly forest industries, which made it through to the final recommendations (in Survey [1]), are as follows:-

- Assisted economic research, through a government economic research unit,[1] and finance to the states for economic studies of forestry.
- Public funds for the administration of and research into multiple use on both public and private forests.

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1 Perhaps the proposed economic bureau could be called 'The Forest Industries Protection and Promotion Bureau'.

- Public funds for the Crown purchase of private lands better suited to forestry.
- Funds for the purchase of farmlands suitable for conversion to coniferous plantation (according to Forwood [1] including special additional funds from Treasury over and above those provided under the Softwood Agreements Acts).
- Commonwealth establishment of a Forest Resources Committee within the Australian Forestry Council organisation, and sponsorship of the Wood Based Industries Council.
- Leasing of idle Crown land for private plantation establishment.
- Government assistance to private forestry to purchase marginal farmland suitable for plantation establishment.
- Jointly financed government-private industry harvesting research programs and co-operative harvesting ventures.
- A National Safety Council investigation of harvesting accidents.
- Federal assistance for intensive practices on native forests if acceptable cost-benefit ratios can be established (no other safeguards are proposed).
- Taxation concessions and financial assistance to the private forestry sector at present levels at least until a fair economic review.
- Government encouragement of technological development of forest industries, including grants for selected projects.
- Public assistance at special rates of interest for sawmill amalgamation.
- Expansion of decentralisation assistance to forest and wood-based industries.
- Government-financed investigation of future forest product markets.
- Government-sponsored National Timber Market Research Units.
- Substantial government financial support for an extended program of forest product research and development.
- Government subsidies for training of workers and managers in the forest-based industries.
- Strong Federal and State support for the Production Forestry Development Plan. This plan, not so far approved, called for:-
- Expansion of the softwood planting program, leading to 3.45 million acres of conifers at 2010.

Behind these final recommendations for assistance stood recommendations for assistance and concessions made by the Panels which did not make it into the Survey recommendations, and beyond these again were the many recommendations of the Working Parties, supplying reports for each Panel which were not incorporated into the Panel recommendations. We give the flavour of the additional Panel recommendations for assistance and concessions by a selective listing:-

- Woodlot schemes should be particularly encouraged by the States in areas of genuine plantation development.
- Governmental encouragement of the technological development of the forest products industry; especially encouraging and extending research programs to assist industry, by grants to industry, by governmental research, etc. (more generally, there is a range of requests for assistance on research projects which directly or indirectly benefit forest industries, e.g. substantial financial support for product research and development; [6] p.11).
- Assistance to private industry for both pine and eucalypt plantation establishment.
- Federal and state authorities' support for a campaign highlighting the forest products industry in assisting regional growth, and increased decentralisation assistance.
- Government support for small industry reconstruction and for amalgamation of small sawmills (a request qualified in some places by the rider, where this is economically viable – in which case it is not so obvious why support is required).
- Government subsidies for both pre-service and in-service training and retraining schemes for both workers and management.

- Continuing review of forest product specifications to ensure that they are not higher than necessary.
- Setting of *realistic* limits for effluent and environmental protection —to 'avoid the high cost to the community that could result from unnecessarily stringent specifications' (but at the same time, and inconsistently, setting high standards for environmental protection and pollution control; [5], pp.18-9).
- The established level of tariff protection should at least be maintained in the future: 'There is a continuing need for a Government-sponsored export scheme'.
- Costs of pollution control and meeting social environmental requirements should be reviewed by federal and state governments with a view to increasing taxation allowances for capital works and operating expenses on environmental control [thereby negating polluter pays and environmental pricing principles].
- Company taxation should be revised to assist decentralised industries, e.g. through revised depreciation allowances.
- Export incentives should be continued, but granted on a more equitable basis; also relief should be granted on the cost of representatives travelling overseas.
- Revaluation of road tax to assist decentralised industries such as forestry should be considered.
- Decentralisation assistance should include the provision of acceptable housing at reasonable cost for industry's employees, and cost reductions for industries in power and energy, transport, and postal and communication charges.
- Pine plantation establishment programs should be intensified in areas around potential pulp mill sites, given that a joint review of the matter by industry and the Australian Forestry Council indicates that this is warranted: similarly for a national eucalypt regeneration and plantation establishment program.
- The Australian government should encourage the technological development of pulp and paper industries, e.g. by encouraging and extending research programs which assist industry, and fostering cooperation between industry and governmental agencies, by grants, etc..
- Market research should be expanded and encouraged with the financial assistance of the Australian government, and a National Timber Market Research Unit should be provided with assistance similar to that available to primary industry units.
- Government should assist with the formation of marketing cooperatives.
- A wide range of state transport and infrastructure concessions should be granted to forest product industries, e.g. concessions in country areas, permission to carry wider and heavier loads on roads, removal of low clearance bridges, revised shipping and rail freight rates, government financed and maintained port facilities, public funds for railway installation and upgrading, an amended Navigation Act to facilitate coastal barging with dumb barges, etc. (For breathtaking lists of such recommendations, see [6], pp.10, 107, 119).
- A joint industry-government committee be formed to ensure close consultation on the establishment and operation of various forms of assistance to industry to meet import competition and on the workings of trade agreements (e.g. NAFTA [1]).
- Incentives and professional advice should be given to owners of suitably located private lands to establish, regenerate and maintain forests of species acceptable to the Australian forest product industry.

Lastly there is a list of suggestions for further assistance, presented in the Finance Panel [7], p.25). These include 100% tax concessions on forestry company shares; taxation, land tax and rate concessions for forest land; and continued fertilizer bounties for afforestation companies. Although these suggestions which the panel received were not put forward as specific recommendations, it was recommended that Australian and State government policies be examined in depth by a joint government and industry committee as they affect wood based industries, e.g. in the fields of taxation (company tax, depreciation and investment allowances, pollution control), export incentives, tariff protection (retention), and so on.

The *Draft Production Forestry Development Plan* (Survey [2]), supposedly built on the Panel Reports [1]-[8], recommends and attempts to justify publicly-subsidised expansion of production forestry in Australia, both through an expanded pine program of almost 3½ million acres (1.4 million hectares) by 2010 AD under the Commonwealth Softwood Forestry Agreements Acts and associated legislation, and through the intensification of exploitation of native forests which it is planned to turn largely to pulp production. It recommends this expansion without any real attempt, despite the four years of preparation involved in the Forwood conference, to assess or discuss properly either (i) the economic structure of the industry and its level of public support and protection or the relative benefits to be obtained by its expansion, or (ii) the effects on the Australian environment and on the remaining forest areas of this proposed expansion.

Although it might initially appear that the proposal to purchase, with government assistance, suitable private cleared land for pine planting is an acceptance of the conservationist proposal that planting pines on cleared land should replace clearing native forests to plant pines, a closer examination of the Forwood's recommendations on this matter show that this is by no means clear. But unless there is a worthwhile reduction in clearance of native forest the proposal to plant on cleared land will do nothing for conservation of native forest, and will just be a way of expanding the forestry empire and producing bigger and better feeder areas for the planned integrated mills with substantial public assistance. The proposal that areas purchased should lie near existing plantation zones suggests that areas of cleared land to be planted will supplement rather than replace areas of native forest scheduled for pines. In addition to the obscurity of Forwood as to whether the clearing of forest would be reduced in proportion to the amount of cleared land bought, the proposal to lease 'idle Crown land' to private companies for planting pines would evidently increase the amount of forest to be cleared for pine, since the private companies involved might otherwise have bought cleared land for their planting. The recommendation to lease 'potentially productive idle Crown land' to private companies, in addition to being inconsistent with the weakened criteria for land use planning[1] also set out in Forwood [1], would carry all the disadvantages of planting to pines by public forest services but without any of the guarantees, e.g. that the material would be used to meet local demand, that even the minimum standards of environmental adequacy that forest services impose would be met, that there would be public access. The recommendation would sanction the virtual alienation of scarce public native forest, amounting to a virtual gift of free Crown land to private interests, and is particularly objectionable in the light of the probably irreversible effects of pine plantations, e.g. the elimination of the original ecosystems and the run-down of the land likely to occur after initial rotations and its subsequent unsuitability for a number of other uses.

The fact is, despite the frequent implicit suggestion that more money and concessions for forestry will add to public amenity and increase the ecological soundness of forest management, that in general this will not be the case; what is required in order to guarantee these things, is not so much more money and more concessions, but an ideological change in forestry attitudes to the forest. Unless there is such an ideological change, away from the industrial crop picture of the forests, more public money and concessions for forestry of the kind largely sought in Forwood will mean more rather than less destruction of public amenity, more ruthless exploitation of forests for timber production, and more reduction in non-wood production and other natural values.

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1 Criteria (b) and (e), Forwood [1], p.10, also pp.23-4. Weak and inadequate as the criteria for land use planning now are, they rule out recommendations like recommendation 12, Forwood [1].

Forwood's treatment of non-wood production matters.
I Industrial ecology

The extensive list of recommendations for assistance with industrial aspects of forestry, for research on marketing and harvesting and for concessions to the forestry industries, contrasts rather markedly with the failure to include any recommendations for assistance for the vital program of research on the ecological effects of forestry operations and other environmental matters[1], and again illustrates the excessive industrial orientation of current forestry thinking.

However Forwood's organisers have been quite correct in claiming that Forwood has not *ignored* environmental matters. Where it has seemed possible to use either the aim of encouraging environmentally desirable production or the other aims of, or even the terminology of, the new environmental awareness to serve the objectives of industrial or organisational expansion and the promotion of long cherished projects, the Forwood conference and papers have given environmental matters considerable emphasis. Thus Dane's results, and renewable resource and biodegradability arguments, and such points as the contribution of forests to oxygen production, reappear in report after report – and are used to 'justify' the expansion of forest industries and as a basis for requests for a range of subsidies and other concessions. But as we have remarked above, a number of environmental debits of production forestry and forest industries do not of course receive nearly as much exposure or attention; such costs as pollution are systematically avoided.[2] In short, the assumptions, values and terminology of the environmental movement have been exploited where they suited the Forwood case, suppressed where they do not.

But despite the use of similar terminology and other superficial similarities, there are a number of basic differences between the values and aims of conservation and the attitudes of conventional (industrial) forestry as exhibited in Forwood. They emerge in at least the following attitudes of Forwood:-

(1) The apparently implacable hostility to the reservation of further commercial forest in national parks, or to the exclusion of significant commercial forest areas from logging (a consistent if muffled theme in Forwood).

(2) The failure to assign a general value to remaining natural systems and areas, or to recognise any cost when a rich, diverse natural system is replaced by a more impoverished one with equal wood production value (except in a few special cases).

(3) Adherence to a public purse policy, and to other 'free good' pricing policies which penalise the environment.

(4) The promotion of high and excessive consumption of needless and largely unwanted paper items (for example), whose production is undoubtedly not without severe costs.

These features show fundamental differences between conservation and conventional forestry.

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1 The most that was recommended (Forwood [3], p.4: the recommendation was not included in the final recommendations of Survey [1]) was that

> Forest managers should make funds available to support continuing research into aspects of forest ecology.

There was no call for assistance for the much needed independent research programs.

2 Just how opportunistic the use of Dane's results [1], which depend largely on pollution, is in the justification of maximum production and consumption of wood products, and how genuine Forwood's concern with pollution is, can be gauged from comparing its use of Dane's results with Forwood [6], p.118, which suggests that Australia has a 'comparative advantage' with respect to Japan in pollution absorption capacity and could well think of taking over polluting Japanese pulp mills; that is Forwood suggests in effect, that Australia could become a pollution haven. It should also be contrasted with Panel 5's expressed concern lest pollution controls on local paper mills not be 'realistic'.

The opportunistic use of environmental concepts and values in part accounts for the very tacked-on treatment given to non wood-production and environmental values in the Forwood papers, where consideration of environmental issues – except where they are used promotionally – is largely confined to the Multiple Use Panel [3] (except for two sections of the Draft Survey [1], which simply repeats and quotes Forwood [3], and a small and largely platitudinous segment of Forwood [1]). And it can hardly be pretended that the treatment in Forwood [3] is satisfactory or involves more than a superficial examination of many of the important issues. An integrated and systematic treatment of environmental matters, which is part of what is involved in genuine 'multiple use', would have considered environmental questions throughout, wherever environmental matters have a bearing or are likely to be affected by decisions taken.

Thus environmental matters should have been considered in connection with all the expansion plans and the likely environmental effects of production targets and their desirability (which was not considered anyway except in the most general, comforting and vague terms), in the plans for pulp production, in the section dealing with royalties and pricing (which should have considered the environmental costs of alternative methods of operation and how royalties are relevant to the issue of discouraging more or less undesirable operations), in marketing (in the determination of demand and desirability and community costs of expanding certain types of consumption such as junk), in the design and operation of harvesting methods, in the mapping of the forest resource itself, and so on. In short, in a properly integrated treatment of multiple use, consideration of environmental and non-wood production matters would have appeared in every section, instead of being relegated to one 'showpiece' section, consisting largely of vague New Year resolutions.

Similarly the whole procedure of setting production goals for forests purely in terms of industrial and forest product consumption goals, and *then* attempting various ameliorative measures to take account of non-wood production matters is a rejection of a proper integrated multiple values approach, which would set production goals *taking account of* all values and by considering what the forest could supply without excessively depressing other values. The procedure of setting production goals in terms of anticipated consumption either assumes a dominant use for wood production approach with other values as afterthoughts, or assumes, what is clearly false given some conflict between wood production and non wood-production variables, that these variables can be maximized independently of one another.

It might be thought that what is proposed in the case of wood production is asking for too much, since few other industrial operations are conducted in this way. However multiple use by its very nature, means that such considerations cannot be a series of vague afterthoughts, but must involve this sort of consideration of all values at all stages, e.g. in each stage from initial data collecting through to final decision-making.

Even apart from these criticisms one can scarcely pretend that the treatment accorded non wood-production matters – where they *are* considered – is at all satisfactory, despite the conviction of the Forwood organisers that Forwood [3] demonstrated the deep environmental concern of forest services and industries and represented the crowning glory of the Panel Reports, and despite the widespread satisfaction with which it was apparently received by many of those attending the conference. For example, the discussion of ecology largely consists of a series of vague generalisations and reassurances, and fails completely to come to grips with, or even recognise, a whole range of important issues, uncertainties and problems. The general impression is conveyed, both in the discussion of Forwood [3] on ecology and clearcutting and in Survey [1] (sections 2.61-3), that those in charge of the forests know all about the effects of their proposed activities and are quite capable of handling any management situation which may arise without modification of their aims of expanded production. There is practically no admission in the Forwood discussions of any inadequacies in present forestry knowledge, or of the need for monitoring of existing projects in order to determine the real effects of present techniques such as clearcutting, which Forwood envisages as becoming extremely widespread, or of the possible need for modification of the program of expanded wood production, outlined in the Draft Plan, in the light of further research and information. In spite of the fact that

Forwood presents a major program of expansion of wood production which would appear to involve major alteration a very large part of (indeed, given the plans for turning the native forests over largely to pulpwood, perhaps nearly all of) the existing commercial forest area,[1] and despite the fact that this is to be undertaken without any real knowledge of what its likely effects will be, there is no real recognition in Forwood of the necessity for a major program of ecological research into the effects of such operations or of the need to modify plans for expansion of wood production in the light of it. Despite the proposed expansion of the pine program (both by public and private plantings) there is scarcely a word about such problems as the effects of pines on soils or the problem of sustainability. In fact the very complex set of problems connected with soils (e.g. podzolisation, erosion, nutrient loss, compaction) receive no discussion whatever, except for the remark that forestry provides better protection for the soil than agriculture.

Not only does Forwood's perfunctory treatment of ecological issues attempt to gloss over uncertainties and problems, but also the little that is presented is largely industrial ecology. The aim of industrial forest ecology is to justify as ecologically sound those methods which produce maximum quantities of wood. In this case the main harvesting method is thought to be clearcutting, and Forwood naturally sees few restrictions on its use, even claiming that it is a 'necessary part of' the management of eucalypt forests. Industrial forest ecology identifies what is ecologically sound with what produces large quantities of regeneration of favoured timber species; at its worst it not only fails to consider other values but fails to consider long-term sustainability, which is by no means demonstrated by initial production of large quantities of seedlings. Large quantities of seedlings can be established even on areas previously strip mined for bauxite and soils run down by rotations of pine monoculture. The production of large quantities of seedlings, then, does not show that site productivity has not been seriously impaired.

It is worth dwelling on this fallacy of equating ecologically sound methods with those which produce the maximum desired crops of seedlings and (in sharper formulation of the dogma) lead to a high wood volume, since it is very common in forestry mythology. Such conditions are, of course, neither necessary nor sufficient for ecological soundness, indeed not even for enabling long-term stability, let alone the maintenance of other relevant forest values. Generally there is a tradeoff of values: high wood production levels in the short-term are frequently obtained at the expense of other values (as we have explained in detail). Not only does the common industrial attempt to meet objections to clearcutting and its effects on other forest values, by pointing to the production of a large crop of seedlings, rest on this

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1 Whether this eventuates depends on whether forest services can manage to unload remaining unexploited forest areas as pulpwood concessions: thus, according to Forwood [2], p.13 ff., in NSW,

> There is a vast resource of timber, unsuitable for sawlogs, poles, etc., present in the native eucalypt forests....this large resource is available to be utilised by any manufacturer who can overcome [the] problems.

In Queensland,

> The most promising area for development is in the utilization of pulpwood from the native forest. There is a huge resource of the material in all regions but there are enormous practical difficulties associated with its utilization.

In Tasmania although almost

> all the available pulpwood is committed on a long-term basis.... It is likely that [the] rainforests will, in the future, contribute significantly as sources of pulpwood for local use.

In Northern Territory

> approximately 300,000 hectares [of the 681,500 hectares of tropical eucalypt in the Darwin Region] is available for development and timber production.

And so on for other regions, wherever unutilized pulpwood remains.

fallacy; the claim that eucalypts prefer to grow on disturbed mineral soil[1] (i.e. regenerate more thickly on bared areas), thereby showing that soil erosion, nutrient and topsoil depletion and so on, are not problems – depends upon a similar equation of the production of large, even excessive, quantities of regrowth with ecological soundness and long-term stability. It is another attempt to substitute short-term industrial wood production concepts for biological ones.

Forwood treats us to a good deal of these sorts of pseudo-ecological justifications for industrial forestry practices (especially in Forwood [3] and the Survey papers), e.g. in its attempted assimilations of clearcutting to natural occurrences, in its discussion of the effects of intensive forestry practices on animals and on other environmental values, and its views of what types of minor safeguards will serve to preserve environmental values:

> ... the retention of suitable stands along migratory flight routes, or the avoidance of removing all suitable food or nesting trees in the course of forest improvement operations, or *some other relatively slight variation in current forestry practice,* may be required for the *survival of some species* in a district. (Forwood [3], p.36., our italics).

A prime example of this mythology, which appears to pass as ecology in many Australian forestry circles, is the assimilation of the effects of clearcutting to the effects of fire (Survey [1], p.12, Forwood [3]) and the myth that Australian forests are even-aged and required regular severe fires for regeneration – matters for which there is hardly conclusive evidence and for which there is a good deal of counterevidence. Despite the obvious fact that there are very significant differences, e.g. in frequency, in intensity, in area affected, in the elimination of a class of habitats such as overmature tree habitats, and that there may be many others (e.g. in effects on soils), between naturally occurring fires and clearcutting, Forwood tries to use the supposed adaptation of eucalypt forests and their inhabitants to a forty-year cycle of devastating bushfires as demonstrating the complete ecological soundness and acceptibility of clearcutting (Survey [1], p.12). Its discussion of maintenance of diversity of animal habitats under clearcutting attempts to obscure the crucial fact that the very widespread application of clearcutting to native forests for pulpwood on rotations of 40 years (or even less), as envisaged by Forwood, will introduce over most of the forest area a regime to which many forest dwellers are not adapted, and will eliminate over most of the forest area the very important range of mature and 'overmature' tree habitats, with the likely result of a vast reduction in the numbers of a big range of forest dwellers and impoverishment of much of the forest. Yet Forwood envisages no non-trivial restriction on clearcutting or wood production goals on this account. Forwood attempts to dismiss these kinds of consequences by saying

> comparatively small areas are selected. These are surrounded by adequate areas of untouched forest to provide flora and fauna habitats (Survey [1]),

which of course is not only not established but clearly incorrect if such adjacent areas have also previously been clearcut and the relevant range of habitats eliminated. The same Survey [1] passage goes on to suggest that sufficient habitat is maintained both for clearcut eucalypt forests and for pine forests by leaving strips and biological corridors and by the safeguards proposed in Forwood. But its comforting claims are largely *a priori.* In fact Forwood envisages embarking on a program of massive alteration of the forests and asserts that such measures are adequate, when in fact knowledge in the area is quite inadequate and the minimum sizes of reserves for and requirements of many species are hardly known at all. And a fairly clear and certainly debatable value judgement is involved in the claim that such small reserved areas are 'adequate' and that one should be satisfied with maintenance of adequate diversity in such strips while the remainder of the forest outside these strips is significantly impoverished.

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1 It has also been caustically remarked that the main commercial eucalypt species are those that will so far tolerate the rough conditions that intensive forestry methods increasingly enjoin. Other more sensitive species with high growth rates and good timber qualities (e.g. perhaps *E. fraxinoides*) have been eliminated as important commercial species in part because they do not respond to the 'treat them rough, they like it' silvicultural systems.

Forwood tries to reinforce its thesis that clearcutting practices are ecologically sound, provided some small safeguards are imposed, by an appeal to examples: there are examples of clearcut forests which are claimed to be every bit as satisfactory as they were before clearcutting (cf. Forwood [3], p.44).[1] There are several reasons why this argument fails to establish its intended conclusion. It is an argument from some cases to all, which fails since there are examples of forests which have been clearcut or heavily cut which are by no means as satisfactory, even for wood production (e.g. many forests in the Americas, and tropical and subtropical rainforest in the Pacific basin region). Even where, as with most eucalypt forests so far, regrowth forests retain, or occasionally may even enhance, wood production values (over early rotations at any rate), it has not been established that other values are retained. For the most part there has been little research in Australia into determining the effects of clearcutting on other forest values. For example, monitoring has not been undertaken to determine the effects on soil nutrient levels, or on erosion and ensuing siltation, though even Forwood concedes that the effects can be substantial, e.g. Forwood [3], p.43:

> the intensity of logging operations resulting from most clearcutting inevitably leads to considerable soil disturbance, and consequently to a high risk of soil movement and erosion.

In cases where heavy rains fall shortly after clearcutting of large coupes, it is plain that environmental values may be seriously reduced, and that the subsequent new forests may be growing on inferior soils. Particularly where soil nutrients are limited 'clearfelling and burning are undesirable, especially in eluvial situations subject to leaching'(Webb [3], p.828). Clearcutting affects not only soils; many species of animals and plants are drastically affected (as we have explained in detail in earlier chapters). For many purposes other than wood production, then, there is clear evidence that clearcut forests are far less satisfactory than the forests they replace. Nor can the argument from examples guarantee that wood production values will be maintained, given the extent of clearcutting now contemplated, the heavier methods and equipment to be used, and the steeper slopes to be cut. Many of the classic Australian examples of clearcut forests which are growing timber satisfactorily are of only patch-cut size, e.g. mostly 20-60 acres, nothing like the 1000-2000 acre cuts now regularly planned for, for which there is very little accumulated forestry experience. Even the Multiple Use Panel was unable to bring itself to impose any significant restrictions on clearcutting, the nearest it gets being the remark 'the Panel doubts whether any annual coupe should be larger than about 400 hectares'([3], p.44). Since the size of coupes cut is especially important from the point of view of maintaining non wood-production values, it is unfortunate that Forwood did not try to formulate specific guidelines on this and related matters concerning clearcutting. Survey [2] p.34 appeals to some heavily qualified remarks of Crafts [2], as establishing the soundness of clearcutting, but fails to note that Crafts later went on to lay down guidelines for permissible clearcutting, which include:- no clearcutting for softwoods in excess of 25 acres, and no clearcutting of hardwoods except under emergency conditions (see p.192 above).

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1 Similar arguments from past forestry practices are used to justify other forestry methods. The general fallaciousness of the argument can be seen from the fact that it could be also used to justify a range of *bad* agricultural practices. The fact is that there are many Australian forests which have been run down by past logging practices — wood production values have been reduced along with other values — as some foresters, in search of extra funds for forest management, have argued in the case of wood production values.

2 Such an argument from authority of course carries little weight on its own: what the authority asserts has to stand up. In this case where the authority, though presented in Survey [2] as former director of the US Bureau of Outdoor Recreation, happens also to be a former deputy chief of the US Forest Service, doubters are perhaps justified in being more than usually sceptical about appeal to authority.

The environmental soundness of and ecological necessity for clearcutting is emphasized largely for the sake of keeping up appearances: the core fact of the matter is that clearcutting is, according to Forwood, both necessary for eucalypt regeneration and cheaper than alternative harvesting methods. The second of these theses, not as vigorougly pursued in Forwood as in other recent literature advocating intensive forestry, is variously formulated in Forwood [3], pp. 42-3 thus: 'Clearcutting systems are among the cheapest and simplest to apply', and 'even where the implementation of a clearcutting system is not essential ..., the economic advantages associated with clearcutting may be such as greatly to favour the use of clearcutting systems'. No evidence at all is offered for these claims. In fact little research appears to have been expended in Australia, to determine the relative costs of clearcutting systems. When empirical methods supplant a priori assumptions, the financial advantages of clearcutting cease to be so clearcut:

> A U.S. Forest Service study in the Redwood Purchase Unit showed that it cost $11.45 per thousand board feet to clear-cut an area, and $11.37 per thousand board feet to log it selectively.
>
> In a pine forest, clear-cutting took 133 man-minutes per thousand feet, heavy selective cutting 118 man-minutes, and a light sanitation cut 119 man-minutes.
>
> Taking only the largest trees also afforded the greatest handling efficiency. It appears to cost twice as much to fell, limb, load and cut into boards a tree 12 inches in diameter as it does a bigger tree, 30 inches or more. (Mines [1], p.102. Cf. also the remarks of Minckler, p.232 above.)

One is at liberty to conclude that clearcutting may be favoured not because it is necessary or substantially more economical, but because it is administratively simpler, easier to apply with unskilled labour, more suited to the heavier equipment being introduced, preferred by the pulp industry, and most importantly, maximises volume of wood produced. This supposition would be in accordance with the forestry tendencies noticed elsewhere, and particularly the preference for maximising productivity and volume production.

The primary thesis, that clearcutting is necessary is more vigorously championed in Forwood. Survey [2], p.34, roundly asserts, without any qualifications, that 'a clearcutting system is a necessary part of eucalypt forestry'. Forwood [3] is more cautious: 'for stands with these silviculture characteristics (examples given are mountain ash, karri, flooded gum, blackbutt and silvertop ash), clearcutting systems are necessary if the forests are to be able to continue to produce timber'. Even the weaker thesis has not been established; it has not been shown that even these eucalypt species will not regenerate in small cleared areas, and it is a reasonable hypothesis (as we argued in chapter 16) that small-patch cutting is the most that is necessary for adequate regeneration — even according to rigorous wood-production standards — of favoured shade-intolerant eucalypt species. At this point in the argument one is likely to be referred to research work showing that these favoured eucalypt species will grow extraordinarily well, in the short term, under clearcutting regimes, especially where growth rates are boosted by fertilizer or equivalents such as ashbed effects. To make such an appeal is however to confuse sufficient with necessary conditions: what is being disputed is not that such eucalypt species will grow under clearcutting practices, but whether they will grow without them.

Naturally the requisite research to establish the matter beyond all reasonable doubt has not been undertaken in Australia — for reasons not hard to locate. However recent American findings go far (when combined with the details given earlier) toward confirming the claim that clearcutting is unnecessary.[1] Thus Franklin and DeBell [1] concluded that there is considerable latitude in choice of silvicultural methods that will meet the biological or ecological need *for regeneration* of most species of trees on most sites. They contended that but few situations require either extreme of individual tree selection or large clearcutting. And the Georgia Forest Research Council concluded, in its study [1] of the silviculture of loblolly pine, that clearcutting is not required for pine regeneration and that

> Under the selection method growth tends to be concentrated primarily on merchantable growing stock. Stumpage value is high. The method permits the nurturing of high quality trees and those earning the highest interest rate. The land-

1 Further evidence that clearcutting is not generally less expensive than alternative harvesting methods with less damaging impact is presented in D.A. Burk, *The Clearcut Crisis*, Montana (1970), pp.94-5.

> owner can expect a regular income at relatively short intervals: thus, the method is adapted to management of small holdings. [The national forests are small holdings in the South]. Uneven-aged stands are not as vulnerable to complete destruction by fire as are young even-aged stands. The stands at all times satisfy aesthetic demands.... The principal disadvantage is that today's logging methods are not compatible with the selection method.

In Australia however the introduction of these incompatible harvesting methods, and particularly elaborate equipment designed only for clearcutting, has not proceeded as far as in the southern United States. These points upset the common idea that even pine plantations have to be managed under a clearcutting system, and undermine the claim that pine plantations have, as a matter of silvicultural necessity, to be monocultures: amenity plantations of mixed hardwood and coniferous composition are silviculturally perfectly feasible.

There is of course no worthwhile discussion of these issues or of the very real options available in place of clearcut methods, a lack which is notable particularly in the Harvesting Panel [4] [1].

Forwood's proposals that the native forests should be turned largely over to pulp production raise the strong presumption that clearcutting is likely to become extremely widespread in the future (although Panel 3 attempts to play this down). Thus it is all the more reprehensible that Forwood's discussion of the likely effects of widespread clearcutting and of ecological issues are so directed towards glossing over uncertainties and problems, and so largely directed towards obscuring genuine options and defending its industrial objectives, instead of the honest discussion of likely costs and presentation of options which should have occurred.

