INDUSTRY COMMISSION

INTERIM REPORT ON PAPER RECYCLING

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INDUSTRY COMMISSION

21 May 1990

The Honorable P J Keating, M.P.
The Treasurer
Parliament House
CANBERRA ACT 2600

Dear Treasurer

In accordance with Section 7 of the Industry Commission Act 1989, we have pleasure in submitting to you the interim report on Paper Recycling.

Yours sincerely

M L Parker	R G Mauldon	D R Chapman
Presiding Commissioner	Commissioner	Associate Commissioner

TERMS OF REFERENCE

I, PAUL JOHN KEATING, in pursuance of Section 23 of the Industries Assistance Commission Act 1973 hereby:

1. specify that as part of its inquiry into recycling of products, the Commission shall prepare an interim report by 30 April 1990* on the effects of government policies on, and the environmental and economic costs and benefits of, recycling of paper products.

2. without limiting the scope of the reference, specify that in its interim report the Commission shall:

   (a) assess the economic prospects for further recycling in Australia based on local waste paper, including the economic viability of green field and integrated developments

   (b) examine the economic viability of a world scale recycling plant processing imported waste paper, taking into consideration global sources and markets for recycled paper

   (c) identify economic, environmental and and technological constraints to further recycling, eg segregation of waste paper into grades, removal of impurities, de-inking and treatment of resultant effluent, etc

   (d) identify products able to be produced, wholly or in substantial part, from recycled paper which satisfy technical requirements of strength, brightness, etc

   (e) examine community attitudes to the use of various grades of recycled paper products

   (f) assess the success of existing Government initiatives in promoting waste paper recycling, taking into account the recent report by the Minister for Administrative Services.

3. specify that the Commission is free to take evidence and make recommendations on any matters relevant to its inquiry under this reference.

P.J. Keating
28 December 1989

* At the Commission's request, the Treasurer extended the report date for the inquiry until 21 May 1990.

THE INQUIRY

This interim report on paper recycling forms part of a broader inquiry into recycling of all kinds which the Commission will complete early in 1991.

In a companion report, *Pulp and paper: bleaching and the environment*, the Commission examines Australian production of paper from unbleached and non chlorine-bleached pulps. The prospects of using non-wood feedstocks in the manufacture of pulp are also considered in that report which is published simultaneously with this.

These parallel inquiries form part of the 'Pulp Mill and Paper Industry Package' announced by the Commonwealth Government on 12 December 1989. The terms of reference of both inquiries are shown in Appendix A.

The Commission received about 250 submissions from the paper and publishing industries, environmental and consumer groups, and Commonwealth, State and local government agencies, and individuals. Without their prompt cooperation, this interim report could not have been completed in the time available. Details of inquiry proceedings and participants are provided in Appendix B.

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OVERVIEW

Paper recycling has wide community support, yet in Australia it seems to be in crisis. The prices of some types of wastepaper have recently plummeted, threatening the viability of household paper collections. There is a feeling that consumers are willing to make an effort but that manufacturers are not. Some argue that if industry, left to itself, will not undertake a satisfactory rate of recycling, governments should induce it to do so.

The important question for this inquiry is not whether recycling rates could be higher, but whether the Australian community would be better off if they were. Recycling can mean that natural resources are tapped at a slower rate. It can also defer the time when products enter the waste stream. Yet neither of these advantages of recycling are costless.

Facts and fallacies about paper recycling

Australia is a substantial paper recycler

Chief among the myths about paper recycling is the view that Australia does very little of it. In fact, as Table 1 illustrates, paper recycling already occurs in most States.

Table 1: State utilisation of wastepaper collected

Use:	*production of printing and writing paper*	*production of packaging and industrial paper*	*Production of tissues*
NSW	Yes	Yes-	-
Victoria	Yes	Yes	Minor
Queensland	-	Yes	-
Western Australia	-	Yes	Minor
South Australia	-	a	-
Tasmania	-	-	-

- Use not undertaken in this State.

a Some limited recycling of pre-consumer waste newsprint.

As shown in Chapter 1, for many years packaging papers and boards have been produced largely from wastepaper, and some printing and writing papers have used a proportion of waste. These papers have not been labelled 'recycled'. They have been produced to conform with performance specifications; recycled wastepaper is a good substitute for virgin pulp up to certain proportions. For packaging papers, the consensus is that Australia is close to the economic limit for recycling given technical considerations.

There is keen demand among these traditional paper recyclers for supplies of clean, high quality wastepaper and board, most of which comes from industry rather than households. There certainly is no mountain of unwanted high grade wastepaper. Indeed, the development of more recycling activities requiring high grade wastepaper will be constrained by inadequate supply unless improved collection and sorting processes are introduced.

To the extent that a 'paper mountain' exists it consists almost entirely of old newspapers and magazines. If recycled, they can be used mainly for the production of lower grade papers such as more newsprint or tissue. They are already used to the maximum extent possible in packaging. They cannot be used in significant amounts to produce widely useable printing and writing papers, though some specialty needs might be met from these sources. But old newspapers and magazines are the types of paper predominantly collected from households by local government kerbside collections. And there is no recycled content yet in Australian newsprint.

The main recycling of Australian newspapers into newsprint occurs in neighbouring developing countries like Indonesia to which we export some 48 000 tonnes a year. Of the 640 000 tonnes of newsprint used in Australia in 1987-88, about 151 000 tonnes, or 24 per cent, was either recycled or exported. The rest ended up in landfill. Much of the debate during the inquiry was about the production in Australia of recycled newsprint and, to a lesser extent, tissues.

Regional differences in recycling

Another myth is that conditions affecting the markets for used paper and the incentives to recycle are the same throughout the country. This is far from true.

In Perth, there appears to be a shortage of most kinds of wastepaper and prices are relatively high. However, in Melbourne, where one packaging producer has closed and supplies have increased in response to State and local government sponsorship of recycling collections, stocks are high, prices are low, and collection schemes are threatened.

Not only are pulp and paper production facilities distributed unevenly with consequent effects on costs of transporting used paper but waste disposal costs also vary widely. While it may seem wasteful to dump paper which could be used for recycling, that is the most efficient and environmentally sound thing to do if the transport and associated energy costs are too high to move it to a recycling facility or export market. Thus, uniform levels of recycling do not make good economic or environmental sense. What is important is to ensure that waste disposal is priced at its full cost. When it is underpriced, paper will be dumped when it should be recycled.

Getting clean wastepaper is costly

Another myth about paper recycling is that the mixtures of papers collected from households and offices are ready to recycle. In fact they are not. They contain significant amounts of non-paper contaminants such as food scraps, plastic film and polystyrene packing which cannot be mechanically or magnetically removed. It therefore requires costly hand sorting. As discussed in Chapter 2, collection and sorting costs are about $50 to $70 per tonne for newsprint. However, charges for disposal of wastepaper in dumps and landfills vary from $0 to $45 per tonne depending on location.

Reliable access to large quantities of clean, graded wastepaper is essential for the production of quality recycled paper. This is one reason why paper manufacturers prefer clean industrial paper waste such as printers' offcuts, publishers' returns or cartons from retailers. The smaller quantities of mixed papers coming from offices and homes can be costly to collect and sort.

Constraints on paper recycling

The ultimate technological constraints on paper recycling stem from the fibre source and pulping process used to make the paper in the first place,

and from the fact that the fibres degrade during reprocessing. Recycling paper is inevitably a downgrading process unless new or higher quality fibre is added. Unlike metal recycling, where an element cannot be destroyed, paper recycling cannot be a closed loop. Some new fibre must be added to replace the old.

But there is more to recycling paper than getting the right fibre into the right use. It also has to be in the right place, and at the right price compared with virgin fibre. Collection and transport costs are a significant part of the cost of recycling. Apart from those paper mills established in cities to use wastepaper or imported pulp, Australia's major pulp and paper mills are located in country areas close to the trees which provide the fibre input. The costs of collecting wastepaper around cities like Sydney can be high, whether it is ultimately tipped or recycled. The cost of transporting the waste to remote mills would also be high.

The location of paper manufacturers is a constraint to greater recycling all over the world. The huge investments in locations remote from major population centres and supplies of wastepaper mean that the pattern of paper production cannot quickly be switched from virgin pulp to recycled paper. This is as true of Australia as it is of North America or Europe. From both commercial and environmental points of view, what is saved in fibre recycling has to be set against the extra petroleum and other transport facilities required.

Is paper recycling environmentally friendly?

Recycling to save trees

It is widely believed that paper recycling will save Australia's native forests. However, as is shown in Chapter 4, it is not clear that it would. Where recycled fibre substitutes for imported pulp or paper, it may save native forests in Canada. But it will not do much for Australian native forests because most wood fibre used in Australian paper manufacture comes from pine plantations, by-products of sawlog production or from sawmill residues. Broadleaved (mainly eucalypt) pulpwood accounts for only about a sixth of the total fibre used in Australian paper manufacture.

Several participants argued that state forest services underprice wood for the paper industry, and that this encourages the use of virgin material and discourages recycling. For this interim report the Commission has not been able to gather any direct evidence about the appropriateness of pulpwood pricing, though there is evidence that sawlogs have been sold at lower prices than the market could bear and that government-owned plantations yield lower rates of return than are required by private investors.

Underpricing of sawlogs would encourage the utilisation of trees by sawmills. To the extent that state forestry services supply all the logs that sawmills request, and that there is an inflexible allocation of trees between sawlog and pulplog use, an oversupply of trees to sawmills would result in an oversupply of sawmill residues and pulpwood.

In the context of existing investments in pulp and paper mills, increasing pulpwood prices would be unlikely to have a significant effect on paper recycling. But in the longer term if pricing and management policies of forest services were more sensitive to the value of wood inputs to users, forests would be used more efficiently. There may be less emphasis on virgin wood as a feedstock in paper making and more emphasis on wastepaper and non-wood fibre sources. Appropriate pricing and management policies of forest resources are matters for consideration by the Resource Assessment Commission in its current inquiry into Australia's forest and timber resources.

Recycling to reduce waste disposal

Paper, including newsprint and magazines, accounts for at least 20 per cent of landfill in many municipalities. As detailed in Chapters 2 and 3, waste disposal authorities see recycling as a way to reduce their costs of waste disposal - and even make money. Makers and users of paper do not have to consider the full costs of waste disposal. Hence present prices of paper products do not reflect the true societal and environmental costs of paper use. This encourages overuse of paper and discourages recycling.

A number of suggestions were canvassed to take disposal costs into account. They included special taxes on virgin materials and making producers responsible for their products 'from cradle to grave'. Such measures would increase the initial price of products in order to fund their eventual disposal.

Although this appears to be a simple concept, it is not simple in practice. Furthermore, it ignores other possible means of waste reduction. Nor is it confined to paper. It will therefore be dealt with in the report of the main inquiry into recycling.

The Commission is undertaking a major survey of waste management for the main inquiry. The information to date suggests that there is scope for councils to improve the efficiency of their waste management, including collection of recyclables. More efficient pricing of waste disposal to reflect its true costs, including the opportunity cost of the land, operating costs, and any environmental costs, may not directly influence manufacturers, newspaper publishers and other paper users, but can affect them indirectly through the effects on consumers.

Pollution

The production of paper by recycling reduces the output of wood-based pollutants. This benefit accrues to Australia if the recycled pulp is substituted for domestic virgin pulp production. In many cases, however, it displaces imports, and the reduction in pollutants accrues to the pulp or paper exporting country rather than to Australia.

Although mills are subject to emission standards, they are not as stringent for older mills as for newer ones. As emission standards are progressively upgraded by the States, this may become less of an issue. The recycling process is not pollution free. Although the residues are easier to treat, recycling can lead to a concentration of the chemicals that were present in the wastepaper, along with those used in the recycling process itself. When chlorinated urban water supplies are used, this can aggravate any organochlorine problem. There is some evidence of recycling plants producing more dioxins than virgin pulp mills.

Apart from packaging, many uses of wastepaper require de-inking if they are to be readily marketed. The Commission understands that the effects of de-inking are relatively benign using currently available technology and modern inks which do not contain heavy metals. However, de-inking does produce salt in effluent, which already is a significant problem in inland areas such as Albury. The location of de-inking facilities and the policies adopted to manage salinity problems are therefore important in assessing the environmental effects of recycling.

Energy and greenhouse gases

It cannot be assumed that recycling saves energy compared with the production of paper from virgin materials. It is true that the recycling process itself is less energy demanding than the production of mechanical pulp for newsprint. The use of electricity in pulp production will be 400kWh per tonne of recycled pulp compared with 2400kWh for mechanical pulp. Chemical pulps require less purchased energy than recycled pulps.

But the manufacturing process is just part of the story. The greatest energy demands in paper recycling are from collecting and transporting the wastepaper. And it is much harder to control the emissions of pollutants and greenhouse gases from trucks than from power stations. It should be remembered, however, that some transportation of wastepaper occurs - even when it is not recycled - to disposal sites.

Recycling newsprint

About a quarter of the newsprint used in Australia is collected for reuse. Notwithstanding the large amounts that enter the waste stream for disposal as landfill, recent growth in collections has exceeded the capacity of local users and exporters to make use of those supplies. Both domestic and world prices have fallen. As a result collection arrangements have been discouraged and in some cases discontinued.

No used newsprint is at present recycled into new newsprint in Australia. Most of that which is collected is recycled into packaging, some is exported, and small amounts are used in the manufacture of insulation and other cellulose based products.

Several initiatives have recently been taken to recycle significant quantities of old newspapers and magazines into newsprint. Australian Newsprint Mills Limited (ANM) has proposed a plant at Albury in New South Wales which would recycle 130 000 tonnes of wastepaper drawn from the major population centres between Brisbane and Adelaide, 70 per cent of which would be old newspapers and the remainder magazines.

It is also investigating a recycling facility at Boyer in Tasmania to process 65 000 tonnes of old telephone directories supplied by Telecom and mixed waste drawn from Tasmania. The Pratt Group is considering the establishment of plants to produce 100 per cent recycled newsprint in Sydney and Melbourne based on old newspapers and magazines. There are also other proposals to produce de-inked recycled newsprint pulp in Melbourne and Western Australia.

De-inking is the key to these proposals. The difficulties associated with the establishment of de-inking facilities at Albury illustrate the trade-offs that the community will have to make in deciding whether to recycle significantly larger quantities of paper. For recycling is not unambiguously environmentally friendly. Although all the governments involved in the decision support greater use of recycled paper products, they are finding it difficult to resolve the conflicting interests. Means will have to be found to speed up and coordinate decision making. In the meantime, there will be an inevitable time lag between a decision to develop a new paper recycling facility and its use of wastepaper.

Improving Australia's recycling performance

Paper manufacturers were recycling in response to market incentives long before it became the focus of attention. They may have been recycling more if governments had not adopted policies oriented towards cheap wood supplies by establishing their own plantations, encouraging private forestry investment, and adopting policies which keep the prices of pulpwood and waste disposal low. While it is difficult to establish the optimal rate of recycling in Australia, the direction is clear. Greater attention to the pricing and supply of sawlogs, pulpwood and waste management would benefit both economic efficiency and the environment. Higher wood prices would favour recycling as new investments are made, though there may be little response in the near future.

In the absence of such fundamental reform, attempts by governments to coerce producers and consumers to change their behaviour through discriminatory purchasing policies, tax concessions, or mandated or 'voluntary' targets would merely compound inefficiencies.

Such policies could have the perverse effect of increasing costs to traditional paper recyclers, and increasing imports of recycled paper and perhaps of pulp.

The industry initiatives currently under discussion are likely to result in a substantially higher level of recycling of newsprint and magazines in Australia, raising overall paper recycling performance. Even if only the Albury development were to eventuate, it would make significant inroads into readily available used newsprint supplies. If any of the other proposals were developed, supplies could become very tight. However, effects would vary regionally. Very high recovery rates would be required in south eastern Australia for recycling into newsprint and/or directory paper. Further afield, in northern Queensland and Western Australia, exports may remain a competitive outlet. In locations which are less accessable to ports or de-inking facilities, landfill may remain the preferred disposal outlet unless attractive back freights or subsidised internal transport (eg for used telephone directories) were available.

Findings

Nearly 2.8 million tonnes of paper products are consumed annually in Australia. About one-third of this is recovered and recycled.

The vast majority (about 750 000 tonnes) of the wastepaper recovered is used in the production of packaging and industrial paper. The utilisation rate in that sector is high at about 68 per cent. With technological improvements, further limited substitution of wastepaper for virgin paper is possible.

About 35 000 tonnes of wastepaper are used in the production of printing and writing papers. The utilisation rate of about 6 per cent is consistent with experience abroad. The degradation of fibres during reprocessing is a constraint on the use of wastepaper in this sector, but printing and writing papers are in demand for recycling into other paper products.

Until recently, no wastepaper was used in the production in Australia of tissue paper. With plants now in operation or being considered, about 16 000 tonnes of high quality wastepaper could be used in this sector within a year or two.

At present, wastepaper is not used in Australia to produce newsprint. This is the area in which most developments are occurring. ANM plans to use 130 000 tonnes of used newspapers and magazines in the production of newsprint at Albury bringing the wastepaper utilisation rate to 25 per cent. The company also proposes to use 65 000 tonnes of used telephone directories and mixed waste for production at Boyer.

Governments can best assist paper recycling by attention to the pricing and management of forests and the pricing of waste disposal, and by ensuring that there are no undue impediments to information about recycled products. The level of paper recycling results from market decisions which reflect the benefits and costs accruing to paper producers and collectors. It does not reflect all of the wider social costs and benefits of recycling. The question for this inquiry is not whether rates of recycling could be higher, but whether the Australian community would be better off if they were.

There is reason to believe that it would. A number of distortions in the market work against a greater use of wastepaper in the manufacture of new paper products or as exports. They are:

- waste management charges which are too low and reduce incentives for households and businesses to recycle;
- prices of pulpwood which are too low and discourage recycling; and
- high transport and handling costs which reduce the incentive to collect wastepaper for recycling within Australia or abroad.

Each of these may not be large individually, but they all work in the same direction to reduce incentives to recycle. At present, there is the further constraint that state and federal policies in the United States have led to surplus supplies of wastepaper, especially old newspapers. These have been exported at what are effectively subsidised prices to the point where we have difficulty in holding our own export markets.