Forwood's treatment of non-wood production matters.
II Multiple use

In the context of Forwood the major function of the Multiple Use Panel Report and recommendation is to defuse objections to the program of expanded wood production on the grounds of likely effects on the environment and render palatable the massive alteration of Australian forests it proposes. The 'safeguards' and conditions proposed in the Multiple Use Report are alluded to in other sections, and particularly in Survey [1], as showing that such objections have been met and environmental and other costs are non-existent or minimal, that there will be no undesirable effects of any consequence. As we have noted, the approach to multiple use of the Panel is essentially ameliorative (the afterthought approach), in that production goals are set both for domestic and export purposes and 'multiple use' then appears in the making of a few minor concessions to non wood-production values (e.g. Forwood [3], p.33). There is no attempt, as there would be with a genuine multiple use

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1 While a consideration of alternative harvesting methods could have been squeezed under the terms of reference of Forwood [4], p.3, e.g. under 1 (iii), the terms of reference certainly did not invite a consideration of alternative methods, and were disgracefully narrow from an environmental viewpoint. In Forwood [4], the environmental impact even of intended harvesting methods — often severe — receives only fleeting mention, as follows: the 'public is becoming increasingly aware of the desirability of preserving environmental values' (p.7 and p.34), there is a 'need to know more about the environmental impact of harvesting operations' (p.24) — an important point that is nowhere developed — and 'an ad-hoc committee should be set up immediately by the Standing Committee to investigate and publish guidelines for harvesting practices which will help to reduce undesirable environmental disturbance' (p.25). That is the sum total of the discussion of the environmental effects of harvesting. The bulk of the discussion of Forwood [4] proceeded as if there were no such further factors to take into account, e.g. in planning roads, equipment, labour, etc. (also mentioned but not detailed in Forwood [3], p.34), not even any of the more obvious and basic restrictions on operations, e.g. avoidance of permanent water courses and steep slopes, were mentioned. The Report provides yet another indication of where the real interests of the forest services and industries lie, and how concern with environmental matters is largely window dressing, for display only.

approach, to tailor wood production goals in such a way as to optimize on all forest values. The ameliorative approach was presupposed not only in the structure and procedure of the conference but also in the terms of reference of Forwood [3] which required the Panel

> to consider the effect of management practices on the objective of *conserving as far as practicable the quality of the environment* (Forwood [3] [1], our italics).

The Panel took wood production goals as fixed by other Forwood Reports (chiefly Forwood [6]) and confined itself to recommending what it admitted were relatively slight variations. This method plus the failure to attempt any real assessment of the likely environmental costs of the program of expanded wood production, precluded any attempt to assess whether or not any benefits (e.g. from consumption of junk paper products or of proposed export programs) were not outweighed by adverse effects of the increased production on the environment and on non wood-production values of the forests. This provides another illustration of the way in which the large and controversial assumptions of Forwood went into the structure, procedure, and terms of reference of the conference, and never emerged for clear examination and discussion.

What are the safeguards Forwood assumes will be adequate to maintain 'as far as practicable' the quality of the forest environment in the face of its plans for greatly expanded wood production? These essentially fall into two groups, the grouping to be made in terms of specificity. The major group of 'safeguards' consists of a set of extremely vague exhortations, that forest managers should take account of this and have greater care for that, which impose practically no conditions of a specific kind on management or restrictions on wood production, and which amount to little more than pious sentiments (since the conditions are for the most part tautologous). Thus according to Forwood [3] (pp. 2-3, our italics)

> [Forest managers] should always give the highest priority in the management of these areas to the *appropriate protection* of catchment values [finding 1], insist that only those logging systems that meet *acceptable standards* for the local environmental conditions should be permitted within their forests [2]; should give *particular attention* not only to logging practices but also to other management operations including road construction and maintenance and the clearing of sites for plantation purposes, with respect to their effects on catchment values, and they should *constantly endeavour to improve standards and performance* for these operations [3]; should extend *every reasonable co-operation* to people or organisations wanting to carry out *genuine* scientific research... [4]; should always *consider* recreational use when planning forest operations [5]; should adopt a *flexible* approach to the recreational use of forest lands, and should as far as possible adapt their policies to cater for changing local circumstances and conditions [6]; ...; should give the closest *consideration* to the aesthetic impact of any development or operation being planned [8]; should practise control burning *with the utmost care* [9]; and *take care* in the design, construction and maintenance of forest roads to avoid creating stream pollution [14].

This set of New Year resolutions, innocuous as they may initially appear when their role of 'safeguards' is overlooked, are certainly not harmless when they are used, as they are in Forwood, to show the environmental costs of the production program can be neglected or have been taken care of. Indeed they have been proposed in place of a specific set of *minimum* environmental standards (the proposal of which the Panel believed would have been pontificating, e.g. Forwood [3], p.39, also p.55). Thus, for instance there are no specific proposals of formulae for limits on slopes logged, no detailed guidelines for low impact road construction, no requirements for carefully monitoring operations.

It is worth noting that the only proposals among the findings of Forwood [3] that had much force, mostly concerning rainforests (findings 10, 11, 12, 13, Forwood [3]) did not find their way into either the recommendations of Forwood [3] or into the final recommendations of Survey [1]. The findings are accompanied by a set of conditions, of a fortunately more specific nature – the second group of safeguards – which are supposed to guarantee absence of environmental cost, most notably the operational guidelines for exotic plantings, which are summed up in the recommendation (7 of Forwood [3]):

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1 The ameliorative approach is also displayed elsewhere in Forwood [3], e.g. p.31 and p.51.

> All organisations, controlling appreciable areas of land more or less in its natural state, should ensure that (a) operations they control never lead to the regional elimination of any species of wildlife; (b) any sites of particular scientific significance are preserved; and (c) good examples of various natural plant communities, and their associated wildlife, are preserved. (Forwood [3], p.4; a fuller list explaining some points is given in recommendation 2).

A better tentative suggestion (Forwood [3], p.40), that

> within the whole plantation block an area representing about ten per cent of the total area for conversion from native forest and also representing the full range of environmental conditions present in the block ... should be retained as native forest,

did not gain recommendation status.

There is no doubt that these suggestions *in themselves* are entirely admirable, as are a number of other suggestions of a similar kind made in the Multiple Use Report,as minimum or necessary conditions. But they are not admirable, and are indeed extremely harmful, when they are taken, as Forwood takes them, as *sufficient* to ensure that environmental values are sustained at a satisfactory standard. It is evident that all these suggestions, in Forwood [3], could be carried out, and that there could still be a disastrous amount of destruction and loss of valuable features over a very large part of the forest area. The conditions do not exclude significant impoverishment of most of the forest areas, when construed as sufficient conditions for adequacy. In short Forwood has traded on a crucial ambiguity in the terms of reference of Forwood [3], namely as to whether the conditions called for there are to be taken as *necessary* or *sufficient* conditions for management which is to maintain non wood-production values at an adequate level. It is quite evident that Forwood does construe them as sufficient (or even optimum) conditions; for example, these 'safeguards' are referred to in Survey [1], p.9, as reducing the cost of the pine program, and consequent elimination of native forest, to acceptable levels:

> It must however, be accepted that some clearing of native forests is necessary and will continue to take place. Adequate safeguards have been prescribed to take into account environmental considerations which are recognised by the Australian forest services to be of vital importance.

In a similar way the even weaker 'safeguards' for native forests in the case of conversion to eucalypt plantations, and for the proposed widespread clearcutting for pulpwood, are taken to eliminate the costs of these proposals or reduce them to what Forwood thinks are acceptable levels.

Certainly we ought not to be prepared to settle for the preservation of existing rich and diverse natural forest systems only in a few sample communities. But even if this were sufficient it is not clear that the Forwood proposals for sample ecosystems would be satisfactory even from the point of view of the very limited aims conceded there, i.e. of preservation of species, of educational value and scientific reference. For example it has been suggested that

> a figure of the order of 50,000 acres is indicated as a minimum size for a reserve if it is to be a self-perpetuating ecological unit. (Day [1], p.207)

It may be doubted that forestry authorities would be prepared to set aside such large areas, and especially to exclude them from logging; certainly the NSW Forestry Commission's system of flora and fauna reserves, commended as a model in Forwood [3], does not preserve areas of such a size in suitable blocks, or generally offer adequate protection from serious encroachment (e.g. roading on Mt Dromedary). Nor does there appear to have been any attempt on the part of Forwood [3] to determine whether the tentative and apparently arbitrary proposal to retain 10% of an area being converted to pine (in most cases resulting in areas of 15,000 to 20,000 acres of unsuitable shape) would be adequate to retain all species, for example in areas of mountain forest being turned to pine. There is some evidence that it would not be, especially for arboreal mammals. There is no indication of any attempt on the part of the working party to consult workers in the relevant areas, and no recommendation that they do so. Thus it is clear that the conditions for preserving samples are only doubtfully minimum ones, even for the limited scientific and other purposes Forwood is prepared to recognise.

In addition to the crucial ambiguity as to whether the Forwood recommendations constitute necessary or sufficient conditions for adequate forest management and multiple use practices, which vitiates much of the discussion of Forwood [3], the Multiple Use Panel Report is theoretically extremely weak. It is in fact largely a justificatory exercise for present practices. The procedure adopted by the Panel illustrates this.

The Panel first approached forest services and a number of private companies to stipulate what they considered to be examples of multiple use, which were then treated as paradigms. Thus instead of considering and arriving at necessary and sufficient conditions for adequacy of management, which would then be used to evaluate whether existing practice measured up, the Panel's procedure was in effect that of assuming existing practice to be generally adequate and basing what theoretical work it did on this practice.

Not surprisingly the Panel failed to find that any existing forestry practices failed to measure up – only the water catchments and national parks were at fault for excluding logging. It succeeded only in imposing conditions and theoretical requirements so weak as to exclude virtually no existing or contemplated forest practices.

This is rather well demonstrated in the paradigms of multiple use cited, which include several projects which have been strongly criticised for their treatment of non wood-production values, e.g. the Eden project and the logging of Wiangarie State Forest. The examples also include two pine areas, an area in Western Australia now included in the Manjimup woodchip scheme, and a cypress pine forest that is used for grazing. The use of such highly controversial examples as paradigms illustrates nicely the essentially apologetic and whitewashing character of the exercise.

The Panel, chaired by an employee of the NSW Forestry Commission, managed to find several opportunities to commend that organisation as a model one from an environmental and non wood-production point of view. The Panel also found that destruction of native forest for the pine program was of minor consequence from an environmental point of view, that much of the criticism of it was uninformed (pp.40-1) and 'emotional', that clearcutting systems are ecologically sound and essential systems (pp.42-4), and that most of the criticism of forest service activities are based on aesthetic objections (p.40)[1]; and it presented the standard picture of forest products as all required to meet genuine human needs and all environmentally sound (e.g., p.34), and recommended a public communications and education campaign designed to persuade enough of the public to adopt similar views (p.3, p.53-4; similarly Forwood [8]). Significantly however the Panel failed to

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1 One of the major recommendations for meeting objections to forestry operations, and for maintaining non wood-production values, was the aesthetic-fix plan (criticised in chapter 15),training for forestry managers in landscape architecture, better landscaping of pine and other plantation projects, aesthetic roads, etc.. It is worth repeating the Bolle Committee's astute comment on such a way of *seeming* to retain values by cosmetic adjustments (Bolle [1], p.14):

> *Aesthetics* – Scattered throughout the report are references to aesthetics with the suggestion that a landscape architect be assigned to every sale. It is not clear whether such a person would have veto power over the sale and sale specifications, or whether he would be called upon, after the fact, to apply his skills toward a cosmetic treatment of an existing, or an about to be produced, eyesore. If effective multiple-use planning were a reality, management plans would not always start with a timber sale which would later be negated by adverse reports from watershed experts or landscape architects.

remark on the parlous state of forestry legislation in Australia and the fact that forest services (e.g. in Western Australia) are prevented under their constituting acts from taking a proper interest in non-wood values, and failed to make any recommendation about remedying this situation.

The theoretical weakness of the Multiple Use Panel first emerges in its definition or treatment of *multiple use* itself, which is basically that of having more than one use (already criticised at length in chapter 16). An attempt is made to justify the definition by appeal to the Encyclopaedia Britannica (from which the definition is drawn, with substantial modifications) but, as any good student knows, one cannot properly explicate key theoretical concepts like *multiple use* by appeal to encyclopaedias or dictionaries giving their regular meaning (as judged by contributors to the dictionary).

Although Forwood employs this very weak 'more than one use' sense officially, the Panel usually appears to operate intuitively with a still weaker notion, what one might call the *concessional sense* of multiple use, that is, that provided that wood production operations make some concessions to non-wood production values — i.e. allow some other use somewhere or allow some modification to accommodate it, no matter how inadequate or incomplete — multiple use is satisfied and one has a sufficient condition for adequacy of management. This seems to be the ground on which the examples are claimed to be paradigms of multiple use; for example the Eden project is admitted because recreation is not excluded (and some facilities are being erected at taxpayers' expense) and strips along permanent streams and biological corridors are concessions to non wood-production values. Similarly the retention of strips of native vegetation in pine projects are concessions advanced as demonstrating multiple use management and presumably the conversion to pine of the Boyd Plateau, provided it fulfills these conditions, would be a similarly fine example of multiple use. No attempt is made to argue that the concessions made to non-timber values in these paradigms are *adequate.*

But such a low redefinition of 'multiple use' as the concessional one provides no guarantee that such 'safeguards' make *adequate* provision for other values[1] or for a sufficient range of other values (let alone ensure optimisation); all it does is to ensure that operations are not totally ruthless or at least not as ruthless as they might be in some cases.

The adoption of the concessional sense of multiple use is combined with an excessively narrow account of what counts as important forest uses or benefits: for the multiple values of forests are quickly reduced in Forwood [3] to three parameters that can, it is supposed, be assigned a marketable value: wood, water and recreation.

> The other benefits can, to a large extent, be accommodated within the limits imposed by the needs for these three, ([3], p.15. Cf. also p.19, and Forwood [8], p.2.)

Hence proper multiple use comes to be use for all three of these 'benefits', multiple use, use for more than one of these 'benefits', single use, use for only one: this is the extraordinarily simple Forwood working model of forest uses. It is obvious enough that quite a number of forest benefits which some would consider highly important cannot be fitted in under the

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1 A point underlined by the decision of US Court of Appeals on a petition of February 1973 on the proposal to clearcut Tongass National Forest, Alaska, that *some* considerations of non-timber values was not sufficient and that what is required under the Multiple-Use Sustained-Yield Act is *due* consideration, which 'requires that the values in question be informedly and rationally taken into balance'.

the classification: wood, water, recreation – which in effect identifies the benefits to be obtained from the forest with overt use of the forest by or for numbers of people. It is hard enough to see how even commercial factors such as grazing, cited in the case studies of 'multiple use' really fit in these categories. Obviously maintaining the natural richness and diversity of the forest, for instance with respect to wildlife or flora, cannot be fitted under any of these headings. For example, it is hopeless to try to reduce wildlife values to recreational values; for the value of the non-obvious and rarely observed forms of wildlife such as certain nocturnal marsupials or small mammals cannot be estimated in recreational or even phenomenalistic observational terms and certainly cannot be counted as zero because there is no *recreational* demand for observing them. The Forwood [3] value system effectively assigns no value at all to the natural forest itself or to its inhabitants, and no cost to its elimination, provided that its very minimal conditions for preservation of species and the retention of sample communities, are met. At least one reason why an independent positive value should be assigned to natural forest areas which cannot simply be reduced to recreational value is that such values may *conflict*, e.g. in the case where the natural features and values of the area, which are what visitors come to enjoy, are adversely affected by visitor and recreational pressure. Many such cases have appeared in America, and they are becoming more frequent in Australia. But values which are sufficiently independent or may vary inversely over a range of conditions cannot satisfactorily be treated as a single factor. And it makes a great deal of difference to the outcome of how forests are to be managed whether or not such an independent value is allowed for. The range of values considered by Forwood then is inadequate, even given a limitation to broad value categories. (See the discussion in Appendix 5.)

It is likewise most unsatisfactory to try to put the many roles of national parks, e.g. wilderness values, wildlife and flora values, soil protection purposes, etc., within the narrow Forwood framework: the result of trying to do so is the ludicrous outcome that for state and national parks 'recreation is the sole use with possible exception of water catchment', Survey [2], p.11. Worse still 'recreation' has been construed extremely narrowly by Forwood so that a forest does not have a recreation use unless people actually use it; e.g. Forwood [3], p.65.

Not surprisingly, then, catering for multiple use can, under the simple Forwood model, be largely boiled down to the business of identifying recreational demand and installing appropriate facilities (e.g. picnic areas, short walks, forest veneers, sample natural communities) to accommodate it. No substantial modification of the wood production aims and patterns, i.e. of dominant use of the forests for wood production, is contemplated then to make satisfactory provision for the full range of other values. Given the contraction of non-wood values largely into recreation (with some allowance for water) the result of the Forwood model will be, as Survey [1] p.11 strongly hints, that only a very few forests – mostly around cities, which receive heavy visitor use and in which recreational value (estimated by market-based methods), is high and exceeds the *revenue* from logging (initial expenditure or expenditure on replacement of course being conveniently overlooked) – will not have wood production as their dominant use, while for the rest which do not receive such heavy visitor use, non-wood values, taken as given by recreational use, will be dominated by wood-production values. Thus wood production will be the dominant use over nearly all forest areas, a convenient conclusion for Australian forest services.

Such an apparent synthesis of dominant and multiple use is only made possible, first through the denial of a positive non-negligible value to natural forest areas and ecosystems over and above their value for visiting (i.e. recreational value), and second through a low redefinition of 'multiple use' such as the many-use or concessional one, which ignores recent optimisation models for multiple use. In fact Forwood's discussion ignores not only the important American Multiple-Use Sustained-Yield Act and the extensive discussion of the Act in the forestry literature but also the clarification of the concept as a result of recent American

court decisions, and major recent theoretical advances such as Alston [1] (which suggests an optimisation model for multiple use[1] similar to the more general model developed independently in chapter 16 above, that is, that multiple use consists in obtaining an optimum over a *range* of values, more precisely maximizing the weighted sum of values subject to constraining relations which set down the dependence relations between the values.[2]) For the values concerned are not generally independent of one another. It is only under such an optimisation picture applying over a system of forests and taking account of an adequate range of values that multiple use can be taken as providing a sufficient condition for adequacy of management, and it seems to be in this sense that Forwood [1] has recommended applying multiple use wherever possible. But such an account is not only inconsistent with dominant use practices and with concessional and many-use accounts (as well as with the related primary and secondary use distinction used throughout Forwood), but casts considerable doubt on many prevailing forestry practices, and rules out most of the examples of 'multiple use' that Forwood has taken as paradigmatic. The Eden woodchip project, for instance, is far from maximizing benefits of the Eden forests; it certainly does *not* do so uncontroversially and accordingly cannot provide a paradigm. One of the consequences of the optimisation model too, undercutting the whole procedure of Forwood, is that one cannot just set production goals in terms of anticipated future demand (unless there is a much higher degree of independence between wood production and non wood-production variables than in fact obtains), but that non wood-production features must be considered also as an *integral part* of setting these production goals.

The optimisation model also shows why arguments such as that given in Survey [1] (p.11, section 2.41) are thoroughly fallacious. The argument form is as follows:

'There are three basic possibilities in relation to use, namely

(i) a is the sole use,

(ii) a is the primary use and other uses are permitted;

(iii) a is a secondary use and is permitted in conjunction with primary use b.'

In the actual Forwood example, a is recreation, and b is timber production. The argument is supposed to demonstrate that timber production must be accepted as the dominant use in most forests because recreation cannot be taken as the dominant use, and that if timber production *is* accepted as the dominant use other uses are sufficiently allowed for, if they are not excluded (are 'permitted'), or by minor concessions. But the argument is invalid for (apart from the fact that a and b could be equal in value, or more fairly that the full range of non wood-production values, not just recreation, or recreation and possibly water, could have *as much* weight as wood production) it is not a question of picking out (on a pretty arbitrary basis) one value or even a combination of values from the set as dominant or primary, attempting to maximize on those and as Forwood puts it so candidly 'permitting other uses to exist', but of obtaining a maximum value over the whole set, which would normally require appropriate modification of some values in order to avoid depressing others and planning accordingly to take account of all of them appropriately in an integrated way. Even where one can clearly find a value which is more heavily weighted than any other value, nevertheless

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1 According to Alston the intention of the American Act, in its phraseology, was to provide for optimisation over the values concerned. Alston's model is explained in Appendix 5.

2 Although the word 'optimise' is used in Survey [1], p.8 (and the account supposed is to that extent inconsistent with the Forwood [3]'s primary account of multiple use), the statement 'if decisions are made in favour of a particular use or uses, managers must still strive to optimise the total benefits which can be derived' shows the important features of the optimisation model for multiple use still have not been grasped, since the model specifically precludes making decisions 'in favour of' particular uses; even where some uses are more heavily weighted substantial modification will still normally be required to obtain an optimum. Nor can the values be maximized independently in the way the statement suggests, since where there are constraining relations between the uses, an optimum will not in general be obtained by attempting to maximize individual values independently.

one would not obtain an optimum by simply attempting to maximize on this one most heavily weighted value designated 'primary' or dominant and discarding the others as 'merely permitted' (that is, not excluded). To put the point another way, the argument presupposes that *some* value has to be nominated as a dominant use, whereas given the optimisation model it is plain that no value need be taken as dominant.

The same fallacious argument also lies behind the recommendation, Survey [1] 4.121, that conflict should be met by zoning of forests with each zone allocated primary and subsidiary objectives of management. There is no doubt that this recommendation would be applied in practice, using the fallacious argument outlined above, in such a way that nearly all the forest would be allocated to wood production as primary use with other values 'permitted', and nothing more than minor concessions made to other values in the direction of substantially modifying wood production activities. The procedure of attempting to resolve conflict by zoning areas, and picking out one use or set of uses as dominant for each zone, which use one then attempts to maximize upon, rather than attempting to find a method of management which could produce an optimum by cutting back some variables in order to avoid greatly depressing others, would only produce an optimum under very special conditions, and in general would not produce an optimum. The zoning method could easily become a way of getting unrestrained dominant use for wood production, with only minor modifications, over nearly all the forest area, while enabling forest services to claim that because a few forest areas have been used with dominant use for purposes other than wood production the requirements of multiple use have been satisfied.

To illustrate the point that zoning is not generally adequate, suppose that one had three variables roughly equally weighted; one would not in general obtain an optimum by dividing the total forest area up into three roughly equal parts in each of which the relevant use was taken as dominant or primary and made minor concessions to others. A superior method for finding an optimum is to modify dominant use to accommodate other values better, to find management techniques which give the highest total sum overall. But it is precisely such a recommendation for extraction of a primary use as a general method of resolving conflict, which would be better resolved by modification, that Survey [1]'s recommendation 4.121 appears to be encouraging. While zoning sometimes has a point and is required in certain cases, e.g. for wilderness areas, what is commonly required is non-trivial modification of wood-production to accommodate other values and maintain them at a reasonable level, and only in this way is an optimum obtained.

The theoretical discussion of this issue of optimising values over the system of forests and the question of how dominant use relates to multiple use in Forwood [3] is thoroughly inadequate and the discussion of the issue of conflict and incompatibility, another issue which becomes quite crucial on the optimisation model, is extremely superficial. This is despite the fact that the issue as to whether high assignments to some parameters depress assignments for others (that is, the issue of conflict) and the issue as to whether some values completely *exclude* other values (that is, the quite different issue of incompatibility), distinct issues frequently confused in Forwood's discussion, are not only fundamental on the optimisation model but even specified as part of the terms of reference of Forwood [3].

Yet this vital issue is dealt with by Forwood [3] (p.19; 4.1) in a half page passage which consists not of a discussion of the real issues involved and how far various sorts of wood production, and particularly high values for wood production, depress other non-wood values in a given set of different situations, but largely of listing a few ways for representing visually a degree of compatibility, once it has been ascertained, by 'compatibility charts' and transparent overlay maps. That is, in place of what was called for, a discussion of incompatibility and conflict between values, Forwood [3] gives a brief discussion of a few visual aids for representing incompatibility! The Panel avoids any

discussion of the real issues of conflict (and constraints) which are however quite crucial to its later discussion, by claiming, what the optimisation model shows is false, that no generalisations can be made as each forest is unique, and by claiming, what is theoretically irrelevant, that insufficient quantitative research has been carried out. In any case, neither the uniqueness of forests, nor the here admitted absence of quantitative research, has been thought sufficient to prevent fuller planning or policy making in the case of wood production objectives. The reasons put up are just a pretext for shelving what is for the wood production ideology an uncomfortable issue, since neither complete quantitative data nor detailed classifications are needed to see that significant modifications in wood producing aims and activities must be made to accommodate other values. The Panel concludes its non-discussion of the subject of compatibility with the misleading claim:

> To the extent that such a generalisation is valid it is apparent that many, but certainly not all, uses can be highly compatible. (Forwood [3], p.19.)

This reappears again in the summary, [3], p.1, but without the qualifications, and presented as a matter of established fact:[1]

> It can be shown that many, though not all, forest uses can be highly compatible with each other.

The weakness of Forwood [3]'s discussion of multiple use emerges very clearly in its discussion of how values are to be combined, how in its terminology one is to 'determine the mix' of benefits or uses. The problem, which arises in three places in Forwood [3] (p.1, p.22.ff and p.38), though solvable theoretically by an optimisation modelling, is nowhere satisfactorily resolved in Forwood. The idea Forwood has is that the problem can somehow be dealt with by a cost-benefit analysis, the clearest statement given being the first:

> the choice between alternative uses can best be carried out – or at least assisted – by using cost-benefit analysis. (Forwood [3], p.1.)

How the analysis is supposed to be carried out is given only in the barest outline (Forwood [3], p.23). Each combination of values would have to be regarded as an alternative in a many-alternative cost-benefit analysis (e.g. in place of the two alternatives, EL and PL for example in the analysis of p.84a, one would in general have several alternatives); then each of the m values considered would have both a benefit and cost assigned in some common utility unit, the net benefit of each alternative (total benefits less total costs) would be computed, and the alternative yielding the greatest net benefit would be chosen. Where there are n alternatives, giving feasible or admitted combinations of values, the analysis could be displayed in an m X n table or matrix, with m rows for values and n columns for alternatives, with each place occupied by a pair of numbers providing the benefit and the cost for the given value for that alternative. The procedure which is not attempted for a single case in Forwood – and would if properly carried out have proved that many of the Forwood 'paradigms of multiple use' were not examples of multiple use at all since alternatives to current practices would yield higher net benefits[2] – is but a poor man's optimisation model. To this extent a cost-benefit analysis can approximate to, and so assist, an optimisation study; but it is false that it is the best way to determine multiple use. For a cost-benefit analysis sacrifices much of the flexibility and several of the key features of optimisation model; e.g. a cost-benefit analysis is discrete and can only consider finitely many alternatives and cannot allow for continuous variation of values, it cannot take adequate account of constraining relations which have to be approximated in an invariant way by the choice of initial alternatives, nor without elaboration can it take due account of the weighting of values. The cost-benefit analyses Forwood suggests suffer from still

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1 However, it is inconsistent with the correct claim: 'In Australia little quantitative research has been undertaken to determine the degree of compatibility between alternative uses.' (Forwood [3], p.19.)

2 For example, much higher net benefits for the Eden forests would be obtained by a combination, e.g., of careful sawmilling, tourism and national park, than by the woodchip use – such at least has been our thesis.

further, but contingent, drawbacks, in particular the failure to take separate account of environmental values (e.g., on p.23 only social values are mentioned) and the misguided attempt to reduce such values to social ones, and all values ultimately to wood, water and recreation. The assumption (Forwood [3], p.23), that wilderness values are psychic benefits (which no doubt can be reduced somehow to recreation, perhaps to spiritual trips since no physical ones can be found to provide the value), is an antiquated and discredited psychological reduction of values, which rests on the assumption that values which cannot be reduced to external or overt uses must be reducible to internal, hidden, mental uses.

Though such a cost-benefit analysis is but a poor man's optimisation model, the technique would be a substantial improvement over the concessional and many-use criteria applied, *inconsistently* with it, elsewhere in Forwood [3]. That it has not been applied is plain from the fact that *no attempt* has been made to show that any of the 'many excellent examples of multiple-use management in the forests of Australia' ([3], p.22) conform to the cost-benefit model (maximization of net benefits under a cost-benefit analysis) of multiple use; indeed 'the application of cost-benefit analysis to multiple-use management is in its infancy in Australia' (Forwood [3], p.23), and none of the case studies cited (p.23-4) go any way towards providing a cost-benefit model of multiple use since, in particular, the range of feasible alternatives is in no case considered and but few values are assessed in each case. That the multiple use notion is employed inconsistently in Forwood accordingly becomes clear; for on the same page (Forwood [3], p.22) that Forwood mentions the many excellent examples of multiple use (under the concessional or many-use criteria) it also claims:

> The basic objective underlying all multiple-use problems is to ensure that the resource in that use, or combination of uses, which yields the greatest net benefit...[1],

which endorses some sort of optimization method,certainly inconsistent with the weaker criteria favoured elsewhere, under which the 'excellent examples' have not been established as cases of multiple use.[2]

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1 A similar point underlies (f) of Forwood [1], p.10, and can indeed be discerned in the definition of 'multiple use' in [3], p.9. Unfortunately Forwood [3], p.22, goes on to destroy its better criterion by adding 'to the owner of the resource'. For where the owner, of a forest say, is a private firm concerned solely with profit maximization in the shorter term, the firm's 'multiple use management' could imply, under this account, serious degradation of the forest, it wildlife and soils — outcomes inconsistent with multiple use.

2 Yet another (objectionable) variant upon these optimisation explications of 'multiple use' figures in Forwood's proof that *forestry entails, indeed is* (according to some prominent foresters), *conservation* of forests. The argument is simply:-

i. Forestry entails multiple use (is multiple use of forests).
ii. Multiple use is conservation (of forests).
iii. Forestry entails conservation (is conservation of forests).

Premiss i — put up in Forwood [3], p.8

> ...this multiple-use concept had always been embodied in the practice of forestry, and was regarded as part and parcel of forestry...
> The task of Forwood Panel 3 has been to examine this multiple use concept, this basic tenet of European forestry, and to see how it is applied in our Australian environment —

is false: there are many counterexamples in the shape of forestry operations which do not conform to multiple use. Premiss ii however is true, given the way Forwood twists the meanings of both 'multiple use' and 'conservation', revealed in [3], p.20:

> multiple use becomes entirely synonymous with conservation where this word is used in the context of planned, long-termed management of the forest ecosystem for the overall benefit of the community at large. ...
> Management for multiple use of land resources is clearly compatible with — indeed, synonymous with — conservation in this sense.

The sense of 'multiple use' has been adjusted, by glossing 'value' with 'i.e. long-term overall community benefit', to bring it into line with the Forwood redefinition of 'conservation' — essentially the account, already criticised (on p. 168), parodied as the position that conservation is long-term exploitation of the environment.

It is evident that value judgements are being made in Forwood [3] about the relative weighting which should be allocated to different factors. For example, where the proposed 'safeguards' or 'requirements' for multiple use – that no species by eliminated from an area and other similar ones – are treated as sufficient for multiple use or adequate management, and as sufficient to maintain non wood-production values at satisfactory levels, it is clear that evaluative assessments, e.g. as to what constitutes a satisfactory level for catering for non wood-production values, are being made. It is quite evident that substantial value judgements are involved in the assumption of Forwood that nothing of value is lost provided these conditions are satisfied, e.g. in the case of pine plantations.

> Adequate safeguards have been prescribed to take into account environmental considerations....(Survey [1], p.9.)

This latter is a value judgement for which no justification is offered, and about which there is plainly a great deal of room for disagreement, since it is quite reasonable to take the view that these conditions could be satisfied and the forests become greatly inferior from the point of view of non wood-production values, so that the treatment of non wood-production values could not be regarded as adequate. An implicit value judgement also appears in the constant theme of Forwood that almost all native forests must be turned over to wood production (and their possible deterioration risked) in order to provide a guarantee that there is no possibility of ever failing to satisfy demand, even of junk paper products. The underlying evaluation is that junk paper products are more important than rich diverse forests.

One of the most pervasive value assumptions which underlies much of the discussion is the now familiar assumption that the most important (primary or dominant) role of forests is for wood production. The assumption, which is built into some of the terminology used (e.g. primary), surfaces in such judgements as that timber production is the dominant role of production forests (Survey [1], p.11), which are taken to include nearly all forests, except for a few 'small forests near centres of population', whether used for production of not. It also surfaces in the assumption that the only three values to be considered, that is after the 'safeguards' mentioned above are applied, are wood, water and recreation (narrowly conceived as actual use for visiting or such similar physical activity), and that no separate intrinsic value is to be allotted to the native forests themselves or what they contain. The failure to assign or consider such a separate value for the original ecosystems is tantamount to assigning these zero value. This is itself a value judgement, and an extremely dubious one.

The proposal to give consideration to the recreational value of forest areas, to be assessed broadly in terms of number of visitors, although a welcome advance on past almost total preoccupation with wood production, does not go nearly far enough, and does not of itself (or in combination with the proposal to retain samples) provide a sufficient guarantee that anything like the existing value of forest areas for non wood-production purposes will be retained. And it is not after all such a very generous concession on the part of wood production to be prepared to admit some tourism in wood production areas, particularly where there is no question of forest services or wood production activities suffering any limitations or financial drawbacks as a result. As the authors of Forwood [3] plainly realise, no substantial modification of wood producing activities may be required or is contemplated in order to cater for this sort of 'multiple use', which is often simply tourism grafted on top of modified wood production (in contrast to the integrated consideration of all values which could be achieved by the use of conservative wood production methods). Wood production can thus proceed unmodified behind veneer strips and away from prime tourist areas, impoverishing forests and natural ecosystems, while the additional assistance which can be claimed for roading and facilities could even assist with the needed industrial infrastructure. The citation by Forwood [3] of several pine plantations as areas with a high 'multiple use' value for such visiting[1] ought to be sufficient warning of the

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1 The argument that because some pine plantations have high visitor use, pine plantations generally have, is of course methodologically unsound; it does nothing to support the claim that pine plantations as a *type* have high visitor value, because of lack of control data. Thus there is no reason to think a good deal of use received

inadequacy of the standards involved from the point of view of retaining the overall richness, diversity and value of natural forests.

The proposal to consider all non-wood values other than water in terms of visitor and recreational use (criticized in Appendix 5), and to make allowance for conservation values only in terms of the retention of *samples* involves then a major value assumption of an objectionable kind. The basic assumption is that the non-commodity value of a natural area can be assessed in terms of the numbers of overt physical human users of it, and, as a corollary, that what does not receive this overt human use or a sufficient amount of it has no value and accordingly can be destroyed without much loss. The assumption thus has drastic implications for remaining natural areas.

Development-oriented economics

None of the Forwood panels which might have concerned themselves with the salient economic issues raised by the Draft Plan and the numerous recommendations bothered to do so to more than a superficial extent, thus continuing the tradition of mammoth indifference on the part of forest services and too many forest economists as to whether or not their activities are economically worthwhile or justifiable. Thus, for example, there is no detailed assessment of the profitability of the proposed pine plantations or of other forestry operations proposed or of the issue of how far existing royalties cover production costs, and but little consideration of the equitability of prevailing royalty levels. Despite the fact that the planning is supposed to set the pattern for the next 40 years there has been no detailed attempt to look at the financial arrangements linking forest services who supply the raw material and private wood-based manufacturing industries. There is no questioning of the virtually guaranteed profitability of private wood-based manufacturing industries which have earned an average net profit (after taxation) of 22% on paid-up capital (Forwood [7], p.55). These profits are virtually ensured given the captive local market, the tariff walls, the cheap raw materials at a price which guarantees profits and expansion. So it is not surprising that larger forest industries were eager to drop the new royalty recommendations tentatively advanced; for the profits they derive under the current arrangements are not only handsome but virtually risk-free given character of the market and a royalty-setting mechanism which allows for a minimum profit. The important issue of the financial and tax structure of the larger wood-based industries is nowhere broached (presumably on the weak grounds that these matters, of public concern, are confidential).

The profitability, and the economic desirability, of various forest service enterprises should have been investigated. In particular, the profitability of large-scale public forestry ventures such as the pine planting projects and woodchipping schemes should have been examined. And the question of the degree of profitability of public sector production forestry is only a part of the more general question of the degree of public support of this sector and of its general desirability. For example, the consideration given to the question of the public support of production forestry can only be described as extremely superficial. Nor, despite the high level of tariff protection (classed as moderate by Australian standards) accorded forest industries, is there more than passing mention of the actual levels of tariffs or adequate discussion of the desirability of maintaining present levels of protection.

What we are offered in place of any real discussion of the main issues is a mass of data, of the sort that appears in the Commonwealth Yearbook and Commonwealth statistics, much of which is fairly trivial and irrelevant to the main case of Forwood. Striking examples of the attempt to bury the important issues, such as the desirability of the growth of the industries Forwood aims to promote, under a welter of statistics are Forwood [5] and the supplementary paper, Wesney and Freestone [1], which is summarised in the section of Forwood [1] of the same title: 'The significance of forestry in the national

(Continued from page 338)

by ACT plantations, for example, is not due to their location, and that their recreational value and visitor use might not be a good deal higher with a different forest type (e.g. amenity planting of mixed deciduous coniferous species, or suitably rich native forest), and a different management regime.

economy'. The assessment is a superficial one which in the main simply assembles large numbers of graphs, tables and figures from other sources, e.g. the latter paper includes graphs for the areas of coniferous plantations by Crown land and private property, for the area of annual plantings of conifers, for apparent consumption of wood-based panel products, and for employment in selected wood-using industries, and tables for coniferous plantation areas, for ownership of forest lands, for the gross value of production in primary industries, for value added for all manufacturing industries, for employment in major wood-based industries, and for value of plant and machinery in wood-based industries. If the assessment of the significance of an industry is arrived at by examining the range of factors considered to be important, then what is important according to the assessment of Forwood is evidently the contribution of an industry to numbers employed, to increasing GNP, investment in plant, sales and output, and its ranking with respect to these. Such data provides little insight into the general economic desirability of production forestry and the wood-based industries, and none of the statistics assembled cast any light on such important matters as the quality of the employment, the environmental costs of the industries through pollution and the significance of the forests (regarded as 'available') for other purposes. In short the data assembled does not point to the importance of these enterprises or provide a case for their growth without assumptions such as that bigger – in such simple (and inadequate parameters) as numbers employed, output produced, contribution to GNP – is better, that almost any sort of commercial growth is desirable. Though we are repeatedly encouraged to infer from graphs and tables in Forwood that forestry *is* a significant part of the national economy (and ought to be encouraged), the leap cannot be justified on the basis of the material assembled without contracting the notion of 'national economy' to what is indicated by narrow conventional indicators such as GNP and as provided by such parameters as size of output, productivity and employment. Likewise the case for growth in forestry enterprises depends (as a necessary condition) on similar assumptions – admittedly part of the wood production ideology – about the desirability of growth in the narrow range of economic indicators selected. But such narrow economic assessments are now widely recognised as no longer adequate measures of economic significance and certainly as inadequate to provide a case for growth. The mere fact of providing employment, for example, is, especially in a full employment economy, no longer adequate ground for concluding that an industry should be encouraged.[1] No attempt is made in Forwood to consider, in depth or even at all, whether the growth of some of the forest industries it is promoting, e.g. junk paper industries, is really in the public interest or (even if it were) is desirable. There is no selectivity in the assessment of commercial growth, at any point.

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1 Likewise that an industry is decentralised is not on its own any indication of its economic merit. An undesirable factory, e.g. one which is heavily polluting, does not become a desirable one by being moved out of the cities. Forwood frequently tries to avoid the issue of real assessment of the quality of forest industries by waving around the catch-cry 'decentralisation'. But no quantification of the worth of decentralisation is anywhere attempted and, on Forwood's ideology, decentralisation should occupy the same difficult position that Forwood tries to force unquantified environmental intangibles into – ultimately assessment at zero value.

The wood-based industries view of decentralisation naturally differs from ours and in places is blatantly pork-barrelling, thus:-

> As most panel products in Australia are manufactured in industries located in decentralised areas, besides assurance of a plentiful supply of wood resources, it is encumbent upon both government and industry to ensure that facilities are provided to house, educate and train the work force required to meet the industries' requirements.
>
> In addition, it is felt that the government should give encouragement by offering assistance to decentralised industries in the form of economic and efficient transport facilities, power and other essential services, thus offsetting some of the handicaps suffered as a result of their remoteness from population centres, the major markets and their facilities (Forwood [5], p.92).

The Panel goes on to request a wide range of further concessions for decentralised industries.

If a main criterion for decentralisation is quality of life (Green Paper [1] 9.145) then industries which are likely to have as serious and adverse effect on the environment as forestry industries under the proposed expansions are bad candidates for assistance.

The point illustrates nicely the fact that while much *lip service* is now paid to the fact that NNP is distinct from net social welfare, and that maximization on certain commercially favoured parameters may yield a result which diverges from what is socially or economically desirable, the fact is not really acknowledged, nor has its influence penetrated to effect most economic analyses, which continue to employ the same undiscriminating approach. Yet it is obvious that given the (now commonly admitted) distinctions one can no longer promote growth of an industry simply on the basis of the fact that it will help increase such a parameter as GNP[1], or that it is a large part of the economy (narrowly construed), and without taking proper account of its contribution to pollution or its repercussions on the natural environment (which in this case is certain to be extremely significant).

Forwood does little, then, to show the larger economic desirability of many of the forest industries it is sponsoring. Nor does it fare much better on the other economic cases it is committed to making good, the case for the many subsidies and concessions it calls for, the case for the continued and expanded plantation programs it requests, and so on, as we shall now see.

The 'case' for subsidisation

A remarkable thing about the recommendations for subsidisation and assistance of forest industries and services is that without any careful investigation of the extent to which the forest industries and the state forest services are already subsidized and protected and given generous and cheap access to a public resource, Forwood calls for increased levels of subsidies and protection, and for a range of other concessions and assistance.

What case is there for such further concessions? The underlying assumptions are those we have already discussed in detail, and rejected: that growth and development per se are good in themselves, and that utilisation of the forest 'resource' is always to be encouraged. Such assumptions have been found wanting: selective commercial growth is the most that can be economically justified (see Appendix 1).

Apart from the domestic needs and impending shortage claims (discussed elsewhere), three main reasons crop up regularly in justification of the concessions and subsidies sought, namely that forest industries are a significant part of the economy, that forestry contributes substantially to decentralisation (both further growth and development considerations), and that forestry should receive the same sorts of concessions and privileges as agriculture, since it is a rural pursuit, whose products are just as essential as agricultural ones; and competition with agriculture for suitable land would thereby be put on a fairer basis.

There are several reasons why the heavily-exploited comparison with agriculture is of limited application. The suggestion that the development of the forestry resource and associated industries should be encouraged in the same sort of way as agriculture, and, as the Bureau of Agricultural Economics puts it (Forwood [1], p.18, p.51), that there is

> a major resource base available for commercial utilization

apart from neglecting such vital questions as the economic desirability and profitability of the utilization, completely ignores a crucial difference between forestry and agriculture, namely that the forests are in the main a publicly-owned resource of unrivalled importance for public amenity and for maintaining significant representations of original ecosystems, and the severe limitations imposed by this fact. The implied assumption in the Bureau's

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1 Given these points it is easy to see that such exercises as Wesney and Freestone [1] (essentially a Bureau of Agricultural Economics production) are not just quite inadequate as regards the general question of the comparative economic desirability of forest industries, but can be positively harmful in sponsoring the growth of industries whose merit is dubious. Such studies are also misleading insofar as they purport to be objective, yet wind up with judgements as to importance which are by no means value-free.

statement that the forest is largely an industrial crop, that it is 'available for commercial utilization' in a way scarcely different from privately-held agricultural land is quite unacceptable in such a case. The comparison with agriculture also ignores important economic and social differences between the two cases; the case for agricultural subsidies and concessions, insofar as it is valid, is largely a welfare one, which hardly applies at all in the case of forestry, where one has, on the one hand, a number of large and in many cases wealthy private companies, and, on the other, state forest services selling raw material to these companies at extremely low prices. The suggestion, that forestry must receive similar concessions to agriculture in order to enable it to compete with the latter for suitable land, ignores in particular the contribution to the uncompetitive nature of production forestry made by unrealistically low royalties, a situation Forwood apparently aims to perpetuate.

What shows, however, that agriculture is more heavily subsidized than forestry? The main, and slight, case that Forwood has advanced for this, also a main part of the case for the many subsidies for forestry Forwood has recommended, can be found in a few lines of the Land Use Panel (Forwood [1]) where it is contended that

> an initial inspection of the updated input-output table for Australia (see Evans et al [1]), particularly in the vectors of indirect taxes, and commodity taxes (less subsidies) leads to the suggestion that agriculture in general is in receipt of more subsidies per dollar of output than is the forest industry (Forwood [1], p.27).

In an earlier draft the inspection is described more accurately, as 'fairly superficial', not 'initial', since examination of the relevant portions of the table (some of which is displayed below) reveals that what slight basis the Forwood claim has in the case of basic forest industry operations (producing the raw roundwood before processing), it has little justification in the case of further processing operations such as pulp manufacture.[1] Nonetheless in summing up the case, in the conclusions of Forwood [1] and Survey [2], these important qualifications, 'superficial' and 'initial' are gradually but illegitimately weakened and omitted.[2] These few lines also represent virtually the only gesture in the direction of estimating the degree of public support involved, an inadequate gesture since some of the factors that ought to be considered are not included in the relevant table (e.g. Commonwealth assistance for pine planting). Moreover the table is an unreliable indicator of subsidies since the contributing factors are based on a 1962-3 analysis and have not been appropriately updated.

The more complex, and quite inconclusive, case provided by the updated input-output table is shown by Table 21. Only with respect to total tax, obtained as is usual by

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1 At this point, and elsewhere, it is important to distinguish again narrower and wider senses of 'production forestry': in the narrower sense, production forestry, or 'raw (production) forestry' or 'extraction forestry' as we shall variously call it when the point needs emphasis, concerns simply wood production prior to any processing such as sawmilling or pulping, while in the wider sense, which we have generally avoided, it encompasses not only roundwood production but also the wood-based industries concerned with the primary processing of roundwood. Wesney and Freestone [1], which provides a key background paper for Forwood [1], though they make this needed distinction, regard it as giving an exhaustive interpretation of the term 'forestry' leading to the result that their assessment of the economics of forests and forestry is exclusively concerned with the production and processing of wood products. This is most unfortunate, as their task was to assess the significance of *forestry* in the national economy. By terminology influenced by the wood production view of forests, forestry activity concerned with non wood-production values of forests has been definitionally excluded, and accordingly cannot figure in the economic assessment of forestry.

2 This method, of erosion of significant qualification, is also exploited elsewhere in the Forwood papers.

TABLE 21

COMMODITY AND INDIRECT TAXES FOR VARIOUS AGRICULTURAL AND FORESTRY ENTERPRISES

	Sheep	Wheat	Meat Cattle	Poultry
(CT) Commodity taxes less subsidies on inputs	-0.3	-2.6	-1.3	0.3
(IT) Indirect taxes	52.4	7.2	17.9	1.5
(TT) Total taxes (CT + IT)	52.1	4.6	16.6	1.8
(TO) Total output industry basis ($ million)	848.4	324.6	363.8	155.5
CT percent of output	-0.04	-0.8	-0.36	0.19
IT percent of output	6.18	2.22	4.92	0.97
Total tax percent of output (TT % of O)	6.14	1.42	4.56	1.16

	Total Agriculture (aggregated)	Extractive Forestry and Logging	Sawmill Products	Pulp, paper and Paperboard
(CT) Commodity taxes less subsidies on inputs	-4.7	4.8	1.4	.2
(IT) Indirect taxes	120.5	4.6	3.7	2.1
(TT) Total taxes (CT + IT)	115.8	9.4	5.1	2.3
(TO) Total output industry basis ($ million)	2787.3	167.4 (148.4)	347.7	193.3
CT percent of output	-0.17	2.87	0.4	0.1
IT percent of output	4.32	2.75 (3.1)	1.06	1.09
Total tax percent of output	4.16	5.62 (6.3)	1.47	1.19

Source. Input-output tables for Australia: Evans et al [1], 1967-68.

Note. The bracketed figures in the Forestry and Logging column are earlier incorrect figures (used by Forwood) from an earlier version of the input-output tables.

lumping together indirect tax and commodity tax, does logging get more heavily taxed – and accordingly in this sense less support – than total agriculture. Even so logging is less heavily taxed than sheep, and both sawmill products and pulp paper and paperboard are less heavily taxed than most agricultural enterprises. Insofar as the Forwood comparison holds up, with respect to *some* agricultural enterprises, it holds only for extractive forestry and logging and *not* for forestry in the wider sense – in short, not in the region where most concessions are being claimed.

With respect to indirect taxes the Forwood argument is likely to backfire. For in this respect total agriculture is a good deal more heavily taxed than logging. As much as 40% of this tax appears to accrue through land rates. If the treatment of raw forestry enterprises is to parallel that of agriculture, should not the effect of rates be matched by assigning a rateable value to public forestry land? What Forwood would like to see is not these penalties extended to logging, but the subsidies agriculture has received also granted to raw forestry; and it has been the case, as the table shows, that agriculture receives negative commodity taxes, i.e. is thus subsidized. The subsidies raw forestry obtains simply enter in other ways, not through commodity tax inputs (as table 8 in Wesney and Freestone [1] reveals), but especially through low royalties.

In several important respects, which further impair the Forwood argument, the input-output tables are now out-of-date; most notably input subsidies to agriculture are beingsharply reduced since the tables were updated, e.g. dairy product bounties and petroleum products subsidies. In particular, fertilizer bounties, which have a large bearing on commodity taxes to agriculture, have been phased out, at the very time when production forestry is increasing its use of fertilizers, accordingly altering the comparison between commodity taxes on agriculture and raw forestry, upon which Forwood's argument depends.

The main argument that is being advanced for more assistance for wood production appears then to have the following form:

(1) Forestry obtains less assistance than agriculture.

(2) The level of assistance accorded to agriculture is desirable, and it is desirable for other enterprises such as forestry to match this level.

Therefore

(3) It is desirable that forestry obtains more assistance (up to the level accorded to agriculture).

However both the premisses of the argument are very doubtful; indeed the second premiss appears to consist of two false conjuncts. The first premiss (1) is dubious, not only for the reasons already given in rejecting the superficial inspection of the input-output table, but also because comparison is with a level of agricultural assistance which no longer obtains and is likely to be still further reduced, and because a number of quite crucial indirect forms of assistance, such as the sale of materials from the public forests to the forest industries at a price less than the cost of production, are evidently not taken into account. The first part of premiss (2) has been frequently criticised (e.g. soundly by Schapper [1]); it would certainly not be generally agreed upon, and there has recently been a substantial beginning made on winding down the extensive system of subsidization bolstering agricultural enterprises. As to the second part of premiss (2) it is doubtful whether the reasons for supplying subsidies to agriculture would extend to all of forestry activities; firstly because some of these are designed to encourage local production of what are regarded as essential items whereas a large part of forestry supplies quite inessential commodities, e.g. much of the estimated 50% or so of consumption devoted to pulp and paper consumption at 2010; and secondly because rationale for many agricultural subsidies, especially dairy subsidies, has been a welfare one, such as the desirability of protecting an existing body of producers, but these considerations completely fail to apply in the case of expanding forestry operations. Precisely the same points apply against the conclusion, of Wesney and Freestone [1], repeated in Forwood [1] (p.18 and p.51) without the necessary qualifications to 'direct aid',

> that the forest industry in Australia has a major resource base available for commercial exploitation; ... and that compared with other rural industries, production forestry has been a minor recipient of [direct] Commonwealth financial aid.

In short, not merely has the case for enlarging subsidization of forestry industries not been established; but the case for continuing with the present level of subsidization has not been made out. To obtain some rough, but more direct, idea of the extent of subsidization of production forestry, consider forest service losses (as reflected in expenditure minus revenue) in relation to the total volume of production, and contrast it with agricultural subsidies in terms of gross production volume. In 1971-2 forest service losses totalled more than $30 million (excluding Forestry and Timber Bureau and other relevant public service losses) for a total value of production from forestry of about $140 million, that is a proportion of less than 1 in 5. A comparable subsidy for agriculture would, in terms of gross production in 1971-2, have exceeded $600 million, whereas total Commonwealth assistance, the bulk of governmental assistance[1], to agriculture, amounted in that year to only $451 million — in what was a record year for assistance, which has since declined markedly. This indicates directly that in terms of gross output production forestry is more heavily subsidized than agriculture.

The familiar claim (argued for in Wesney and Freestone [1] and Forwood [5]) that production forestry is a significant part of the national economy, whether correct or not, does nothing on its own to support the contention that subsidies and other concessions for production forestry should be maintained or even increased. There is little doubt that the bulk of the Australian economy would be but marginally affected by some reductions in the subsidization of production forestry (e.g. prices may be redistributed somewhat but only in a way that would be generally equitable, some substitution may occur and imports slightly increase to consumers' advantage, and some few workers may be displaced, a matter which need be of little importance in a full employment economy). In fact, production forestry is, like primary industries, supplying a declining proportion of the national income (Forwood [5], p.11), thus whatever indispensibility it could be claimed to have is presumably declining also. Just as the claim, correct or not, that production forestry contributes to regional employment does not on its own demonstrate that production forestry merits subsidies (because, e.g., enough such employment may be generated without such subsidies, or in other ways, insofar as it is desired), so also the contentions that production forestry contributes to GNP, that it could produce substitutes for expensive imports, and that it could replace more socially and environmentally undesirable competitors, by wooden products, do little to show on their own — and the further needed assumptions do not stand up — that subsidization should not be discontinued.

The studies of the significance of forestry in the national economy also fail to take account of the opportunity costs of investment in forestry enterprises, especially the opportunity costs on public capital invested in raw production forestry. The comparisons made, of raw production forestry with certain agricultural pursuits, are not just too restrictive, but they neglect that, as well as forests (more narrowly: land), opportunity costs on capital and labour have to be considered. The fact is that in Australia, though some sorts of forests are already scarce, capital is a scarcer resource than land. What has to be shown, then, even given that forestry is significant, is that such scarce resources of capital should be used to subsidize it. This Forwood has not succeeded in doing.

What further arguments Forwood has to propose in support of its case rely on unconfirmed multiplier effects of forestry enterprises on the remainder of the economy through increased employment and spending in other sectors of the economy. The underlying assumption in the argument that these effects would provide a case for expansion of course remains one we have systematically rejected, that increase of commercial activity, as secured by increases in GNP, volume of sales or an equivalent, is of itself desirable. Unfortunately,

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1 While the bulk of assistance to agriculture comes from Commonwealth sources, the substantial part of assistance to forestry is channelled through the States. For this reason the claim that

> Compared with other primary industries forestry appears to have been a relatively minor recipient of direct Commonwealth financial assistance (Green Paper [1], 9.119; Forwood [1], p.18 and p.51; and Wesney and Freestone [1], p.32)

is liable to mislead seriously as to the extent of forestry assistance.

too, for the Forwood case another essential premiss in the argument has not been established, as is admitted in Forwood [5], p.12.

> This 'multiplier effect' has not been fully evaluated, but it is felt to be an important characteristic of these industries.

The multipliers displayed in Forwood [5] table 6, p.29, which provide what base there is for the 'important characteristic' assumption, appear to be purely speculative, and lack empirical substantiation. As is admitted

> the methodology for evaluating these (multipliers) is only partially developed, and there has been only limited application in Australia of the imperfect techniques that are available.

In fact some of the type I multipliers proposed in table 6 resemble those of one of the few Australian studies, Ferguson [2], the inadequacy of which has already been explained (in chapter 13).[1]

At best then Forwood has proposed a 'multiplier hypothesis', but such an unestablished hypothesis provides no basis for detachments of the sort Forwood has made, e.g. the exaggerated conclusion [5], p.17:

> The wood-based industries are making a considerable contribution to the social and economic life of the nation... . The larger forest industries are a major commercial force and they tend to generate ancillary industries and services thus introducing diversification into the economic and social structure of communities.

Not even narrowly commercial multiplier effects, reflected in spin-off in sales and employment in supplier industries, are known. The wider economic and social multipliers, which would take account of the spin-off in environmental and social costs and damage, are largely unknown. What we see at work once again is promotional economics which lacks any sound foundation.

A final batch of arguments for the subsidization of production forestry take off from the question of *who pays* for environmental protection and the costs arising from concessions to non wood-production values. In their more extravagant forms these arguments even suggest that because of the effects of non wood-production measures on wood production costs, wood production costs should be subsidized. Thus in Forwood [1] p.37-8, for example, it is argued that because provision and reservation for non-wood values will reduce the area of commercial forest devoted just to wood production and thereby force more intensive forestry, public monies should be made available to offset the (increased) costs of commercial forestry. But the premiss is false, as it assumes that available forest land for purely domestic wood production is in very short supply.

Forwood repeatedly contends however that it is the public who must pay for the protection of non wood-production values and that it would be inequitable for *any* of

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1 Much the same criticisms extend to the claim in Forwood [1], p.13 that

> some Australian data show that the economic stimulation produced by the forest industries is generally higher than that produced by agricultural industries.

The main base for this claim, set out on [1], p.30, is supposed to be Douglas [1]. (Of the other studies mentioned in passing, Ferguson [2] has already been criticised, while Reilly [1] is unavailable.) Douglas is far less confident in his claims, drawing attention to the substantial limitations of his study, and arrives only at the *much* weaker conclusion:

> In terms of employment generation, the high labour/output figure for forestry and, to a lesser extent, meat cattle, *indicates* that these industries have a greater influence per dollar of output than do other industries. This argument can, in this case, be *extended to suggesting* that forestry and meat cattle also stimulate a higher degree of economic activity in the rest of the economy [than sheep and wheat] ([1], p.7, our italics).

Obviously Douglas's conclusions are far more tentative and restricted than those of Forwood, for the good reason that the study has, as Douglas admits, considerable limitations. Forwood's claim that forestry stimulation is generally higher is thus open to question in its main points. Secondly, Douglas's comparison is only with three agricultural pursuits; to reach its conclusion Forwood would have to extend its 'study' to cover the several further agricultural industries included in the tables of Evans et al [1]. Thirdly, Douglas's argument does not distinguish raw forestry decisively from meat cattle. Lastly, Douglas's comparison only concerns raw forestry and logging; it does not therefore extend, as the Forwood claim suggests, to the wood-based forest industries.

this cost to fall on the wood producer or wood user. Thus it advocates in several places (e.g. Forwood [3], p.51, Forwood [1], p.38, Forwood [8], p.17, Survey [1]):

> Public funds be made available to meet the increasing investment in administration and research *associated with multiple use of the forests* .... so that timber producers and users do not have to subsidize the community in the provision of these goods and services. (Survey [1], p.24.)

But this recommendation fails to make the important distinction between (i) costs, e.g. for loss of amenity and environmental values, that are incurred through non wood-production uses, such as for recreational facilities, and (ii) costs which do not arise in this way but through logging, e.g. for restoring degraded environments, streams, research costs on the effect of forestry operations, etc.. Hence the recommendation fails to sort out the users who are responsible for bearing different costs, and indeed seems to suggest, by using the phrase 'associated with multiple use', that *all* such costs connected with the protection of non wood-production values should be paid for by the public even where the costs in question arise because of the effect of wood production activities. It implies that it would be unreasonable and inequitable to expect the wood user to pay any of these costs of protecting non wood-production values even where they arise as a direct result of logging. As we have remarked in chapter 16 (p. 237) this is in effect a complete rejection of the polluter pays principle[1], which would require that the wood producers and users pay such costs, e.g. research costs, costs of modification of logging practices where they are required to protect the environment from or restore the environment after this use. The extravagant concern throughout much of Forwood (Forwood [7]'s discussion of royalties is the exception) lest the wood user be asked to pay something is particularly incongruous when one considers the extent to which the wood producer and user is subsidized by the rest of the community through low royalties. Nor can it be argued so convincingly that it is impossible to make a distinction between these different costs since Forwood thought it was quite practicable to do so in the case of research and service costs: Forwood [7] p.45, makes the requisite distinction between costs of research and services provided to industry and those provided for the public in general.

While there is an excellent case for increased funding for forest services to cover independent visitor facilities, and some case for assistance with roads receiving substantial recreational use (although not perhaps such a very good one given the extent to which public roads are used and damaged by logging activity, and given the possibility it raises of funds designed to increase public amenity helping to finance roads, e.g. for woodchip schemes, which help to destroy the amenity), the suggestion that wood production should be compensated for all areas it does not log is quite pernicious. It is not only in conflict with the polluter pays principle, but would plainly lead to an argument against reserving areas on the grounds of the great public expense involved. The proposal that wood production should be compensated for every concession in the direction of making its activities less damaging to public amenity and to the environment (the Expensive solution, as explained in chapter 16), is little different from the suggestion that a polluter should be compensated for refraining from or ceasing to pollute public waterways, i.e., for concessions he makes to reduce the damage his production causes to the environment and to public amenity. The particularly pernicious suggestion that compensation be paid to wood production (e.g. in the form of compensating assistance and concessions) for every area not cut assumes that wood producers have a prior right to everything in the forest and have to be compensated for not exercising their right and for not conducting a totally ruthless operation. The picture should be rejected not only because it conflicts with a multiple use account of forest (since it assumes that the natural state of affairs is the use of forests entirely for wood production), but also because it conflicts with the polluter pays principle and related assumptions, that it is the responsibility of a producer to conduct his operation in such a way as to avoid damaging the environment

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1 Another stronger rejection of the polluter pays principle appears in the recommendation that the costs of pollution control should be tax-deductible. It is difficult to know without further details how much is involved in this sort of concession, but in the case where all such costs could be so written off the recommendation would amount to a complete rejection of the polluter pays principle. In any case it is clearly a partial rejection of the principle.

and public amenity. The point illustrates the fact that the multiple use concept must be handled with great care if it is not to be abused and become a vehicle for infiltrating a public purse policy. There remains however a very serious problem, about which concessions it is the responsibility of wood production to pay for (since plainly not all are) and how to draw the line.[1]

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1 The application of the polluter pays principle is, as is normal for matters involving an assessment of responsibility, far from straightforward. In a way typical of responsibility assignments it appears to depend upon assuming a normal, initial or background state against which interference and responsibility is measured. As usual responsibility can be seen in terms of damage to a pre-existing facility or item (e.g. the forest or stream) which is taken to have a normal or background state. Responsibility is incurred by altering or interfering with the background state (usually in a damaging way).