Markets for most categories of wastepaper generated by industry remain firm. However, community enthusiasm for recycling, coupled with plummeting world prices, has made it more difficult to dispose of wastepaper generated by households - notably newspapers and magazines. This need not jeopardise the collection of other recyclables, and does not warrant interim assistance from government.

Used newsprint is a raw material for which new and innovative uses are being developed. Many manufacturing processes are being tested or considered to produce insulation materials, mouldings, timber substitutes and perhaps tissues and fuel. The most significant new developments, however, are ANM's proposed de-inking and recycling plants at Albury and Boyer.

The additional de-inking capacity will broaden opportunities for the use of wastepaper on the eastern seaboard. It will not do much to assist recycling in the more outlying States.

It will be two to three years before the de-inking facilities are operating. In that period, the community will need to come to terms with the environmental trade-offs inevitably involved in paper recycling because recycling too can be a polluting process. The difficulties associated with the proposed establishment of de-inking facilities at Albury illustrate the trade-offs that must be faced (see Chapter 3).

Exports provide the only way of marketing significant amounts of our excess supplies of waste newsprint in the immediate future, since additional paper recycling capacity cannot be brought on stream in the short term. However, the subsidisation of used newsprint exports could endanger planned recycling initiatives in Australia. If costs on the waterfront and freight rates were reduced more old newsprint could be profitably exported, since these costs are equivalent to two thirds of the cif value of export sales. This emphasises the need for continuing effort on waterfront reform.

The terms of reference for this interim inquiry ask the Commission to respond to the following specific issues:

(a) further recycling based on local wastepaper supplies, including green field and integrated developments

Prospects appear bright for the recycling of newsprint and magazines which are the main types of wastepaper in surplus supply in Australia (see Chapter 3). Green field developments at Albury and possibly also Boyer should ensure this, but not before investments come on stream in two or three years. To increase the utilisation rate of fine papers, improvements are needed in the efficiency and quality of paper collection systems. If the supply of high quality wastepaper is not increased, the demand for fine papers produced from recycled fibre would merely increase prices and divert some current users of high quality wastepaper to virgin pulp.

(b) world scale recycling using imported wastepaper

Fibre costs are a significant proportion of the costs of producing paper. For this reason, paper mills have traditionally been sited close to the source of fibre supply. Although Australia now imports a small quantity of high grade wastepaper for use as a substitute for virgin pulp, our location and high transport costs constrain the importation of wastepaper on any significant scale. United States exports of wastepaper to Asia depend in part on low 'backload' freight rates which are not available to Australia.

Not only is the supply of imported wastepaper unlikely to be available at competitive prices, but `world scale' production of recycled paper is unlikely to be economic. The Australian paper industry is oriented to the domestic market. We are a net importer of paper products. Recycled paper is more labour intensive than current production from virgin materials. It is unlikely that Australia could be competitive on export markets for recycled paper.

(c) economic, environmental and technological constraints to further recycling

The largest constraints to further recycling are economic. Failure to efficiently price waste disposal and to a lesser extent forest resources, has an influence on the level and pattern of paper recycling. Inefficiencies in the transport system, including the waterfront, also impede the movement of wastepaper for recycling.

Despite this, recycling of paper is increasing. As the price of wastepaper has fallen, it has found greater uses. The Commission found no evidence of reluctance on the part of manufacturers to engage in recycling where it was likely to be profitable. Entrepreneurs are emerging with ideas to use wastepaper. Some sought government assistance. The Commission can see no justification for specific assistance to recycling activities. The important thing is to get the pricing of waste management and pulpwood right.

Recycling of paper can itself generate environmental problems in terms of:

- retention and possible creation of dioxins and organochlorines;

- salt and other residues generated in the de-inking and paper-making processes; and

- high energy use in the collection and transport of wastepaper.

Whether the production of newsprint from recycled waste is less polluting than production from pulpwood can only be assessed on a project by project basis. If subject to control by relevant State authorities, the levels of pollution may not pose any significant environmental risk.

Technological constraints on the manufacture of paper from recycled material apply mainly when the recycled material accounts for a high proportion of the fibre used. Australian paper manufacturers have been using substantial quantities of wastepaper in their products for many years while achieving high levels of quality. If the focus remains on efficient production of papers for various purposes, rather than requiring a given proportion (or 100 per cent) of recycled fibre, then technology should not be a constraint to the use of recycled material in paper products.

Problems in disposing of salt and organochlorines in effluent are a constraint on further recycling. The difficulties of recycling composite materials such as plastic coated paperboard are another. While the technologies of production processes and of environmental safeguards can be expected to improve over time, there are no quick technological fixes which would avoid the need for trade-offs between processes or locations.

(d) products able to be produced from recycled paper

Paper can be recycled into a wide variety of paper and other cellulose products. Contamination problems limit its reuse in food packaging such as milk cartons, and the degradation of the fibres mean that used paper is generally 'downgraded' as it is recycled. Thus, old newspapers cannot be used to produce high quality printing and writing papers, but they can be used in applications requiring mechanical pulp, such as newsprint and tissue. Most paper applications other than packaging require de-inking if they are to be suitable for large scale marketing. The lack of de-inking facilities in Australia limits the scope for these other forms of paper recycling in the near future, but proposals are being considered which could alter this situation three years or so from now. Apart from paper production, there is a small market for wastepaper to be recycled into moulded products, insulation and animal bedding.

(e) community attitudes to use of recycled paper products

Submissions were received from a wide cross section of the community. They were generally supportive of the use of recycled paper products, but some were critical of the higher prices charged for recycled printing and writing papers. However, consumers generally lacked information about the extent of paper recycling in Australia today, and about technical constraints on the use of 100 per cent recycled printing and writing papers.

Some paper industry market research indicates that consumers respond as favourably to 'environmentally friendly' or 'unbleached' as to 'recycled' labels. If informed choices are to be made, better information on performance characteristics of paper, including papers with varying proportions of recycled inputs, must be available. If paper manufacturers and converters were to indicate the recycled content of their products on labels, this would encourage a more rational approach to paper recycling and discourage inappropriate consumption of 100 per cent recycled paper.

(f) the success of existing Government initiatives in promoting paper recycling.

Recent Commonwealth Government initiatives to promote paper recycling are the sales tax exemption for 100 per cent recycled papers and the Department of Administrative Services (DAS) report and guidelines for government procurement and office recycling schemes. Neither of these have been in operation long enough to evaluate their performance in practice.

However, the Commission considers the sales tax exemption is unlikely to encourage efficient paper recycling and could have the perverse effects of increasing costs of those papers which have traditionally relied on recycling. That is because in practice the exemption applies almost entirely to printing and writing papers. The production of these papers requires high grade wastepaper which is already in high demand in its traditional markets, the production of packaging and printing and writing papers. Artificially encouraging the production of 100 per cent recycled printing and writing paper, a product with severe technical limitations, will increase demand and prices of high grade wastepaper and do nothing to encourage use of the wastepaper in excess supply, newspapers and magazines.

The DAS report, by contrast, has focused attention on the importance of choosing papers for their performance. Its wide dissemination makes a valuable contribution to information in the market for recycled paper.

1 PAPER RECYCLING IN AUSTRALIA

This Chapter examines Australia's paper recycling performance. In particular it looks at factors which limit the growth of demand for recycled paper. Two important questions emerge:

. Is Australia's paper recycling level lower than it should be because the incentives are wrong?

. Is there a role for government in bringing about higher levels of paper recycling - particularly for newsprint?

Answers to these questions depend on both technical and economic considerations, including the demand for products into which paper is recycled, and technical limitations on the levels at which wastepaper is incorporated.

1.1 What is Australia's paper recycling performance?

In 1987-88, Australia's overall recovery and utilisation rates[1] of about 30 and 36 per cent respectively were lower than those for Japan, the Netherlands and the Federal Republic of Germany, but comparable with those of the United States, the largest paper consumer (refer Table 1.1). Use of wastepaper in the manufacture of different types of paper also varies between countries (refer Table 1.2). Australia makes substantial use of wastepaper in the production of packaging materials and some printing and writing papers, but little in tissue papers and none as yet in newsprint. Many other countries make extensive use of wastepaper in the manufacture of newsprint and tissue paper. Some participants saw this as an indication that major opportunities exist for the increased use of recycled fibre in the production of paper in Australia.

[1] The **recovery rate**, also called the collection rate, is the proportion of recyclable paper collected, expressed as a percentage of the total consumption of paper and paperboard. The **utilisation rate** is the amount of secondary fibre (recovered fibre) used in the manufacturer of paper, expressed as a percentage of the total fibre used. The two will differ depending on quantities of new and wastepaper imported and exported and on inventory changes.

Comparisons of recycling activity between countries are of limited use in indicating options for paper manufacture using wastepaper. Each country is unique in terms of its fibre supply, the level of imports and exports of paper, wastepaper availability, arrangements affecting the relative prices of its fibres, paper product mix, production facilities, population densities and distances between population centres.

Table 1.1 **Wastepaper use in 20 countries, 1987-88**

Country	*Wastepaper recovered* [a] *('000 tonnes)*	*Wastepaper consumed* [a] *('000 tonnes)*	*Recovery rate (%)*	*Utilisation rate (%)*
Taiwan	1 140	2 385	40	87
Denmark	345	250	29	69
Rep. Korea	1 420	2 630	43	68
Netherlands	1 410	1 480	55	68
Mexico	1 250	2 070	47	65
Spain	1 660	2 220	41	58
UK	2 700	2 300	30	56
Venezuela	320	400	35	50
Colombia	225	245	42	50
Japan	12 000	12 590	48	49
Italy	1 600	2 360	26	44
Portugal	305	325	44	44
Fed. Rep. Germany	4 735	4 310	41	43
France	2 550	2 400	35	42
Australia	690	605	30	36
Brazil	1 470	1 600	34	31
People's Rep. China	2 600	2 900	20	25
Belgium	610	260	35	24
USA	28 660	22 156	31	24
Canada	1 400	830	23	5

a) The difference between wastepaper recovered and wastepaper consumed is accounted for by imports or exports, according to whether the country concerned consumes more or less wastepaper than is recovered (refer footnote 1).

Source: Pulp & Paper, Vol. 63, No. 6, June 1989, p. 142-145.

Table 1.2 **Wastepaper utilisation rates for major paper product groups**
(per cent)

Product group	*Australia*[a]	*West Germany*[b]	*Western Europe*[c]	*USA*[c]	*Japan*[c]
Newsprint	0	50	25-30	20-25	45-50
Printing/writing	6	4	3	6	NA
Tissue paper	1	25	40	30	NA
Packaging/industrial	68	90	65-70	30	65-70

a) APM, Submission No. 144, p. 19. b) APPM, Submission No. 193, p. 3. 1987-88 data. c) ANM, 1985-87 data.

What is important for Australia is that it recycles that level of wastepaper which is most beneficial for the country and not how that level compares with levels abroad. The important question is whether there are impediments and distortions which, if removed, would result in a different level of paper recycling that would bring with it net economic and environmental gains.

In Australia about 15 per cent of the wastepaper recovered consists of used newsprint, about 16 per cent is printing and writing papers and the remaining 69 per cent is packaging materials. About 1.4 million tonnes (54 per cent of all paper consumed) is discarded in industrial, commercial or domestic garbage.

The majority of mills involved in paper recycling produce packaging material. Most are located in New South Wales and Victoria (refer Table 1.3).

1.2 Which industries use wastepaper?

In 1985-86 the pulp and paper industry used 98 per cent of all wastepaper collected (refer Table 1.4). This proportion fell to 90 per cent in 1988-89, largely as a result of rapid growth in the exports of wastepaper. Other domestic uses were for insulation, shredded packaging, animal bedding, pulp mouldings and compost. Some was used for energy generation, and about 8 per cent was exported.

Table 1.3: **Paper mills in Australia using wastepaper**

Company	*Location*	*Process and feedstock*	*Products*	*Output Capacity ('000 tpa)*
APPM	Shoalhaven (NSW)	recycled paper and cotton linters	papers and boards	70
APM	Fairfield (VIC)	recycled paper APM and imported pulp	packaging materials printing and writing paper	150
	Botany (NSW)	recycled paper	corrugating materials, linerboards	170
	Petrie (Qld)	chemi-mechanical pulp and recycled paper	packaging material	100
	Spearwood (WA)	mainly recycled paper, some APM pulp	linerboards, packaging, etc	46
	Broadford (Vic)	recycled paper	unlined box board for packaging	40
Austissue	Canning Vale (WA)	recycled paper	tissue paper	6
Bowater	Box Hill (Vic)	virgin pulp and recycled paper	tissue paper	55
Pratt (Visy Board)	Reservoir (Vic)	recycled paper	packaging material	a
	Warwick Farm (NSW)	recycled paper	packaging material	a
	Smithfield (NSW)	recycled paper	packaging material	a
	Coolaroo (Vic)	recycled paper	packaging material	a

a) The four Pratt (Visy Board) mills use a total of more than 300 000 tonnes of wastepaper.

Source: APPM, APM, Pratt and other industry sources.

Table 1.4: **Wastepaper use in Australia, 1985-86 to 1990-91**
('000 tonnes)

	1985-86	*1986-87*	*1987-88*	*1988-89*	*1989-90 Est.*	*1990-91 Est.*
Papermaker						
APM	342	342	398	400	480	500
Smorgon[a]	165	155	155	165	45	-
Pratt (Visy Board)	55	110	130	160	220	260
APPM	17	18	20	22	22	22
Others[b]	0	0	0	3	6	6
Total paper industry use	579	625	703	750	773	782
Other Uses[c]	4	7	13	20	20	20
Export	5	28	25	65	95	95
TOTAL	588	660	741	835	888	897

a) Smorgon withdrew from paper manufacture in September 1989, but continues to use some wastepaper for pulp moulding. b) Bowater and Austissue. c) Insulation, shredded packaging, animal bedding, pulp mouldings, energy generation etc.

Source: APM, Submission No. 144, p. 19; and other industry sources.

1.3 Paper production and consumption

Paper can be categorised into four broad groups: newsprint, printing and writing papers, tissue papers, and packaging and industrial papers. The packaging and industrial papers group is the largest, in volume terms, followed by newsprint and printing and writing paper (refer Table 1.5).

The large increase in paper consumption between 1986-87 and 1987-88 stemmed in part from the increased use of computers and facsimile equipment. While initial predictions were that the widespread use of computers would lead to a decline in paper consumption, thus far the opposite appears to have occurred.

Table 1.5: **Apparent consumption of paper in Australia, 1985-86 to 1987-88,** ('000 tonnes)

Product Group	*1985-86*	*Percent of Total*	*1986-87*	*Percent of Total*	*1987-88*	*Percent of Total*
Production:						
Newsprint	364	22	354	20	362	20
Printing/Writing	284	17	325	18	340	18
Tissue	129	8	135	8	134	7
Packaging/industrial	882	53	965	54	1009	55
Total Production[a]	1659	100	1779	100	1845	100
Exports:						
Newsprint	4	4	1	1	4	5
Printing/writing	20	22	9	8	7	8
Tissue	-	0	-	0	-	0
Packaging/industrial[b]	68	74	102	91	73	87
Total Exports[a]	92	100	112	100	84	100
Imports:						
Newsprint	257	34	231	30	264	25
Printing/writing	253	33	311	40	416	40
Tissue	10	1	15	2	10	0
Packaging/industrial	237	31	214	28	348	34
Total Imports[a]	757	100	771	100	1038	100
Apparent Consumption:						
Newsprint	617	27	584	24	622	22
Printing/writing	517	22	627	26	749	27
Tissue	139	6	150	6	144	5
Packaging/industrial	1051	45	1077	44	1284	46
Total Apparent Consumption[a]	2324	100	2438	100	2799	100
Apparent Consumption Per Person (kg)		145		150		170

a) Totals may not add due to rounding. b) These figures do not include paper entering Australia as packaging of imported goods.

Source: Pulp and Paper Manufacturers Federation.

Australia is almost self-sufficient in tissue papers. But overall, imports have accounted for about one third of apparent consumption of all papers (refer Table 1.6).

The Australian paper industry depends on domestic demand for the bulk of its sales. Only about 5 per cent of Australian production was exported in 1987-88.

Table 1.6: **Imports as a proportion of consumption, 1985-86 to 1987-88,** (per cent)

Product group	*1985-86*	*1986-87*	*1987-88*
Newsprint	42	40	42
Printing/Writing	49	50	56
Tissues	7	10	7
Packaging/Industrial	23	20	27
Average	33	32	37

Source: Pulp and Paper Manufacturers Federation.

1.4 Technical possibilities in paper recycling

There are some technical constraints on the increased use of recycled fibre and its substitution for virgin fibre.

Fibres weaken with recycling

Paper fibres weaken and shorten each time they are recycled. This is a particularly important constraint where recycled pulp includes a substantial proportion of short eucalyptus fibres. As the wastepaper collection system becomes more efficient, the number of times a fibre recirculates is likely to increase. The more a fibre is recycled, the less capable it becomes of bonding to other fibres. This limits the scope for recycling in Australia at present unless a proportion of virgin pulp or higher quality wastepaper is added. However, Steinbeis Temming Papier GmbH & Co (Steinbeis) of West Germany said that with suitable equipment, and an appropriate mix of wastepaper fibres, recycling to a higher quality can be achieved.

The company produces office paper from a pulp made out of a combination of de-inked newsprint and magazines.

Ecopaper stated that the number of times individual fibres can be recycled varies, depending on fibre type, pulping and refining processes used, and the type of end product. Adding a proportion of virgin fibre or high quality wastepaper can upgrade the recycled pulp.

How substitutable is recycled paper for wood pulp?

The major wastepaper grades and their possible end uses are set out in Table 1.7. Limited deviation from these uses is possible. There is the further possibility of recycling higher quality papers into a range of lower grade uses, but this is usually limited by price considerations.