Failure to observe that the polluter pays principle is a matter of responsibility for altering a background state so as to adversely affect others, is responsible for the difficulties encountered, e.g., by Mishan [1] in his discussion of the justification of the polluter pays principle. His difficulty in seeing its justification is due to his picturing of the pollution situation simply in terms of one set of interests (those of the polluter) conflicting with another (those of certain other stream users), an overly evenhanded approach which gives no proper opportunity to arrive at an assessment of responsibility.

There is of course plenty of room for wrangles over what the background condition in disputed cases is, and judgements will tend to reflect the views of competing interest groups. Thus the wood-production forester may tend to view the background state of the forest as one in which it is all used, without modification, for wood-production (so that he should be compensated for the non-wood users' adverse alteration of this background state), while the conservationist may tend to see the background state as that of the virgin unlogged forest, or one used only lightly for wood production, and regard it as the responsibility of the wood producer to compensate for altering this condition adversely. In a similar way the industrialist may see the background state of the stream as highly polluted (and sees the responsibility to pay as one to compensate him for interfering to alter it adversely from his point of view), while others will see the background state of the stream as totally unpolluted, moderately polluted etc., with responsibility falling on the industrialist to pay for damaging interference. At the extreme end one might consider a protection racket which demands that a gang be compensated for desisting from damaging some person or smashing up some forest. Plainly judgements on the background state will reflect rival value systems and competing interests, and decisions on who must pay will have a political character as well as a large arbitrary element. Presumably we can expect to see many interesting torts cases on the subject as the polluter pays principle and associated costs become to a greater extent the subject of legal decision.

That it is not the responsibility of the wood-producer to pay for the provision of independent visitor facilities can scarcely be disputed since these cannot be regarded as part of the background state or the wood-producer responsible for altering it; similarly it is clear that it is the wood-producer's responsibility to pay for at least a large part of research on the effect of logging on wildlife, since he is responsible for altering the background state so as to necessitate it. However other issues, for example how far the wood-producer should be compensated for extensive ecological surveys, are less clearcut, and will depend heavily on how the background state is envisaged. In any case, it is plain that claims for extra subsidies for wood production on the basis of disadvantages suffered due to multiple use must be treated with the utmost care if they are not to introduce an unwarranted public purse policy with rewards for desisting from damage.

The matter of the profitability and commercial desirability of production forestry

Totally inadequate as the Forwood discussion of the degree of support for private forest industries is in the context of the recommended forestry expansion and the aim of self-sufficiency, it is nevertheless more extensive and adequate than the discussion and consideration accorded the issue of the profitability of public sector forestry and equitability of existing royalty arrangements.[1] It is extraordinary that a conference which is supposed to determine forest policies for the next 40 years should have so ignored these issues. On the contentious issue of the returns to the public sector from the woodchip export industry no data or economic discussion is offered. On the issue of the profitability or commercial desirability of the pine program the Working Party makes the remarkable admission that it

> has not had access to full details of the studies of costs and benefits which went into the planning of the Agreements (Forwood [7], p.16).

All it was supplied with was a brief general statement of the method adopted – a benefit-cost ratio with costs and prices discounted back to present values and selling prices determined through import-replacement values – which gives quite insufficient detail[2] to enable any assessment of the asumptions adopted to be made, and leaps to the conclusion that

> in most recent studies the ratio of benefits to costs varied but in all cases were at least one and generally were about two (Forwood [7], p.18).

For example, there is not enough detail in the statement to determine what price rises were assumed and therefore whether the somewhat low discount rates of 6% and 7% adopted were realistic, or whether the same sort of techniques which were used in NSW [12] were employed. Nor are the benefit-cost ratios cited particularly outstanding, as the discussion of NSW [12] in Appendix 4 likewise makes plain; once again there are much better returns to be obtained on public investments and the opportunity cost argument (p.90ff.) applies against extensive pine programs.

In any case if the account given of the method and information used is correct and the benefit-cost ratios are considered so uniformly good, there does not appear to be any sound reason why these benefit-cost studies should not have been released publicly so that

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1 The procedure of applying forest service budgets to show the unprofitability of Australian forest service wood production activities (used on p.5 above, and also in the Coombs Report, Comm [10]) has been objected to on the ground that it ignores the amount of capital forest services have tied up in trees, and that when this capital, reflected in a commercial account, is added to current accounts, such forest services as NSWFC show a reasonable profit. The argument is defective and the accounting methods proposed illegitimate. The fact that Leyland (Australia) has a good deal of capital tied up in unsold vehicles does not enable the company to avoid a net loss over the financial year (1973-4 in this case). The fact that the NSW Railways has a good deal of capital tied up in rolling stock does not enable it to avoid incurring a financial deficit year after year. The most that one is entitled to count into a profit and loss account from such capital investment is the net capital increment. Since the NSWFC is working at best on a cost-covering basis in its timber sales, there is no annual net capital increment. Therefore the expenditure-revenue figures cited do provide a reliable reflection of forest service profits in NSW, namely that they are negative. In fact NSWFC has been operating at a loss virtually since its inception; and its ship will not come home even when the plantation pines come onto the market unless royalty levels rise substantially.

2 It is worth noting that the import-replacement method of determining prices (also assumed in Green Paper [1], chapter 9, and nowhere properly detailed in Forwood) would not tell one anything about the viability of the program as an export enterprise, since prices assumed are presently above those on the world market – yet a proportion of the planting program is now export-oriented. Moreover as prices assumed are apparently higher than those on the world market, the favourable benefit-cost ratios are obtained at the expense of the Australian consumer of forest products who is obliged to pay more than he would otherwise do.

doubts about the details of the analysis could be resolved and the viability of the pine program publicly demonstrated. However not only are the benefit-cost ratios claimed difficult to reconcile with previous studies, but also they are difficult to reconcile with the apparent returns of the South Australian Woods and Forests Department which, operating almost entirely on *Pinus radiata* plantations, shows at best a small profit, despite the swelling of revenues through state operated sawmills. Furthermore if benefit-cost ratios of these orders can be obtained when the projects are discounted at a 7% rate it is clearly unjustifiable that the Commonwealth Softwood Forestry Agreements Act should be supplying finance to the States at an interest rate which averages only 3%. And as Survey [1] admits, in a candid moment (p.18) when it is appealing for expansion of governmental assistance for forestry:

> normally returns from forestry are less than those that can be obtained from most other long-term investments and therefore, if self-sufficiency in forest products is accepted as a national objective, it will be necessary to request continuation and expansion of the assistance already provided by the Australian Government.

The benefit-cost ratios supplied to Forwood [7] have been distorted by the standard forestry assumption that land is costed at zero value, an assumption that has come under increasing criticism recently not only because it values the bush destroyed and its non wood-production assets at zero but because it does not even reflect the commercial value of the land, as shown for instance by what it would cost a parallel private company to purchase comparable land. According to Forwood ([7], p.18)

> this can be justified by the experience that most land bought for planting in the life of the first agreement was, except in South Australia, bought for less than the cost of clearing.

The argument is thoroughly fallacious. It does not constitute any sort of argument for the thesis where (as was the case in NSW and presumably to a large extent in other states with the exception of South Australia) a large proportion of the land purchased, even if at some time used for agriculture, was in fact bush, i.e. uncleared land. The fact that the comparatively small ratio of land purchased was bought for less than the cost of clearing would only show that Crown-held bush could be commercially valued at zero if most of the land purchased was already cleared land, or the average purchase price was an average purchase price for cleared land: otherwise clearing costs have to be added to land costs and are not avoided. But since much of the land purchased is not cleared land but bush which still requires clearing the fact that the purchase price is less than the cost of clearing does nothing to show that uncleared land can be valued at zero. And purchases were largely of bush except in South Australia, where little bush is available, and which is admitted to be an exception. The argument, like the claim that most pine planting is on 'cleared land', trades on the ambiguity between 'land once used for agriculture' and 'cleared land'. Finally if the Forwood assumption needed to justify the argument – namely that the land purchased was cleared land – were correct and purchase had been of cleared land bought for less than the cost of clearing bush, then plainly the practice of bulldozing native forest to create pine plantations would be completely indefensible both on economic and environmental grounds.

Meagre and inadequate however as the economic data on the proposed 3.45 million acres of pine is, it is rich compared with that set out in the case of woodchip export projects, for which no financial data or costing is anywhere given.

The question of royalties

The profitability of production forestry would of course be assured by a very substantial increase in stumpage prices – but at the expense of volumes of sales, especially of end products such as sawnwood where royalties make up about 8-12% of the wholesale price. And there is a good case, which emerges from Forwood [7], pp.35-46, for a thorough overhaul and reappraisal which, properly conducted, would lead to substantially higher royalties.

Forwood [7] brings out clearly both the arbitrariness and the subjectiveness and the variability from state to state of the present methods of determining royalties, and the

failure of the states to relate royalties to the cost of producing wood:–

> the average level of royalties charged...in Australia...is generally determined in an arbitrary manner. There is no apparent attempt to relate royalties to the cost of growing timber and the relationship of royalties to the market price of the end product appears to be fairly loose. (Forwood [7], p.35.)

Some of the case is detailed in Appendix A (Forwood [7], pp.36-40), where it is revealed that the procedures – which are *not explained* – for determining royalties vary markedly from state to state, with some states operating with some (generally ad hoc) version of the residual values method in the case of saw logs, and with others (e.g. Victoria and Tasmania) applying largely unrevealed methods which do not consider the selling price of sawn timber. But Appendix A is far too sketchy. Moreover far too much of the case, which should have been made available, is omitted. For example, the royalty questionnaire ([7], pp.40-1) requested information about state royalty systems, but even in the case of sawlogs no recipes were provided (though a much clearer picture of what *is* taken into account in each state could have been more succinctly provided in this way, through explicit recipes). The questionnaire went on to request details of the relation of royalties (if any) to several important factors, in particular the cost of growing timber, the cost of providing non-wood benefits, and the overall running expenses of the forest authority, but no analysis, or summary of replies even, is attempted. Though it was asked what factors affect forest service decisions to raise or lower royalties across the board, no answer is given, (though it does emerge that royalties are kept down, or reduced, to assure the competitive position of wood products and continuing volumes of sales). Though information was requested concerning pulpwood royalties, none is supplied in Forwood: there is no discussion of any depth of the important matter of pulpwood royalties, or why they should differ so substantially from sawlog royalties.

Insofar as these matters are not documented, the Panel has failed to meet its terms of reference, which included 'a study of royalties as imposed by Government forest authorities' and 'their methods of calculation'. As it was, the terms of reference were changed from those initially specified to delete controversial issues. Although the terms of reference of the Finance Panel originally included a discussion of the levels of royalties and the question of their equitability, e.g. whether private industry was paying enough, these terms were subsequently amended so that the issue was not discussed except in a peripheral way. (They were changed apparently as a result of pressure from industry representatives.) The new terms of reference (Forwood [7], p.35) take an explicitly protective form, appear to presuppose the desirability of industrial expansion, and are far too narrow. Not only is the equitability of royalty levels avoided, but the important social and environmental bearing of royalty settings (e.g. the role of royalties in directing operations away from environmentally damaging kinds) is nowhere broached.

Evidently much important information, available to the Panel, has not been made available even to the readers of Forwood – though much of the information could bear vitally on the policy decisions many readers of Forwood are supposed to comment upon and vote on. Thus this suppression of available information, so characteristic of forestry authorities, seriously reduces the prospect of informed and rational decision-making on important policy matters, not just concerning royalty rates and the financial viability of forest services, but also concerning wider issues such as the expansion or continuation of woodchip export projects whose future would be jeopardised by realistic royalty levels. Nor is the suppression of this information – nowhere justified – in the public interest. As we have argued the *full* financial details of the management of public forests, and royalties in particular, should be publicly available and assessible. At the very least, the forest services should have to be accountable in the end to the community in their management of public forests and Crown lands; but accountability is excluded while so many important management details remain 'confidential'. What tenuous case there is for keeping the financial details of private companies confidential[1], when so many of their activities impinge heavily on the public domain (e.g. through environmental interference by way of degradation of public land, pollution, noise, through their reliance on publicly supplied infrastructure, education and research, and through consumer

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1 This confidentiality Forwood was keen to respect ([7], p.44.)

issues), certainly does not extend to public corporations, where it is generally (except in very special areas such as defence) most advantageous to have all details publicly assessible. A significant omission, then, from the royalty recommendations is the recommendation that royalties, and subsidies where these occur, be made public.

Despite its failure to divulge much important information, which it managed to assemble and which should have been made public, and despite its failure to discuss important principles in royalty determinations, e.g. the case for subsidising producers remote from main markets through diminished royalties, the Finance Panel did manage to come up, very tentatively, with some reasonably good if very general, recommendations as to how royalties should be calculated. In summary, these recommendations were as follows:-

Royalties should be set primarily so as to cover the full costs of production together with a margin of profit to ensure a reasonable return to the forest service; but settings so determined should be adjusted (i), in the interests of equitability, to take account of differences in tree species, quality, accessibility and remoteness, and (ii) where the primary setting 'would result in unrealistic timber selling prices'.

The full costs of production were to be assessed in terms of the full growing and maintainence costs, or alternatively (and where the first is not possible) in terms of the replacement costs. The full costs, properly include all costs involved in wood production, e.g. roading and access costs, costs of research and services (though Forwood erodes this by saying 'after agreement with...industry'), but not non wood-production costs incurred by forest services for public services and amenities.

Though some of the recommendations of Panel 7 as to how royalties should be set are meritorious (they happen also to overlap those set out in chapter 16), they could be much improved upon by including environmental costs of wood production within the full costs which royalties are to cover. Nothing as desirable as environmental pricing is contemplated in Forwood.

However the discussion of royalties illustrates a major objection to the conference, namely the failure to set out and assess significant options and evaluate their advantages or disadvantages from the point of view of a broad range of social and environmental objectives – not just from the point of view of their effect in promoting industrial growth and expansion of consumption, the factors explicitly considered. The royalty section was one area in which the method of setting out and assessing options could easily have been implemented. For example, it would seem that realistic royalties would tend to encourage use of residues and recycling, help discourage excessive and wasteful use of materials, and improve the ability of forestry to compete with agriculture for suitable cleared land without further subsidies. Low royalties would tend to lose these advantages. None of these broader social effects are discussed or considered, nor are the options clarified. The ruling considerations for Forwood are the effects of royalty settings on industrial growth and consumption.

The suggestion, canvassed at the conference, that forest services should operate on a non-profit basis, since they are providing a public service – or at least a service to the wood-product consuming public – has many serious weaknesses. Firstly it neglects opportunity costs, both of public capital invested in forest services and of land forest services control. Thus, secondly, it amounts to proposing subsidization of wood producers and consumers; and supposes in particular that consumption of wood products of any form is generally desirable and worthy of encouragement. But, as we have argued in chapter 16, there is certainly no good case for the overall subsidization of wood products, that such non-profitable forest service operations would imply; a big increase in junk paper products, for example, is neither in the public interest nor desirable.

From the point of view of public investment, royalties charged at cost or less divert scarce public funds into an indiscriminate subsidy for certain sorts of consumption (something with a good deal less to be said for it in the case of much paper consumption than the recently abandoned rural petrol subsidy), and provide no compensation to the community for the closing of other options and the likely damage to land and its natural ecosystems as a result of ceding it to forestry activity, as opposed to leaving it untouched. Accordingly, the 'reasonable rate of return' to forest services (which should include an

efficiency factor) included in primary royalty settings should be *adequate* in the light of opportunity costs on capital and public land.

Both the assumption that royalty levels should not rise to a point where they do more than cover costs, and the assumption, made in Forwood [7] that, in order to meet the proposed royalty system, royalties will have in general to rise, contradict the forest service thesis that forest services are making a profit in their forestry operations. For profitable operations the current royalty systems will have to be thoroughly overhauled.

But while royalty settings should no doubt be adjusted to take account of the quality of logs supplied and of differences of species, the merit of some of the other differential adjustments proposed under headings (i) and (ii) is more debatable. Firstly, royalties should not be adjusted, as at present in NSW and Tasmania, to encourage anti-environmental practices, but to penalise them, e.g. by making royalties higher for steeper slopes, in erodable country, etc. Since extraction costs are higher in difficult country, such a policy would imply that the present royalty system 'under which royalties diminish as the estimated average cost of supplying the market increases' (p.35) should be abandoned. It is quite inadequate to take account only of extraction costs and to neglect the environmental and non wood-production effects of operations in royalty settings. Secondly, a leading feature of the current system, that 'freight on the product to the principal market [is] is a major determinant of log royalties', which is suggested under heading (i) as a factor to take into account, is open to serious question. An analogous principle has been rejected in comparable agricultural enterprises. No doubt Forwood would defend the principle, like a petrol equalization scheme, which effectively subsidizes petrol in remoter areas where freight costs are high, on decentralisation grounds; but the standard reply, that if decentralisation is the aim, then the equalization principle, which frequently channels advantages to very large organisations such as Blue Metal Industries, is not an efficient and economical means of doing so, applies (cf. the Coombs Report on the Petroleum Products Subsidy Scheme, Comm [10], p.225). The way in which royalties are adjusted on the equalization principle simply on a state-wide basis is also open to serious criticism (especially as the principle market is often not the closest major market). Thirdly, what counts as 'unrealistic timber selling prices' is not spelt out clearly. Forwood [7] is right in saying that if such a consideration were introduced in adjusting royalties, it would be a political decision (but wrong in saying that *only then* would it be a political decision, since a decision to support remote producers would also be). But then presumably it should not be left in the hands of a forest service to decide: it is not the forest services' role to decide on governmental policy matters such as decentralisation, maintenance of employment, etc. (the justification according to Forwood for royalties being 'unrealistic'), without very specific directives. For one thing such policy decisions should take account of opportunity costs, and of alternative ways, beyond forest service jurisdiction, of making adjustments.

Though pulpwood will provide an increasingly large proportion of the wood harvested, remarkably little is said as to how such royalties are set, or how and why they should be differentiated, if at all, from sawlog royalties. There is a good case (advanced in chapter 16) for not differentiating in the currently practised way.

If, as Appendix B ([7], p.12) contends and the forest industries believe, even a large increase in the level of royalties for pulp and paper would have little effect either on final product prices, and hence on demand, or on competition from imports (a view which is still more difficult to accept), there seems to be no good reason why the suggestions that pulpwood royalties should fully cover the costs of production should not have been accepted, or why such a recommendation should not be implemented. If it is indeed the case that such a royalty rise would make little difference to the overall price (which is doubtful) there is a straightforward welfare argument for doing so; for in this way the forest services could be made to pay their way and funds subsidizing them released for welfare investment elsewhere, thus making many better off, while but few need be made worse off by substantially increased pulpwood royalties if increased royalties have only a small effect on final product prices.

Despite its shortcomings, the system of royalty calculations outlined in Forwood [7], p.45, is a vast improvement on those currently operating. In the final recommendations of

Forwood [7] the new system was only proposed however in an extraordinarily hedged fashion, as if the Panel expected their recommendations to be rejected — as they apparently were, not unexpectedly, by the Marketing Panel. The recommendations of Forwood [7] took the weak form that if their system of royalty calculations, which they recommended be implemented, were not accepted by a forest service *or industry* then a joint committee from industry and the forest services should be convened 'to reach agreement on a system of royalty determination to replace the existing system' (Forwood [7], p.35, p.8). This is entirely unsatisfactory; it is not for industry to help to decide that royalties should not cover full production costs or what sort of assistance it is to receive. Similar points apply to the third recommendation that

> representatives of industry and forest services meet...to determine a formula for annual review of royalties to replace the present system of arbitrary changes at irregular intervals.

If the Forwood system were worked out and adopted, royalties would automatically adjust with costs (and with prices should these be included), and such a formula for annual review would be otiose.

In summary, what the recommendations on royalty settings boiled down to is the recommendation that industry and forest services get together to devise a less arbitrary system, with Forwood [7] system as a favoured one to be looked at first perhaps. It is evident that even if the favoured system were to conform, as Forwood [7] claims, to the Coombs Report criteria for pricing policies of public enterprises (Comm [10], pp.26-7) (it does not because of differential adjustments under heads (i) and (ii) above, Coombs' criteria plainly ruling out, e.g., the simple favouring of producers because of remoteness), the alternatives arrived at with industries' help most likely would not conform.

Despite the very tentative and weak nature of the royalty proposals and Forwood [7]'s concern with accommodating industry, none of their recommendations found their way into the final recommendations of the Draft Coordinated Report (Survey [1]), whose recommendations were to form the basis for policy as determined by the conference voting. Indeed there is no mention of royalties or their determination in the Survey Reports ([1] and [2]), in spite of the fact that they are important in determining, through their effect on future prices, both future demand, at least for sawn timber, policy towards imports, and other important matters.

It is really not surprising that the royalty issue was swept under the carpet and the suggestion that royalties should cover full production costs dropped. Not only did industrial pressure clearly work against adoption of the recommendations for the adoption of more realistic royalties, even in the very weak form in which they appeared in Forwood [7], but also the recommendations were clearly in conflict with the promotional, expansionary, and public purse spirit of the Survey Reports.

Forwood's estimates of market 'requirements' and demand

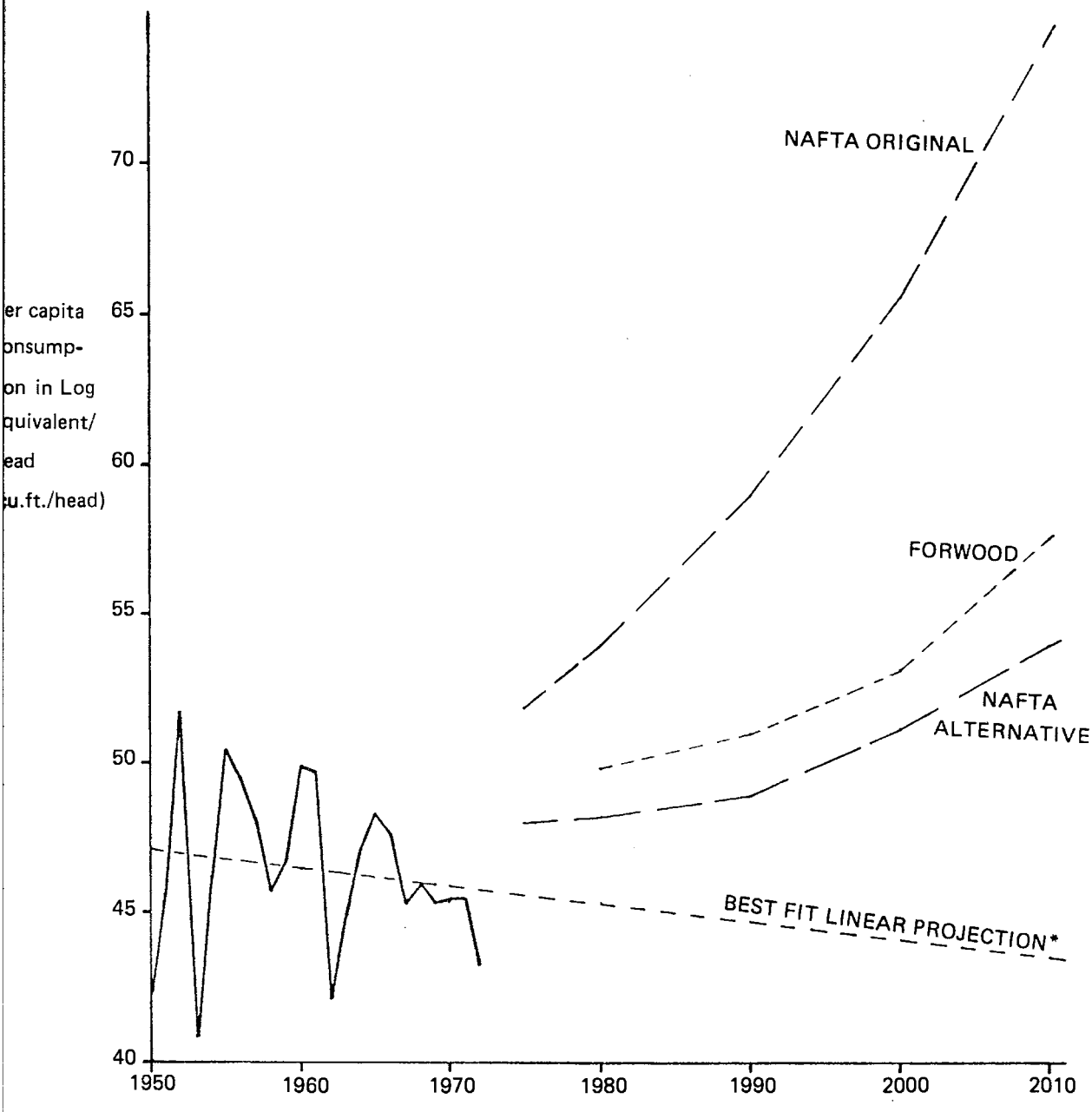
Forwood's case for its program of expanded wood production depends completely on its estimates of future domestic market requirements to 2010. We shall argue that the case falls down, most notably when more realistic population estimates are adopted.

Forwood's estimates of 'market requirements', 'projected domestic consumption', 'projected demand', as it variously calls its estimates in the Marketing Panel (Forwood [6]) and Survey [2], were obtained by partitioning wood products conventionally into end uses and then, for each given end use, with but a minor exception, by the undesirable method of allowing industries concerned with the production or application of the relevant end use to make their forecast of 'requirements'. It is hardly surprising then that decidedly inflated figures emerged. But the overestimation of requirements cannot be ascribed just to the fact that industry was allowed to predict its requirements, as we shall see.

Forwood makes a case for a 'future domestic requirement' at 2010 of 1452.3 million cu. ft., i.e. 57.6 cu. ft. per person for an anticipated population of 25.2 million at 2010,

CHART 6

PER CAPITA APPARENT CONSUMPTION OF FOREST PRODUCTS WITH VARIOUS PROJECTIONS TO 2010



Notes: *The best fit linear projection was obtained by the method of least squares with a modified 'LINEFIT' Program on UNIVAC 1108, ANU Computer Centre.

Confidence intervals for the curve, of the form $y = a + b\,(t - t_o)$, assuming that E(I) is normally distributed, and for a percentage probability of 95, are:

$a = -0.058 \pm 0.183$

$b = 160.735 \pm 359.457$

Sources: 1950-1972 figures are from FTB [3] and the Forestry and Timber Bureau.

Projections are from NAFTA [1] and Survey [2].

and for a similarly high figure at 2000 (see chart 6).[1] The Forwood estimates are thus very high estimates, not quite but almost as high as the earlier projections of NAFTA [1] but higher than those of the alternative NAFTA projections (criticised in chapter 4). In fact the Forwood strategy seems simply to postpone the excessive consumption levels predicted by Hanson and by Jacobs (see chart 1, p.40) from 2000 to 2010; thus these levels will still be aimed for but for 10 years later. The material on future requirements and demand which supports these high estimates, is the most important part of the Forwood papers from the point of view of future planning; for, given the wood production orientation of Australian forest services, it is around these estimates that future proposed management of the forests will largely turn. Not unexpectedly the conclusion is reached, on the basis of the high estimates of future demand that Forwood arrives at, that the pine planting program, far from being reduced, should be stepped up, and that many more native forests will have to be managed in an intensive way if domestic consumption is to be satisfied.

There are two main reasons for this outcome which are incorporated in the estimates of 'requirements', namely, firstly, the use of very high population growth rate figures with no allowance for a decrease in the rate of growth even after 2000 or for the effect of this on demand for dwellings, and, secondly, the assumption of a very substantial growth in the consumption of pulp and paper, particularly in the area of disposable paper products, packaging and industrial papers and paperboard, newsprint, and sanitary tissues. Total paper consumption is predicted to rise from its present per capita level of about 11 cu. ft. to 27.4 cu. ft. at 2010 (Cf. Survey [2], p.28), that is to rise from its present position of about one quarter of per capita assumption to almost half of per capita consumption at 2010. A third important ingredient in the outcome is the use of yield estimates from native forests which are very much lower than those regularly given in previous sources (see the understating of likely yields discussed below).

A striking feature of the estimates of future 'requirements' is the bewildering variety, and the opportunism, of the extraordinary hodge-podge of methods used to predict future population and consumption levels. Thus population levels are 'predicted' by extrapolating from existing figures (and from a single year with a high growth rate figure at that), with the suggestion that such a method has good reliability and deviations a low probability. However, in the case of sawnwood extrapolation from existing (or recent average) per capita consumption levels is eschewed in favour of a holistic method called 'a subjective approach based on patterns known or anticipated' (with the suggestion that extrapolation is unsatisfactory), except for the years 2000-2010 when it is displaced by a different method, cited as 'econometric analysis', which operates with per capita demand and per capita supply, and leads to higher aggregate estimates. The method adopted in the case of hardboard and softboard is simply extrapolation from the last decade's aggregate demand, while in the case of plywood and of all pulp and paper components the procedure is one of subjective estimate based on annual percentage growth in aggregate demand over the last decade. In the case of particleboard 'the actual projections given are a rationalisation of current opinion in the industry' (Forwood [6], p.73). The methods are inconsistent; but although their selection for a particular case might appear arbitrary a pattern for their use soon appears, that in general a method which gives bigger results is preferred over its rivals. Thus, for example extrapolation gives a higher estimate of population than more subjective estimates based on trends and so is preferred, while extrapolation from aggregate consumption data is eschewed in the case of sawnwood estimates because much lower figures are obtained than for the 'subjective' method. Disagreement between authorities is resolved by taking the highest estimate. Moreover in each case the method used yields figures higher than those which

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1 The estimates of future domestic consumption given in Forwood [3], p.15 are defective; apparently a mistaken conversion factor has been applied in obtaining log equivalent figures. The figures given would lead to a per capita consumption at 2010 of only about 41 cu. ft., a figure notably lower than present levels though Forwood has allowed for substantial increases in per capita consumption.

would have been obtained by alternative more reasonable methods, and much higher than those which would have been obtained by extrapolation from past average per capita consumption figures using functions which reflect what is known theoretically of the patterns of consumption of the respective end uses.

We examine Forwood's demographic assumptions before turning to their estimates of future sawnwood, panel product and pulp and paper consumption, and then returning to the question of 'requirements'.