Table 1.7: **Major wastepaper grades and end uses**

Wastepaper grade	*Usual product end use*
Office papers, including computer print-out, ledger, etc	Fine papers, tissues, high quality board
Magazines, newspapers	Newsprint, tissues, insulation, packaging
Corrugated containers	Linerboard
Mixed waste	Corrugating medium

Recycled paper is substitutable for most virgin pulp in the manufacture of linerboards, cartons and other packaging materials. In Australia wastepaper is used extensively for that purpose. Office papers made from up to 100 per cent recycled paper are also produced. However, many participants said that the Australian product is not suitable for many photocopiers and sophisticated office machinery, principally because of the relatively short fibres in paper made from recycled material. Suitable qualities can be obtained through the incorporation of some 20 per cent virgin pulp. Alternatively, office machines can be modified to use recycled paper, for example with vacuum feeds for photocopiers.

Steinbeis claimed that with investment in suitable machinery and equipment, 100 per cent recycled paper made from used newspapers and magazines can be produced which is suitable for existing photocopiers and office machinery. The 100 per cent recycled paper which the company produces in West Germany is suitable, but some virgin fibre or high quality wastepaper is added where superior characteristics are required, for example extra strength. Associated Pulp and Paper Mills (APPM) stated that Steinbeis products have limited application, being predominantly used by governments and institutions for internal short life uses. It stated that Steinbeis copy paper has not been accepted by most leading photocopy manufacturers as meeting their minimum quality standards.

Certain types of office waste can be recycled only with difficulty, or into low value products, because of technological problems. For instance, window envelopes present difficulties because of the material used for the window and the glue. Laser printed or photocopied material also has limited use where a bright, white product is required because of problems with de-inking.

Making pulp from wastepaper

The suitability of wastepaper for re-use by paper manufacturers is affected by the qualities and characteristics of the original pulp and the paper made from it. These may limit the extent to which existing processes and machinery can be adapted for recycled fibre use.

The pulping process for wastepaper is different from that using pulpwood. No grinding or heavy chemical or heat treatment is required. After sorting and the removal of contaminants such as staples, the wastepaper is delivered to a blender where it is slurried in the presence of a variety of chemicals dissolved in hot water. Various washing, cleaning, bleaching and screening actions may then be applied. De-inking may also be involved.

1.5 Incentives to substitute recycled fibre for virgin pulp

Relative prices of wastepaper pulp and virgin pulp

Fibre accounts for between 20 and 40 per cent of the costs of paper production in Australia. The major sources of fibre for pulp production are local pulpwood and wastepaper. Details of types of pulp used are given in Appendix E. The types of wastepaper used also differ with the different types of paper produced.

If the price of wastepaper were to fall relative to that of virgin materials, paper producers would have an incentive to increase the amount of wastepaper used and possibly decrease the amount of virgin fibre. However, the extent of any such expansion or substitution would depend on transport costs which are influenced by the location of mills, access to materials, the ease with which technologies can be adapted and the quality requirements of the final paper product. The factors which influence the cost of various pulps are considered in Chapters 2 and 3.

The production cost of Steinbeis de-inked wastepaper pulp was reported to be 69 per cent that of mechanical pulp and 37 per cent of the cost of chemical pulp. As recycled pulp is cheaper, there is a strong economic incentive to substitute wastepaper for wood as the feedstock for paper manufacture.

The economic incentives for recycling in Australia differ from those in some other countries. The cost of wood pulp in Australia is much lower than in West Germany (see Chapter 3 and Appendix G). The cost of recycled pulp is also lower but to a lesser extent. In Australia the cost of wastepaper is estimated to be, on a delivered to mill basis, two to three times that of wood, reducing the incentive to use wastepaper.

Environmental controls on the production and pulping of wood relative to those for the collection and pulping of wastepaper could also be important in influencing the price competitiveness of recycled pulp relative to wood pulp (its main competitor as an input in the manufacture of paper).

Existing mill locations inhibit wastepaper use

Pulp and paper mills are generally located close to the source of the raw materials they predominantly use. They also require water supplies and waste disposal facilities.

In Australia, producers of printing and writing paper and newsprint are mainly located close to forests. Packaging papers, which use a high proportion of wastepaper, are manufactured close to population centres where wastepaper is mainly sourced. Tissue paper production is mixed; most pulp is produced close to forests whereas some tissue paper is produced close to forests and some in population centres.

Transport currently accounts for about 10 to 15 per cent of the cost of pulp and paper manufacturing. The long distances wastepaper would have to be hauled are a disincentive to increased wastepaper use for newsprint, printing and writing paper, and some tissue paper production in current locations. The present location of mills therefore limits the likelihood of recycled pulp being quickly substituted for wood pulp in response to a fall in its relative price.

Pulp and paper machines are often designed to use virgin fibres

The weakening of fibres imposes technical constraints on the use of wastepaper pulp. Not only does the intended use of the paper influence the proportion of waste which can be incorporated, but much of the machinery used at existing mills and paper converters is designed to process the stronger virgin pulps. Thus, investment choices made in the past influence the freedom to change the use of wastepaper at present. The use of pulps and papers containing weaker fibres can lead to frequent breakdowns and consequently higher costs.

Contaminants in wastepaper are a further constraint. APPM said that its machinery can effectively deal with up to 5 per cent of contaminants, but the level of contaminants in office waste is in general higher and beyond the capacity of the plant to remove or reduce to an acceptable level.

Does industry concentration inhibit competition and wastepaper use?

Australian pulp and paper production is highly concentrated. Many participants argued that this concentration and the vertically integrated nature of the industry limits competition and inhibits the incentive to use wastepaper.

Concentration

Eight companies make up virtually the whole of the industry. Three companies, Australian Paper Manufacturers Limited (APM), APPM and ANM produce nearly 90 per cent of Australia's paper and paperboard output. ANM is the sole producer of newsprint. About 42 per cent of Australia's newsprint needs are imported, mainly from Fletcher Challenge (a 50 per cent owner of ANM) or its subsidiaries. Significant imports compete with most other paper products except tissue paper (refer Table 1.5).

In the past, APM specialised in packaging and wrapping papers, APPM in printing and writing papers and ANM in newsprint. Over the past few years a greater degree of competition has developed with the Pratt Group (Pratt) being a significant competitor in the packaging sector, and both APM and ANM producing some printing and writing papers. The withdrawal of Smorgon Consolidated Industries (Smorgon) from the paper making business is said to have reduced competition and the price paid for used corrugated box boards. APM and APPM also compete in the 100 per cent recycled printing and writing paper market. Discussions have taken place between ANM/News Ltd and Pratt on co-operation in the recycling market (discussed further in Chapter 3). This could have eventual implications for concentration in used newsprint recycling.

Bowater Corporation of Australia (Bowater) and Kimberley Clark Australia (KCA) produce 95 per cent of Australia's tissue paper. There are also two smaller producers. Cosco Holdings operates a plant in Ipswich that uses only imported pulp to produce toilet tissues. In 1989, a company based in Western Australia, Austissue Pty Ltd, began making tissue paper out of high quality wastepaper.

Vertical integration

Each major producer has access to raw materials through the ownership and/or control of forest resources or has long term pulpwood supply agreements with State Governments. APM has a paper collection division which buys and sells wastepaper. One of Pratt's subsidiaries, Southern Waste Management, collects wastepaper. Austissue sources its wastepaper through its subsidiary, Paper Processors Pty Ltd. Most paper producers make final paper products or have ownership links with enterprises making final products.

Where existing paper producers can source lower priced virgin wood-pulp and/or are constrained by existing agreements with State Governments to use thinnings and/or sawmill offcuts (discussed in Chapter 4), they have little incentive to use recycled paper. New entrants to paper recycling will also be discouraged if they are required to carry the cost of higher environmental standards while existing pulp and paper manufacturers do not carry all the pollution costs associated with their products.

Although costs of some types of waste fibre, notably newsprint, have fallen relative to virgin fibre, this has had only a limited effect on the use of recycled fibre. Technical constraints, industry concentration and mills being located close to forests all have contributed to the relatively stable patterns of fibre input use. The fall in price of some types of wastepaper, however, has stimulated a number of industry initiatives which may greatly increase the use of recycled fibre in the longer term.

1.6 Consumer preferences and the use of recycled paper

The technology and economics of paper making set limits to the use of wastepaper in the manufacture of various qualities of paper. Consumers' preferences and their willingness to pay may set quite different limits.

Some participants said that the higher prices of some recycled and unbleached papers are worth the environmental benefits. However, many questioned whether in the long run consumers would be prepared to pay the higher prices now applying to wholly recycled paper. The retail price of wholly recycled printing and writing paper was said to be 20 to 200 per cent higher than paper made from virgin pulp.

This price differential could be due to higher prices perhaps relating to the scale of production. But it also indicates consumer willingness to pay a premium, at least for the quantities being marketed.

Partly recycled paper is not generally sold at a premium over comparable paper made from virgin fibre. Many types of printing and writing paper have traditionally included a proportion of recycled material, without this being identified at the point of sale.

Higher prices for some recycled printing and writing papers are not unique to Australia. Fully recycled stationery is reported to be more expensive in Britain than the equivalent virgin products. However, Steinbeis indicated that in West Germany it sells wholly recycled office paper at a discount of 15 to 20 per cent compared with paper made from virgin pulp. But as noted above, virgin fibre pulp is relatively much more expensive in West Germany than it is in Australia. ANM stated that this price discounting suggests that there is in fact a discount for quality. Ecopaper imports recycled paper from West Germany and has found a ready market for the imported product.

The Stationery Manufacturers Association said that the sales tax exemption on 100 per cent recycled paper had reduced the surcharge on a range of stationery products, but it was doubtful whether market penetration would reach more than 12 to 15 per cent in retail outlets and significantly less than 5 per cent in commercial use.

The Stationery Manufacturers Association referred to community confusion about environmental issues: recycling, the ozone layer, the greenhouse effect, felling of rain forests, dioxin. Bowater said that there is no clear evidence that a recycled fibre label is of more value to consumers than a chlorine free or 'environmentally friendly' claim. About 75 per cent of consumers surveyed by the company were aware of environmental issues and 28 per cent had trialled 'environmentally friendly' products. Bowater said that the proportion of consumers buying 'environmentally friendly' products will continue to increase, but the market edge offered by the 'environmentally friendly' label will diminish as manufacturers introduce more products. The relationship between 'recycled' and 'environmentally friendly' was not made clear in the submission.

In the longer term greater output of recycled paper in Australia may lower its cost relative to that of paper made from virgin pulp. Consumer demand for recycled paper is also likely to rise as it becomes more substitutable for paper from virgin fibre. Recycled paper is already a ready substitute in packaging grades and in some uses of tissue paper. In Australia it does not yet meet the broad range of specifications needed in printing and writing papers. At present, the use of Australian made 100 per cent recycled paper can shorten the life of office machines and result in more frequent servicing.

1.7 Uses of wastepaper

In Australia, wastepaper is mainly used as an input in packaging and industrial papers. Some high quality wastepaper is used in the manufacture of printing and writing papers and, since 1989, a small amount has been used in tissue manufacture.

Waste newsprint comprises 10 to 15 per cent of the wastepaper used in the manufacture of packaging and industrial papers. The market for used newsprint is discussed separately in Chapter 3.

Packaging and industrial paper

During the early years of paper manufacture in Australia plants used only waste materials and were located close to population centres where raw materials were sourced. As the industry developed, those sectors which began using wood pulp set up plants close to the source of their raw materials, generally well away from large population centres. The packaging sector continued to use waste materials in plants located in urban areas.

Packaging materials need to be cheap to produce, strong and stiff, resistant to water and other liquids, and should not burst or tear easily. These qualities can be met with a substantially (sometimes 100 per cent) recycled feedstock.

The packaging and industrial paper sector uses the vast majority of all wastepaper recovered for recycling in Australia. Pratt estimated that about 935 000 tonnes of wastepaper will be used by the sector in 1989-90.

APM's estimate was about 750 000 tonnes. The utilisation rate in the sector was about 68 per cent in 1988-89. The remaining fibre inputs consist of virgin wood pulp, most of which is bleached or unbleached chemical pulp, including kraft pulp.

The domestic demand for wastepaper by this sector has been growing at about 7 per cent per year. There has been some substitution of wastepaper for virgin wood pulp. APM said that technological improvements have enabled the use of more wastepaper in packaging materials in recent years. These include starch additives, increased use of wood pulp enriched wastepaper, and increased paper machine capability.

Pratt said that further research and development in papermaking technology and the use of more effective chemical additives could extend the performance and the use of recycled packaging papers. These initiatives seem to be of a fairly long term development nature.

Given that the level of recycling in packaging is already high, the demand for wastepaper from this sector is not expected to exceed the rate at which the economy is growing. The demand is affected by the substitution of plastic for paper packaging.

Printing and writing paper

This category of papers includes fine papers and stationery, and business and technical papers. Users generally require them to have high printability and ease of writing characteristics, high brightness, readability, and durability, particularly where archiving or even relatively short term storage is required. Because of its relatively higher quality and cleanliness, used printing and writing paper waste is in strong demand for recycling.

Small quantities of high quality wastepaper have long been used in the manufacture of printing and writing papers, but in different proportions for different qualities of paper. The degradation of fibres during reprocessing is a constraint. The Printing and Allied Trades Employers Federation of Australia (PATEFA) stated that the incorporation of any amount of recycled paper in the manufacture of high quality books and magazines involves higher costs and lower quality. However some participants argued that for many current applications a lower grade paper incorporating a higher proportion of secondary fibre could be satisfactorily used.

About 35 000 tonnes of wastepaper are used by the printing and writing papers sector (equivalent to about 6 per cent of the total domestic production of this group of papers).

Some printing and writing papers are now made wholly from wastepaper pulp. APM is currently producing over 2000 tonnes of a stationery paper made entirely from recycled paper. Much of this is made from relatively clean commercial waste, particularly printers' waste, which does not require de-inking. APPM uses wastepaper and cotton linters (waste from the cotton ginning process) in the production of fine printing and writing papers at its Shoalhaven mill. It said wastepaper and cotton linters represent over 50 per cent of the mill's fibre usage.

Some hand-made printing and writing paper is also made from 100 per cent recycled paper by Paper-Go-Around.

APM plans to double its present investment of $5m in the manufacture of a range of stationery and computing listing papers made entirely from wastepaper. The new facilities will be designed to utilise waste fibre sources which are not used at present, for example window faced envelopes.

Tissue paper

Tissue papers combine softness or bulk with absorbency and strength. They are mainly used in toilet paper, paper towels and sanitary products.

Two companies produce 95 per cent of Australia's tissue papers. Bowater operates a pulp mill at Myrtleford and a paper and converting plant at Box Hill in Victoria. KCA operates a mill at Millicent in South Australia. Until recently the remaining 5 per cent was produced by Cosco Holdings of Ipswich, Queensland. A recent entrant is Austissue of Canning Vale, Western Australia.

Both the major operators, Bowater and KCA, produce mechanical pulp out of sawmill residues and pine plantation thinnings. KCA also produces bisulphite pulp. The pulp is bleached, partly for appearance, but also because bleaching contributes to the softness of the final product.

In the UK and Sweden, about 8 per cent and 18 per cent of recovered wastepaper respectively was used in household and sanitary paper manufacture in 1988. Until recently no wastepaper was used in the production of tissue papers in Australia. Austissue, which commenced operations in September 1989, now manufactures tissue paper from 100 per cent high grade wastepaper. The company expects to use about 6000 tonnes of high quality waste annually.

Bowater now uses about 500 tonnes of printers' waste annually. It is assessing the viability of installing about 10 000 tonnes of tissue making capacity, to use high quality wastepaper and replace imported chemical pulp.

Insulation, animal bedding, energy generation and other uses

About 20 000 tonnes of wastepaper annually are used to produce insulation and other products (refer Table 1.4). Cellulose Industries Pty Ltd has a plant at Dandenong in Victoria, which produces insulation material from wastepaper for the building industry (refer Chapter 3, section 3.3).

Wastepaper is also used on a small scale for commercial grass seeding, in a shredded state for filling boxes and animal bedding, and for energy generation.

Exports

Significant quantities of wastepaper are exported to South East Asian countries. About half of the wastepaper exported in 1988-89 was old newspapers and the balance mainly printing and writing papers. Exports during 1989-90 are estimated to total 95ÿ000 tonnes. Exports are principally to countries where the papers are de-inked for use in newsprint production.

The low prices currently paid for old newspapers in Asian markets (refer Chapter 3) appear to have depressed exports. Exports from Western Australia have not been affected to the same extent because of their closer proximity to these markets and relatively lower freight costs.

Fluctuations in prices paid in overseas markets have brought problems in forward planning. Participants also expressed concern that the United States exports low grade wastepaper below cost to avoid waste disposal costs.

High freight and wharfage charges in Australia were said to be a constraint on the export of wastepaper. According to Tredex, freight costs can vary between 44 and 81 per cent of the average cost and freight price to Asian ports, depending on the paper grade and its compressability. Wharfage costs are around 5 per cent of this price. Higgins and Co. said that freight and demurrage costs were 75 per cent of the sales value of over-issued newspaper exports. Aspex said while the cif price of old newspapers had fallen from $145 to $120 per tonne, over the last 12 months, shipping costs had increased from $73 to $83 per tonne and road freight including demurrage from $12 to $15 per tonne. The freight paid from Australia to Asian ports was said to compare unfavourably with that faced by United States exporters. According to Tredex, freight rates from the United States can be up to 50 per cent less than those from Australia.

Exporters have been impeded by the availability of shipping services and delays and difficulties in scheduling and loading consignments. Where conference lines decline to ship low value cargo, charter vessels have to be used.

The strict censorship laws in some Asian countries were said to be a constraint on the export of old magazines.

2 SOURCING WASTEPAPER

In 1971 about a quarter of the paper consumed in Australia was recovered. By 1989-89 the recovery rate was about a third.

Many factors have combined to increase the recovery of wastepaper, especially newsprint. They include greater community enthusiasm for recycling, competition between wastepaper recycling mills which led to very high but temporary prices for wastepaper some eighteen months ago, and government encouragement of recycling. This chapter examines some of the incentives which influence the quantity of wastepaper recovered, including costs of collection and charges for disposal in landfill.