The Forwood forecasts of future population, a vital question for future wood product requirements, failed to take proper account of available information, and consequently appear to be seriously astray – a matter which throws out all the estimates of future requirements and demand. The Forwood population forecasts were 'based on a net immigration of 88,300 persons per year (the average for 1966-70), and 1970 fertility rates' (Forwood [6], p.2) and led to populations of 21.5 million at 2000 and 25.2 at 2010. Their projections are marred by the following deficiencies:

(i) No allowance is made for a decline in or cessation of immigration intake *even after 2000.* The immigration levels allowed for are in fact much higher than levels which have recently been reached.

(ii) More recent information suggests a natural growth rate at 2000 far lower than those presently being experienced and tending towards zero.

(iii) The Forwood figures have been projected from a high period, with the effects of the post-war baby boom lifting natural increase figures above average levels for the general period. Thus the forestry tradition of projection from higher than average population growth rates is continued in Forwood [6].

(iv) Projections have been made from a single year, 1970, methodologically a quite unsound procedure for a projection over 40 years. At least an average figure over a longer period should have been used as base, and really theoretical considerations should have been taken into account and discussed (see chapter 3 above).

Evidence was available in 1973 (at a time when Forwood had not settled upon its population projections: Minutes [1]) of a declining rate of population growth, as the following figures drawn from Comm [2] (published November 1973) reveal:-

Rates of Australian population growth (as percentages)

Year ended June 30th	Year ended Dec. 31st	Natural increase	Net migration	Aggregate rate	Aggregate rate
1969		1.16	1.05	2.12	
	1969				2.15
1970		1.16	0.92	1.99	
	1970				2.07
1971		1.29	0.81	1.99	
	1971				1.93
1972		1.27	0.33	1.59	
	1972				1.42
1973		1.12	0.22	1.33	
	[1973	1.04	0.31		1.35]

Moreover earlier in 1973, W.D. Borrie, a leading demographer upon whom forestry authorities had claimed to rely for population projections, had stated – at an Australian Housing Industry Convention – that the most likely demographic projection, on available evidence, would result in 18-20 million people, and in the order of 24 million people by 2030 (Borrie [1]), projections much lower than those of Forwood.

By the time of the Forwood Conference there were good reasons for thinking that even estimates of an Australian population of 18-20 million by 2000 were too high, and with subsequent events these reasons have gained in strength.[1] Firstly, the fall in net immigration rates, obvious in the above table, is not an emphemeral phenomenon. Immigration rates are unlikely to return to the high levels of 1969-70, and may well fall still further with the partial dismantling of the Immigration Department. Secondly, what is not obvious from the above table, natural increase rates are beginning to decline.

> The main influence on future fertility is expected to be a continuation of the decline of large and middle-sized families and an increasing predominance of the two-child family. (Australia's Population [1], p.10.)

Moreover a worldwide tendency in developed countries to declining natural growth rates can now be observed, and similar tendencies have recently been observed in the Australian natural growth rate. A decline in the natural growth rate in Australia, tending towards replacement levels before 2000, would mean that populations of more than 20 million at 2010 would be improbable even if the current immigration levels were continued or even increased, and without immigration a population of only 16 million would be the outcome at 2000. It now appears, in the light of available evidence, that the most likely population at 2000 is in the range 16.5-18.5 million,[2] the precise level depending not just on the rate of decline of natural growth rates but on political decisions as to population policy and the rate of migrant intake.

Projections of Australia's population prepared for the 1974 World Population Conference and published in April 1974 are compared with Forwood's projections in the following table:-

	Excluding migration	Including net immigration after 1973 of the following numbers annually				Forwood
Year	after June 1973	20,000	40,000	60,000	80,000	
1980	14.2	14.4	14.5	14.7	14.8	15.1
1990	15.7	16.1	16.5	16.9	17.3	18.2
2000	16.9	17.6	18.3	19.1	19.8	21.5

Source: Australia's Population [1], p.10. Figures are in millions of persons to the nearest decimal place.

Since the main table was prepared the fertility rate appears to have declined to a still lower level than that on which the projections were based. It is unlikely moreover that immigration rates will return to such high net levels as 80,000 persons annually.

A spurious air of accuracy is given to the Forwood projections by the claim that they are 'forecasts' made by the Bureau of Census and Statistics — in fact the Bureau only reports projections from given bases under specified assumptions — and furthermore that

> considering all sources of uncertainty deviations of plus or minus 12% for the levels forecast are possible, although the probability of such large deviations may not be great (Forwood [6], p.2).

No basis is stated for the 12% error figure, or is given for the last claim concerning deviations, which was already clearly false before the Report appeared, and it is quite evident that much greater deviations towards the lower end which do not have neglible probability have not

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1 The rapidity with which available evidence can indicate changes in estimates is enough to destroy the case for the forestry proposal that estimates should only be revised every 10 years and that softwood forestry legislation should be enacted for 10 year periods. Since probability estimates are characteristically relative to total available evidence, estimates of probabilities can likewise be quickly outdated.

It is thus singularly unfortunate, and from a planning viewpoint very short-sighted, that Forwood is trying to settle its planting and other programs shortly in advance of the release of the most comprehensive population enquiry ever undertaken in Australia.

2 Quite apart from new information indicating that population levels *are* expected to be reduced well below previously accepted expectations, there are renewed and impressive (if still very sketchy) arguments that Australian population levels *should* be so reduced.

been considered, while the upper end figures considered are extremely high and improbable and can now be discounted. Although there is this gesture in the direction of considering a range of probabilities, in fact the procedure has not been applied seriously, and in the Survey papers and marketing estimates only the single population projections for given years have been considered.

Not only are Forwood population levels grossly overestimated, but also there has been no attempt to take into account the very important effects of reduced population growth rates on reduced demand for sawnwood, of the *differential* effect of population growth on demand (outlined in chapter 4). Forwood managed to avoid considering the differential issue because it failed to consider significant reductions in growth rates, or to take its lower limits seriously; however once substantially reduced growth rates are considered the issue cannot be so easily sidestepped. It is simply unsound to transfer sawnwood per capita consumption rates obtained in a period of high population growth without change to a period of much lower growth.

With the declining natural growth rate now being experienced, more realistic population estimates for the year 2000 would range between 16.5 million and 18.5 million at 2000, depending on the immigration intake, and between 17 million and 19.5 million at 2010. The effects of a reduced natural growth rate will of course be different from the effects of reduction in immigration considered in chapter 3, since the resulting reduced demand for housing would not begin to appear for about 20 years after birthrate reductions began to occur. Nevertheless they should be beginning to be felt by 1990, when softwood supplies will also begin to come on stream, and to be marked by 2000 and 2010 when the softwood program will be fully functioning.

In terms of likely population developments, Forwood's estimates of future wood requirements are drastically wrong. Every major end use is severely effected, but the effects emerge dramatically in the case of sawnwood uses, where Forwood does offer a more detailed breakdown. According to Forwood [8], p.13,

> sufficient timber and related products must be available for the 3 million new houses needed by the year 2000;

more exactly, Forwood anticipated that the number of new dwellings built annually will rise from 147 thousand in 1971-2 (104 thousand new houses and 43 thousand flats) to more than 307 thousand in 2000 (169 thousand houses and 138 thousand new flats). Given the more likely population estimates outlined, Forwood planners will be building about *three* times as many dwellings as are required at 2000, and if they get their way they will have timber to build something like 2 million houses for people who will probably not be about.

It is a straightforward matter to estimate via the reduction in population size and the resulting reduction in numbers of houses to be built, given the amount of sawnwood in each house at the relevant period (it is expected to be less than at present), the excess plantation area resulting. A similar estimate of the effect on aggregate demand can be obtained by multiplying the difference between Forwood population figures at 2010 and upper likely population figures, i.e. nearly 6 million (and possibly as many as 8 million), by the expected consumption levels at that time according to Forwood, about 57 cu. ft. The result would indicate that *at least* 1 million acres of pine plantation allowed for in Forwood is unnecessary, even using the inflated consumption figures given there and taking no account of the differential effect of decreased rates of population growth.

The differential effect of decreased rates of population growth and resulting decrease in per capita demand for sawnwood and panel products is difficult to estimate in the case of decreased natural growth rate, but its qualitative effect is easier to gauge; new housing would reduce almost entirely to second housing and replacement housing, possibly leading to levels of per capita consumption levels of the European (Common Market) type, and so rendering possibly as much as a *further* million acres of pine otiose.

Even apart from the failure of forecasts of sawnwood consumption to consider the direct and the differential effects of lower rates of growth, other severe criticisms can be levelled at the extrapolation procedures. Two forecasts of future sawnwood consumption

CHART 7
FORWOOD'S PER CAPITA SAWNWOOD DOMESTIC CONSUMPTION PROJECTIONS

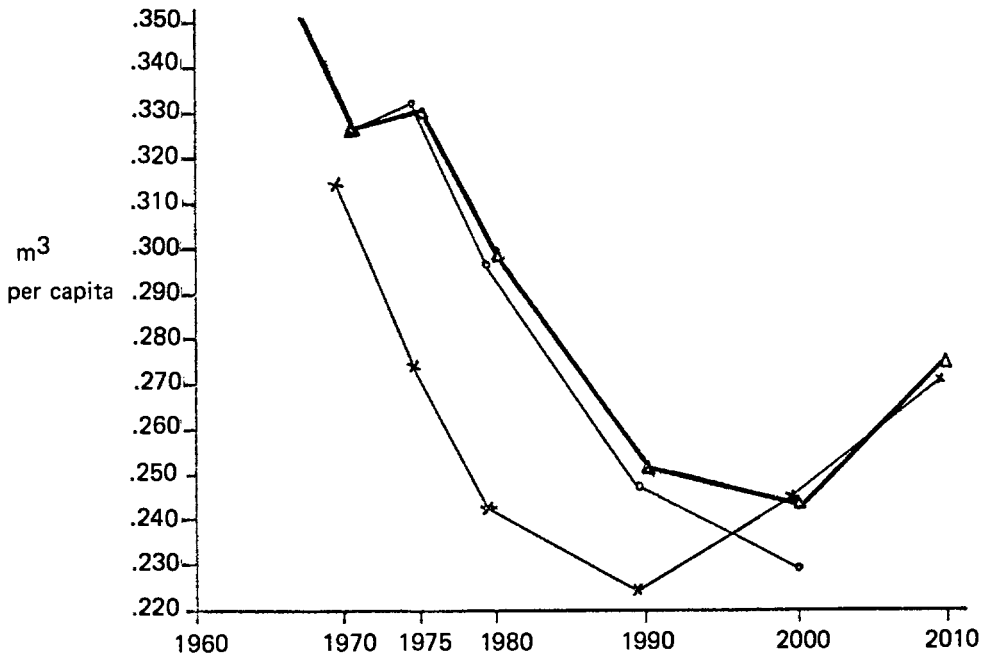
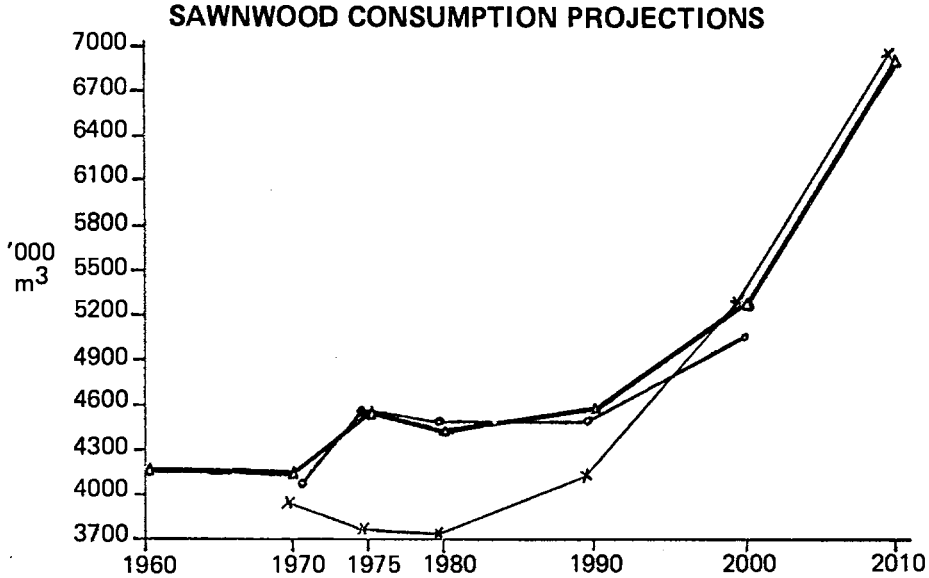


CHART 8
FORWOOD'S AGGREGATE DOMESTIC SAWNWOOD CONSUMPTION PROJECTIONS



Key: Ferguson
Brabin
Combined-Forwood [6]'s projections

Sources: Forwood [6]. Population figures used in deriving per capita consumption figures were supplied by the Bureau of Census and Statistics; all but that for 1970 are to be found in Forwood [6], p.2 and p.40.

Note: The figures in cubic metres used are in terms of log volume *by sawmill output.* To obtain figures (likewise in cubic metres gross roundwood volume) by forest removal, the figures cited have to be multiplied by a factor of 2.5 (see the discussion of the defect allowance, Survey [2], p.21). Sawnwood figures given in chapter 4 are uniformly in cubic feet gross roundwood volume *by forest removal.* Thus to convert the figures in the above graph to a form comparable with earlier ones a factor of 2.5 x 35.315 has to be applied (since 1 cubic metre = 35.315 cubic feet, to three decimal places).

were made for Forwood [6], which were however inconsistent with one another. With not unexpected opportunism, the procedure adopted in Forwood [6] and in the Production Planning Paper (Survey [2]) was to continue the overestimation method, to use the highest figure in each year where conflict appeared, resulting in the very odd set of figures for sawnwood graphed below. Thus, for instance, combined sawnwood and panel product consumption are supposed to decline until 1990 on a per capita basis and then rise again after 1990. While the first set of sawnwood estimates, prepared by T. Brabin of the Victorian Sawmillers' Association, appears to have adopted a somewhat more realistic assessment of the trend to declining use of sawnwood in housing than the estimates formerly used by the FTB [1] and NAFTA [1], Brabin's estimates are excessively high, as the fact that the aggregate figures are evidently well above even a straight line extrapolation from recent consumption data indicates (see the chart for total consumption). The estimates are excessive, largely because of the population growth rates presupposed, but partly because known trends, e.g. to alternative house framing, have not been taken sufficiently into account. These defects already appear in the estimates of the Housing Industry Association prepared by Murden [1], and insofar as he has followed these estimates, Brabin has been led into reflecting the faults.

Forwood's first set of estimates is presented honestly enough as 'a subjective approach based on patterns known and anticipated to the author'.. Although the method is a not unreasonable one, under such necessary conditions as that available information is used, it is here arbitrarily applied, since important timber trends, e.g. the introduction of light timber framing which could reduce sawnwood in housing to as much as 50-60% of present usage, are ignored.[1] Although no allowance is made for such likely technological innovatior several rather esoteric effects likely to *increase* consumption have been budgeted for. As well, there is a surprising absence of discussion of trends away from detached housing and the likely effect of technological changes such as prefabricated housing, mobile homes, and so on, none of which will favour increased consumption of sawnwood.

Forwood's second set of sawnwood consumption estimates, prepared by I.S. Ferguson, is billed as based on 'econometric analysis'. In fact closer examination reveals that, despite its pretensions to objectivity, it is largely based on trend estimates, e.g. prices of sawntimber and personal incomes at 2010, just as speculative as and certainly less thorough than, those used in the first set of estimates. For few of the detailed changes noted in the first analysis are considered in the second one, which bases its claims on such matters as an expected trend to larger houses and depends, in a qualified way, on the extremely doubtful and ill-confirmed *income assumption* (already criticised in chapter 4). Even if one accepted a trend to increased house size (a trend which surely cannot continue at the same rate without a program for wholesale import of domestic servants, leading as it does to 6 bedrooms and 2 bathrooms by 2010 for a 2.11 child family), this is only one trend and is offset by others. In short, the trends taken into account are incomplete, arbitrary, involve a high level of speculation[2] and their application to the last 15 years' data leads to incorrect conclusions. They are apparently chosen for their growth properties while others with the opposite effect (e.g. light framing) are ignored.

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1 Contrary to the extravagant claim made in Survey [1], p.6, this is not a development which would increase the use of environmentally more damaging substitutes, so there is no legitimate basis for ignoring it on supposed 'environmental' grounds..

2 To appreciate the uncertainties of Ferguson's methods and the way in which the sketch in Forwood [6] disguises the degree of uncertainty one has to turn to the background paper, Ferguson [3], since few of the requisite details are presented in Forwood [6]. Ferguson's model used the following equations, which were simply introduced with very little justification, especially the supply function:

$$(1) \quad d = b_1 + b_2 p + b_3 \log_{10} y + b_4 h + u$$

$$(2) \quad s = c_1 + c_2 p + c_3 t + v,$$

where d and s are respectively quantity demanded and supplied per capita, p is

The remarkable increase in sawn timber consumption predicted after 1990, deriving from Ferguson's estimates, is attributed to the considerable volume of softwood timber expected to enter the market. This increasing volume of pine is the only ground Ferguson offers for the decline he estimates in the rate of increase in real prices of sawn timber (as exhibited in table 4, Forwood [6], p.41). Not only are these price 'estimates' not independent of the pine projects the future of which they are supposed to help to determine, but their basis, their reasonableness and the extent of their arbitrariness, is unrevealed and so not assessible. Nor is their *considerable uncertainty* sufficiently remarked.

But if one is entitled to take account in this way of the effect of price *decreases* after 2000, then firstly one is not predicting *requirements,* since these do not increase with decrease in price, and secondly, one should take account of the effect (on decreasing demand) of price *increases* before 2000. Both Ferguson and the Finance Panel [7] remark that sawnwood is very sensitive to price changes, and hence to royalty changes, royalties being an important component in the final price. But the Finance Panel remarks that the existing system of royalty settings is arbitrary (bearing little relation to costs of production) and inadequate, and tentatively recommended changing royalty assessments (which certainly have some influence on prices) and the adoption of a system whereby forest services cover their production costs and make a reasonable rate of return. Since present royalties do not enable this, these recommendations would presumably have a significant effect on prices. Under these conditions the basis for Ferguson's extrapolation of sawn timber prices to 1990 would be removed. The procedure of taking account of possible price decrease (promoting consumption) while neglecting likely price increases (damping consumption) illustrates the arbitrary but promotional nature of the estimates made, and raises in a sharp way the issue, taken up later, of what the purported 'predictions' of consumption really are predictions of.

Ferguson's estimate at least have the virtue of taking *some* account of prices (and recognizing that they ought to be taken account of in prediction of *demand*) whereas the estimates of other end-use groups appear to take no account of prices, though the final price has a fairly crucial effect on demand and what will be consumed. Nor is inconsistency between prices confined to that between the Finance Panel recommendations and the sawnwood estimates; for example in Forwood [6] both the particle board and plywood working parties assumed that they would in future capture 'significant parts' of the flooring market currently held by sawnwood, although no proper allowance has been made for this in sawnwood estimates.

(Footnote 2 continued from p.361.)

price, y personal disposable income per capita, h the percentage of houses to dwellings commenced, t the year, and u and v random error terms. For example, there is no account taken in the demand function of substitutes for sawnwood or of the differential effects of population growth, both seemingly as important as h and log y, or of factors such as market promotion, and no account in the supply function of, e.g., imports or tariff levels. The effectiveness of h, and with it the technological changes that can be taken into account through it, was in any case reduced as prior estimates of the coefficient of the housing variable were made for every state except Queensland. The inclusion of h in linear form in fact makes several assumptions that are known to be false:

> Despite the fact that none of these assumptions are likely to hold exactly, this simple formulation proved highly effective. (Ferguson [3], p.164.)

There is little evidence that the supply function takes the linear form given, and as Ferguson admits 'quality supplied *per capita* is not really appropriate' at all. Not too surprisingly

> results for the supply function were unsatisfactory for all states other than Western Australia where the supply price was predetermined. Negative price coefficients were obtained, values for multiple coefficients of determination were generally small, and all regression coefficients had very high variances attached to them. (Ferguson [3], p.166.)

No doubt the negative price coefficients would suit the building industry well, but how the difficulty was resolved in obtaining consumption forecasts is not explained.

The method used in the case of wood panel products for estimating market requirements is much less satisfactory even than that adopted in the case of sawnwood. Although total consumption of plywood did not rise appreciably between 1959 and 1969 and 1966 levels practically coincided with 1952 total consumption levels (Forwood [6], p.41) it has been assumed that total plywood consumption will increase annually at 2.5%, allegedly on the basis of 'population projections and historic growth statistics' ([6] p.46). It is then claimed, though without any basis, 'that the actual growth of the industry will be considerably in excess of these figures' and that 'the availability of softwood logs from plantation forests will greatly speed growth in standard plywoods' – on assumptions inconsistent with the earlier claim that 'price of course is the most important factor contributing to plywood usage', should the royalty recommendations be adopted so that softwood prices rise.

Evidently the estimates of sawnwood and plywood consumption and demand are not independent of assuming a certain sort of supply, in particular the on-going pine program. Thus *a portion of the pine program is self-generating,* it creates its own demand. For demand depends on prices, but prices (especially after 1990) depend on quantity planted, and quantity planted depends on estimated demand. Forwood's argument for part of its increased plantation program is just such a bootstrap operation[1]: more pines must be planted to meet increased estimated demand, which will increase at least after 1990 because of the lower prices ensuing from the pine planted to meet increased estimated consumption. Thus the consumption estimates supplied by Forwood are not independent of assuring a particular method of supply, i.e. that a certain proportion is to be supplied from the pine program. But given a different method of supply, e.g. where native forests supply more sawlogs, much of the extra demand would not occur. Because part of the demand estimated is generated by the pine program itself, that part of the estimated demand which would not otherwise have occurred cannot provide a justification for the relevant part of the pine program. Alternative estimates assuring a much smaller pine program should have been prepared.

The estimation procedure followed in the case of particle board, though different, is no more satisfactory than that for plywood:

> The actual projections given are a rationalisation of current opinion in the industry [as to consumption?] and provide for an ultimate per capita consumption *approximately fifty per cent higher than the current Australian rate,* but a rate which is common in many of the developed countries in the northern hemisphere (Forwood [6], p.73; our italics).

But in the relevant northern hemisphere countries these higher consumption levels are obtained in large measure at the expense of sawnwood for which they substitute: in other words, double counting of overall future requirements is again going on, and quite inconsistent assumptions made and procedures adopted in order to build a case for higher consumption levels.

Even if these sawnwood and panel product end use estimates have endeavoured to exaggerate to some extent what they call their 'future requirements', or at least to hold their place in the face of declining trends, their excesses are comparatively minor compared to those for the pulp and paper estimates. Paper and paperboard consumption is predicted to rise from the present level of consumption of about 11-12 cu. ft. per capita to more than 27 cu. ft. per capita at 2010, thus accounting for most of the large rise in consumption predicted for that date, when it would constitute almost half of total consumption. This can be seen from the fact (Survey [2] p.18) that the combined per capita figures for sawn timber and wood panel products remain approximately constant over the period, the entire and substantial increase in projected consumption accruing from pulp and paper products.

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1 The bootstrap method is conspicuous too in Ferguson's background paper [3], motivation for which was said to be the need for improved forecasts in order to better assess the Australian softwood planting programs, but where equations were determined to allow not just for *past* planting but for an on-going program.

Figures for pulp and paper although slightly less extravagant than some previous projections, are thus still very high and account for most of anticipated per capita increase, with per capita increase in pulp and paper products estimates *alone* accounting for almost one million acres of pines or a quarter of expected requirements at 2010. Yet the increase will be almost entirely in junk paper products, in disposables and unnecessary packaging materials.

The method by which the projections were obtained – essentially that of asking the pulp and paper industry[1] for its assessments – leaves a great deal to be desired. It scarcely needs arguing that pulp and paper producers are interested in increasing the output and consumption of their products regardless of public benefits, and hence in furnishing 'projections' which suit their organisational objectives – thus avoiding the question of the levels of consumption that are more likely to result under alternative, not unlikely, conditions. Once again a range of outcomes (of which Forwood figures would be a very high upper level) should have been considered. No details of the methods by which the pulp and paper industry arrived at its 'projections of demand' are furnished. One is simply presented with a table of figures (also deceptively graphed on logarithmic paper) for separate end uses (packaging and industrial papers and paperboards, newsprint, other printing and writing papers, and sanitary tissues and papers) at selected years and their totals, and the sketchy covering remark:-

> Factors considered in preparing these projections include growth in population and GNP, using figures agreed by the Marketing Panel, as well as historical growth patterns and international comparisons. *It was assumed that there will be no shortage of raw material and that paper and paperboard prices can be set at levels which will provide a reasonable return on funds invested.* (Forwood [6], p.93; our italics).

This is thoroughly unsatisfactory. Since much hinges on these estimates, e.g. the future of extensive areas of public forest, the methods should have been set out in detail, with the formulae used displayed; and the evidence used should be available for critical assessment. All that we are offered in the way of discussion of the separate end uses is a restatement of the projections, e.g. in the case of other printing and writing papers:

> Growth in apparent consumption averaged 7.4 per cent per annum during the 60's. This is expected to fall to 5.2 per cent during the present decade and to drop further in subsequent decades. (Forwood [6], p.93).

No basis for the expectation is anywhere revealed. Since all the Forwood projections of 'market requirements' should be critically reexamined and re-estimated, it is hoped that when this is done the bases for projections and the recipes used will be published.

Without further details the pulp and paper projections are difficult to assess; but it is evident that the methods used are questionable and the estimates obtained probably wrong and in need of revision before any planning is done on the basis of them. There is no evidence that factors which should have been considered over such a long time period were considered, e.g. prices and substitutes[2]; and factors that were taken into account, e.g. international comparisons with high consumers (where the unwarranted comparison with excessive North American pulp and paper consumption levels has very likely influenced growth expectations) and 'historical growth patterns', would, on past form, have been given excessive weight. This and several other points are readily brought out upon observing that, apparently completely fortuitously, the Forwood projection of pulp and paper con-

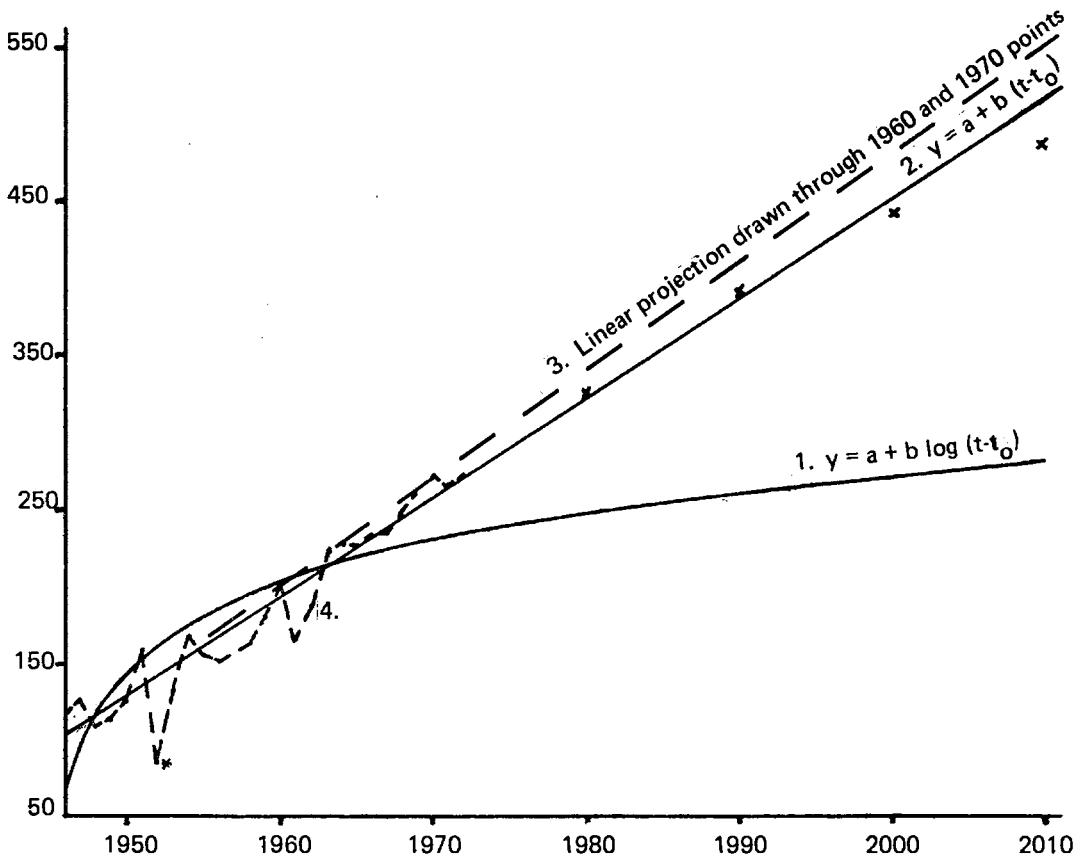
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1 The Paper and Paperboard Working Party consisted of 2 members of APM, 1 member each of APPM, Bowater-Scott and Smorgon Consolidated, and 1 member each from Australian National University Forestry Department and the Department of Secondary Industry; the Party was assisted by the Managing Director of ANM.

2 In case it should be thought that recent rises in oil prices have eliminated the worry of plastic substitutes for paper products, it should be pointed out that synthetic paper products are made from an inexpensive by-product of petroleum and can easily be made from coal or natural gas. (See Runeberg [1]). As well organic substitutes for pulpwood are practically competitive with pulpwood and may become internationally important should pulpwood prices rise significantly.

CHART 9

PER CAPITA APPARENT CONSUMPTION OF PAPER PRODUCTS WITH VARIOUS PROJECTIONS TO 2010



Key:
1. Log fit.
2. Linear fit.
3. Extrapolation.
4. Actual figures.

x Forwood's figures, from Survey [2] and Forwood [6], p.100.

Notes: The best fit curves were obtained by the method of least squares with a modified 'LINEFIT' program on UNIVAC 1108, ANU Computer Centre.

*The 1952 figure was excluded from the best fit analysis.

Confidence intervals for a and b, assuming that E(I) is normally distributed, for a percentage probability of 95, are:

linear fit: $a = 6.473 \pm 0.705$
$b = -195.655 \pm 42.121$

log fit: $a = 122.779 \pm 31.525$
$b = 59.612 \pm 34.903$

sumption practically coincides with the best fit *linear* extrapolation of per capita consumption (as is shown in chart 9). But international comparisons of pulp and paper consumption and historical growth patterns for comparable commodities indicate that such a linear extrapolation is theoretically wrong.[1]

The reader may notice some tension between the graph showing that Forwood's per capita estimates resemble a linear best fit extrapolation and Forwood's attempt to convey the impression that it has allowed for declining growth rates for each pulp and paper end use on 1960-1970 averages, and therefore that its projections are not unreasonable. In fact the appearance of decline is achieved by the methodologically unsound procedure of selecting rather arbitrarily just two base points, 1959-60 and 1969-70, the latter above average levels, and determining the average growth rates (indicated by a dashed line on the graph) between these two points, an average rate which is not however representative of average growth rates when intervening and earlier years are also taken into account. Such a procedure fails to make use of all the data available (e.g. intervening years), and because there is substantial variation between years projection from two artitrarily selected years has a much higher level of unreliability than an extrapolation from a more substantial base. In fact in this case it results in a considerable overstatement of the growth rate, as a comparison of the gradients of the linear extrapolations graphed reveals.

With pulp and paper products, as with wood panel products for some of which a large aggregate rise is also predicted, no proper account is taken of the prices of commodities or of their substitutes, nor of the suggestion that royalties be restructured, nor of the possibility (more relevant for paper and paperboard) that other subsidies, such as having the community bear cost of disposal for packaging be eliminated. It is assumed too that tariffs will be maintained:

> Tariff protection is necessary to enable the healthy development of this industry in the Australian economic environment. (Forwood [6], p.96)

Forwood's commitment to the 'healthy development' of a highly polluting industry whose growth largely involves an increase in packaging is most revealing. Since Forwood has made no real effort to consider whether such growth is desirable (although there is every good reason to believe that it is not) its concern with the promotion of such 'healthy development' stands revealed as a preparedness to promote indiscriminate industrial growth, which there is good reason to believe decreases net welfare, and is a clear application of the allegedly discredited GNP = Welfare thesis. There is nothing either inevitable or desirable about the pricing arrangements Forwood's estimates of expanded consumption rest on, and other options should have been considered and presented.

In view of failure to take account of price variations, the estimates are not predictions of demand, and cannot be disguised as such (although this is what they become in Survey [2]).

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1 Evidence so far accumulated indicates that, after a certain stage where a commodity catches on, consumption does not increase in a linear fashion but damps off logarithmically in the way the graph shows. The fuller picture, taking account of the earlier pre-war, consumption patterns, is captured in Gompertz curves, which provide S-shaped curves for the historical pattern of consumption of many commodities, including some such as city garbage intimately related to pulp and paper products, as well as for many other economic functions: Such S-shaped curves also capture the known pattern of per capita pulp and paper consumption in some European countries (cf. Runeberg [1]). There are however too many unknowns in the general Gompertz function to extrapolate Australian pulp and paper consumption data with high reliability. What can be done, which gives a much better picture than Forwood's methods, and approximates the relevant part of the Gompertz picture, is to determine the best fit logarithmic curve; for there is evidence that the later consumption of commodities like pulp and paper tends to behave logarithmically. Needless to say, the resulting best fit curve (displayed in chart 9) predicts consumption levels well below those estimated by Forwood. But though the curve does reveal some of the features that international comparisons and historical growth patterns should have disclosed to Forwood [6], it is by no means adequate, since it does not take account of, e.g. likely consumption and population trends. Were such features included, still lower predictions would emerge.

Nor are they estimates of what might reasonably be called 'requirements'. No one can really seriously claim that we need the items whose increase is being so conscientiously allowed for, e.g. disposable sheets, or that their consumption is in any way beneficial or environmentally sound. Moreover requirements do not increase under price reductions (as is mistakenly assumed for sawn wood 'requirements' after 2000.) Nor are the estimates reasonable projections or extrapolations of existing consumption patterns (as the graphing of separate end uses, in Forwood [6], p.101, reveals) – not that such simple projections would have much validity anyway. Firstly because prices and other parameters upon which consumption depends, cannot be reliably *predicted* so far in advance, it is in a good sense *impossible* to predict consumption so far ahead, and the only thing it is sensible to attempt to *predict* in the long-term, is requirements. Secondly, mere extrapolation of past trends (and from just two years in the last 15 years at that) 40 years into the future does not carry much weight in the absence of a whole range of assurances such as that prices will remain relatively constant. As stressed earlier, there is no good reason in the absence of such (unobtainable) data for the assumption that a particular consumption level will continue as it is, and this assumption has no particular pre-eminence over the assumption that it will diverge in various ways, particularly under price variation.

Forwood attempts, with its consumption estimates, to have its cake and eat it too – when presented as estimates of 'demand' its estimate masquerade as objective, value-free estimates of what consumers want and will in any case consume, and such that failure to supply will result in serious shortage. We shall argue, however, that it not only makes no sense to predict such consumption or 'demand' so far ahead in the absence of price information (which in this case, involving as it does various subsidies, tariff settings etc., is at least partly a matter for determination), but it is nonsense to regard the satisfaction of such demand as of vital necessity, and there is no point either in safeguarding or *taking elaborate* precautions to ensure that such 'demand' for disposable sheets, paper towels, etc., is fulfilled, apparently at any cost, and that supply and price is right to ensure that consumption remains at the estimated level. These procedures would only make sense if the estimates genuinely were estimates of *requirements*, or needs (not demand), and failure of consumption to reach these levels were to result in serious shortages of vital material or a drop in the standard of living – something which would plainly not hold good in the case of much of the anticipated increase in paper product consumption. On the other hand, if it is requirements or reasonable consumption levels, i.e. levels which it is reasonable to plan to supply taking all considerations into account, which are being estimated, not only are the procedures adopted (asking industry what it expects to unload) inadequate and methods for the assessment of desirability nonexistent (e.g. pollution levels from paper consumption), but it is clear that only a fraction of the pulp and paper material allowed for can be passed off as required. The procedure of estimating what is called 'demand' (at undetermined prices) and attempting to pass its satisfaction off as essential and of *urgent necessity* (which would be justifiable only for such requirements), then plays crucially on the ambiguity between demand (or consumption) and requirements discussed in Appendix 1 above. The deliberate confusion of requirements (principally a *welfare* notion) and demand is also vital to the strategy of continuing subsidization for forest products, and cheap wood for forest industries.

If what has been estimated or 'predicted' is not demand, and if it is not requirements, what, one might ask, is it? The answer appears to be provided by the methodology involved in the pulp and paper and other cases, namely *asking industry* what it expects to sell. The methodology gives the relevant hint: the figures represent 'demand' schedules (in a sense) – but not the predicted demands of consumers; *rather the demand of industry.* They represent levels of expansion which would be satisfactory for the industries whose predictions they are, and which were virtually invited to set supply levels (and price levels) so as to achieve these expansion targets. The tacit agreement (made explicit through the dropping of the royalty recommendations) is that prices and supply will be set in such a way as to maintain these indicated levels. Thus Forwood [5] p.83:

Timber royalties should be set at levels which maintain satisfactory levels of forest profitability, but do not inhibit industrial growth or contribute to cost inflation.

The decision element is recognised here, but is operated to maintain industrial growth rather than net welfare or environmental protection. Despite the frequent appeals to consumer sovereignty and the presentation of the market as inexorable and of high levels of consumption of paper products as inevitable it is clear that decisions *are* being made on levels of consumption and expansion through price, tariff and other mechanisms. But if such decisions can be made in the interests of industrial growth they can also be made in the interests of the environment. The market is presented as inexorable and high levels of consumption of paper products as inevitable or uncontrollable, when in fact the consumption levels predicted depend on decisions about prices, subsidies (such as for disposal) and tariffs, and there is nothing inevitable or particularly desirable (except from the point of view of industry) about the arrangements Forwood promotes.

Forwood then presents an interesting and unusually clear example of producer sovereignty — the determination by producers and in the interests of producers (in this case paper and paperboard manufacturers) of a significant part of consumption levels, representing levels and types of consumption which are in the interests of industry. In this case manufacturers are ably assisted in their task by public servants and the mechanism of government-industry cooperation. Because of the long time period involved in forestry planning and the need for a public case to obtain public funds, Forwood presents a rare opportunity to see in operation a process which is usually far more carefully hidden.

The dual conflations of demand, requirements and consumption on the one side, and of potentially available produce and supply on the other, Survey [2] strikingly illustrates. Available forest produce — all usable accessible wood — simply becomes supply, e.g. the total of sawlogs available from natural forests in 1980 as assessed in Forwood [2] and transferred to Survey [2] table V simply reappears as supply of sawlogs in 1980 from native forests in table XII. Such crucial variables in the determination of a supply function as price nowhere figure. What has happened is rather obvious. It is just assumed that all available wood will be used, the underlying assumption being that prices will adjust — not so as to cover costs or provide an adequate return, etc. — but to ensure this total use. The pattern is similar on the demand-consumption side, except that conversion factors, which take account of 'defect' in wood removed and wastage between the wood removed and the initially processed product, are applied. Thus, for example, in the case of sawn timber, market requirements of Forwood [6] e.g. p.43, broken up (in [6] into domestic consumption, exports, imports, and *required* domestic production (i.e. domestic consumption minus imports *plus* exports), are carried over into Survey [2] as domestic consumption and export opportunities for sawn timber in table VII (together they sum in 1970 to 4173 thousand cubic metres) and then transposed after application of the recovery factor (of 2.5) into domestic demand for sawntimber (of 11,175 = 4,173 x 2.5 thousand cu. m. for 1970). In short, market requirements are equated with required domestic production, which is in turn equated with demand (the sole point of the conversion factor being only to change units from gross sawnwood to sawnwood). None of these equations are valid, except under very special conditions, e.g. that prices are specially adjusted, that substitution of materials is limited, imports carefully restricted — which would be neither compulsory under a free market or mixed economy nor reasonable in a fully planned economy.

Understating the likely yields

Among the innovations of the Forwood papers is an additional twist to the over-estimation methods, designed to maximize on the areas of forest intensively managed. The new strategy, of underestimating the expected yields from forests under the plans of management proposed, more than compensates (together with the allocation of much pulpwood for export) for the slightly less exaggerated consumption projections that forestry planners who prepared the Forwood papers made, as compared with earlier assessments such as the original NAFTA figures, and so enables earlier grandiose plans for intensive forestry to be continued and even expanded. Yields from softwood plantations especially appear to have been understated.

In estimating future availability of softwoods an MAI (mean annual increment) of 16 cu. m. per hectare (i.e. about 229 cu. ft/acre) annually has been assumed for coniferous plantations (Survey [2], p.25): however in arguing that Australia has a 'comparative advantage in timber production' the first point stressed is that 'the weighted Australian average growth rate on plantations is 17 cubic metres per hectare' (i.e. about 265 cu. ft/acre) a year, (Survey [2], p.5, quoting Forwood [7] [1]), and in Forwood [3], p.15 an average growth rate of 17.1 cu. m./hectare/year is assumed for Australian plantations. The assumption of an MAI of 16 cu. m/hectare annually is thus, unnecessarily, inconsistent with the probable yields. (The assumption is very likely also inconsistent with the assumptions made in benefit-cost studies of softwood plantations; for it reduces the average site quality to worse than SQV, a site quality under which pines return only negligible or even negative margins) and which would suggest serious difficulties in later rotations. Moreover the average site quality is well below that now generally sought by forest services for the pine plantations, and therefore the site quality allowed for in the Forwood estimates appears suspiciously low.

Nor is the matter minor, but could make a difference of practically half a million acres in the area of native forest to be bulldozed for pines. For given the total exotic pine plantation area of 1.4 million hectares by 2010 aimed for by forestry planners (Survey [2], p.25), the difference between the MAI of 16 and 17 cu.m/hectare annually means an amount of about 125 million cu.ft. of softwood, that is, reexpressed as acres of conifers, of about 1/2 million acres of pine.

Similarly the anticipated yields from native forests have some very puzzling aspects. Sawlogs available from native forests are supposed to shrink from the actually attained removal level of 7.3 million cu.m.in 1970-71, through 6.9 million cu.m. in 1980 to only 4.8 million cu.m. at 2000; in other words, on this plan sawlog removals from native forests will be reduced by a third between 1970 and 2000 — despite the claims for 'better native forests for the future'. The extent to which the wood and sawlog production from the native forests has been written down by Forwood can be gauged by comparing Forwood's estimates with those of other projections (set out on p.59 above).

Native hardwood availability at 2000 (in million cu. ft.), together with comparative figures for 1970 and 1975.

	FTB [2]	Jacobs [6]	NAFTA [1] and Parkes [2]	Forwood	1970-1 removals	1975 estimated removals
Sawlogs		423	209	156	244	226
Pulpwood (and other)		275	467	316	67	314
Total	578	698	676	472	311	540

Explanatory note on the Forwood figures cited:- (i) Estimated native forest sawlog availability of 170 million cu. ft. at 2000 in the tables of Forwood [2] includes about 14 million cu. ft. of softwoods (callitris and rainforest species); (ii) as well total native forest estimates exclude 12 million cu. ft. of hardwood pulp grown in plantations (see Appendix 4, [2]); and (iii) pulpwood figures include those (negligible) figures given as 'other' in Forwood [2].

1 The average figures to date are in fact somewhat lower but still well above 230 cu.ft./acre. Given the average quality of sites planted and the intensive forestry methods applied the average yields achieved are disappointingly low.

No explanation is given for the extraordinary decline in sawlog availability from native forests (the Great Sawlog Robbery), obvious even by 1980, or any indication of how far the material to be turned to pulpwood supply could otherwise have supplied sawlogs if paper consumption were more limited. This represents another example of the obscuring of important options (cutting down on pulpwood export and paper consumption and planting fewer pines), and of how the data is presented as if there were only one possibility. A claimed 'deficit' in *sawlogs* (which suggests shortage but would only be such on the assumption that nothing is imported) is a far better promotional weapon than a claimed deficit in pulplogs so obviously devoted to unnecessary uses, since a sawnwood shortage for housing can then be claimed if planting is not increased. And the unexplained decline in sawlog availability from native forests, the curious later decline of pulpwood availability from native forests continuing even after 2000 when the 'better forests for the future' should begin to produce, the even stranger fact that total estimated removals from native forest at 2000 and 2010 will be a good deal less than that estimated for 1975 – all these (obvious from Survey [2], pp.26-8) are very difficult to reconcile with claims that the export woodchip industry and other intensive treatment methods are improving the productivity of native forests.

The table makes several points plain:- firstly under forestry planning, native hardwood forests will be shortly turned over predominately to the production of pulpwood and that sawlog production from native forest will progressively decline (a pattern supposed to continue beyond 2000); secondly, despite the improved management of much larger areas of the native forests for wood production that we are supposed to see, the forests will in fact yield little more at 2000 than in 1970-1 and less than in 1975 (Forwood [2] p.24); thirdly the native forests are according to the latest estimates of Forwood [2] to produce much less than was recently thought, e.g. according to the equally detailed estimates of NAFTA [1], despite plans for heavy exploitation.

As to the first, the plan to turn the native forests over predominately to pulpwood production carries the alarming implication that most of them will in the future be managed on a clearcutting basis. Thus it appears to be inconsistent with the claims made in the multiple use section [3] that most of the native forest will continue to be managed extensively (unless 'extensive management' is given a new meaning). It also refutes the claim that the degradation of the native forests is to be carried out to meet eventual needs, since the forests will in future be subject to extensive clearcutting and serious deterioration in order to meet a manufactured demand for more packaging and disposables and in order to promote the growth of the domestic pulp and paper industry. As to the third point, it could be argued that the Forwood estimates are more recent than other estimates and supersede all earlier estimates. It could be argued, less than convincingly, that there is no need to explain the discrepancies between Forwood estimates and earlier ones, and still less convincingly, that there is no need to explain why native forests should suddenly be found to yield much less than had been thought, or what accounted for the discrepancy. However there is some explaining to be done. For on the Forwood estimates, for 2000, assuming that less than 60% of the total potentially productive forests are used for wood production (60 million acres, say) the average increment of the native forests would be less than 8 cu. ft. annually! Put differently, Forwood's estimates could be satisfied by only 5 million acres of eucalypt with an MAI of 94 cu. ft. – fairly low-yielding forest – when most of the production is aimed at pulpwood (see table 7, p.82); that is, the amount predicted could be supplied by less than 5% of the commercial forest area.

The Forwood picture of good forest management of much more of the native forests, with good profit margins and improved yields[1], does not hang together with their estimates of native forest yields. There are several dilemmas here for forestry planners. For example, to make out their case for continuing and extending the pine program they feel obliged, in view of the widely recognized interchangeability of hardwoods and softwoods for most

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1 A picture also painted large in a renewed round of forestry advertising and campaigning, e.g. Lembke [1]:

> This [intensive management of eucalypt forests cutover for pulpwood] ensures a crop in perpetuity with much higher volumes per acre than in the original unmanaged forests.

purposes (one point well explained in Richardson [1]), to understate the likely future yields from native forests; but to justify the export woodchip industry and in calling for public subsidies for intensive management of increasingly more of the native forests they feel obliged to stress the higher yields they can achieve from native forests by their management techniques. Again, to justify taking over more and more of the native forest for intensive management under clearcutting regimes, they feel obliged to represent the yields they are achieving as decidedly low; yet, to avoid the accusation that they are seriously degrading the native forests by their activities, they feel obliged to point to the high and improved yields they are getting In neither case can they have it both ways.

A further mastermove in the Forwood strategy of underestimating native forest yields is a newly-devised *defect allowance* which automatically writes off 20% of the produce of native forests, as defect.

> For this exercise a defect allowance of 20 per cent of gross log volume has been applied to derive net volumes. No defect allowance has been applied to the log volume from plantations (generally coniferous) because such defects [pipe, brittle heart, etc.,] are generally absent in the species planted. (Survey [2] , p.21.)

This defect allowance — which discriminates against native forests in an unwarranted way, as defective wood also occurs in plantation produce (as Forwood [7] , p.38 reveals) — is actually absorbed into conversion factors for converting gross log volume into the net volumes and weights of various wood end uses (Survey [2] , Appendix 1). The procedure is methodol - ogically unsound, since the residue (after conversion) will remain as waste or 'defect', as a materials balance consideration shows; hence the matter cannot be one simply of a conversion factor which should only change units. On the proper picture, which shows residues correctly, table VIII (Survey [2] , p.21), giving proportions of log volume by sawmill output, should be redrafted along the following lines:-

Native Forest Output	40% Sawntimber	20% Residues currently suitable for pulp wood use	40% Other residues; sawdust, shrinkage, partly defective waste.

Thus expressed it is plain that there is a very considerable waste surplus that could, with only slight technological improvements, be put to use for pulpwood and in panel products in the same way as sawmill residue. Indeed a not insubstantial quantity of defective wood is already accepted in pulpwood export contracts; and there is much less worry about gum veining and brittle heart than there is about excessive charwood.

In total, Forwood writes off in this way, as defect, about 2.7 million cu. m. of wood produced from native forest at 2000, that is the equivalent of more than 150,000 acres of pines, or one giant plantation complex.

To its credit Survey [2] does make use of further sources of supply (see p.61) neglected in earlier forestry planning models such as NAFTA [1] and those of Jacobs, namely sawmill residues and recyclable waste paper products. But the allowances made are in no case generous, and take no account of likely technological improvements or of improvements in urban waste disposable systems. Thus the allowance for recycled waste paper at 2010 (Survey [2] , p.28) is but 29% of paper and paperboard consumption, not much above the current Australian figure of 26% and well below percentages already obtained in many European countries (see p.55). Given Forwood's estimates colossal quantities of waste paper products — almost three times as much as at present — will be included among metropolitan garbage. The resulting strain on disposal systems, already facing serious problems both in handling and in location of dumps, will be severe.

The allowances for sawlog residues are likewise niggardly. Even at 2010 only about 8% of waste from native forest sawlogs, and 17% of waste from plantation sawlogs will be used for pulping on Forwood's estimates. Higher proportions of comparable waste are already used in Japan and some European countries. Thus the materials balance picture

Survey [2] points at for 2010 is hardly a conservation one. Very substantial quantities of material removed from the forests will not be converted to pulp, though use of much more of the material would be quite feasible and encouraged by better pricing policies, and though technological developments will no doubt facilitate the use of much larger proportions of sawlog wastes.

In the event of the possible shortages and price rises Forwood appeals to (e.g. in Survey [1]) to justify self-sufficiency, much recyclable material and wood waste would become commercially available and accordingly would provide a large backstop, thereby undercutting the case for a part of the pine program. Once again the Forwood case is broken-backed.

Self-sufficiency — and export ambitions

The crucial ambiguity between predicting and planning for future consumer demand and predicting and planning for future requirements comes particularly to the fore in the treatment of the self-sufficiency issue. Here it is assumed that it is essential to have a cast-iron guarantee of supply such that the predicted consumption levels will be met; and since the possibility of a future world shortage or a shortage of fibre cannot be absolutely excluded, it is argued that virtual complete self-sufficiency is essential.

> The conference amended the original bold self-sufficiency assumption,phrased as follows: the need for Australia to supply its wood requirements from its own resources insofar as it can do this at economic cost, in view of possible scarcity or non-availability of imports:- (Survey [2] p.3).

to read

> — Provided that, having safeguarded its domestic supply position, both an import and export trade in forest products should be developed where these are in the country's best interests
> — and provided that planting programmes and forest management regimes are kept under review in the light of changing requirements for forest products.

However the difference is largely verbal. Since 'wood requirements' (i.e. Forwood's estimated consumption levels) are to be 'safeguarded' anyway, no reduction in planned production will be made on account of possible imports, and the clause on the export trade may well be used as a justification to press for further concessions and finance for additional export projects. But given the nature of much of the consumption allowed for, e.g. the large increase in packaging and disposables, the argument from 'possible scarcity or non-availability of imports' is quite unconvincing, and the procedure of requiring a cast-iron guarantee quite irrational.. Of course a shortage of wood fibre after 2000 is *possible,* although, given the slowdown in population growth rates now becoming evident in developed countries (and the distinct possibility of zero growth at 2000), this possibility is far less likely than it appeared at the time earlier estimates were made, and there is a distinct possibility of future regional oversupply, since not only Australia but other developed countries in the region may show a similar decline in growth rates possibly resulting in large surpluses. However, the rational procedure in the face of a real possibility of shortage at 2000 would be to attempt to safeguard, by ensuring sufficient domestic supply of, those end uses and levels of consumption which can be considered essential, or at least *important* from a welfare point of view. Thus it *might* be sensible, e.g. given that satisfactory substitutes are somehow ruled out, to ensure that sufficient sawnwood and wood panel products are available from local forests to satisfy likely housing requirements at 2000, and to plan for *essential* paper requirements. The supplies it might be prudent to guarantee are already well catered for through the native forests and established plantations. But one does not need a cast-iron guarantee that one will never be threatened with the prospect of running out of supplies of disposable sheets, needless packaging, etc. It is quite irrational to go to great lengths to ensure that one never has to face the prospect of running out of something quite inessential and doubtfully desirable which one might *otherwise* have consumed were a supply available at a suitable price. Thus it might be rational to demand a guarantee for the satisfaction of important *requirements,* but it is not rational to demand a guarantee for the satisfaction of projected demand; the argument trades once again on the crucial ambiguity between

'demand' and 'requirements' (the equation of which corresponds to the GNP-Welfare equation) and on passing off the entire projected 'demand', including export opportunities, as quite essential, and in effect assumes that it is essential to guarantee that anything which might possibly be consumed *is* consumed. The misuse of the ambiguity is extremely plain in the amendment to (c), Survey [2] p.3 above, which speaks of 'the need for Australia to supply its *wood requirements* from its own resources, in view of possible scarcity or non-availability of imports', and of 'safeguarding its domestic supply position', which in the context is taken to mean *not* the supply of that fraction of projected demand which can be taken as important or essential, but as necessitating a cast-iron guarantee of the entire projected demand (less the tiny allowance for imports) of all material given under the heading of 'Required Domestic Production', which *includes* exports.

The argument that a guaranteed domestic supply is required, because if material is available it will be very expensive, is similarly defective. For if it becomes expensive people will simply not use, or use far less of, such commodities as disposables and excess paper packaging, and this cannot be regarded as a matter for concern (except to paper and packaging companies). Again, it is only in the case of essential or important material that price rise is a matter one needs to guard against (again unless one is acting in the interests of paper and packaging companies).

However it is doubtful that domestic production of the 'required' material would be sufficient to prevent a price rise, even if that were desirable, in the event of a major world shortage and general world price rise. The assumption assumes an unrealistic degree of possible shielding from world market pressures. For in the event of a price rise for raw material, producers (particularly private producers) will prefer to sell on the overseas market if the local market is lower (as we have recently seen with meat and to some extent with oil), and governments are reluctant to impose export controls to ensure a lower domestic price. Moreover the Forwood argument takes no proper account of the effect of price rises on reducing demand and rendering substitute materials more commercially viable. Thus the possibility of an international price rise does not justify domestic production of *all* the material claimed to be required.

Such a procedure, of requiring a guarantee of totally inessential and largely undesirable consumption, which might occur if supply and price were suitable, would be sufficiently neurotic even if there were a serious prospect of a serious regional shortage. But in fact such a procedure was adopted in the face of assurances at Forwood from the commissioner of the New Zealand forest service that New Zealand would have a substantial exportable surplus of softwood at 2000.[1] Only a small portion of this available surplus (in fact only about the bare minimum admitted under NAFTA) has been allowed for in estimated imports at 2000 and beyond. The excuse for this is that New Zealand supplies are 'uncertain' because it cannot be guaranteed that New Zealand might not sell the material elsewhere – despite the fact that Australia would have obvious attractions as a market for New Zealand because of the stability of the market, its proximity, and the low transport costs (a major factor in the price of wood products), as well as because of the complementarity of the respective economies.

The fact that private producers need not sell on the local market is of course ignored. The export woodchip projects planned for North Queensland, Northern Territory and Western Australia (which are to yield 107 million cu. ft. in 2010) are also ignored in the shortfall argument, on the ground that these are 'not economically available for domestic consumption' (Survey [2] p.29). But it is hard to see how in the situation of substantial price rise envisaged in the shortage and great price rise argument, these extra supplies of pulpwood, earmarked for export, could not economically be diverted to the local market, or why then they would not provide a substantial 'safeguard' in the event of the price rise and shortage assumed. Thus these supplies cannot be written off in the way Forwood suggests. The same applies to pulpwood from woodchip export projects currently on ice in NSW and Queensland because of 'technical problems' (Forwood [2]). Survey [2] p.29 also makes the extraordinarily misleading claim that

All quantities identified as pulpwood surplus are in fact not commercially available

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1 In fact this could well understate the surplus New Zealand can expect to have since it is likely that New Zealand will show the same decline in population growth rates as other developed countries.

because of existing export commitments,

when in fact the authors of the survey can scarcely be unaware of the fact that none of the existing Australian export pulpwood contracts are for a period of longer than 15 years (Hansard [2]), and that they will therefore have expired by 1985-1990 when the main deficit is claimed to be likely to appear.

In the light of these several possible backstops, it seems that what is required is not just, what is bad enough, a *guarantee* that one will never be threatened with a shortage of such inessential and undesirable material as disposable sheets, but a *cast-iron guarantee*!

When it comes to excluding competition, Forwood [6] does not appear to share the Survey's gloomy view of the regional forestry situation. Thus as Forwood [6] and other Panels make plain, not only New Zealand but also a number of other Asian countries, are expected to have continuing supplies available. Indeed the concern for future regional supplies expressed in the Survey Reports is inconsistent with the detailed assessments of all the groups reporting in the Marketing Panel [6], which even went so far as to express considerable concern about competing materials from the region. Thus:

> There is no doubt that resources available for plywood manufacture in S.E.Asian countries are sufficient to seriously damage the Australian industry. ([6], p.49.)
>
> The working party [on sawntimber] believes that in the long run prices of imports are unlikely to increase greatly relative to Australian prices. Thus supplies of imports, while subject to fluctuations, because Australia's imports are small in relation to regional trade in timber, will continue to be available at competitive prices. There will be some reduction in supplies from North America but supplies from New Guinea and other S.E. Asian countries are likely to increase. ([6], p.21.)
>
> Of more immediate significance to Australia [according to the hardboard and softboard report] is the S.E. Asian region which has the necessary labour and material resources but lacks capital and technology. It is the region which has the potential of converting its dormant resources into an economic advantage. ([6], p.61.)

– thereby of course competing with Australia. It is evidently one of the aims of Forwood to do what it can to prevent this situation arising. This is despite the fact that assured future markets and better prices are more likely to encourage these countries to develop their forest resource on a sustainable basis and hence to decrease the likelihood of once-only cutting of forests or destruction for agriculture.

The wood-panel products working party also expresses serious concern about competition from imports.

> The Australian tariffs are barely adequate in some cases to protect the wood-based panel products industries. ... Constant vigilance is necessary to ensure that the intent of the present anti-dumping measure is not circumvented. ([6] p.87.)

Similarly the paper and paperboard report insisted:

> Tariff protection is necessary to enable the healthy development of this industry in the Australian economic environment. Paper and paperboard are commodities particularly prone to dumping, marginal pricing and similar practices, and so continuing vigilance against dumping is essential to avoid injury to the industry. ([6], p.96.)

The panel also complained of 'strong competition in [principal export] markets particularly the S.E. Asian markets. ...'

These sentiments, and the emphasis on continuing tariff protection, are hardly compatible with the fears expressed in the Draft Plan, of serious future regional shortages and higher prices, and they undercut the arguments for self-sufficiency which they were used to support. The Forwood arguments are clearly opportunistic; when, in justification of large planting plans and overestimation, it is a question of arguing for self-sufficiency, Forwood planners appeal to future shortages and price rises; but in justification of continued tariff protection they appeal to the likelihood of strong and continuing regional competition at cheaper prices.

Other arguments for self-sufficiency, most of which have already been dealt with, reappear. Thus the balance of payments argument for self-sufficiency is dragged out again, this time on the form of the bogey of a *possible* serious future deterioration in the present healthy balance of payments. But the mere possibility of balance of payments difficulty is not sufficient justification for self-sufficiency in this or any other product, and no evidence

is adduced for anything more than mere possibility. Further, high inflation rates make the accumulation of large reserves which these moves would foster particularly wasteful and pointless. Second, not only is Australia's import bill for forest products a reasonably normal one, (as argued in chapter 2) but the figures cited in Wesney and Freestone [1] indicate that the forest product import bill is not abnormal in relation to that for other comparable Australian industries. Thus on their assessment wood-based industries ranked 7th on a value-added basis, 5th in terms of employment, 5th in terms of value of plant and machinery employed, and 6th in terms of estimated capital to labour ratios. But they ranked 5th in terms of value imports. Thus the present import level of 20% or slightly more is by no means excessive. The Forwood argument (and also the new amendment) does seem to operate on the assumption that *each industry* should have a balance of imports and exports, or fail to have a deficit after importing, whereas of course, such balance is an overall matter for a whole economy. A related point is that if balance of payments does become a problem in the future, there are certainly more appropriate and flexible ways to cope with it than by production of a domestic crop which requires 40 years to mature (see chapter 2 again), and which runs the risk of accumulating unnecessary surpluses while depriving Australian consumers of the benefits of competition and placing excessive strain on forest areas and reducing public amenity.