2.1 Types of wastepaper

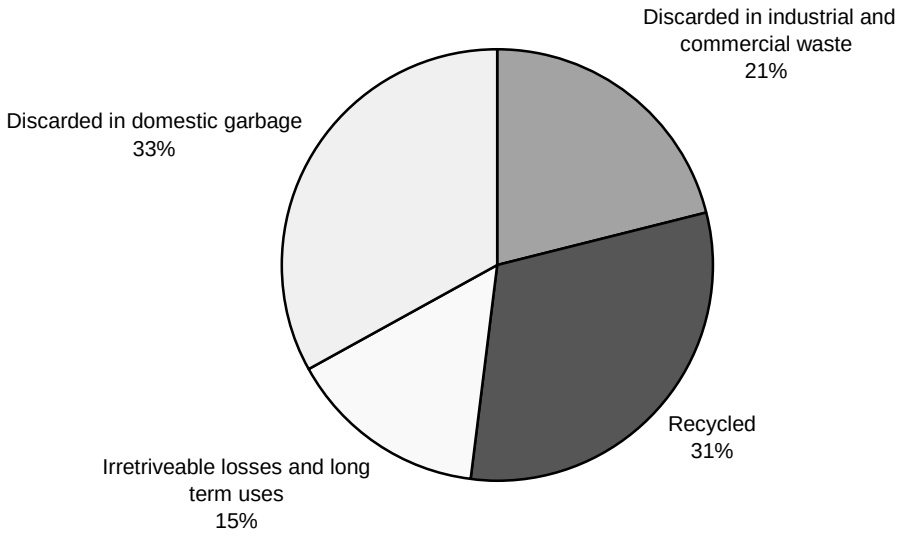
Nearly 2.8 million tonnes of paper products are consumed in Australia annually. The ultimate destinations of paper are shown in Figure 2.1.

About 15 per cent of paper used never becomes available for reprocessing. This includes most tissue papers and much of the printing and writing papers used for long term applications such as books and for filing and archiving, and also some packaging papers. Some 2.4 million tonnes of paper products are potentially available for recycling. Currently, 850 000 to 900 000 tonnes are recycled. The amount held in storage is not known, but most of it consists of old newspapers.

The eastern States are the major sources of wastepaper. APM said that 370 000 tonnes of wastepaper were collected in New South Wales alone in 1989, equivalent to 38 per cent of the total collected in Australia.

Estimates made by Pratt suggest a recovery rate of 50 per cent for Victoria and about 28 per cent for New South Wales. Reasons given for the higher rate in Victoria include a higher population density and shorter distances between population centres. Table 2.1 shows projected wastepaper collections for use in packaging by State (excluding Western Australia). APM recycles up to 46 000 tonnes of wastepaper collected in Western Australia in its Spearwood plant.

Figure 2.1**: Destinations of paper**



Source: APPM, Submission No. 193, p. 25.

Table 2.1: **Projected wastepaper collections[a] for use in paper packaging - 1989-90**
('000 tonnes)

New South Wales	245
Victoria	260
Queensland	130
South Australia	90
Tasmania	10
Total	735

a) Collection data for Western Australia are from a different source and are not included in this table.

Source: Pratt, Submission No. 150, p. 10.

A high proportion of wastepaper is collected from commercial premises. For instance, in Brisbane, APM derived about 72 per cent of its waste materials from commercial collections and 28 per cent from household collections (Durkin & Davis 1989, p. 21). Newsprint accounts for about 10 per cent of post industrial wastepaper.

Printing and writing papers

About 750 000 tonnes of printing and writing papers are consumed annually in Australia. APPM said that 164 000 tonnes were collected in 1988-89, making a recovery rate of 22 per cent. Of this, 48 000 tonnes were exported, about 35 000 tonnes were used in the manufacture of printing and writing paper and most of the remainder in packaging.

Paper used for long term applications such as filing, archiving and books, does not become available for recycling. If no more than 15 per cent of printing and writing paper were lost to long-term use, about 600 000 tonnes could theoretically be recovered. However, based on Japanese experience, APPM estimated that the potential recovery rate is 40 per cent, or nearly 300 000 tonnes. This is considerably more than the 164 000 tonnes recovered in 1988-89.

Used printing and writing paper is collected as office waste and from industry. Very little is collected from households.

Packaging and industrial papers

Annual consumption of packaging and industrial papers (excluding packaging accompanying imported goods) is about 1.3 million tonnes. In 1988-89, about 720 000 tonnes, or 51 per cent, were recovered and recycled, mainly into new packaging products.

Not all packaging materials are potentially available for recycling. Some of those used in the food, tobacco and cement industries are irretrievably lost. About 16 per cent of the total value of sales is to exporting industries, and a small percentage is directly exported. Certain types of used packaging are not recycled in Australia. Factory off-cuts produced in the manufacture of cartons for milk, juices and other liquid foods are recycled. Used cartons are not recycled because of health considerations and the possibility of plant contamination.

Based on the Japanese experience, APPM estimated that the potential recovery rate (in terms of wastepaper collected and delivered for recycling) of packaging products is 55 per cent of total consumption. On that basis Australia's recovery rate may be close to its potential.

Newsprint

About 640 000 tonnes of newsprint were consumed in Australia in 1988-89.About 151 000 tonnes of this, or 24 per cent, were recovered. Of this, 48 000 tonnes were exported. Newsprint is discussed in Chapter 3.

Imports

Imports of wastepaper are negligible. In 1988-89 imports were 964 tonnes. This consisted of 864 tonnes of unbleached kraft paper, paperboard, or corrugated paper or paperboard, and 100 tonnes of other paper products made mainly of bleached chemical pulp. The average value of the former was about $110 per tonne and of the latter $778 per tonne.

2.2 The availability of wastepaper

Prices paid for the different types of wastepaper vary widely. As noted above, users of imported wastepaper may pay very high prices. Locally sourced high quality, clean waste, such as printers' offcuts, can be as high as $500 per tonne, while the price paid for old newspapers can be less than $10 per tonne.

Wastepaper can be disposed of as landfill, burnt, or recycled. The prices necessary to divert a tonne of wastepaper from the waste stream into recycling will depend on collecting and sorting costs compared with waste disposal charges.

Collection and sorting costs

Densely populated and/or heavily industrialised areas are potentially better sources of wastepaper than sparsely populated areas with little industrial activity. The paper is available in larger quantities and at lower costs per tonne collected.

Industrial wastepaper

Recyclable wastepaper generated by industry does not normally enter the waste disposal stream. Market mechanisms provide adequate incentives for commercial collections of industrial waste. Comparatively high prices are paid for this relatively high quality wastepaper and all supplies are clearing. Tredex reported purchase prices of $300 per tonne for white printers' paper. Bowater stated that the price of good quality wastepaper suitable for its purposes was $500 per tonne (including some processing).

Firms producing wastepaper may call tenders and enter into contractual arrangements with collectors who either sell it to paper mills or export it. Most of these arrangements are separate from any arrangements for disposing of waste destined for landfill, or other methods of disposal.

Publishing houses such as News Ltd and the Fairfax organisation usually call tenders for the collection of all types of wastepaper by a single contractor. In contrast, some supermarkets sort and bale paper and cardboard and sell it directly to Pratt or APM.

Office wastepaper

Wastepaper from offices generally has a higher value than wastepaper from households. Although more contaminated than industrial wastepaper, it is more homogeneous, cleaner and available in larger quantities than household wastepaper. Mixed office waste has a value of between $200 and $300 per tonne.

The prices on offer for office wastepaper have not always resulted in well organised collection systems. Recyclers collecting wastepaper from high rise office buildings said that the time spent in collecting from each floor adds to costs to such an extent that collection is not viable.

However, in Melbourne APM is running a campaign to encourage office workers to save waste stationery paper in specially supplied bins to be collected by the company. More than 200 multi-storey office buildings have been signed up and APM intends to extend the scheme to other capital cities.

Many participants said that there is scope for greater collection of printing and writing paper waste from offices, commercial premises, schools and other educational establishments. The Commonwealth Government, State Governments and many firms Australia-wide are beginning to develop systems for more efficient collection of office waste.

Wastepaper generated by households

Arrangements for the recovery of wastepaper generated by households are often integrated with the recovery of other recyclables, and/or with regular kerbside garbage collection systems. They are usually under the control of local councils. About 85 per cent of wastepaper generated by households is newsprint. Prices obtained for newsprint and other recyclables are a determinant of the viability of such collections.

Sometimes kerbside collection of recyclable materials only is carried out by private contractors or community groups. In this case the income obtained from newsprint and other recyclables may be the only return. Hence collections may cease if prices fall below a level needed to cover costs, or at least some minimum acceptable level in the case of charitable organisations.

In some areas householders can take their recyclable waste to collection depots. These depots can be at the local tip or in a central area (depending on health regulations etc). They can be mobile or permanent, council operated or privately managed (with council permission). Some function as receiving centres for many kinds of recyclable materials or for just one, such as paper, bottles, or aluminium cans.

Household participation rates

An ABS survey conducted in 1986 showed that a little less than a third of Australian households were involved in paper recycling, with 73 per cent of these having paper collected directly from the home (ABS, 1986). Victoria had the most households involved in paper recycling (600 000), equivalent to 42 per cent of all households in the State. In New South Wales 538 000 households (28 per cent) participated in paper recycling. The survey has not been repeated.

Quantities of wastepaper which can be economically collected from households are closely related to participation rates. These rates are determined by the availability of collection facilities, the willingness of households to participate, and the cost and ease of alternative disposal methods.

Households bear the primary cost of waste separation when they give of their time and effort, and use fuel in transport. When motivated by a concern for the environment, householders will continue to bear this cost while it is less than the satisfaction received. The suspicion that wastepaper returned to depots for recycling may end up in landfill can reduce the level of satisfaction and deter recycling at the household level.

When collections become less frequent or collection facilities less available there will be a reduction in household participation rates. Lower participation rates may lead to higher collection costs, creating a spiral of increasing costs and reducing participation further. Local authorities respond in a variety of ways. The Gosford City Council for instance subsidises wastepaper collections by the recycler when the price is below a critical point. When the price is high the Council keeps the net proceeds. In this way participation rates can be maintained and even increased during periods of low prices.

Transport costs

Costs of transport in the collection and delivery of wastepaper to paper mills differ between regions. Important determinants of cost are population density, road congestion, volumes collected and whether paper collection is integrated with the collection of other recyclables. Tredex said that transport costs are between $20 and $42 per tonne, depending on the grade of wastepaper.

This represents between 35 and 50 per cent of collection costs.

Kerbside collection can mean high transport costs. Wastepaper accounts for about 20 per cent of total household waste. By itself paper collection is not always viable, but when integrated with the collection of other recyclable materials and/or with household refuse destined for landfill, costs are spread between materials and over larger volumes. Integrated systems also allow for cross subsidisation, where the collection of one of the materials on its own would not be economically viable. Integrated schemes therefore may survive fluctuations in the price of one item, for example newsprint, better than non-integrated schemes.

With collection depots, the costs of picking up and transporting materials to the depots are not borne by the operators. Many have remained viable despite reductions in prices offered for wastepaper and other recyclables which have caused kerbside collection schemes to be terminated.

Some wastepaper is back-loaded from remote areas to paper mills. This is possible where trucks would otherwise return to their base empty, and transport charges are therefore very low.

Labour costs

The collection, sorting and baling of wastepaper is labour intensive. Tredex said that labour comprises 15 to 29 per cent of total collection costs. ANM said that it had been quoted $20 to $30 per tonne for manual sorting of wastepaper on a large tonnage basis.

Wastepaper picked up from firms which have contractual arrangements with recyclers is relatively clean and homogeneous. As less sorting is required, it is a preferred source of waste for recyclers.

Householders and voluntary groups provide much of the labour of sorting, cleaning and standardising the wastepaper collected from households. In so doing they reduce the collection and sorting costs of councils, recycling companies or paper mills.

Administration costs

Tredex said that administration comprises between 15 and 18 per cent of its total collection costs.

Because a wide range of recyclables is involved, the analysis of collection and sorting costs within various collection schemes is beyond the scope of this interim report. Kerbside collection and sorting arrangements for recyclables will be addressed in the report on recycling generally.

Waste disposal charges

Waste disposal charges can be an incentive to recycle. In Australia, waste disposal is mostly by landfill, and is principally the responsibility of local councils. Expenditure on waste disposal by councils includes the cost of collection, transport, and tipping. Expenditure varies considerably between city and country areas, and between areas of high and low density population. For instance, the average cost to local governments of domestic garbage collection and disposal services in high density metropolitan areas of Melbourne is $60 per tonne. In low density metropolitan areas the average is $39 per tonne. In rural areas disposal costs are generally much lower.

Tipping charges

Disposal charges need to be set at levels which reflect the true social cost of landfill to the community. This is particularly important in densely populated areas where potential new landfill sites are few and further away. However, charges are frequently based on operating costs and the historical cost of landfill sites. The use of historical cost, by ignoring changes in land values, means that the true replacement cost of landfill sites is not taken into account in the setting of charges. Costs of precautions against environmental damage such as ground water contamination from leachate, the release of methane, air quality problems and odours, are also frequently excluded.

Tipping charges vary widely. Berwick, on the perimeter of the Melbourne metropolitan area, charges $9 per tonne for general waste. Prahran, an inner Melbourne metropolitan suburb, charges $24.89 per tonne to the City of St Kilda which has no tip of its own.

In the Perth metropolitan area the charges for disposal at tips vary between $4 per tonne and $50 per tonne and in many country areas no charges are levied. In the Sydney metropolitan area tipping fees vary between types of users. The Artarmon Transfer Station charges $30.50 per tonne to councils and $37.50 to commercial/industrial users.

The Commission received considerable information indicating that, from society's point of view, disposal charges are currently too low. Problems of illegal dumping may place limits on the extent to which disposal costs can be increased. These issues go well beyond paper recycling and will be addressed in the Commission's report on recycling generally. However, it is clear that landfill costs will rise in some of the larger centres, creating pressures to either recycle or reduce waste or both.

Transport costs

Expenditure on collection and transport can be as high as 95 per cent of total household waste disposal costs. Transport costs are particularly high in metropolitan areas where traditional landfill sites have been used to capacity and new sites are more distant. The South Eastern Regional Refuse Disposal Group Refuse Study (in metropolitan Melbourne) found that transport and collection costs varied between $24 per tonne in Sandringham and $77 per tonne in Caulfield, the average for the region being $45 per tonne. These estimates are not necessarily representative of costs Australia-wide. At the lower end they are similar to the transport costs of wastepaper recyclers as quoted by Tredex.

2.3 The relevance of collection and disposal costs

Paper recycling involves many players, each responding to different incentives.

Private contractors have an incentive to recycle if the net returns they can make from collecting and delivering wastepaper to paper mills exceed the returns which they can make from disposing of the wastepaper at landfill sites.

Disposal charges therefore influence the supply of wastepaper for recycling. If disposal charges do not cover the total cost to the community, the incentive to recycle will be reduced. Larger quantities of wastepaper than are socially desirable will find their way into tips or be burnt in commercial or domestic incinerators.

Local councils have a key role. If the cost to local councils of collection and disposal of municipal waste is greater than the cost of collecting the materials for recycling, savings can be made by recycling. For instance, the City of St. Kilda (in the Melbourne metropolitan area) pays $1000 per month to have paper collected from kerbside once a month because this is less costly to the Council than disposing of it by landfill. The higher the disposal costs, the greater the incentive to recycle.

In response to community pressures and to save on landfill costs, many local councils have instituted collection arrangements from industry and households for recyclable waste, including paper, glass, aluminium and plastic. With the fall in used newsprint prices, some kerbside collection schemes have ceased and some commercial operators no longer collect wastepaper. The Gympie Branch of the Red Cross Society of Australia (Queensland) said that it had been forced to cease collecting old newspapers when advised by APM that newsprint was no longer required. The Lismore City Council said that the final load of 29 tonnes of cardboard sent by contractor to Sydney cost the Council $400 for baling and over $600 for freight and dumping fees.

3 NEWSPRINT

About a quarter of the newsprint used in Australia is collected for reuse. Notwithstanding the large amounts that enter the waste stream for disposal as landfill, recent growth in collections has exceeded the capacity of local users and exporters to use available supplies. As a result, collection arrangements have been discouraged and in some cases discontinued.

No used newsprint is at present recycled into new newsprint in Australia. Most of that which is collected is recycled into packaging, some is exported, and small amounts are used in the manufacture of insulation and other cellulose based products.

3.1 Australia's 'newspaper mountain'

The past eighteen months have seen a dramatic turnaround in the market for waste newsprint. In December 1988 old newspapers were reported to be selling for as much as $100 per tonne in Sydney. By early 1990 these prices were as low as $10 per tonne. However, the decline in prices of used newsprint has not been uniform across regions or across categories of newsprint. Prices in early 1990 were still $35 per tonne in Perth and one company, Green Recycling, was offering $30 per tonne for set supply arrangements up to two years ahead.

The high prices of 1988, which coincided with intense competition for supplies among the manufacturers of packaging papers and exporters, brought forward increasing supplies within Australia. The subsequent reduction in prices coincided with the withdrawal of one manufacturer (Smorgon) from the domestic packaging market and a reduction in world prices as the United States exported increasing amounts of its own surplus.

In 1988-89 about 151,000 tonnes of used newsprint, or 24 per cent of consumption in that year, was estimated to have been recovered. Some participants said that the quantity recovered was larger than 151,000 tonnes, but that much of it had been stockpiled. Increased consumer awareness of environmental issues and intense competition between recyclers were said to have led to a newspaper recovery rate of about 80 per cent in some areas.

A distinction must be made between post-industry and post-consumer waste. Post-industry waste newspaper accounts for 10 to 20 per cent of newsprint used, but this proportion is falling as publishers introduce new machines and techniques to minimise waste. There is still a ready market for post-industry newsprint waste. Participants indicated that unprinted and uncontaminated white newsprint waste can be sold for $200 per tonne for use as butchers' wrapping paper. Printers' waste and returned unsold newspapers also have a ready market at reported prices in Sydney and Melbourne of $20 to $35 per tonne.

The surplus of old newspapers is in the post-consumer chain and stems from the collection and recycling efforts of voluntary groups, councils, commercial collectors, recycling companies and exporters. Since old newspapers cannot be stored without undergoing some deterioration, increasing quantities are reported to be dumped rather than recycled or exported.