To bolster the balance of payments' argument, it is argued in favour of self-sufficiency that Australia has a comparative advantage in the production of raw wood products (Survey [2], pp.5-6). This claim is supported by citing high mean annual increments from Australian pine plantations as compared with those from Europe and North America. A figure of 265 cu. ft. per acre per annum is cited (or 17 cu. metres per hectare annually) for Australian pine forests for the purposes of this argument (although interestingly a *much* lower figure is used in later estimates in the same paper for the purpose of predicting yields). It cannot of course be denied that Australian pine forests show initially high growth rates by world standards. But a great deal more than *that* is needed to demonstrate comparative advantage which would be sufficient to justify self-sufficiency.

First the claim that Australia does have a sufficient comparative advantage is difficult to reconcile with existing high tariff rates and with the plea, stressed throughout the Forwood papers, for the necessity to continue and even increase existing levels of protection against overseas competition.

In fact MAI's and comparative MAI's with respect to Northern Europe and America, are not nearly as relevant as they have been made out to be. For a comparative advantage, designed to support the case for domestic production, has to be a *relevant* advantage, and it is scarcely enough to demonstrate an advantage with respect to *some* set of producers (particularly remote ones shielded by transport costs) if there is another set of producers in the region with a greater comparative advantage. Thus having a comparative advantage with respect to growth of *some* Northern American and European countries does not then do anything by itself to show a sufficient advantage to support self-sufficiency and exclude imports. The fact that Australia has a comparative advantage with respect, e.g., to cotton and rice over *some European countries* does not show that it has a regional advantage or that it is worthwhile growing such commodities locally.

In fact MAI's in first rotations for pine plantations are only one factor to consider in determining comparative advantage – other crucial factors are suitability of soil and long-term sustainability. It appears, however, that other countries in the region also planting pines have a strong comparative advantage compared with Australia in these respects (see p.72). Nor is it just the ability of the site to grow wood that has to be considered – other demands on the land and other resources (e.g. capital) and the extent to which these are excluded by proposed developments have to be considered. For example, if land for plantation is obtained by excluding other important roles, such as recreation, for which land may be in short supply, this has to be debited against the advantage for the plantation. That is, comparative advantage has to be a comparative advantage when all relevant factors are considered.

The arguments for self-sufficiency do not really stand up. But this is not really surprising, for they are in fact no more than rationalisations for a policy which is pursued because it is in the interests of the forest services and forest industries. Self-sufficiency is pursued and promoted at Forwood not because it is a rational policy in the circumstances or because it is in the interests of Australians but because it promotes the growth and interests of the forest industries and services, the groups that Forwood explicitly sets out to serve.

The environmental justification

Despite the fact that it is concerned with promoting the growth of an industry a large part of which is environmentally damaging, unnecessary, and whose growth is to a large extent against the public interest, namely the junk part of the paper industry producing packaging and disposable products, Forwood predictably sets itself to package this expansion as environmentally admirable and to be promoted on environmental grounds. [1] In order to do this it employs the terminology and some of the distinctions of the environmental movement. The main arguments employed are (1) the Shelter Industry argument (p.12), namely the attempt to assimilate pulp and paper products, whose enormously increased consumption accounts for much of the projected future consumption, to sawnwood, and to assimilate their environmental effects and properties to those of sawnwood; (2) the argument that wood is admirable because it is a renewable resource and a biodegradable product; and (3) the argument that any attempt to restrict consumption of forest products must lead to the use of more environmentally damaging alternative materials. The main relevant sections are Forwood [1], p.37-39, Forwood [5], p.12, p.33-4, (The Social Significance of Forest Products) and Survey [1], p.6 (The Social and Economic Importance of the Forest Resources). According to Forwood [1] p.39

> Few people see timber industries in their real role as the vital link between trees in the forest and supply of the multitude of wood products for their use and enjoyment of an improved quality of life. Timber is an essential crop....

It goes on to claim, without any discrimination between products, that forest material generally is

> processed into commodities that are essential to our well-being and an acceptable standard of living.

These claims are made in the face of export production and the fact that so much of consumption at 2010 will be in junk paper. The attitude to industrial and consumption growth in this passage is completely undiscriminating and reflects the standard forestry value system, assuming that any increase in consumption is desirable and increases quality of life, and refusing to recognise environmental costs of production, distribution and disposal.

Survey [1] p.6 is used to mount an attack on a sinister and anonymous group referred to as 'some environmentalists', who are accused of claiming that 'the commercial production of timber is *not compatible* with the other benefits of the forests which they consider to be more important', and of advocating the restriction of consumption of forest products and *the use of alternative* products. It is scarcely surprising that the persons concerned are not named, since it is probably not possible to find any published expression of such views from environmentalists; the claims in question in fact seem to be a peculiar and convenient distortion of the views expressed earlier in this book that an attempt should be made to curb the growth of packaging and disposables rather than to promote and assist them, and that a conflict exists between intensive forestry and non-wood production values. But to say that a conflict may exist and is severe under *some* methods of wood production is of course quite different from saying that commercial production of timber is *never* compatible with other benefits. The claim is not that timber production is *always incompatible* with other benefits – except for wilderness values and areas best left in national park. The claim is that there is a *conflict* between intensive or maximum wood-production and many non wood-production values, and that substantial modification of commercial timber production

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1 The public is to be convinced of this too, through a communications and education campaign (Forwood [3] and [8]): no reassessment of forestry thinking is contemplated.

According to Forwood [8], p.7 and p.18, the public needs educating in other respects as well; they 'should be taught how to enjoy the forest resource without damaging it'. The same Panel expressed complete satisfaction with the forestry education system.

practices rather than the exclusion of lumbering, is required to obtain an optimum. It is a question of excluding certain *sorts* of operations (rather than logging generally) to prevent excessive exploitation and maintain other values. The accusation that environmentalists claim that timber production is not compatible with other values harks back to the accusation that they wish to see *all* timbering stopped, and results from a failure to distinguish between conflict and incompatibility (two quite different concepts). The passage upbraiding 'some environmentalists' continues:

> They have argued that the utilisation of the wood should be limited and if necessary, increased demands should be met with alternative materials. ... From the economic viewpoint the alternatives to producing timber for industry are to import it or to use substitute materials.

It then goes on to argue that substitute materials have a higher environmental cost than wood (referring to Dane [1]) and concludes

> Thus, rather than limit the use of forest produce, every effort should be made to utilize it further.

The argument again involves a fair amount of distortion of opponents' views and represents a prime attempt to confuse two completely different commodities, end uses and environmental effects – those of sawnwood and paper. The authors evidently preferred to turn a blind eye to the fact that paper products will account for nearly half of consumption levels at 2010 and nearly all the anticipated increase in per capita demand at 2010 if Forwood is correct, and that it is junk paper production and consumption, *not* sawnwood, that 'they' have argued should be discouraged. (Of course it is far from true also that *all* alternatives to sawnwood are environmentally damaging, or that sawlogs are generally produced with as little damage as claimed.) It is certainly false that the *only* alternatives to using local paper for packaging and disposables is to import paper or use alternative environmentally inferior materials for packaging and disposables. Not only is it unclear that alternative materials to paper are markedly worse (see Runeberg [1]), but there is the clear alternative of not using any sort of packaging and disposables at all – or at least *minimizing* or discouraging their use, e.g. by use of durable recyclable or non-disposable substitutes, or by increased services.

Nor is it true for wood products *generally* that, as the passage claims, the use of alternative materials involves substituting for them environmentally inferior materials, and that forest produce generally is environmentally admirable. Even if such a generalisation was excusable in a situation where only a small proportion of consumption was in paper, it is certainly *not* excusable when nearly a *half* of consumption is in paper and more than one third of consumption is junk paper. The passage cites, in support of its thesis, Dane's results which apply only to sawnwood and have no relevance at all to paper products. The use of these results to claim that all forest produce is environmentally admirable and that no restriction of any sort ought to be envisaged is quite illegitimate and misleading. The exercise blithely ignores the facts, stressed above, that paper production is highly polluting, the end products often unnecessary, and contributory to disposal problems, and that while it is true that logs *can* be produced with little environmental cost it is unfortunately far from true that they always or even normally are (especially in pine plantations). The appeal to renewability, low energy use, recyclability and biodegradability to paint a picture of environmental soundness which smoothly glides over the inconvenient facts of numerous well-documented detrimental effects of a large part of the forest product industry, has a great deal in common with the similar distortion found in advertising by paper companies[1],

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[1]The following is a good sample:

> Continuous and increasing research is a vital part of Litter Ltd.'s total progress. It has helped Australia in two important ways...strengthening the vital Australian paper industry; working with nature to protect and improve our environment. We've made zoological and botanical surveys and bred fast-growing tree crops. Native plants and animals thrive in company forests, like the kangaroo in this pine plantation. Our planting programme ensures a renewable resource and increases our breathing forests. At our paper mills, research has helped to conserve and purify water, recycle and recover raw materials, and to minimise emissions to the atmosphere.

This should be compared with the facts documented in pp.137-138.

but is inexcusable in what claims to be responsible, expert and non-promotional assessment from a body supposedly furthering the public interest rather than the interests of paper companies. Nothing could better illustrate the excessive connection between forest services and the forest industries than the promotion of this misleading picture at Forwood. Presumably some of the general promotional advertising by large paper companies can be cut now that forest services and the Forwood Conference have been induced to take some of it over at public expense. Forwood finally suggests that every effort should be made to encourage consumption of forest produce of all sorts, thus advocating an increase in paper mills and pollution, in clearcutting and overexploitation of native forests, and increased disposal problems – all in the name of environmental soundness. One way to make 'every effort to utilise it further' is of course to ensure that material continues to be sold at an unrealistic or very low price and to give undiscriminating concessions and assistance to forest industries at public expense.

Forwood advocates such encouragement, not only in the name of environmental soundness, but also in the name of protection of the interests of the *consumer* of forest products. However protection for the interests of consumers does not justify handing out indiscriminate subsidies and concessions for the production and consumption of certain products, or selling them at an unrealistically low price with compulsory public support, or what is the same (given opportunity costs on the public capital involved) at cost; and protection of consumers' interests must be distinguished both from unwarranted public support for and from encouraging unnecessary, wasteful and damaging consumption. It should mean that the consumer gets a fair go (with respect to producers), not that he gets an *open* go (with respect to the environment). The 'consumer protection' label, just like the environmental soundness label, is introduced in an opportunistic way to justify furthering the interests of the forest industries and concessions for these industries. One indication of the genuineness of Forwood's concern for the consumer of forest products is that the sources insisting on unrealistic royalties, allegedly in the interests of consumers, were the very same as those who advocated increasing Australia's already high levels of tariff protection, particularly for paper products.

There is no justification, either in the name of the environment or of consumers, for encouraging the consumption of junk paper materials. A reduction in consumption (or at least non-increase) could be achieved by appropriate pricing – at least involving the removal of present hidden subsidies encouraging it, e.g. the public bearing the cost of disposal and part of the true cost of production. If the recommendations of Forwood are accepted these forms of encouragement for junk paper consumption will be continued – even perhaps increased. These will have to be at least continued, and combined with extensive promotion of paper products and their infiltration into areas where their extensive use is virtually forced upon consumers (as, e.g., milk cartons), in order for the Forwood projections of paper consumption to be approached. Pulpwood royalties will be retained at present low levels (although for the convenience of forest industries some of the arbitrariness of their determination will be removed), planting at public expense will anticipate high levels of consumption, and cheap supply of raw materials and other concessions will enable paper companies to expand their markets. The forests will have to produce at least one third more than would otherwise be required. Paper mills will proliferate and the existing rich natural forest will be confined to small samples while the bulk of the native forests will be impoverished by being clearcut on short rotations, to produce pulp for overseas consumers if local ones cannot be induced to multiply their numbers and consumption sufficiently. In these ways the avowed aim of Forwood (the *growth* of the industries involved) will have been achieved.

it is likely that New Zealand will show the same decline in population growth rates as other developed countries.

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Index of Names

Alston, R.M. 298, 299, 304, 306, 334
Amaya, N. 137
Aristotle 252
Askin, R. 141
Barb 181, 184
Barkley, P.W. 150, 152, 199, 248, 249, 250, 259, 262, 268, 292, 293, 305
Beale, J.G. 128, 140, 141, 142
Beardsley, W. 292
Beckermann, W. 266-267
Bell, J.J. 302
Bentham, J. 257, 301
Bertalanffy, L. von 302
Beveridge, G.S.G. 303
Biswas, A.K. 288, 292
Blakely, W.F. 163
Bolle, A.W. 180, 181, 183, 194, 209, 210, 219, 224, 225, 298, 331, 377
Borrie, W.D. 358
Boulding, K. 89
Brabin, T.R. 209, 360
Brandborg 183, 194, 196
Breeden, K. 105, 112, 212
Breeden, S. 105, 112, 212
Brookes, J.D. 74
Brown, A 23, 24, 25, 26, 29, 30, 39, 59, 78, 79, 80, 270, 271
Brown, H. 87, 137, 148
Browne, F.G. 122
Bull, H. 50
Calaby, J.H. 85, 104
Cane, E. 142
Carr, S.G.M. 113
Carter, W.G. 25, 59, 91, 132
Cass, M. 32, 98, 154, 160, 162, 164, 166
Chapman 178, 180, 185, 235
Church (U.S. Sen.) 195
Clennett, B.G. 10, 11, 15
Commoner, B. 13, 42, 71, 73, 110, 121, 236, 241, 262
Conacher, A.J. 154, 160, 162, 163
Conley 175
Connaughton, C.A. 192
Coomber, N.H. 288, 292
Coombs, H.C. 47, 55, 243, 349, 353, 354
Costin, A.B. 71, 72, 85
Cotton 28, 73, 87, 96
Crafts, E.C. 177, 180, 192, 326
Crane, A.H. 5, 15
Cremer, K.W. 60
Cromer, D.A.N. 5, 7, 9, 10, 76, 166, 206, 209
Cunningham, T.M. 103, 108, 120, 125, 128, 129, 151
Curry 102, 170, 171, 172
Dahlsten 176, 177-178, 187, 194
Dane, C.W. 75, 315, 322, 377, 378
Dasmann, R.F. 7, 71, 73, 138, 212
Davidson, B.R. 79
Davidson, F.W. 136, 138
Davis, K.P. 176, 192
Dawkins, H.C. 377
Day, M.F. 69
DeBell, D. 327
Donohue, R.L. 72
Douglas, J.J. 346
Draper, J.E. 365
Duffield, B.S. 289
Duffy 59
Eckstein, O. 283
Edgerby, M.W. 10
Ehrlich, P.R. 35, 138
Eisler 175, 177
Elton, C.S. 114
Enderby, K. 95
Evans, B. 174, 181, 184, 188, 189, 194
Evans, H.D. 343, 346
Ewart, A.J. 108
Fairbairn, D. 26
Fedkiw, J. 236
Felton, K.C. 103, 114, 151
Ferguson, I.S. 47, 134, 136, 145, 146, 147, 150, 158, 192, 346, 362, 363
Ferguson, C.E. 258
Fitzwarryne, P. 283
Florence, R.G. 11, 12, 15, 64, 74, 192, 233, 236
Forrester, J. 35, 47, 48, 265, 268
Franklin, J. 327
Fraser, L. 234
Freeman, P.H. 73
Freestone, R. 339, 341, 344, 345, 375
Frith, H.J. 69, 105
Galbraith, J.K. 9, 19, 44, 221, 222, 253, 254, 257, 260, 293, 301
Gardner, R.G. 106, 125
Garland, R.V. 271
Gilbert, J.M. 108, 120, 125, 128, 129
Gilmour, D.A. 77, 102, 109, 110, 270
Goard, J.C. 161
Goldman, M.I. 74, 137
Grassby, A.J. 31
Gray 170
Gregory, G.R. 254, 255, 259
Greig, P.J. 158, 192
Grose, R.J. 11
Groves, K.W. 87
Haden-Guest, S. 4
Hall, N. 23, 24, 25, 26, 29, 30, 39, 59, 79, 80, 270, 278
Hamilton, C.D. 72, 109
Hanson, A.B. 16, 28, 30, 38, 39, 41, 42, 44, 45, 49, 90a, 105, 158, 198, 238, 240, 244, 245, 355
Hardin, G. 258, 261
Harkin, D.A. 237
Harris, A.C. 18, 92, 142, 145, 156

Heather, W.A. 115, 116
Henault 183, 184, 188, 189, 195
Henry, J.L. 18, 19, 28, 42, 49, 64, 77, 80, 81, 101, 106, 111, 118, 123, 132, 133, 134, 135, 138, 139, 141, 219, 220, 230, 236, 270, 273, 276, 285
Higgins, H.G. 92, 95, 122, 135, 144, 177
Hobbes, T. 261
Hogg, D.McC. 87, 137, 148
Holloway, J.T. 13
Hooven, E.F. 174, 175
How, R.A. 70
Hoy, R.J. 77, 270
Huddleston, E.B. 11, 39, 64
Jackson 108
Jacobs, M.R. 9, 15, 22, 24, 25, 26, 27, 28, 30, 34, 35, 37, 38, 39, 40, 41, 42, 44, 45, 49, 59, 61, 91, 96, 124, 133, 135, 137, 204, 209, 220, 256, 355, 370, 372
Jeffrey, R. 51
Jones 114
Kahn 52
Kapp, K.W. 80, 261
Keeves, A. 71
Klingman, J.S. 365
Kneese, A.V. 55, 61, 74, 136, 137
Kohler, A. 209
Korven-Korpinen, E. 108, 233
Kreps, J.P. 257
Krutilla, J.V. 283
Kuhn, T.S. 311
Lawrence, R.G. 87
Leslie, A.J. 7, 76, 81, 83, 84, 86, 87, 88, 198, 239, 243, 244
Lewis, N.B. 71, 77
Lipsey, R.G. 248, 260, 261
Lowenthal, D. 72
Lugton, G.R. 77, 78, 84
Macrae, N. 25
Maddox, J. 16, 52, 74
Mahmood, L.H. 122
Marks, G.C. 97, 110, 114, 115, 116, 162
Marshall, A.J. 69
McArthur, A. 155
McCarthy, W.O. 77, 78
McCormack, R.J. 59
McGee, C.E. 192, 193
McGrath, K.P. 278
McIlwraith, J. 144
Meadows, D.H. 35, 48, 265, 266
Meadows, W.G.H. 11
Meagher, E.R. 19
Merriam 175, 188, 189, 191
Metcalf, L. 206, 226
Mill, J.S. 252, 268-269
Milton, J.P. 73
Minckler, L.S. 227, 231, 232, 327
Mines, S. 327
Mishan, E.J. 248, 348
Mohrer, H.V. 55, 62
Montgomery, K. 103, 118, 192, 193
Moore, G.E. 251
Morison, I.G. 77, 270
Moulds, F.R. 10, 11, 19, 87, 96
Muncey, R.W.R. 30, 39, 44
Murden, D. 360
Murray, R.D. 161
Myer, G.C. 56
Nader, R. 46
Nagel, E. 311
Neutze, M. 263
Newhook, F.J. 114, 117
Nowell-Smith, P. 293
Nozick, R. 51
O'Neill, P. 10, 11
Ovington, J.D. 61, 62
Owen, M.L. 289
Paine, M. 377
Parish, R.M. 261, 263
Parkes, E.D. 23, 26, 27, 59, 61, 79, 253, 254, 282 370
Patterson, R. 73, 152
Pearse, P.H. 292
Phillips, F.H. 95, 122, 135, 144, 177
Pierce, R.S. 73, 99, 109, 110, 171
Pierre, D.A. 303
Pigou, A.C. 260, 261
Platt, 102, 173-4
Plumb, J.W. 193
Podger, F.D. 114, 117
Popper, K. 39, 261
Powis, J. 131, 278
Pratt, B.H. 115, 116
Prest, A.R. 83, 87
Pryor, L.D. 14
Rawlinson, P. 103, 115
Ray 102, 173, 234, 235
Reece, E.E. 19
Reich, C.A. 19
Reilly, J.J. 77, 270
Richardson, S.D. 289, 290, 371
Risser 180, 181, 183, 185, 187, 189, 190, 19 192, 195
Robinson 169, 186, 187, 188, 232
Routley, R. 116, 251, 252
Routley, V. 116
Runeberg, L. 281, 365, 378
Russell, B. 268
Saito, K. 96
Samuelson, P.A. 248, 259, 268, 305
Saul, C.M. 11
Schechter, R.S. 303
Schlaifer, R. 51, 53
Schloemer 182, 186, 195
Scobie, P. 144
Seckler, D.W. 150, 152, 199, 248, 249, 250, 259, 26 268, 292, 293, 305
Shepherd, C.J. 115, 116
Sinden, J.A. 77, 270
Slinn, R.J. 45, 50, 80
Slomson, A.B. 302

Smith, R.F.C. 69, 104
Smoot 196
Specht, R.L. 110
Squire, R.O. 281
Stocker, G.C. 113, 118
Stocking 176, 177
Stoddard 180, 183, 184, 196, 223, 232, 235
Swartz, R. 19, 141
Tepfer 173, 188
Thompson, A.P. 198, 201
Toulmin, S.E. 311
Treloar, D.W.G. 77, 270
Turnbull, R.F. 38, 45
Turner 174, 180
Turvey, R. 83, 87
Tyndale-Biscoe, C.H. 69, 70, 104, 112
Unwin, P.T. 11, 18, 129-30
Uren, T. 32
Van de Mark 170, 182, 183, 191, 194
Vickery, J.W. 234
Victor, P.A. 75, 137, 138, 149, 243
Walker, C.M. 103, 118, 192, 193
Waring, H.D. 74
Watt, A.J. 76, 101, 106, 111, 134, 135, 138, 139
Weaver, J.H. 47, 55, 64, 253, 260
Webb, L.J. 109, 234, 326
Weetman, A. 28
Wesney, D. 339, 341, 344, 345, 375
Weste, G.M. 114, 115, 116, 117
White, M.G. 108, 233
White, V.S. 92, 95, 96, 109, 126, 136
Whitlam, E.G. 31
Wilde, S.A. 71
Wood, N. 169
Wriedt, K. 81, 154, 206, 311
Yirrkala people 118
Yoho, J.G. 47, 134

Index of Places

Africa 91, 134, 168
Alaska 169, 175, 178, 188, 191, 332
Albany (WA) 95
Alpine National Park (proposed) 65, 212
Anembo 66
Arnhem Land 113, 118
Atherton Tableland 270
Badja State Forest 59, 65, 66, 213
Bass Strait 138
Bega 148
Bermaguee State Forest 273
Bermagui 100, 273
Bitterroot National Forest, Montana 169, 181, 182, 187, 189, 190, 194, 196
Blackwood Valley (WA) 270
Blenheim State Forest 66
Bombala 29, 53, 66, 67, 68, 74, 96, 97, 100, 103, 121, 143, 278, 281, 285, photo 15
Bondo State Forest 2, 3, 273, photo 1
Bonville 111
Boola-Boola State Forest 99, 100
Boonah (Queensland) 95
Boyd Plateau 65, 213, 309, 314, 332, photo 17
Braidwood photos 14, 16
Brazil 121, 123, 137
Bridger National Forest, Wyoming 191, 192, 194
Bridger Wilderness Area, Wyoming 191
Brindabella Ranges 102
British Solomon Islands 122, 168
Brogo 100
Budawang Ranges 115
Bunbury 267
Cairns (Queensland) 95, 110, 111, 112, 151
California 169, 170, 176, 181-2, 187
Canada 2, 25, 27, 42, 44, 80, 137
Canberra and ACT 16, 66, 86, 102, 207, 224, 242
Cape Weymouth 111
Cape York 21, 111, 113
Captain's Flat 213
Casino 271

Chapman Forest (WA) 270
Chile 25
Clarence River 85
Coffs Harbour 95
Cooloola 111, 215
Cumberland Falls 86
Currowan State Forest 193
Dampier State Forest 213, 193
Darling Range 97
Denmark 289
Derwent 137
Deua-Tuross-Brogo National Park (proposed) 213
Devonport (Tasmania) 95
Dividing Range 314
Dubbo Creek 66
Dubois, Idaho 180
East Boyd State Forest 276
East Gippsland 95, 114, 115, 117 photo 22
Eastern Tiers 106
Eden (NSW) 16, 19, 67, 92, 97, 99, 100-106, 108, 109, 110, 113, 114, 115, 118, 119, 121, 125, 126, 128, 130, 131, 132, 133, 134, 135, 138, 140, 141, 142, 143, 145, 146, 147, 148, 156, 159, 168, 193, 273-278, 279-286, 331, 332, 334, photos 21, 23, 24, 25, 26, 34, 35, 36, 37, 38
Edrom 138, 273
Egan Peaks 113
England 86
Eurobodalla Shire 145, 148
Fiji 25, 168
Florentine River Valley 213
France 22
Fraser Island (Queensland) 95, 109, 111
Gabo Island 103
Genoa River 103, 138, 275 (map)
Georgia (USA) 327
Germany 71, 72, 200
Gippsland 114, 149
Glenbog State Forest 273
Gove (Northern Territory) 95, 111, 113, 118
Green Hills State Forest 77, 84
Gympie (Queensland) 95
Holland 55
Hong Kong 123
Huon 137
Idaho 169, 173, 178, 183, 188, 194
Imlay Shire 145, 147, 148
Imlay – Wog Wog Park (proposed) 113
India 91
Indonesia 25, 91
Jackson Hole, Wyoming 191
Japan 22, 27, 39, 95, 96, 106, 109, 113, 120, 121, 122, 123, 126, 130, 136, 137, 141, 142, 144, 198, 219
Jervis Bay 95
Kanangra-Boyd National Park 68, 213, photo 17

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Kimberleys 113
Kioloa State Forests 223, photo 33
Kosciusko National Park 66, 145
Krakatoa (volcano) 16
Lake Bonney 137
Lake Pedder 1, 195
Lidsdale State Forest 77, 84
Little Desert (Victoria) 215
Long Reach 95, 143
Malaysia 26, 120, 122
Mallacoota Inlet 103
Mamuka ranges, NZ 196
Manjimup 95, 97, 141, 142, 144, 154-167, 278, 306, 313, 331
Maryvale 138
Melbourne 212, 283, 310
Melville Island (Northern Territory) 95, 113
Monga State Forest 64, 66, 67, photos 4, 6, 20
Mongarlowe River photo 16
Monongahela National Forest, West Virginia 169, 196
Montana 171, 178, 183, 189
Moruya 95, 97
Moss Vale 66
Mumbulla Shire 145, 148
Murganella (Northern Territory) 95, 113
Murramurrang National Park 213, 223
Myall Lakes 143, 215
Naghi State Forest 101, 105, 115, 276
Nelson (NZ) 197
New South Wales 6, 29, 39, 45, 46, 52, 59, 64, 65, 66, 67, 68, 68a (map), 69, 70, 73, 74, 75, 77, 80, 83, 84, 85, 86, 89, 92, 95, 97, 99, 100, 101, 103, 105, 110, 111, 113, 114, 116, 117, 121, 125, 126, 128, 131, 132, 133, 134, 137, 138, 142, 143, 146, 168, 213, 214, 222, 224, 230, 236, 244, 268, 270, 276, 277, 278-286, 314, 324, 350, 353
New Zealand 2, 24, 26, 27, 42, 72, 73, 79, 84, 98, 109, 110, 114, 119, 121, 168, 193, 196-203, 222, 243, 244, 316
Northern Territory 92, 95, 106, 108, 111, 113, 118, 145, 314, 324
Nowendoc 67
Oberon 66, 67, 74, 80, photo 17, 315
Oklahoma 171
Orbost 114
Oregon 169, 174, 187
Otway Ranges 16, 217
Papua New Guinea 110, 113, 121, 122, 168
Pemberton 158
Perth 145
Perup River 164
Philippines 26, 91, 110, 122
Queensland 5, 8, 21, 66, 77-78, 93, 94, 97, 110, 111, 112, 151, 152, 205, 215, 217, 270, 314, 324
Richmond River 85
Sabah 122
Sarawak 122

Selangor 122, 244
Sequoia National Forest, California 176
Shelburne Bay (Queensland) 95, 111
Sherbrooke Forest (Victoria) 16, 86
Shoalhaven River 65, 66
Shoalhaven Shire 145, 148
Siskiyou Wilderness Area, California (proposed) 181-182
South Africa 25, 27
South America 91, 134, 168
South Australia 8, 64, 71, 137, 214, 270, 315, 350
Southland (NZ) 197
Sweden 27
Sri Lanka 91
Styx River Valley 212
Sydney 65, 66, 77, 212, 283
Taipei 123
Tallaganda State Forest 16, 29, 53, 59, 65, 66, 67, 68, 73, photos 4, 5, 7, 8, 9, 10, 11, 18
Tanami Desert 212
Tantawanglo State Forest 68
Tasmania 5, 6, 8, 21, 59, 64, 66, 68, 91, 92, 95, 97, 99, 100, 102, 105, 106, 107 (map), 108, 109, 110, 111, 112, 114, 115, 116, 118, 120, 121, 124, 125, 126, 130, 132, 134, 135, 136, 137, 138, 140, 142, 144, 145, 149, 151, 155, 163, 181, 185, 195, 197, 198, 208, 210, 211, 212, 224, 225, 233, 236, 276, 315, 324, 353, photos 29, 30, 31, 32
Texas 171
Tongass National Forest (Alaska) 178, 332
Towamba River 103, 138, 275 (map)
Triabunna 95
Tumut 66, 67, 68, 69, photo 1; 77, 271, 314
Twofold Bay 138, 143, 273
UK 27
USA 2,11,12,17, 25, 27, 35, 42, 44, 55, 56, 61, 100, 102, 118, 137, 168-196, 200, 202, 209, 222, 223, 224, 225, 227, 228, 230, 231, 232, 235, 236, 238, 242 244, 253, 254, 276, 277, 298, 299, 324, 326, 327, 332, 333
USSR 25
Victoria 6, 19, 59, 65, 66, 77, 79, 80, 92, 95, 96, 100, 103, 106, 114, 116, 133, 138, 197, 209, 212, 214, 236, 270
Wallagaraugh River 103
Wallum region, Queensland 77-78, 215
Washington (state) 169
Weipa (Queensland) 95, 108
Wenatchee National Forest, Oregon 194
Werriberri 273
Wesley Vale 136
West Germany 27
West Virginia 178, 181, 192
Western Australia 21, 80, 92, 95, 97, 114, 116, 117, 141, 143, 144, 145, 146, 154-167, 199, 201, 214, 243, 270, 314, 331, 332
Westland (NZ) 197
Wiangarie State Forest (NSW) 331
Willamette National Forest, Oregon 194
Wyoming 169, 173, 178, 183, 191, 194
Yardboro State Forest 193
Yellowstone National Park 191