Local government councils have responded in various ways to the fall in used newspaper prices.

. In South Australia, for example, Minlayton Council formerly collected wastepaper and cardboard (including used newspaper). The scheme operated at a financial loss to the Council, since savings on the use of tipping facilities only partly covered the costs involved, but was maintained as a service to householders. The arrangements were terminated when the purchasing company announced that it could no longer buy paper from the Council.

. The District Council of Orroroo (South Australia) had an arrangement whereby RSL members baled paper left by householders, to be forwarded by the Council to APM in Adelaide. This was terminated when APM ceased taking deliveries.

. In Victoria, the Geelong Waste Management Committee said that until December 1989 two paper recycling companies had collected about 100 tonnes of domestic used paper each week as well as 120 tonnes of used cardboard and paper from commercial premises. Only the collections from commercial premises were maintained. The domestic collections were considered to have been equivalent to 13 kg per person per year.

. Some councils are paying a subsidy of 3 1/3 cents per tenement for the monthly paper collection to continue, and consider this to be justified by savings in tip space and waste collection and transport costs.

. Lismore City Council in NSW discontinued the recovery under contract of its wastepaper from September 1989. Paper and cardboard are now disposed of in Council landfill areas.

The decline in used newsprint prices has also affected school recycling programs and the activities of special schools, sheltered workshops and similar groups involved in sorting paper and other recyclables. For example, the Aspley Special School in Queensland has discontinued sorting paper at its recycling station. Keep South Australia Beautiful (KESAB) said that a pilot program set up for schools to promote recycling was abandoned due to the declining market for used newsprint.

APPM said that the potential recovery rate of used newsprint is 65 per cent, or more than 400,000 tonnes annually, based on actual recovery rates in Japan. However, ANM considered that Sydney, Melbourne, Adelaide and Brisbane, and areas in between, account for 80 per cent of newspaper consumption in Australia and that only 55 per cent of that quantity can be recovered.

3.2 Recycling newsprint in Australia

Currently no old newspapers, or wastepaper of any kind, are used in newsprint production in Australia. By contrast, a significant proportion of the fibre input into newspaper manufacture in many countries consists of wastepaper. Old newspapers and magazines form the bulk of household wastepaper which represents about a fifth of domestic garbage.

In Australia, old newspapers are used mainly in the production of packaging materials. Of the 151 000 tonnes of old newspapers recovered in 1988-89, 98 000 tonnes, or 65 per cent was used in the manufacture of packaging materials. The demand for this purpose varies cyclically. The greater the level of economic activity, the higher will be the industrial demand for these products, and in turn the demand for used newsprint.

Table 3.1: **Wastepaper utilisation rates in newsprint production - selected countries**

Country	*Utilisation Rate %*
Australia[a]	0
Federal Republic of Germany[b]	50
USA[c]	20-25
Japan[c]	45-50
UK[d]	26
Sweden[d]	27

a) APM, Submission No. 144, p. 19. b) APPM, Submission No. 193, p. 3. 1987-88 data. c) ANM, 1985-87 data. d) The Pulp and Paper Manufacturers Federation of Australia, submission no. 94 p. 15, quoting a 1988 FAO Survey.

About 3 per cent appears to have been used by other industries in the production of shredded packaging, insulation, pulp mouldings, compost and mulch, animal bedding and energy.

Nearly one third, or 48 000 tonnes, was exported to South East Asian countries where the waste is de-inked and used in newsprint production.

Chapter 1 pointed out that overseas recycling rates could not be used as a guide to what is appropriate for Australia. Table 3.1 shows that recycling is most developed in countries like West Germany and Japan where fibre and energy costs are relatively high and wastepaper costs are low because of high population density and low internal transport costs.

This situation is virtually reversed in Australia. Fibre and energy prices to paper manufacturers are relatively low. Because of the lower concentration of the population, paper collection costs are high. As the two newsprint mills are located in Albury in New South Wales and Boyer in Tasmania, transport costs from the major cities where the wastepapers originate to the mills are relatively high.

Table 3.2 illustrates in index form the production costs in Australia of making newsprint from recycled pulp compared with virgin wood pulp. On the basis of the data in the table, a firm would not choose to recycle old newspapers into newsprint in Australia as recycling is more expensive than production from wood pulp. The cost structure of individual recycling projects could vary substantially, however, according to location, the nature of inputs used, and paper produced.

As shown in the table, while the cost of energy used directly in recycling is lower, fibre and labour costs are estimated to be higher. The high fibre costs for recycling stem from high transport and sorting costs.

Table 3.2: **Estimated private costs in Australia of newsprint production**
(all values expressed as an index, total private costs = 100)

	Wood pulp based	*Recycled*	*Ratio of recycled to wood pulp*
Fibre	27[a]	60 +[b]	2.2 +
Chemicals	4	2 +	.5 +
Energy	26	5 +	.2 +
Labour	18	18 +	1.0 +
Materials and overheads	14	14	1.0
Depreciation	11	11	1.0
Total private costs	100	110 +	1.1

a) Cost includes felling, transport and any royalties or other payments. b) Cost includes energy and labour costs of collection, initial sorting and transport to mill.

Note: The location of wood pulp mills can mean higher costs of transporting the final product to markets in some cases.

Sources: H.A. Symons Ltd and estimates based on information supplied by participants.

The estimates in Table 3.2 cover only the private costs which producers, on average, have to pay. They make no allowance for other costs borne by the rest of the community, such as waste disposal or environmental costs. Nor do they reflect relative price changes that might be expected in future. For example, if wood pulp or electricity prices were to rise relative to other prices, or social or environmental costs were to be internalised into newsprint production costs, recycling would be more attractive. Such prospective changes appear to have played a part in encouraging several proposals to recycle old newspapers and magazines into newsprint and similar papers.

3.3 Recycling proposals

As part of a major upgrading and expansion of its Albury newsprint mill, ANM proposes to develop a $100 million recycling and de-inking facility which would use 130 000 tonnes of wastepaper, some 70 per cent of which would be used newspapers and the remainder magazines. Some 100 000 tonnes of recycled pulp would be produced. The inclusion of magazines in recycled pulp is considered to confer technical benefits, since newsprint incorporating them is much brighter and stronger than newsprint made solely from unbleached mechanical pinewood pulp, and the clay content (used as a paper coating or filler) has a beneficial effect on the flotation de-inking process. The facility is not expected to be commissioned for two to three years. ANM expects to source most of its wastepaper from Sydney, Melbourne, Adelaide, and Brisbane, in that order, and areas in between.

However, the Albury proposal has some environmental costs as well as benefits. The establishment of a de-inking plant would double the present level of salt discharge from the pulp and paper mill into the Murray River. The issues involved are discussed in Chapter 4. Implementation is subject to approval on environmental grounds.

The level of salt discharged could also be increased from 700 to 1700 tonnes per year by plans to use a bleaching process to brighten the pulp at the Albury mill. ANM said that the paper currently produced there, which supplies 30 per cent of Australia's newsprint needs, is regarded as unsuitable by some national newspaper publishers.

ANM is also investigating establishment of a recycling facility to process 65 000 tonnes per annum of wastepaper at its Boyer mill in southern Tasmania. It would enable ANM to recycle old telephone directories and Tasmanian mixed wastepaper into new directory paper for Telecom. An option under consideration by ANM is to use recycled fibre at the Boyer mill in conjunction with pinus radiata thermo-chemical pulp. The eucalypt wood at present used to produce pulp for newsprint would then be used for lightweight coated paper. ANM stated that these changes (the use of recycled newsprint and the associated increased production of papers) are likely to lead to more native trees being cut.

Pratt is also considering the establishment of plants to produce newsprint from 100 per cent recycled newspapers and magazines. Feasibility studies are being undertaken and similar plants in the United States have been examined.

The company has discussed with ANM a possible joint operation to collect old newspapers and other wastepaper nationally and to segregate the material for use in one or more de-inking plants which could be jointly owned. A pilot plant may be built in Sydney or Melbourne. Subsequent to ANM's announced decision to establish a de-inking plant at Albury, Pratt advised that `discussions with ANM about joint venture possibilities are continuing'.

A recycling plant proposed by Pratt would be located adjacent to its existing paper mill at Smithfield in New South Wales and/or at Coolaroo in Victoria. It would have a potential production of up to 150 000 tonnes of newsprint using wastepaper. Pratt said that the plant would only be justified if supported by governments, and if firm commitments were obtained from Australian newsprint users to take the newsprint.

A proposal to establish a newsprint recycling and de-inking plant in Melbourne was put forward on behalf of the Resources Recycling Group. The proposal is for an integrated system of regional recycling centres which would involve equity participation from local government, the State Government, and waste contractors; and a de-inking plant and paper mill which would involve equity participation from waste contractors, users of de-inked pulp, and the State Government. The Group has subsequently advertised for expressions of interest in this proposal.

Paper and Pulp International, initiator of the Austissue project, said that it is considering a recycling project for Western Australia which would make use of waste newsprint. The plant would use about 38 000 tonnes per year of wastepaper of a variety of grades. The paper would be de-inked and then exported as bulk pulp to South Asian markets. Some 33 000 tonnes of pulp would be exported per year.

Other uses of used newsprint

Old newspapers are used on a small scale for commercial grass seeding, for hand made paper and craft products, and in a shredded state for filling for boxes and bedding for animals. Visy Board, a member of the Pratt Group, has developed a disposable sleeping bag for use by voluntary groups.

Cellulose Industries Pty Ltd produces insulation and other products from recycled newspapers. The newspapers used as raw material are collected by community-based organisations. The company has also entered into an agreement with Telecom to examine the use of old telephone directories to make insulation material. It has a plant at Dandenong in Victoria, where non-toxic chemicals are added to shredded newspaper and the product is hammermilled to produce insulation material for the building industry. The present plant is considered to have an output capacity of 10 000 tonnes per year. The company believes that it would be appropriate to install a series of such small plants close to major population centres. It anticipates building such plants in Sydney, Brisbane and Adelaide.

Newspaper environmental research

The major newspaper publishers informed the Commission of other initiatives to encourage research and public support for recycling. News Ltd, Australia's largest single user of newsprint is to co-operate with Fairfax and Australian Consolidated Press in setting up an environmental issues secretariat. The secretariat will analyse information and advise the companies concerned on resource management and waste collection issues, including the recycling of old newspapers and magazines.

Effects of proposals

The ANM proposals alone would radically change the paper recycling scene in Australia. The widely expressed concern that greater quantities of used newsprint should be recycled would be met. Within two to three years the recovery rate for newsprint in major cities on the eastern seaboard could rise from the current relatively low levels to about 55 per cent. The utilisation rate for newsprint could rise to about 25 per cent and the scene would be set for higher rates in years to come.

If any of the other de-inking and recycling projects proposed for Sydney, Melbourne and Western Australia were also developed, used newsprint supplies could become very tight. However, the effects would vary regionally. Very high recovery rates would be required in south eastern Australia. Further afield, in northern Queensland and Western Australia, exports may remain a competitive outlet.

In locations which are less accessible to ports or de-inking facilities, landfill may remain the preferred disposal outlet unless attractive back freight or subsidised internal transport (eg for used telephone directories) were available.

Chapter 4 outlines the environmental issues associated with paper recycling. It shows that the process of recycling newspapers and magazines into newsprint is not necessarily environmentally benign. Recycling of newsprint can save landfill space, whereas the production of paper from wood pulp, or its importation, does not. This is likely to become a more important consideration, at least in the major cities, as present landfill sites are used up.

Recycling also has the potential to save electricity and water used directly in pulping. However, when energy used in paper collection and transport is also considered, it is not clear that less energy is used in recycling than in the production of wood pulp. Nor is it clear that a lower level of air pollution and carbon dioxide output is associated with recycling.

The additional production of newsprint in Australia would mean some additional water pollution. Potential problems are the retention and creation of dioxins and other harmful organochlorines and salt and other residues generated in the de-inking and paper-making processes. Whether the production of newsprint from recycled waste is less polluting than production from pulpwood can only be assessed on a project by project basis. On balance, however, it would appear that there are environmental benefits from producing recycled newsprint in Australia.

From a global perspective, there would be environmental gains. As the recycled newsprint is likely to replace imports, any reduction in output of paper could lessen environmental costs in countries presently exporting newsprint and pulp to Australia.

4 PAPER RECYCLING AND THE ENVIRONMENT

Government resource and environment policies are an important influence on Australia's pulp and paper industries. Governments control virtually all native forests and about 70 per cent of plantation forests. Most electricity generation and water supplies are controlled by governments, as is environmental protection. The decisions which governments take in providing access to forest resources, electricity and water, and in regulating use of the environment and pollution can influence the industries' recycling decisions.

4.1 Paper recycling and resource policies

Forests are a source of wood. They also provide habitats for wildlife, water catchments, and have many recreational and other values. Plantations can improve degraded land, help control salinity and improve water quality. It follows that the harvesting of forests, particularly native forests, can bring benefits and costs to the wider community. For the most part these are matters for the Resource Assessment Commission's current inquiry into options for the use of Australia's forests and timber resources. A background paper on that inquiry has been released by the Resource Assessment Commission for public discussion. This interim inquiry has a much narrower focus - the incentives of pulp and paper producers to use virgin as opposed to recycled fibre.

Many participants such as the Tasmanian Conservation Trust, Friends of the Earth, Australian Greenhouse Action, the Australian Conservation Foundation and Rainbow Alliance argued that the market does not consider the non-priced benefits of protecting the environment or the costs of its degradation. They said that resources such as pulpwood, water and electricity used in paper-making, are underpriced and over-used. This has encouraged the dependence of the pulp and paper industries on native forests, at the expense of alternative feedstocks such as wastepaper.

Are pulpwood prices subsidised?

The pricing of pulpwood is complex. Pulpwood prices vary significantly between and within States, between hardwoods and softwoods and, in Tasmania, between pulpwood exported and that used in the local production of pulp. Within a State they also vary according to costs of operating the forestry concession, including responsibility for roads, fire prevention, and accessibility.

There is some debate as to whether pulpwood is a waste by-product and should be priced accordingly, or a joint product with sawlogs. The New South Wales Government, APPM and ANM referred to pulpwood as a by-product of forestry and sawmill operations. However, Bowater and the Pulp and Paper Manufacturers Federation of Australia (PPMFA) said pulpwood is a joint product with sawlogs.

There is evidence to support the latter view. Where they are permitted to do so, pulp and paper companies and sawmill operators do substitute sawlogs for pulplogs and pulplogs for sawlogs in response to a change in their relative prices. ANM uses sawlogs from private plantations for pulpwood where there is inadequate demand for sawlogs, and sawmill operators in Western Australia are now processing wood previously considered unsuitable as sawlogs, in response to increased log prices. ANM charges an internal 'royalty' to cover the cost of re-establishing its plantation in southern Tasmania, which indicates that pulpwood should not be considered simply as a waste material.

Pulpwood supplies and prices cannot be considered in isolation from the more general issues of forest management. The sawlog management regime followed will determine the rotation period used, and hence the number of thinnings prior to the final sawlog harvest. The management regime will also determine the size of the total sawlog harvest, and hence the annual supply of logging residues.

If an inappropriate sawlog regime is followed, too much or too little pulpwood will be supplied, implying that the price of pulpwood is subsidised or taxed. There is evidence that sawlogs are underpriced and over-harvested and that pulpwood, as a result, is over-supplied (see Appendix G). The question of immediate relevance to this interim report, however, is whether the existing supply of thinnings and residues is priced appropriately.

None of the allocation mechanisms for harvest rights adopted by forest services allows a market to generate pulpwood prices. In South Australia, Tasmania and Victoria, prices are determined through negotiation. However, there is usually one seller of the concession (a State forest service) and one buyer (a pulp and paper company). Thus the negotiated pulpwood price is likely to reflect the relative bargaining strength and objectives of both parties, and not necessarily the value of the pulpwood to the user, or its true cost of supply.

In New South Wales, the Forestry Commission places long-term agreements for the supply of pulpwood out to tender, and then periodically renegotiates pulpwood prices with the successful tenderer to at least cover the Commissions' costs of producing the pulpwood. A potential advantage of the tender system is that it could convey information to the Forestry Commission about the true value of the pulpwood supply to the industry. However, the benefits of tendering may not be realised in New South Wales owing to the regional dominance of a few companies that have bid for, and now hold, long-term agreements to particular parcels of pulpwood.

Although tendering provides some scope for pulpwood to be used in its best application, for example as an input into pulp or particle board production, or exported as woodchips, forestry regulations may preclude its use for sawlogs.

Further evidence that governments are not efficiently producing or pricing their pulpwood is the rate of return on government-owned plantations. The PPMFA said the market requires a higher real rate of return than 4 per cent on plantations - the real rate of return required by the Victorian Government - to encourage investment in plantations. While a low rate of return may indicate that government plantations are run inefficiently, it could also suggest that royalties charged for timber from government plantations should be increased in order to earn a more reasonable return. If royalties exceed the costs of running a private plantation, there is an incentive for the industry to grow its own trees.

Most government-owned forests are managed principally for the production of sawlogs. This objective, together with long term agreements

for the supply of pulpwood with limited scope for price adjustments (see Appendix G for details), regulations which govern who has access to forests and at what price, and physical rather than economic criteria which specify what constitutes pulpwood and sawlogs, all work to reduce prices of pulpwood and increase supplies. Under-pricing will discourage private plantations and reduce the incentives of the pulp and paper industry to adjust to changes in the relative prices of wood and wastepaper. The current level of recycling reflects these relative prices and is therefore lower than the socially optimal level.

Would more paper recycling save native forests?

Industry groups generally argued that the production of pulp and paper does not make great demands on native forests. The pulp and paper producers and the Forestry Commission of New South Wales said that native forests are managed on a sustained yield basis and are principally logged for sawlogs. The Department of the Arts, Sport, the Environment, Tourism and Territories (DASETT) said the main sources of fibre for paper production in Australia are imported pulp, plantation thinnings and wastepaper. It said that only about 10 per cent of fibre for domestic paper consumption comes from native forests, although around half of the native forest hardwood removals are exported as woodchips.