Subject Index

Aboriginal land rights 113
Accidents and accident rate 87, 145, 277-278
Aesthetic values 11, 16, 18, 68, 70, 85, 149, 163, 166, 191, 227; 'aesthetic fix' 193, 202, 331
Agriculture; comparison of forestry with 77, 78, 79, 87, 110, 145, 147, 236, 270, 283, 313, 341-344
Amalgamation of projects 278, 279, 280, 282
Amenity values 5, 9, 119, 206, 215-6, 218, 221, 233, 236
Australian Conservation Foundation 309
BDU (Bone Dry Unit) 140, 141
Beekeeping 158, 159, 224
Benefit-cost ratio 7, 83, 84a, 90b, 90c, 279, 282, 283, 285, 349
Birds 68, 69, 70, 104, 112, 113
Bolle Committee 183, 209-210, 226, 331
Bushfires 15, 17, 85, 103, 113, 117, 118 *see also* Fire
Cheap wood doctrine 5, 8, 9, 10, 187, 218, 219, 220, 221, 236, 244, 316, 321
Clearcutting 59, 100, 111, 118, 189, 196, 202, 326; cheapest and simplest method 196, 327; effect on scenic, aesthetic and recreational values 190-193; effect on soils 71, 72, 73, 99, 102, 103, 109, 110, 161, 164, 172, 200, 232, 281; effect on watershed properties 73, 99, 101, 110, 161, 164, 173, 232, 281; effect on wildlife 69-70, 99, 103-105, 112, 164, 174, 175, 195; environmental soundness 327; essential 189, 327; regeneration after 101, 108, 109, 159, 161, 165, 172, 194, 195, 200; *versus* less intensive methods 168, 175-178, 186-187, 207, 233, 234, 245
Cleared land; planting on 48, 51, 63, 245, 271-272
Commodity tax 343, 344
Compaction of soils by machinery 71, 101, 102, 109, 110, 201
Company tax 88, 140, 142, 143, 144
Comparative advantages for forestry of NZ 24, 25, 26, 27, 72, 73
Comparative disadvantages for forestry of Australia 26-27, 72, 73, 78-79, 171, 375
Conflict of forestry and conservation 1, 17, 18, 168, 189, 222, 322; of wood-production and non wood-production values 13, 19, 20, 65, 70, 81, 88, 99, 152, 163, 166, 180, 200, 204, 222-231, 233, 235, 335, 376
Conservation 17, 18, 21, 67, 168, 190, 202, 222, 224, 226, 227, 309
Conservative forestry 186; *see also* Selective logging, Restrained yield, Partial use, Multiple-value management
Constraints in decision modelling 227; site productivity 298; sustained yield 298; budget restrictions 298; *see also* Decision theory, Optimisation
Consumer sovereignty 255, 257, 258, 259
Consumerism 257, 309
Cost-benefit analysis 50, 52, 81, 83, 84a, 85, 86, 87, 88, 89, 90, 90a, 206, 207-8, 236, 247, 336; as a special case of optimisation analysis 300, 336, 337; as a poor man's optimisation model 337
Crown land 2, 51, 65, 67, 106, 208, 209, 210, 211, 212, 213, 216, 235, 273; 'Idle' 316, 321
Decentralisation 28,52, 86, 145, 146, 150, 156, 340
Decision theory 30, 34, 49, 50, 51, 52, 53, 88, 117, 167, multi-objective decision-making 298; best decision 299, 300, 301; Bayesian rational decision-making 300; utilitarian recipe for decision-making 301; *see also* Uncertainty
Defect allowance (in estimating yields) 371
Demand (future) 254, 255, 256, 257, 259, 260, 354-368
Development 266-269, 311; development-oriented economics 339-341; *see also* Regional development
Discount rates 83, 133, 349; real 282, 283, 284; current 282, 284; social 7, 9, 76, 84a, 124
Disease 113, 114, 115, 117, 119, 162
Disposal; disposable paper products 49, 88, 316; cost of 245; *see also* Waste disposal
Diversity of wildlife 65, 69, 70, 85, 104, 105, 113
Dominant use 80, 225, 230, 323, 333; dominant-use — concessional position 304, 332
Economic growth 5, 32, 33, 152, 248, 260, 262, 263, 264, 265, 266, 267, 268; development-oriented economics 339-341; in forestry 340
Economies; comparison of forestry management objectives with 304; compensatory approach 305; goals of 303-306; multiple integrated objectives 305; types of 303
Ecosimplification 114, 164
Education; of foresters 8, 194, 222; of public 11, 12, 64, 163, 193, 195, 202, 376, 378

Employment 28, 31, 33, 52, 81, 86, 87, 137, 144, 145, 146, 147, 148, 150, 151, 156, 158, 246, 277
Environmental costs; of the pine program 19, 64, 270, 315; of intensive forestry methods 91, 99; of clearfelling100, 159, 163; economic evaluation of 119, 126, 138, 140, 144, 149, 150, 156, 167, 199, 221, 233, 236-243, 245, 246, 247, 281, 285; of production and consumption 89, 242, 256-7, 259; of substitutes for wood377
Environmental economics 248, 249
Environmental forestry 289; *see also* Conservative forestry
Environmental impact statements; independence of 98; and 'minimization of costs' 164, 200-201, 242; not sufficient condition for policy-making 242; inadequacies of 160-167, 199, 201, 206-207; NZ 199; WA 154-156, 158-159, 162-167; and cost-benefit studies 206; lack of for expansion of Eden project 285
Environmental justification for forestry growth; Shelter Industry argument 12, 209, 239-240, 376; renewability and biodegradability argument 13, 70, 376
Environmental pricing 236-247, 262, 307
Environmental protection; responsibility for paying for 346; *see also* 'Polluter pays' principle, Environmental pricing
Erosion; in pine plantations 17, 71, 73; clearfelling and 101, 103, 109, 150, 161, 163, 170-172, 182, 200, 232; control measures 101, 102; photo 10
Expensive Solution (to the economic problems of production forestry) 236-237, 347
Eucalyptus calophylla (marri) 97, 154, 159, 163, 165
Eucalyptus cypellocarpa (mountain grey gum) photos 24, 26
Eucalyptus dalrympleana (mountain gum) 68, photo 2
Eucalyptus diversicolor (karri) 154, 158, 159, 163
Eucalyptus marginata (jarrah) 97, 114, 154, 159, 162, 163
Eucalyptus obliqua (messmate) photo 8, 81, 106, photo 18, photo 24
Eucalyptus regnans (mountain ash) 84, 109, 132, 212
Eucalyptus robertsoni 68
Eucalyptus sieberi (silvertop ash) 101, 106, 115, 132
Eucryphia moorei (pinkwood) 68, photo 4, photo 6
Even-aged management 72, 176, 178, 195
Export earnings 140, 142, 153
Export of forest products 2, 9, 73, 78, 79, 98, 204, 206, 211, 246, 247, 372-376; woodchips for export 141, 154, 156, 278; competition from S.E. Asia region 374
Extrapolation procedures 39, 41, 43, 50-51, 256, 359, 361, 366
Factors in decision-making; weighting of 83, 106, 227, 298, 338; *see also* Decision theory, Optimisation
Fauna; diversity of 74, 75; effects of clearing on 68, 69, 99, 104, 105, 112, 113, 114, 118, 160, 166, 175, 207; *see also* Diversity of wildlife
Ferngully 16, 68, photo 12, 233
Fertilizing 73, 91, 110, 126, 172, 176
Fire; protection 59, 103, 118, 155, 277, 278, 281; bushfires 15, 17, 85, 103, 113, 117, 118; burning after clearing 71, 73, 100, 102, 108, 109, 159, 160
Fishing; recreational 150, 159; breeding of fish 102, 103, 171, 172, 174; industry 88, 138, 147, 285
Flora 69, 74, 85; conservation 7, 52, 211, 227; effects of clearing on 68, 69, 110-111, 112, 118, 207
Forest; definition of 2; montane 21, 65, 68, 68a (map), 69, 75, 89; wet sclerophyll 64, 65, 68, 69, 109, 118, 154
Forest area 2, 3, 154, 208, 217; Forwood-forest 314; percentage of pine forest 314
Forest ecology 8, 70, 113, 119, 177, 180, 189
Forest products industries; links with forest services 9, 10, 11, 19, 135, 185, 186, 187, 218, 219, 226, 234, 237, 309, 310, 368; opposition to national parks 65, 96, 188, 189, 209, 212, 216, 310; profitability 79, 136, 246; concessions to by Forwood conference 318; demands for raw material 316
Forest services; accountability to public 20, 98, 205, 210, 244, 351; and clearcutting 109; competition between states 123; connections with industries 10, 11, 205, 218, 309, 310, 368; employees of 86-87; and information and secrecy 92, 98, 183, 197, 205, 219, 351; organizational aims 188; orientation to wood production 17, 18, 88, 91, 98, 184, 194, 197, 217, 218, 219, 222, 226, 229, 230; and profitability 46, 80, 124, 131, 134, 211, 349; as providing a

public service 9, 18, 218, 219, 352; pseudo-ecological arguments 12-17, 189, 190, 322, 324, 325, 376; and woodchipping plans 92
Forestry; significance in national economy 23, 87, 120, 140, 340, 345; as a miniature economy 298
Forestry and Timber Bureau 5, 98
Forestry legislation 8, 18, 19, 22, 45, 80, 125, 133, 204, 222, 223, 230; in USA 223, 225, 227, 235, 298-299
Forwood Conference 219, 224, 253, 309-378; attitudes to national parks 313, 314; conservation representation at 309; fundamental assumptions of 310, 312; multiple use, accounts of 332, 333; paper companies' representation at 310, 311; recommendations of 318-320; underlying ideology 311-318
Forwood-forest 314
Free good approach 77, 183, 243, 279, 322, 350
Fund transfers 279
Future requirements for forest products; self-sufficiency 21; and pine plantations 39, 47, 62, 67, 76, 96, 271, 272; over-estimation 46, 49, 151, 186, 247, 317, 318, 362, 367; reasonable requirements 47, 90a, 253-256, 259, 261, 262, 281, 354, 362, 363, 367; decision theory 50-53; probable ranges 54, 57-58; confusion with demand 47, 253-255, 367, 372-373
GNP 26, 32, 44, 47, 98, 121, 248, 262, 263, 265
Genetic conservation 52, 215
Gliders 104, 112; greater 69, 70, 104; feathertail 69; sugar 69, 70
Habitats; requirements of Australian species 18, 103, 104, 112, 160, 195, 230-231; threatened by pine program 65, 69, 70; threatened by clearcutting and woodchip projects 103, 104-105, 112, 118, 160, 165, 166, 175, 195, 231; preservation 84
Hardwoods; Australian 22, 59, 370; sawn-wood 42
Harris-Daishowa (Australia) 92, 96, 142, 143, 273, 285, 286
Harvesting equipment 101, 176, 186, 232, 281
Harvesting practices 101, 109, 110, 176, 186, 328
Holistic effect 112, 242
Hydrology 73, 85, 101, 102, 160-162, 170
Ideological theses; cheap wood doctrine 5, 8, 9, 10, 187, 218, 219, 220, 221, 236, 244, 316, 321; maximum wood production doctrine 18, 19, 90a, 165, 192-193, 194, 196, 202, 204, 208, 219, 220, 229, 231, 234, 235, 311; maximum wood consumption doctrine 18, 46, 47, 49; total use doctrine 17, 18, 19, 152, 204, 212, 216, 219, 220, 230, 231; of US forest service 169, 184; developmental industrial ideology 311
Ideology; characterisation of 311; wood production 311; developmental-industrial 311; Marxist-Leninist criticism of 311
Immigration program 28, 29, 30, 31, 32, 33, 34, 35, 38, 39, 156
Import replacement 22, 23, 24, 26, 62, 84, 89, 91, 246
Imports; the 'import burden' 22-24, 26, 91; sources and availability of 24, 25, 89; advantages of 24, 25, 246; comparison with other countries 27; likely future levels 51, 54, 62
Indirect taxes 343, 344
Industrial ecology 322-328; account of 324; industrial crop picture 321
Industrial lobby 309, 312, 318
Information 20, 64-65, 98, 155, 197, 205, 210, 244, 349; secrecy and censorship 92, 125-6, 136, 154, 183, 205, 218, 219, 349, 351
Insect predation 113, 114, 163, 190
Intangibles; assessment of 52, 81, 83, 85, 119, 150, 199, 206, 227-230, 236, 295; neglect of 5, 7, 90a, 149, 151, 166, 219, 237, 247
Intensive forestry; as a threat to native forests 1, 14, 15, 16, 17, 59, 91, 97, 204; maximizing wood production 2, 9, 10, 180, 186, 204, 220, 222, 226, 229, 235, 237, 311; profitability as compared with non-intensive methods 7, 21, 23, 78, 79; severity of methods 109, 110-111, 118; ecological costs and risks 71, 99, 112, 170, 171, 173, 174, 195, 207; conflict with non wood-production values 11, 13, 17, 99, 207, 231, 235, 335, 376
Intensive Solution (to economic problems of production forestry) 236
Internal rate of return 52, 76, 77, 80, 90a, 90c, 91, 133, 134, 204, 238, 270, 282
Land expectation values 270, 279, 280
Logging standards 68, 73, 101, 103, 171, 173, 207, 219-220

Lyre birds 68
Machinery, influence of heavy 101, 109, 110, 114, 190, 232
Mammals; arboreal 69, 70, 104, 112, 114; small 69, 104, 105, 112, 114, 160; *see also* Fauna, Glider
Market theory 260, 261, 262, 368
Maximum wood consumption doctrine 18, 46, 47, 49
Maximum wood production doctrine 18, 19, 90a, 165, 192-193, 194, 196, 202, 204, 208, 219, 220, 229, 231, 234, 235, 311
Mechanisation of forestry operations 87, 97, 131, 145, photo 14, 186
Melbourne Metropolitan Board of Works 310
Mills; pulp and paper 74, 135, 137, 138, 156, 164, 200, 244, 315, 322; sawmills 244; integrated 74, 187, 321
Minimization method 101, 192, 193, 200, 201
Monga Waratah 68
Monocultures 13, 110, 111, 114, 176, 177, 178, 186, 200
Multiple use 7, 8, 10, 17, 81, 88, 152, 180, 196, 207, 225-235, 328-339; concessional (ameliorative) approach 323; conflict and incompatability of uses 335; narrowing the sense of 287, 288, 291; reduction of value to use 287, 288; through cost-benefit analyses 336
Multiple value management 194, 211, 222-235, 312
National parks; area of – present 2; –forested 5, 65, 66, 67, 88; –needed for future 113, 204, 208, 212, 213, 217; –statistics in Forwood 313; comparison with state forests 210-211; cost of 164, 214 (table), 215; forestry opposition to 65, 96, 188, 189, 209, 212, 216, 310; obstacles to, pressures on 1, 75, 103; opportunity cost argument against 296-297; state forests as 64, 192, 208, 210, 217; value of 216
Natural areas and wilderness areas 14-15, 21, 70, 75, 89, 204, 272; values of 22, 53, 68, 98, 215, 216, 227, 234; threats to 52, 63, 64, 70, 80, 89, 91; conservative exploitation of 14, 15, 59, 62, 165, 178, 233, 234; wilderness areas 106, 188, 215, 216, 235
Naturalistic fallacy 295
Net welfare (social) 262
New South Wales Forestry Commission; and the pine planting program 64, 65, 66, 67; areas controlled by 65, 273; employees of 86; research undertaken 105-106; profitability 121, 125-6, 131, 132, 273-278
NAFTA 39, 40, 41, 42, 43, 44, 45, 49, 310, 365
No-conflict assumption 10-11, 12
Non wood-production values; conflict with wood production values 90a, 99, 152, 163, 166, 200, 218, 233, 234; evaluation of 151, 207, 219, 227-230, 237, 285, 286-297; and multiple roles of forests 17, 81, 174, 208, 225-226, 231, 235; willingness-to-pay criteria 286; *see also* Aesthetic values, Recreation, Tourism, Wildlife, Watershed protection, Conflict
Nutrient depletion of soils; and intensive forestry methods 71, 109; in plantations 72; and reduced yields 73, 102; after clearcutting 110, 150, 162, 170, 171-173
Objective assessment, myth of 294; senses of 'objective' 294
Onus of proof 166, 199, 201
Opportunity cost 84, 88, 90a, 90b, 128, 139, 142, 163, 206, 345, 352; on land 213, 215; argument against national parks 296-297
Optimisation 90a, 90b, 227-231, 234, 235, 282, 298-307
Overestimation; fallacy of 34, 37, 42, 49, 50, 255; of population 30, 32, 34-35, 49, 50, 63, 310; of consumption 38, 39, 40, 42, 43, 44, 49, 52, 247, 310
Packaging; excessive 8, 12, 44, 46, 317; limiting demand for 48, 239; and environmental pricing 138, 221, 238
Partial use 202, 228-231, 233
Patch cutting 165, 175, 232, 233; *see also* Small patch cutting
Philosophy of science 311
Phytophthora cinnamomi (root-rot or dieback disease); susceptibility 97 110, 115; research 105; spread and activation of 114, 115, 117, 162, 279; quarantine measures 116, 117; cost of 119, 162
Pine planting program; planning 10, 35, 41, 51, 76; replacing native forests 16, 81, 235; import replacement 22, 23; areas involved 21, 24, 29, 39, 45, 47, 52, 53, 54, 59, 60 (table), 62, 64, 67, 89, 98, 314; environmental costs 64-75, 215, 278, 315 planting on cleared land 48, 51, 270-272; profitability 76-88, 90a, 90b, 285; and woodchip projects 96-98; photos 1, 2, 3, 5, 7
Pinus caribaea 21, 270
Pinus elliottii (slash pine) 21, 66
Pinus radiata 21, 59, 64, 72, 73, 77, 81
Planning 4, 5, 10, 18, 22, 29, 38-39, 44-45, 47, 49, 50, 53, 54, 55, 74, 75, 88, 90a, 105, 202, 204, 229, 234, 247, 255, 256, 262

Plantations; pressure on natural forests 1, 2, 14-16, 21, 100, 270,370; problems of monocultures 13, 15, 200; profitability of 21, 23, 73, 76-81, 86, 87, 124; area needed 39, 47, 51, 59, 64; environmental costs of 70-75, 85, 86; cost-benefit analysis 81-90, 240; employment on 86, 87; on private land 63, 79, 271, 272
'Polluter pays' principle 241, 247, 296, 347, 348
Pollution; from pulp and paper mills 48, 74, 88, 137-8, 200, 315, 322; and recycling 55; from integrated wood-products mills 74; from chip mills 136, 150; water pollution 73, 101, 102, 149, 161, 162; air pollution 149; thermal pollution 172, 173; costs of 88, 237-238, 245, 248, 249, 322; and growth and population 1, 254, 265; 'Pollution Pays' principle 237; 'Polluter Pays' principle 241, 247, 296, 347, 348
'Pollution pays' principle 237
Population Australia 2; policy 268; rate of growth 1, 32, 34, 35, 38, 51, 54, 55, 56; future 7, 29, 33, 35, tables 36, 37, 38, 49, 50, 52, 53, 54, 63, 65, 356, 357; growth 22, 25, 30, 39, 75, 265, 267, 357; differential effect of growth 359; Forwood's newer projection 358
Possums 114; brush, 69, 70; ringtail 69, 70; pigmy 69, 104; mountain 70
Producer sovereignty 309, 368
Production forestry, senses of 342; *see also* Intensive forestry
Profitability of intensive forestry 5, 7, 9, 236, 339, 349, 350, 352; pine plantations 21, 73, 76-81, 87, 88; woodchip projects 96, 120, 121, 128, 131-139, 140, 154, 155, 156, 157, 158, 197, 198, 279, 285
Proper Balance approach 202
Proteaceae spp. 162
Pseudo-ecological arguments; argument from change 13-14; beetle argument 190; biodegradability argument 322, 376; degenerate forests argument 14-15, 16; forestry entails (is) conservation 15, 190, 337; great bushfire argument 17, 118, 325; interference improves forests 15-16; large quantities of seedlings argument 324; natural disaster argument 16-17, 190; nothing's really natural argument 14-15, 16; renewable resource argument 12-13, 322, 376
Psychic benefits of forests 286, 337
Public service – industry collaboration 309, 318, 368; *see also* Forest services, Forest products industries
Public purse policy 237, 241-242, 322; *see also* 'Polluter pays' principle
Pulp and paper products consumption; subsidies for 8, 238-239; promotion of 10; excessive 12, 64; and softwoods 22; predictions of future requirements 42, 43 (chart), 44, 54; recycling 54, 55; export of chips for 91; *see also* Wood product consumption
Pulpwood 128, 132, 133, 134, 135, 181, 209, 239, 370
Queensland Department of Forestry 5, 97, 111, 112
Rainfall 21, 59, 66, 72, 74, 101, 102, 103, 109, 110, 115, 154
Rainforest 1, 16, 65, 100, 103, 105, 109, 112, 122, 124, 151, 314; tropical 111, 112, 120, 121, 123; temperate 111; monsoon 111; threatened by woodchip products 65, 111
Recreation; values of forests 7, 52, 67, 154, 158, 159, 163, 164, 190, 191, 207, 215, 224, 226; evaluation of 86, 151-152, 158, 227, 292, 293; value through visitors 288-292; recreational forestry 288-292; value as a function of numbers of visitors 290
Recycling 51, 54, 55, 56, 62, 352, 371, 372
Regeneration; cost of 121, 124-5, 128, 129 (table), 131, 143, 155; failure of 162, 163, 194, 195, 200; density of 132; methods 159, 160, 245; natural 100, 101, 106, 108, 131, 228
Regional development 145, 147, 149, 150, 151, 156
Renewability of resources 13, 70, 120-121, 261, 265, 322, 376
Research; need for 68, 99, 103, 164, 180, 200, 205, 206, 207, 208, 322; lack of 66, 68, 91, 103, 104, 105, 113, 119, 164, 166, 180, 233; funds for 164, 205, 206
Restrained yield (principle of) 228, 230, 235
Revenue from forests 5, 6, 120, 123, 125, 128, 133-134, 139, 140, 155, 158, 197-198, 206, 239-240, 243-244, 273, 283; *see also* Internal rate of return, Profitability, Royalties
Roading 73, 103, 105, 114, 117, 182, 234, 276, 277

Rotation period 29, 106, 133, 164; second rotation problem 71, 72, 281
Royalties; differential adjustments 353; equalization scheme 353; insufficiency of current rates 91, 125, 155, 206-207, 238, 239, 240, 243-244, 247, 352; in USA 182; in NZ 198; method of determining 123, 207, 243-245, 273-274, 280, 350, 351; —residual values method 244, 351; need for increased 165, 207, 243-247, 272; —as encouraging use of residues and recycling 352; pulpwood 353; questionnaire 351; and road costs 125-126; role of industry in determination 354; sawnwood 238, 276; and second rotation costs 120-122, 125; secrecy of 245, 351
Safeguards, for forest environment 329, 338
Sassafras 68
Sawmill residue, use of 352, 371, 372
Sawnwood consumption; proportion of total consumption 23; predictions of future requirements 41-42, 44, 54, 55, 356, 359-363; declining 54, 209; subsidies for 8, 9, 238; demand 38, 48, 139, 210
Scenic values 85, 191, 224, 227, 234
Seed production (of eucalypts) 108, 117, 159, 162, 163
Selective logging 14, 15, 59, 62, 164, 165, 178, 202, 219, 231, 232
Self-sufficiency 2, 21, 24-28, 208, 219, 247, 372-376; balance of payments argument 23, 374, 375; cast-iron guarantee of supplies 372
Shortage, impending 25, 209, 210, 341; argument from possible scarcity 372; great price rise argument 373
Sierra Club 189
Siltation 68, 101, 102, 103, 149, 150, 161, 173, 174, 200, 201, 232
Site productivity 59, 71, 298
Slopes; unsuited to pines 65-66; effect of clearing on 67, 68, 101-103, 161, 170, 232; risks of planting on 73, 200; regeneration on 132; and small patch cutting 233
Small patch cutting 175, 232, 233, 234
Socialising raw wood production 9, 76, 133, 135, 218, 221, 236, 316
Softwood Forestry Agreements Act 22, 80, 133, 204, 271, 309
Soils; types 71, 72, 109, 200; suited to pines 73-74; and sustainability of yields 86-87; effect of clearing on 99, 171; effect of pines on 17, 68, 71, 85, 200; and intensive management 11, 18, 71, 99, 109, 110, 113, 207, 234; topsoil loss 109, 110; *see also* Nutrient depletion, Erosion, Compaction
Standard of living 39, 44, 47, 56, 64, 89
State forests 2, 15, 66, 67, 106, 154, 210, 212, 213, 216, 217, 218, 232, 235; area 208; NSW 65
State parks 66, 211
Streams; siltation 68, 101, 102, 103, 149, 150, 161, 173, 174, 200, 201, 232; eutrophication 110; salinity 161, 162, 164, 201; soil nutrients in 223, 232; *see also* Pollution, Water, Watershed protection, Siltation
Subsidies; for wood product consumption 8, 46, 78, 207, 221, 255, 256; for sawnwood production 8, 9, 238; for pulpwood production 9, 126, 133, 135, 154-156, 159, 164, 165; for domestic use 78, 278; for export projects 130, 142, 204, 271; as incentives to companies and private planters 79, 80, 81, 126, 271-272; and environmental pricing 236-241; in USA 180-181, 210; case for 341-348
Substitutes for forest products; alternative fibre sources 133, 134; effect on prices 134; environmental costs of 74, 377; neglect of in planning 90a, 281, 364; synthetics 74, 134, 280, 364
Supersonic transport 52, 167
Systems analysis methods 280, 302-303; general system 302
Tariffs 84, 208, 210, 245, 246, 255, 374
Tasmanian Forestry Commission 5, 108-109, 124, 125, 128, 135
Taxation; commodity taxes 343, 344; company taxes 88, 140, 142, 143, 144; indirect taxes 343, 344
Technology of forestry 5, 62, 186, 187, 218, 281; mechanisation 87, 97, 131, 145, 186, photo 14; and employment 87, 131, 145, 156
Thinning; costs 127, 130, 131, 279; amount required 132, 281
Timber for housing and building 9, 12, 22, 38, 41, 74, 209, 239-240, 359; income assumption and demand for housing 41, 42, 361
Total use doctrine 17, 18, 19, 152, 204, 212, 216, 219, 220, 230, 231
Tourism 100, 145, 150, 151, 154, 158, 159, 164, 192, 224, 285; tourist demand 292

Uncertainty; and decision-making 49, 50, 53, 54, 90a, 90b, 117, 139, 167, 206, 207, 253, 256, 279, 280, 281; of population size and rate of change 29, 34, 35, 54
Urban transport 90c, 283
Utilization; total use principle 2, 17, 18, 19, 91-92, 152, 204, 212, 216, 219, 220, 230, 231; conversion factors 61, 62
Values 11, 12, 19, 20, 250-252; value judgements 259, 260, 263-4, 338; multiple values 194, 226-233, 234, 312; economic assessment of 227-229; objective value judgements 294; *see also* Multiple value management
Victorian Forests Commission 77
Waste disposal systems 74, 245, 315, 371
Water; quality 52, 55, 85, 160; pollution 73, 101, 102, 138, 149, 161, 162, 172-173; supply 138, 156, 315
Watershed protection 7, 66, 85, 99, 110, 160, 161, 224, 226, 227, 233
Welfare; and population 32, and choice 206, 208, 250, 257-259, 267; and forestry ideology 165, 220, 222, 285; and GNP 262-4; quality of life 90c, 150, 215; *see also* Welfare economics
Welfare economics 228, 248-253, 262-3
Western Australia — Forests Department 97, 154, 155, 159, 160, 161, 162, 164, 165
Wilderness 100, 106, 151, 188, 208, 215, 216, 217, 234, 235, 247
Wildlife; diversity of 65, 69, 70, 85, 104, 105, 113; effects of clearing on 70, 99, 103, 104, 160, 182; in conflict with wood production 7, 11, 16, 166, 180; reserves, size of 70, 104, 164, 231, 325, 330; value of 84, 85, 227; *see also* Habitat, Fauna, Flora
Willingness-to-pay criteria for non wood-production values 286, 295; compensation-for-foregoing-visiting criteria 289; responsibility to pay 296; *see also* Recreation
Wood product consumption; public subsidies for 8, 9, 78, 237-238, 256; maximization of 18, 88, 89; predicting future requirements 22, 29, 39, 40, 41, 49, 50, 55, 254-256, 354-368; ideology 22, 46, 221, 237; amounts imported 22, 23, 26; excessive 47, 48, 52, 53, 64, 75; promotion of 22, 45, 46, 238, 245, 254-256; overestimation 49, 52; pulpwood production 9, 11, 13, 92-95, 109, 209, 239, 241; sawnwood production 9, 16, 121, 241; woodchip production 12, 91, 96; estimates — maximization method 356; — procedures 361, 363; bootstrap method of forecasting 363
Wood production; and multiple value management 7, 223-231; subsidies for 9, 243; maximization of 10, 18, 155, 204, 211, 219, 220, 221, 222, 229; expanding 12, 106, 244; conflict with other values 13, 65, 70, 81, 88, 99, 180, 200, 223-231, 233, 236-237; ideology 19, 98, 184, 202, 204, 218-222, 236, 311, 323; cost-benefit analysis 84-88; non-intensive methods 234-235; pulpwood 9, 11, 13, 91-93, 95, 96, 109, 121, 209, 239, 241; sawnwood 9, 16, 38, 121, 126; woodchips 12, 91, 96; socialisation of 316
Woodchipping; conflict with sawnwood 97; information about plans 98, 154; conflict with wildlife values 103, 104, 105, 166; destruction of wilderness 106, 151; effect on soil of clearing for 110; research and planning 113, 164; and *P. cinnamomi* 114, 115, 117; environmental risks and costs 114, 118, 120, 149, 150, 152, 165; commercial viability 120, 128, 131-135, 140-143, 156, 164, 273-278, 285; types of operations 120-123; price structure 122, 123, 124, 126; indirect benefits 128, 147-149, 150, 151, 156; subsidization 130, 159, 204; export industry 91, 96, 120, 128, 133, 136, 140-144, 152, 153, 154, 156, 204, 278; Commonwealth guideline price 140, 141, 142, 143, 144; area involved 16, 92, 94 (table), 95, 97, 99, 107 (map, Tas.), 154
Yields 49, 51, 54, 76, 84, 85, 96; plantations 51, 54, 59, 62, 71, 72, 74, 77, 96, 371; native forests 51, 54, 59, 61, 62, 106, 274, 276, 371; principle of restrained 228, 230, 235; sustained 86, 298, 375; Great Sawlog Robbery 369, 370; defect allowance in estimating 371
Zoning 234-235, 335

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