Forestry interests agreed that sawmill residues and plantation thinnings would be burnt or left to rot if not used in pulp and paper manufacture. The Forestry Commission of New South Wales identified three sources of pulpwood available from state forest or other crown lands:

. thinnings - log material obtained in thinning either hardwood or softwood plantations or hardwood natural regrowth in native forests;

. log residues - logs or sections of logs felled to provide other products, but found subsequently to be too defective; and

. silviculture residues - logs removed for the health and overall productivity of the forest, but too defective for other products.

It said it wished to dispel claims that recycling paper will result in saving trees from harvesting in state forests:

If pulpwood demand by one firm was reduced as a consequence of that firm using increased quantities of recycled paper, the Commission would organise pulpwood sales to other customers to best advantage.

ANM said its Albury mill uses pine thinnings from Victorian and New South Wales Government plantations. Its mill at Boyer uses pine thinnings and some old growth eucalypt forest. The company plans to de-ink and recycle old newsprint and magazines but said that this will lead to lower imports of newsprint rather than reduce the use of Australian pulpwood.

The Australian paper industry makes a comparatively small demand on native forests. Table 4.1 shows that in 1987-88, broadleaved pulpwood used for domestic paper and paper board production accounted for only 2.4 per cent of total broadleaved forest removals, including removals from plantations. The bulk of pulpwood for paper comes from coniferous plantations. The 1.3 million cubic metres of coniferous pulpwood harvested for domestic paper and paperboard production in that year were more than four times the quantity of hardwood pulpwood. Sawmill residues are an additional important source of fibre. Sawmill residues, not all of which are used in pulp and paper, were 1.4 million cubic metres in that year.

When the other fibre inputs - imported pulp, wastepaper and cotton linters - are considered as well, it is apparent that about one sixth of total fibre in Australian-made paper comes directly from native forests. Increased recycling of paper is therefore unlikely to have a significant effect on the rate at which native forests are cut down and on the associated environmental costs. However, reforms to forestry management which reduce the supply of sawlogs and increase their price would also have a similar effect on pulpwood. Although this might have little effect on the uptake of wastepaper as a source of fibre in the near future (because of the location and technical restraints on existing mills), as new investments are made it would provide an impetus to recycle paper.

Table 4.1: **Estimated removals of roundwood from the forest, 1982-83 to 1987-88**

Item	*Average for 1982-83 to 1986-87*		*1987-88*	
	'000 m^3	*%*	*'000 m^3*	*%*
Broadleaved				
Saw and veneer logs	4 537	29	4 311	25
Pulpwood				
- for board	143	1	115	1
- for domestic paper & paperboard[a]	151	1	263	1
- for export[b]	4796	30	5 619	33
Other	935	6	795	5
Total	10 561	67	11 103	65
Coniferous				
Saw and veneer logs	3102	20	3 557	21
Pulpwood				
- for board	658	4	808	5
- for paper and paperboard	1 381	9	1 289	8
Other	134	1	145	1
Total[c]	5 275	33	5 799	34
Broadleaved and coniferous				
Saw and veneer logs	7 639	48	7 868	47
Pulpwood for paper	1 526	10	1 552	9
Other pulpwood	5 602	35	6 542	39
Other	1 069	7	940	6
Total[c]	15 836	100	16 902	100

a) These figures are understated because they are derived by deducting pulpwood exports from total pulpwood used for paper and paperboard. Exports include a small proportion from coniferous trees, the figures for which are not publicly available. b) Pulpwood is exported predominantly in the form of woodchips. The figures include a small proportion from coniferous trees. c) Excludes fuelwood obtained from logs.

Note: Quantities are expressed in gross roundwood equivalent. The figures exclude firewood removals, sawmill residues used in manufacturing processes or exported in the form of woodchips, and recycled wastepaper. Sawmill residues were estimated at 1.4 million m3 and collected wastepaper at 690 000 tonnes for the year ended 30 June 1988.

Source: ABARE (1986), Australian Forest Resources, Project 1214, AGPS, Canberra, Tables 6 and 9.

Electricity and water

Pulp and paper manufacture makes heavy use of electricity and water. Some participants claimed that these resources are under-priced, which reduces the incentive to use wastepaper instead of virgin pulp. Whether this is true depends on how important these costs are in the total costs of producing virgin compared with recycled pulp.

For most kinds of paper produced from virgin wood fibre, electricity accounts for only about 5 per cent of the costs of production. Consequently, higher charges for electricity may not significantly raise the relative cost of using virgin fibre as a feedstock. However, the share of electricity in the costs of producing newsprint using mechanical pulp is substantially higher. Electricity accounts for around 30 per cent of operating costs for a newsprint mill (New South Wales Pulp and Paper Industry Task Force Report, 1989). The requirement for electricity does not seem to be substantially different when wastepaper is used as a feedstock, except in the case of newsprint.

In announcing its intention to build a recycling plant in Albury, ANM said that the use of wastepaper as the feedstock would reduce electricity requirements from 2400 kWh per tonne of pulp, to 400 kWh per tonne (ANM Press Release, 30 April 1990). In these circumstances any under-pricing of electricity is of greatest benefit to plants which use wood as a feedstock in a mechanical pulping process.

State Governments have frequently offered low utility prices to induce firms to locate in regions outside the major cities. The Commission has not received information that this has applied to the paper industry. However, if it has influenced the location of paper mills in country areas remote from sources of wastepaper, it could have helped to bias production against the use of recycled fibre. Once a decision is made to locate a paper mill in a remote area, recycling becomes much less of an option because of high transport costs.

The Industries Assistance Commission found in a recent inquiry (IAC, 1989a), that electricity is substantially under-priced. The study showed that in 1987-88, the rates of return earned on investments in electricity generation were substantially lower than market interest rates, and that electricity charges would have to increase by an average of 28 per cent if real rates of return were to be increased to 8 per cent.

The extent of under-pricing was found to vary between States. South Australia and Western Australia required only a 5 per cent price increase to raise real rates of return to 8 per cent. New South Wales, Victoria and Queensland were found to be under-charging by 36, 30 and 22 per cent respectively. In Tasmania, which has often used low electricity charges to attract industries to the State, a 96 per cent price increase was required.

Similar considerations apply to water pricing. It has been estimated that, on average, charges for non-metropolitan water (as distinct from metropolitan and irrigation water) should be increased by 150 per cent in order for water authorities to earn an 8 per cent real rate of return on their capital investments (Evans and Reynolds, 1990). These estimates mask substantial variation across States. The rate of return currently earned on the provision of non-metropolitan water in New South Wales, for example, was found to be 3 per cent, while in Queensland and Victoria it was 2 per cent. The rates of return in South Australia and Western Australia were minus 2 per cent, implying that water charges in those States should be increased by more than 150 per cent.

Pulp and paper production uses a substantial volume of water. According to information supplied by ANM, production of newsprint from virgin fibre uses about 5 cubic metres per tonne of pulp produced, while production of recycled newsprint requires around 3 cubic metres per tonne. As water currently accounts for only 1 per cent of total production costs, even a 150 per cent increase in the price of water would have a very small effect on the cost of using virgin fibre. It seems unlikely that the introduction of appropriate water prices, by itself, would have much effect on the incentive to recycle paper.

Subsidised electricity, water and pulpwood prices may, individually, have had little effect on the incentive to recycle paper. However, taken together they may have led to a lower than optimal rate of recycling. There would be net benefits to Australia if this situation were corrected, though a significant increase in paper recycling may not occur until major new investments are planned and come on stream.

4.2 Pollution

While the production of virgin wood pulp and paper unavoidably create some pollution, recycling and de-inking of paper have pollution problems of their own. The relative significance of these various pollutants is an important determinant of whether there are net environmental benefits from more paper recycling. As the DASETT submission stated:

> While new technologies and new products may well alleviate current environmental problems, it is essential that such technologies and products be assessed for environmental impacts at the outset, before being embraced. It is critical that we learn from our mistakes and do not merely replace one set of environmental problems with another.

Where pollution prevention is part of the production process, its costs are included in the overall costs of production. However, where pollutants are discharged into the environment, social costs are imposed through degradation of the air, land and water and through damage to plants and animals including marine life. In this case the production process is more costly to society than to the pulp or paper producer alone.

Polluting effluents in the pulp and paper industry come from the wood or pulp, the chemicals used and generated and the production techniques employed. These resources vary considerably from one plant to another. Their effects are also diverse because of different environmental sensitivities at each location. In addition, there are significant measurement problems, and many unanswered scientific questions associated with some pollutants which occur in very low concentrations, such as dioxins.

This section examines first the major sources of pollution from recycling wastepaper. As production of newsprint from recycled wastepaper is the most significant likely addition to paper recycling in Australia in the near future, the section concludes with a comparison of the environmental costs and benefits of producing newsprint from mechanical pulp and from de-inked pulp as proposed by ANM.

Sources of pollution from paper recycling

The pollution which results from paper recycling is related to the type of wastepaper and processes used, and the treatment and disposal of wastes. The Centre for Human Aspects of Science and Technology (CHAST) at the University of Sydney submitted that the recycling of paper results in fillers, additives, inks, dyes and hazardous chemicals present in the ink finding their way into mill effluents.

The de-inking process has had a reputation as a highly polluting process. Although technological advance has overcome many of the old problems of de-inking, concerns were expressed about the disposal of salt and other wastes such as ink sludge and heavy metal residues.

The ink is removed by washing or flotation, or a combination of both. Dispersant chemicals facilitate the breakdown of the ink particles, and hydrogen peroxide may be used for bleaching where brightness is required. In the flotation process, the broken down ink is collected as a scum, dewatered and disposed of as waste. The de-inking process uses caustic soda and produces salts, the disposal of which could be a major environmental issue at an inland location.

The disposal of solid wastes from recycling

Where no chemicals have been used in paper recycling, and de-inking has not been undertaken, the disposal of waste may confer environmental benefits rather than costs.

Austissue, which produces tissue from recycled office paper without the use of chemicals or de-inking processes, stated that its residues are collected by horticulturalists for use as garden mulch. The composition of this material was said to be one third clay and ash, one third small fibres too small to be recycled, and one third carbon black - an inert substance - and any associated pigments. Austissue said that the material is valued as mulch because the biodegradable cellulose fibres which it contains improve the soil, and because the clay component can improve the water retaining qualities of Western Australia's sandy soils. The APPM mill at Shoalhaven also disposes of some dried effluent as mulch.

Suspended solids

Suspended fibres and clay residues present in recycling effluent can cause environmental damage. The quality of the effluent in terms of suspended solids is measured by the Non-Filtrable Residues (NFR) level for inert material. The Biological Oxygen Demand (BOD) of effluent is the indicator of putrescible material.

Inert suspended solids pose environmental costs if they are dense enough to block out sunlight because photosynthesis is reduced with adverse effects on underwater plant growth and marine life.

Landfill use

De-inking sludges require landfill space unless disposed of as mulch or in effluent. Solid de-inking waste from the Shoalhaven mill not disposed of as mulch is at present dumped as landfill. At the proposed plant at Albury part of the de-inking waste will be burnt to generate heat, but inert wastes such as sand and metal fragments will be dumped in landfill.

As long as pollution from leachate can be prevented, the cost to society of using landfill for de-inking wastes is small compared with the savings in landfill from recycling of paper. The production of 1000 tonnes of recycled paper results in a net saving in post-consumer waste of 300 tonnes.

Salts

The de-inking process results in the presence of salts in the effluent. The extent to which this is an environmental problem depends mainly on the location of the mill. The APPM Shoalhaven Mill at Nowra, New South Wales, is located close to the sea, so that the salt effluent from its de-inking plant is not an environmental problem. The same would be true of salt effluent from de-inking on a tidal location such as Boyer in Tasmania.

However, the salt content of the effluent is a significant environmental problem for inland de-inking facilities. For example, the proposed Albury plant would double the present level of salt discharged into the Murray River by the paper mill. Although the amounts involved (1000 tonnes) are

small in terms of the 1.1 million tonnes of salt which the Murray is estimated to carry each year at the point where it crosses the Victoria - South Australia border, it is a significant problem. The salt is in such low concentration that it cannot be effectively removed before discharge. The Murray-Darling Basin Commission's policy is to ensure that existing Murray River water quality is not allowed to deteriorate.

ANM has sought to contribute to government schemes to remove salt from the river before it reaches South Australia, thereby avoiding any effect which the additional discharge would otherwise have on water quality at Adelaide. The company is seeking a similar facility to that available to States. Each State which reduces the quantity of salt entering the Murray (for example by a drainage or evaporation scheme) is allowed to release salt from other arrangements into the river so long as the overall State limit in terms of electroconductivity units (a measure of salt content) is not exceeded. To date, the arrangement has not been approved for use by a single point user of water such as ANM.

Heavy metals

The question of heavy metal emissions from de-inking was a source of controversy in the inquiry. CSIRO Division of Forestry and Forest Products submitted that heavy metals from coloured inks in the effluent from a de-inking plant could present major environmental problems. They said that any proposal to site a de-inking plant where the effluent would be discharged to an inland waterway should be scrutinised very carefully. DAS also stated that there are technical difficulties in disposing of the sludge from de-inking in an environmentally acceptable way as it contains heavy metals from coloured inks.

However, F.T.Wimble, suppliers of half the Australian market for inks, said that although the printing inks used for newspapers are not biodegradable they are environmentally benign. The inks are composed essentially of carbon black and bitumen, and can be removed through mixing pulp in a caustic slurry. It claimed that virtually no heavy metals are now used in either black or coloured inks. Lead is no longer used as an ingredient. Soybean oil is under consideration as a mixing base for ink.

Steinbeis stated that sludges from wastepaper plants are relatively free of hazardous elements, having a lower heavy metal content than the sludges from municipal waste water plants. The company presented the findings of research undertaken in Germany (Hamm and Goettsching 1989) which indicate that the heavy metal content of wastes is well within allowed limits.

On the basis of the evidence given to this inquiry, the heavy metal problem appears to have been overcome by the development of new inks which do not contain heavy metals. Any risk of heavy metal contamination in the residues from de-inking appears to stem from the possible use of magazines or other printed material imported from less developed countries where inks may still be made in a traditional manner, or kaolin with a significant heavy metal content used in paper making.

Organochlorines and dioxins

One of the environmental benefits of a higher level of paper recycling put forward by participants was a reduction in production of pulp bleached with elemental chlorine. This would not be a benefit to Australia in the case of newsprint, as Australian mechanical newsprint pulp is not bleached with elemental chlorine.

Paper recycling tends to concentrate any organochlorines and dioxins present in the pulp, and these are retained in the paper and effluent. The recycling of high quality printing and writing paper which has been chlorine bleached may result in their presence. The use of chlorinated urban water supplies for de-inking could also result in the formation of organochlorines in the pulp and effluent.

In a survey undertaken in Sweden of five pulp mills using different technologies (Rappe, Glas, Kjeller, Kulp, de Wit and Melin 1989), one of which was a recycled paper mill, the recycled pulp samples showed the highest levels (albeit still at very low concentrations) of toxic dioxin equivalents. A possible explanation of this was considered to be contamination due to the presence of these chemicals in the ink or in chemicals used in the de-inking process.

No information is available to the Commission about levels of organochlorines in Australia's existing paper recycling plants.

Information is confined to new projects for which environmental assessment is required. This suggests that the recycling of newsprint is unlikely to pose a significant organochlorine problem because of the low levels of organochlorines in the wastepaper.

Newsprint produced at Boyer is within an adsorbable organic halides (AOX) level, a measure of organochlorines present, of 1 kg/t and has no detectable dioxins. The pulp produced at Boyer is not bleached with chlorine, although purchased chlorine bleached pulp is used to a level of 8 per cent by weight of newsprint produced. Newsprint produced at Albury is not bleached with chlorine and no chlorine bleached pulp is added, hence organochlorines and dioxins are even less of a problem than at Boyer. Newsprint paper and pulp imported into Australia are considered to be roughly equivalent to the domestic product in terms of AOX levels and the presence of dioxins. Hence newsprint used for recycling in Australia should contain less than 1 kg/t of AOX and no detectable dioxins.

The environmental effects of organochlorines and dioxins are discussed in Chapter 2 of the Commission's companion report on *Pulp and paper: bleaching and the environment.*

Environmental costs and benefits of newsprint recycling

Newsprint is produced by ANM at Boyer in Tasmania and Albury in New South Wales. Both mills use mechanical processes, which are relatively energy intensive, to produce pulp. At Boyer a cold soda process is used in pulping. At Albury heat and additional energy are used for pulp production as thermo-mechanical pulping is undertaken. Bleaching is undertaken with hypochlorite at Boyer and there are proposals to undertake it with hydrogen peroxide at Albury.

Table 4.2 lists some of the environmental effects of producing newsprint from wood pulp and recycled pulp respectively.

Table 4.2: **Environmental costs of wood pulp and recycled pulp mills for newsprint in Australia**

	Mechanical pulp mill per 1000 tonnes mechanical pulp	*Recycled pulp mill per 1000 tonnes recycled pulp*
Materials -	Approximately 1050 tonnes pulp wood	Approximately 1300 tonnes used newspapers and/or magazines
Fresh water	5 m^3/t	3 m^3/t
Air pollutants	No significant emissions of air pollutants except combustion products from collection and transport of waste	No significant emissions except combustion products from collection, transport, and burning de-inking residue
Suspended solids	May have negative impact on photosynthesis as they lower light penetration of water environment	Depends on whether waste is dried and disposed of in effluent, as landfill or as mulch
- BOD (biological oxygen demand)	10 mg/l in waste water at Albury, where treatment reduces BOD by 99%. Where mill is on tidal location environmental cost will depend on the strength of tides depend on the strength of tides and currents	BOD 15 kg/t of pulp. Max. allowed level at Albury 20 mg/l in waste water
- NFR (Non-filtrable residues)	15 mg/l in waste water at Albury	Max. allowed level 30 mg/l in waste water at Albury
Process solid wastes	Depends on disposal method. Landfill may impose little cost, sea disposal greater costs, inland water disposal very high costs	Ink sludge and waste fibre burnt to generate steam. Inert material requires landfill disposal
Salts	Salts may be produced. Disposal into sea or tidal waters imposes little or no cost. Disposal into inland waters, eg Murray River, has significant cost from degradation of irrigation and drinking water, or taking actions to remove an equivalent quantity of salts	De-inking produces twice the level of salt. With bleaching the level is three times. Disposal into sea or tidal river imposes little or no cost Disposal into Murray River has same effect as for wood pulp mill

AOX (Adsorbable Organic Halides) – a measure of the quantity of organochlorines	Approximately 1 kg/t of fibre produced at Boyer, lower at Albury where no chlorine bleached pulp incorporated	Organochlorines present in original paper are retained in the paper produced and liquid and solid wastes, but levels are small. Use of chlorinated urban water in production could add to these
Dioxin	No detectable dioxins. Dioxins naturally present in water, wood etc, used in production would be retained in paper and effluents	Possible dioxin levels
Net post-consumer waste	1000 tonnes (assuming none is exported)	-300 tonnes (assuming none is substituted for exports of wastepaper)
Electricity use[a]	2400 kWh/t of pulp	400 kWh/t of pulp
Other energy use[a]	Some energy use in wood cutting and transport. High energy use in collection and transport of waste	High energy use in collection and transport

a) Exhaust gas emissions from energy used in collections and transport, and by power stations, have a detrimental effect on the environment.

Source: Information supplied by participants

The main environmental costs of the current de-inking proposals appear to be the salt effluent to be discharged into the Murray River. While the costs of salinity are significant, adverse effects further downstream could be dealt with by salt reducing measures funded by the recycling plant. But stretches of the Murray closer to the plant would be made more saline. The environmental benefits of newsprint recycling come primarily from savings in waste disposal.

5 PAPER RECYCLING POLICIES

Governments at all levels have announced plans or policies to stimulate paper recycling. The Commonwealth Government has provided a sales tax exemption on certain papers made wholly from recycled paper. The Victorian Government is considering 'a package of legislative options which will provide for much more rapid change where industry cannot or will not address these issues'. Other States have assisted or propose to assist paper recycling through industry development packages. As outlined in Chapter 2, local government councils have adopted a number of approaches to encourage waste separation and its collection for recycling as a means of avoiding more costly means of disposal.

But recycling is not an end in itself. It is not a simple matter of promoting the maximum possible levels of recycling, for recycling has costs as well as benefits. A theme of this report is that governments can best assist paper recycling by ensuring that the use of raw materials is not encouraged at the expense of those recovered from the waste stream. Whilst supporting this approach, many participants advocated incentives to directly encourage further paper recycling, such as import duty concessions for recycling equipment, accelerated depreciation allowances, subsidised research and mandatory recycling targets.

5.1 Costs and benefits of more paper recycling

The economic and environmental costs and benefits of paper recycling can be divided into the private costs and benefits which accrue to the paper manufacturers themselves, private costs and benefits which accrue to others such as paper collectors and waste disposal authorities, and social costs and benefits which are not appropriated by particular individuals or groups but accrue to society as a whole. Pollution and other environmental effects fall into this last category.

Private costs are at the heart of commercial decisions about wastepaper collection, waste disposal and paper production. Assuming that the capital costs of producing paper from waste and from virgin pulp are the same, the main costs which affect a decision to use recycled material are those of fibre, electricity, chemicals and labour.

For those papers which have long been recycled in Australia, the cost of recycled fibre is significantly less than the price of virgin chemical pulps. However, the cost of recycled fibre for newsprint manufacture in Australia appears to be two to three times the cost of fibre from virgin mechanical pulp. Labour costs within mills are probably higher for recycling too. ANM said that the cost of producing de-inked pulp in Australia will be about the same as the cost of mechanical pulp. Lower electricity and chemical costs are major offsetting factors.

The major private costs of collecting, sorting and transporting wastepaper to the recycling plant are labour costs and the petroleum and capital costs involved in transport. The major private benefits are the savings in waste disposal costs by waste generators and waste management authorities.

The private benefits which paper consumers enjoy from purchasing recycled paper will be reflected in the prices which they are prepared to pay provided that they are well informed about quality and performance.

Not all of the costs and benefits of paper recycling are borne or received directly by the commercial interests in the recycling chain. An example of such costs would be the voluntary labour provided by households, office workers, charities and other community groups such as the scouting movement in the initial sorting of wastepaper. Corresponding benefits include avoided tipping or other waste disposal charges, funds raised for charity and the perceived benefits of participating in a worthwhile cause.

The higher the sacrifice in terms of convenience, or forgone leisure for these groups, the lower their participation rate in recycling schemes and the higher will be the prices which users of wastepaper will have to offer. Conversely, the greater the community benefits from participation, the greater will be wastepaper supplies and the lower will be wastepaper prices.

To the extent that these less tangible benefits and costs influence the market prices for recycled paper, albeit indirectly, they help to determine the level of recycling. Only when some benefits or costs of paper recycling go unreflected in prices is there a likelihood that we will get the 'wrong' level of recycling.

This will indeed be the case where the full benefits to society of charity paper collections are not captured in the prices paid for wastepaper. Environmental costs are another area of concern. Not all the environmental costs of recycling or its alternative find their way into charges to firms and then into the prices of recycled and virgin paper products.

The full environmental costs of using land, water and the atmosphere as a waste sink are not reflected in commercial decision making. Paper manufacturers, whether using virgin or recycled feedstocks, only bear the environmental costs of their discharges insofar as they install pollution controlling equipment or are charged for effluent discharge. Other uses of the environment, because they are not fully reflected in paper prices, produce a bias against recycling. These are the costs of waste disposal and to a lesser extent the use of forests.

5.2 Price distortions impede recycling

This report has pointed to a number of areas where market prices paid by paper producers do not fully reflect costs to society. Some of the factors involved may not be large individually, but they all work in the same direction to reduce incentives to recycle. They are:

. waste management prices that are too low and therefore reduce incentives for households and businesses to recycle;

. prices of pulpwood that are too low and discourage the use of alternative feedstocks (including wastepaper); and

. the high transport and handling costs in Australia which reduce the incentive to move wastepaper for recycling within Australia and to overseas markets.

There is the further constraint that state and federal policies in the United States, have lead to surpluses of wastepaper, especially old newspapers, which have been exported at effectively subsidised prices to the point where we have difficulty in holding export markets.

What can Australian governments at all levels do to solve these problems?

Overcoming inefficiency in waste disposal

Waste management charges do not give users clear signals as to the real costs of paper disposal. This results from the way charges are levied as well as their level. Council garbage collections are generally funded by taxes. This means that ratepayers are not charged according to the quantities of waste disposed of. Information about the state of the wastepaper market is therefore not passed on to waste generators to influence their behaviour. However, this issue involves a wider range of products than paper. It will be considered in the Commission's main report on recycling.

Getting the level of charges right is also important. The Commission is not yet able to estimate the extent of underpricing of waste management services (this will be attempted for the main report on recycling) but the information available suggests that it is substantial. This encourages people to discard paper rather than collect and sort it for recycling.

The fall in prices of old newspaper in 1989 led to collection services run by local governments, voluntary groups, and commercial interests becoming less viable on a strictly commercial basis. Some collections have been abandoned and others subsidised by local governments.

Some local governments have seen collection subsidies as an economic option where the costs can be set against tipping costs of $30 to $50 per tonne, as in Sydney and Melbourne. The subsidies that have come to the Commission's attention have not been anywhere near that level. The subsidy required would increase as prices of wastepaper fall, but should not exceed the full costs of disposing of the paper as waste. Otherwise there would be an inefficient over-expansion of recycling. This principle should apply whether the paper is recycled in Australia or overseas. In areas where the real costs of waste disposal are low, considering both economic and environmental factors, the best option may be to bury the paper in landfill.

Increasing waste disposal charges to fully reflect their costs is primarily a responsibility of local government, but 'rate-pegging' by State governments may inhibit local government waste management reforms. Another impediment is the small size of many local governments. Individually they may be too small to reap the economies of scale that are available from modern waste management technologies. One solution is for councils to band together in regional groups as happens in Victoria.

Another is the development of a central agency like the New South Wales Metropolitan Waste Management Authority which operates all tips and transfer stations in Sydney. Another approach is through local government amalgamation such as that which formed the Brisbane City Council.

Underpricing of pulpwood

The relative prices of woodpulp and recycled pulp influence the extent of paper recycling. In countries where woodpulp is relatively dear and recycled paper is cheap, such as Japan and Germany, there are stronger incentives to recycle than in countries where woodpulp is cheap and wastepaper is expensive. In Australia, at current pulpwood prices, the fibre cost of wastepaper far exceeds the cost of wood fibre at least for mechanical pulp (refer Chapter 3). This is compensated to some extent by the lower electricity requirements for recycling, but a purely commercial decision to make recycled newsprint would have to be marginal at best.

Given our supply of wood compared with a fibre-poor country like Germany, it is not surprising that wood fibre is relatively cheap in Australia. However, this appears to be exacerbated by policies of governments which have encouraged the supplies of timber and the underpricing of pulpwood.

Underpricing is probably more pronounced for the use of native forests. However, only a sixth of total fibre used in Australian paper making comes from broadleaved (predominantly eucalypt) pulpwood. Pulpwood comes mainly from plantation thinnings, which are by-products of sawlog production and silviculture. Underpricing and forest management practices which increase the supply of sawlogs also increase the supply of pulpwood and encourage the use of virgin wood fibre instead of recycling.

The practical impact of underpriced pulpwood may well be greatest when decisions are made about mill locations. Once a mill is sited close to the pulpwood source, the use of recycled fibre becomes much less economically attractive.

The management of Australian forests is closely linked to sawlog production. It is there that any underpricing would need to be addressed. Without such fundamental reform, increasing the rate of recycling will affect the use of pulpwood or alternative fibre sources like imported pulp, but will not affect the rate at which trees are cut down.

As in waste management, there is no substitute for getting prices right in the first place. However, the effect of an increase in the price of wood could be complex. It could reduce the demand for timber but also encourage private plantations, which would alter the sourcing of pulpwood in the longer term. In the more immediate future, with mills relatively tied to particular types of pulp, the scope for change is probably small.

5.3 Commonwealth Government initiatives

Wholesale sales tax

Since January 1990 a sales tax exemption has applied to printing and writing paper, tissue and toilet paper, and paper bags, made wholly from recycled paper. Although many participants supported the exemption, others expressed doubts about its effectiveness in encouraging recycling and about the wider effects of sales tax exemptions.

The sales tax treatment of paper

Goods produced in Australia or imported for domestic consumption are subject to sales tax at the rate of 20 per cent unless exempted or specified to be taxed at another rate. The sales tax is levied on the wholesale price of the goods. 'Aids' to manufacture such as materials and plant and equipment are exempt from sales tax.

Most paper is used as an input to the production of other goods. In these applications, paper is free of sales tax, though many products in which it is incorporated are taxable later in the production chain. 'Cultural' publications such as books, magazines and newspapers are also free of sales tax, and so is the paper used to print them.

The main paper products subject to tax are final consumer products such as stationary and tissue lines, and packaging and commercial papers used by industry in non-exempt applications.

These include office and printing papers and wrapping papers.

When is paper 'used' or manufactured?

Higgins Trading Company Pty Ltd (Higgins) converts unprinted waste newsprint into packaging paper. The company requested that its product, which is currently taxed at 20 per cent, be exempted from sales tax. Higgins said that as unprinted newsprint is a used product it should not be taxed. However, the Australian Taxation Office (ATO) has ruled otherwise. Higgins said its market share has declined because it now experiences greater competition from smaller operators who evade sales tax arrangements and from alternative packaging such as polyethylene bags.

Higgins said that its problems are compounded by an ATO ruling that it is reprocessing the newsprint and not manufacturing a new product. Therefore it has been denied manufacturing status which allowed it to claim sales tax exemption for all its 'aids to manufacture'. Higgins requested that its status as a manufacturer be restored to assist it in the recycling of wastepaper.

The issue of exemption for 'aids to manufacture' has been fraught with disputation for many years. As long as the sales tax legislation exempts from tax goods used in particular production processes, such as `manufacture', rather than all production processes, disputes over where the line should be drawn are inevitable. Arbitrary divisions between taxable and exempt products are to be expected where similar products are classified to different sales tax categories and attract different rates of tax. These are very broad issues which cannot be resolved in this inquiry.

Effects of the exemption on recycling

Some types of paper are more amenable to recycling than others because of the type of pulp from which they are made. The inevitable degradation of the fibres during recycling means that printing and writing papers are technically the least suitable types of paper to be produced from recycled materials. However, waste printing and writing papers are in high demand to be recycled into other types of lower grade papers such as packaging.

APM argued that the sales tax exemption is not an efficient mechanism to encourage paper recycling. It increases the already high demand for high quality wastepaper, increases its price, and distorts the efficiency of its use. The company said that the properties needed in a high quality paper product, for example strength and brightness, are a constraint on the amount of recycled paper that can be used in its production. Some virgin fibre is required to instil these attributes.

APPM also said the sales tax exemption will not increase the use of wastepaper because it is confined to products of limited application. For example, the 100 per cent recycled paper produced by APPM is not suitable for high-speed conversion into stationary products or envelopes. The company said government initiatives to increase the use of wastepaper should focus on increasing the demand for paper products with wide applications and which are suitable for recycling.

Pratt, however, argued that the sales tax exemption could be used to increase the rate of paper recycling. It said that extension of the exemption to include packaging when incorporated in other goods 'would encourage the use of packaging which has been manufactured wholly out of recycled wastepaper and also ensure that Australia's native forests are afforded some protection.' The Commission notes that separate tax treatment of particular inputs once incorporated in a product would be a radical departure from the current sales tax.

Pratt also advocated that the exemption be extended to packaging wholly made from recycled paper. APM, however, said that administration of the scheme would be complicated further if the exemption were extended to paper packaging or to papers containing varying proportions of wastepaper.

The sales tax exemption on certain paper products wholly made from recycled paper is unlikely to do much to increase the utilisation of wastepaper. Indeed, it is likely to have some adverse effects on paper recycling. It will distort consumer choice in favour of products that have limited application and limited potential for recycling. It does nothing to encourage greater recycling of newsprint, the major issue identified in the inquiry. If it does stimulate more paper recycling in those uses, it will increase the price of high grade wastepaper. This will increase costs for traditional paper recyclers. Inefficient uses of high grade wastepaper would be encouraged at the expense of more efficient uses.

Report by the Commonwealth Department of Administrative Services

A 1990 report by the Commonwealth Department of Administrative Services (DAS 1990) looked at government procurement policies and the use of recycled paper. It advised on technically appropriate applications for recycled paper, on the establishment of a Commonwealth Government office paper recycling scheme, and an education campaign for Commonwealth employees. The report considered that papers with 50 to 80 per cent recycled content were likely to have wider application than those with 100 per cent recycled content. It noted that no official quality standards have been set for paper (virgin or recycled) in Australia, and recommended that standards be devised for technical specifications and testing of performance.

The report concluded that changes in government purchasing policies are unlikely to significantly change the paper recycling situation in Australia. Total government paper consumption amounted to between 33,500 and 83,700 tonnes per annum in 1984, equivalent to only between 1.7 and 4.4 per cent of total Australian paper consumption.

The summary and conclusions of the report have been widely circulated. DAS has also been implementing the report's recommendations that the Commonwealth should:

. actively promote the use of recycled paper for suitable applications by departments and authorities and by the Parliament;

. demonstrate commitment by using its buying power to obtain the best possible price for recycled paper and to increase the range of products available;

. issue policy and good practice guide-lines to its users of recycled paper so that it is clear when the use of recycled paper and paper products is appropriate and when it is not;

. identify with recycled paper by taking every opportunity to label products used as 'recycled';

. pursue an active, national policy of recycling paper from Commonwealth offices.

. encourage all departments to adopt a preferential purchasing policy towards products made from recycled materials;

. encourage all departments to adopt recycling, with the major focus on paper, glass, metal, plastic and lubricating oil; and

. ask all departments to comment on what costs will be incurred if government departments are asked to pay more for recycled products, even if they are more expensive than those made from 'virgin' materials.

Research

Many participants argued that publicly funded research is needed to assist paper recyclers to overcome technical constraints and to develop new products. Some said that the Commonwealth Scientific Industrial Research Organisation (CSIRO) was the appropriate research body. Some of the research into pulp and paper technology currently undertaken by CSIRO is referred to in the Commission's parallel report *Pulp and paper: bleaching and the environment.*

Greenhouse Action Alliance suggested the setting up of a National Pulp and Paper Commission. Among other activities this body would collect industry funds, some of which would be used to finance initiatives to increase the level of paper recycling.

The paper manufacturing industry itself may undertake little research if market conditions do not provide the incentive to do so. When these conditions have changed, as they appear recently to have done with respect to newsprint, industry has responded. Considerable research has been undertaken into de-inking and, as noted in Chapter 3, the major newspaper publishers are establishing a secretariat to undertake research into newsprint recycling, among other activities.

Paper producers may not have an incentive to undertake recycling if promotion of traditional paper products is more profitable. There are, however, incentives for others, such as some importers and exporters of European technology, to make the technology available. And they are doing so.

As part of its policy on pulp and paper, the Commonwealth is funding research into organochlorine and other pollution from pulp mill effluent. This report has shown that the organochlorine issue also arises from recycling.

In addition, there is the question of salt in inland waterways. Such research would be of benefit to the general community and is unlikely to be undertaken in the absence of public funding. Furthermore, in an area as contentious as this, it is important that the research be seen to be impartial and on a broader front than one type of feedstock or production technology.

5.4 State Government initiatives

Production assistance

A number of participants advocated assistance for recycling activities. Such assistance could take many forms, from special import duty concessions for recycling equipment to subsidised research, electricity or wastepaper transport.

Electricity, water and rail transport subsidies have been common forms of incentives offered by State Governments to encourage firms to set up within their State, particularly in non-metropolitan regions. To date assistance of this kind has favoured virgin pulp production.

The provision of assistance to recycling might seem merely a question of equity. But giving assistance to one activity to compensate for assistance to another leads to inefficient resource use and unforeseen and arbitrary outcomes. Encouraging the establishment of enterprises dependent on government support does not make good economic sense.

Wastepaper is a raw material for which new and innovative uses are being developed. There are sound commercial reasons for some firms to undertake the investment. For others, the commercial justification is strengthened by the perception that their existing markets for paper products will be in jeopardy unless they are seen to respond to the community's growing concern for recycling. Such projects are likely to proceed without government assistance. Indeed, some industry participants unequivocably rejected the need for assistance. In discussing ANM's proposals to recycle waste magazines and newspapers, the representative of News Ltd said 'We have argued consistently that we see the challenge, we will meet it and we will fix it.'

Some of the smaller projects may not eventuate. Some may succeed initially, but have difficulty in competing when prices paid for wastepaper eventually recover. There was evidence that if all the proposed projects were undertaken, the requirements for wastepaper would exceed any realistic assessment of the supplies available in the near future. Government assistance now could add to these problems later. Of special concern would be government assistance to projects which have been planned solely in expectation that governments will (as in the United States) intervene in ways which create a captive market for the firms concerned.

From an environmental point of view, the case for government intervention is no better. The main environmental benefits of greater recycling stem from reducing waste and conserving trees. Both of these objectives are best addressed by direct measures to reform pricing and management practices. The other environmental issues concerned with recycling - pollution and energy consumption - do not unambiguously favour recycling. The way to reduce energy use is hardly to subsidise electricity and transport!

5.5 Recycling targets

Currently there are no targets for the recycling of paper in Australia. However, a number of participants advocated voluntary targets of the type now applying in Victoria for certain beverage containers. The Victorian Government referred to the possibility of encouraging, or if necessary mandating, fixed percentages of recycled material in products. The Tasmanian Conservation Trust proposed the imposition of mandatory minimum recycled content levels for paper, which would start at 10 per cent and increase yearly, say by 10 per cent, until optimum levels are achieved.

In advocating recycling targets, participants frequently compared Australia's recycling performance unfavourably with achievements overseas. However, as discussed in Chapter 1, comparisons of recycling activity between countries reveal little about the policies needed to encourage efficient resource use and protection of the environment in Australia.

Each country is unique in terms of its fibre supply and the other determinants of its paper product mix.

The optimal level of paper recycling will vary between States, between urban and rural areas, and between individual industry applications and plants, so that a blanket adoption of targets would inevitably create distortions. In the short term, production targets simply could not be met as significantly increased recycling requires substantial investments which take time.

Targets set for the production of recycled papers would not address the reasons identified in this report for recycling levels probably being lower than is socially optimal, that is underpricing of waste disposal and pulpwood. Nor would targets for the consumption of recycled paper. Indeed, they would create further inefficiencies by distorting consumption patterns. If paper producers responded by setting up production which could not be justified without government support and a mandated market, production inefficiencies would be added to the consumption inefficiencies. If they did not, the recycled paper required to meet the targets would be sourced from imports. As Australia now imports a substantial proportion of its paper needs, generally for higher quality papers, consumption targets directed at lower quality paper could increase the dependence on imported paper.

In referring to the distortions that could follow from mandatory targets PATEFA said '... if there were to be regulations that required a printed or paper converted product to be manufactured from 100 per cent or indeed some other percentage of recycled fibre, then there is every incentive to act as highly protected manufacturers often do - that is, less efficiency, at higher cost, charging higher prices'.

Publishers such as News Ltd and John Fairfax argued strongly that there should be no mandated solutions to the problems of waste and paper recycling. They supported ANM's proposal to produce newsprint with a substantial proportion of de-inked pulp but claimed that if a mandated recycled content were set too high newspapers would be less attractive as an advertising medium. This would result from the poorer quality of colour printing and a potential loss of readability of classified advertising. The viability of newspaper production was said to be at risk because advertising accounts for two-thirds of total revenue from publications and 44 per cent of the space used in them.

News Ltd claimed that other media do not and cannot supply the community services which newspapers supply. Classified advertisements provide the community with the ability to use inexpensive small advertisements, to give notices of community and social events and to buy and sell goods and services. Any reduction in the availability of newspapers would mean a reduction in social welfare through the loss of such services, in addition to any direct loss to newspaper producers and distributors.

Australia can gain some insights from United States experience with mandatory targets (refer Appendix F). The imbalances and distortions which have been evident in the United States stem from a mix of government incentives. However, in Connecticut a task force studying ways of achieving greater use of recycled newsprint has called for overturning of legislation which previously set mandatory targets for the recycled fibre content of newsprint. The task force has recommended that newspaper proprietors should instead be asked to gradually increase recycled fibre content to 50 per cent by 1999 and the definition of recycled newsprint be widened to allow a combination of both secondary and virgin fibre in its secondary fibre content.

The Commission considers that government interventions to mandate certain required levels of recycled fibre contents of paper products would run the risk of encouraging inefficient forms of recycling which would invoke economic loss to the community, inadequately conserve resources and inappropriately protect the environment. If a higher level of paper recycling is considered desirable in order to reduce the pollution created by wood pulp production, to lower the rate of landfill use, or to reduce the level of exploitation of native forests, then the application of specific measures to those issues will be a more efficient means of achieving community objectives.

Government office collections

Most State Governments require or propose to require that waste office paper be retained for recycling. In South Australia, wastepaper is collected from departments and sold to contractors. In Victoria, office waste collection schemes are running in several departments and are to be extended.

In Tasmania a policy is being developed to co-ordinate the collection of wastepaper from departments, while in Western Australia the Government is to work towards 100 per cent recycling of government wastepaper. In the Northern Territory a number of departments dispose of their wastepaper through collection contracts.

Office collections involve used printing and writing paper, which is high quality waste for which there is a significant market in Australia. The policies help promote recycling and do not appear to impose any economic cost beyond those involved in gathering together wastepaper.

A number of the States also encourage their agencies to use recycled paper. New South Wales and Victoria have policies which give a preference to recycled paper. Other States encourage its use only if it is competitive in price and quality.

Consumer education

Many State (and Commonwealth) agencies have released educational material to promote recycling of paper and recycling in general.

The Government of New South Wales is to circulate a Waste Management Authority brochure 'Recycling in NSW' to householders throughout the State. The Victorian Government's 'Maximum Plan for Minimum Waste' includes the production of education kits. In order to develop views and plans for newspaper recycling, the Victorian State Government's Environmental Protection Authority (EPA) has established a Newspaper Recycling Advisory Group, the membership of which includes State officials and newspaper publishers. The Western Australian Government's publication 'You Can Recycle It' contains general information about recycling, as well as details of State Government initiatives and plans with regard to recycling of paper and other waste products and of industry, local authority, school and voluntary initiatives in this area.

5.6 Interim assistance

The key to further recycling of newsprint is de-inking. But investment in new de-inking plants will take two to three years to come on stream. This was highlighted by a number of participants who called for government initiatives to maintain the momentum already established in community recycling schemes.

The interim measures suggested by Greenhouse Action Australia (GAA) of Melbourne were typical of many put forward by environmental groups. GAA observed that problems in disposing of one material (such as paper) can endanger the viability of collection services. The group argued that:

> Community interest in recycling must be maintained if the required supply of paper is to be generated for furnish in new plants. ... residents hearing stories of collected paper being destroyed are becoming cynical about participation in local government kerb-side collection schemes.

In response to the deterioration in the market for waste newsprint, the then Victorian Minister for Planning and Environment canvassed the idea of a $3 per tonne levy on the price of newsprint sold in Victoria. The levy would be used to subsidise, by about $20 per tonne, the export of waste newsprint - the intention being to increase exports from Victoria by about 1000 tonnes per month. The levy was described by the Minister as a short term measure, pending the build up in demand which will precede the operation of a de-inking plant.

Is interim assistance needed?

Markets for most categories of wastepaper generated by industry remain firm. Participants reported few problems in marketing clean, segregated papers of the type conventionally used in the packaging industry. High quality (writing and office) papers also remain in strong demand and are finding additional outlets in the manufacture of office papers and tissues. There nevertheless remains the problem of waste newsprint.

Clearly community support for paper recycling has been dampened, but the response of local councils to the depressed market for wastepaper has not been uniform. Some near city councils have found it profitable to maintain paper collections, if only to avoid the cost of landfill disposal. Some have maintained the service only for the duration of current contracts. Others have already terminated door to door collections.

The temporary eclipse of paper collections need not put in jeopardy the collection of other recyclables. Indeed, collections of glass and aluminium beverage containers have frequently underpinned the collection of paper and they can continue in their own right. In any event many councils will continue to collect wastepaper and to find rewarding outlets. Their opportunity to do so may well be influenced by the response of other (perhaps more remote) councils.

There is a danger that community groups will be encouraged to commence or maintain collections that are not justified on either economic or environmental grounds. In so doing they could jeopardise the viability of collections elsewhere. The dumping of wastepaper can be the most efficient and environmentally sound response if the transport and associated energy costs are too high to move the paper to a recycling facility or export market.

Are export subsidies an answer?

Subsidies could impede the commercial arrangements to collect wastepaper for the new Albury and Boyer recycling facilities. These plants will draw their supplies from the south east corner of the country, the only area where there is currently a substantial surplus of old newspapers. Exports of old newspapers from Perth and Sydney are substantial already without government support.

ANM has indicated that it intends to establish long term contracts for the supply of wastepaper. In the process of developing these contracts, some exports may be involved. Export subsidies would artificially raise the price of waste newspapers and divert them from other uses at some cost to these and other recycling initiatives.

Export subsidies would do nothing to overcome the impediments to export caused by high freight rates and the costs and delays on the waterfront. Government attention to these issues would improve the competitiveness of all our exports, not just exports of paper for recycling.

Appendix A: Terms of reference of Related Inquiries

I. RECYCLING OF PRODUCTS

I, PAUL JOHN KEATING, in pursuance of Section 23 of the Industries Assistance Commission Act 1973 hereby:

1. refer the question of recycling of products for inquiry and report by 28 February 1991

2. specify that the Commission report on

   (a) the current level and possible costs and benefits of recycling, both in terms of economic and environmental considerations

   (b) any institutional, regulatory or other arrangements subject to the influence of governments in Australia which affect the incentives to recycle or re-use products, and advise on their effects and on any appropriate changes to these arrangements

3. specify that the Commission is free to hold public hearings in advance of releasing a draft report and to take evidence and make recommendations on any matters relevant to its inquiry under this reference.

P. J. Keating
18 October 1989

II. PULP AND PAPER: BLEACHING AND THE ENVIRONMENT

I, PAUL JOHN KEATING, in pursuance of Section 23 of the Industries Assistance Commission Act 1973 hereby:

1. refer the following matters to the Commission for inquiry and report by 30 April 1990*:

    (a) the market prospects for, and technical feasibility of, unbleached and non-chlorine bleached paper products

    (b) community attitudes to the use of unbleached paper products

    (c) global trends in the substitution of unbleached pulp for bleached pulp

    (d) the prospects for using non-wood feedstocks in the manufacture of unbleached pulp

    (e) available evidence on the environmental impact of alternative bleaching technologies.

2. specify that a draft report on the matters under reference need not be prepared and that the Commission may take evidence and make recommendations on any matters relevant to its inquiry under this reference.

P. J. Keating
28 December 1989

*At the Commission's request, the Treasurer extended the report date for this inquiry until 21 May 1990.

APPENDIX B: THE INQUIRY PROCESS

The Commission received the reference for an interim report on paper recycling on 28 December 1989. It is part of the Commission's general inquiry into the recycling of products, the terms of reference of which were received on 18 October 1989. The Commission was also requested to report on Pulp and Paper: Bleaching and the Environment. The terms of reference for these related inquiries are reproduced in Appendix A.

Following receipt of the reference, the Commission called for submissions. Industry consultations were undertaken in all States in January and February 1990, and public hearings were held in Sydney, Melbourne, Brisbane, Perth, Adelaide, Hobart and Canberra during February, March and April 1990. Joint consultations and public hearings were held for the three related inquiries.

The names of organisations, companies and individuals consulted by the Commission are included in Appendix C. The names of participants who presented submissions are listed in Appendix D.

APPENDIX C: ORGANISATIONS, COMPANIES AND INDIVIDUALS CONSULTED

NAME	DATE	VENUE
Aspex Paper Australia Pty Ltd	22 January 1990	Sydney
Associated Pulp and Paper Mills	8 November 1989	Melbourne
Austissue	8 February 1990	Perth
Associated Pulp and Paper Mills	6 February 1990	Melbourne
Australian Conservation Foundation	9 February 1990	Perth
Australian Conservation Foundation	19 November 1989	Melbourne
Australian Conservation Foundation	27 November 1989	Sydney
Australian Consumers Association	27 November 1989	Sydney
Australian Council of Recyclers	8 November 1989	Melbourne
Australian Newsprint Mills Ltd	23 January 1990	Hobart
Australian Paper Manufacturers	29 November 1989	Sydney
	7 February 1990	Melbourne
	8 February 1990	Perth
Bowater Tissues Ltd	24 January 1990	Melbourne
	9 February 1990	Melbourne
Dr Bob Brown, MHA Tasmania	23 January 1990	Hobart
Bunnings Ltd	9 February 1990	Perth
CSIRO	24 January 1990	Melbourne
	8 February 1990	Melbourne

NAME	DATE	VENUE
City of Brunswick	8 November 1989	Melbourne
Conservation Council of SA	7 February 1990	Adelaide
Containers Packaging	8 November 1989	Melbourne
Department of Manufacturing and Commerce (Queensland)	5 February 1990	Brisbane
Department of Administrative Services (ACT)	17 January 1990	Canberra
Department of State Development (NSW)	14 February 1990	Sydney
Department of Environment and Conservation (QLD)	5 February 1990	Brisbane
Ecopaper Pty Ltd	27 November 1989 14 March 1990	Sydney Sydney
Environment Protection Authority (Victoria)	9 November 1989	Melbourne
Forestry Commission of NSW	22 January 1990 14 February 1990 14 March 1990	Sydney Sydney Sydney
Forestry Commission of Tasmania	23 January 1990	Hobart
Friends of the Earth (Fitzroy)	19 November 1989	Melbourne
Friends of the Earth (Sydney)	27 November 1989	Sydney
J. Gadsen Pty Ltd	6 February 1990	Melbourne
Golden Australia Paper Manufacturers Pty Ltd	9 February 1990	Perth
Green Recycling Company of WA	8 February 1990	Perth
Inner Metropolitan Regional Association	9 February 1990	Melbourne

NAME	DATE	VENUE
Kimberly-Clark Australia Pty Ltd	22 January 1990	Sydney
Leighton Group Process Services Division	3 May 1990	Canberra
Philip Morris Ltd	6 February 1990	Melbourne
Pratt Group of Companies	8 February 1990	Melbourne
Melbourne City Council	8 November 1989	Melbourne
Melbourne Metropolitan Board of Works	9 November 1989	Melbourne
News Limited	22 January 1990	Sydney
NSW Recyclers Association	29 November 1989	Sydney
Queensland Cane Growers Council	5 February 1990	Brisbane
Queensland Forestry Commission	13 February 1990	Brisbane
Recycling Company of WA	8 February 1990	Perth
SA Brewing Company Ltd	7 February 1990	Adelaide
SA Department of Environment and Planning	7 February 1990	Adelaide
State Pollution Control Commission (NSW)	27 November 1989	Sydney
State Pollution Control Commission (NSW)	14 February 1990	Sydney
Waste Management Commission (WA)	7 February 1990	Adelaide
Waste Management Authority (NSW)	28 November 1989	Sydney
Western Australian Office of the Cabinet	8 February 1990	Perth
Western Australian Department of Resources Development	30 January 1990	Canberra

NAME	DATE	VENUE
Western Australian Environmental Protection Agency	9 February 1990	Perth
Wilderness Society	6 February 1990	Melbourne
Woolworths Ltd	14 February 1990	Sydney

APPENDIX D: LIST OF PARTICIPANTS AND SUBMISSIONS

Company\Organisation	Inquiry[1]	Hearing Attended[2]	Sub No
ACI Glass Packaging	M	S	181
ACI Plastics Packaging	M	M	216
ACT Recycling Campaign	M,P,F	C	7
Advertiser Newspapers Ltd (News Limited)			65
Agricultural & Veterinary Chemicals	M	S	50
Alcoa of Australia Limited	M		239
Aldermen Alty and Bell - Hobart City Council	M		37
All Seasons Home Insulation Pty Ltd	P		232
Ankal Pty Limited	F		223
Ankal Pty Ltd.	P	S	168
Arisa Ltd	M,P,F	A	23
Aspex Paper Australia Pty Ltd.	P	B	172
Aspley Special School Recycling Station	M	S	192
Associated Liquidpaperboard Converters	P	M	97
Associated Pulp & Paper Mills	F	S	158
Associated Pulp and Paper Mills (Sydney)	P	S	193
Associated Pulp and Paper Mills (Tasmania)	F		221
Association of Fluorocarbon Consumers and Manufacturers	M	A	19
Austissue Pty Ltd	M,P,F	P	21
Australian Chemical Industry Council	M		119
Australian Conservation Foundation (Brisbane)	M	B	88
Australian Conservation Foundation	M,P	S	134
Australian Conservation Foundation (Portland Branch)	M		185
Australian Consolidated Press Limited	P	S	167
Australian Consumers' Association	M,P,F	S	145
Australian Council of Recyclers	M		179
Australian Glass Workers' Union	M	M	177
Australian Groundwater Consultants Pty Ltd	M		53
Australian Institute of Environmental Health	M		248
Australian Institute of Petroleum Ltd.	M	S	154
Australian Newsprint Mills Limited	P		218
Australian Newsprint Mills Ltd	P,F	H,M	90
Australian Newsprint Mills Ltd	P	S	194

Company\Organisation	Inquiry[1]	Hearing Attended[2]	Sub No
Australian Newsprint Mills Ltd (NSW)	F		224
Australian Paper Manufacturers	F		222
Australian Paper Manufacturers	P	S	144
Australian Paper Manufacturers	F	S	157
Australian Red Cross Society	M,P,F		71
Australian Refined Alloys Pty Ltd	M	M	92
Australian Soft Drink Association Ltd	M	S	131
Balranald Shire Council	M		4
Bathurst Conservation Group	M,P		136
BHP Steel	M	S	162
Bluhdorn Pty Ltd	M	S	195
Bowater Tissue Ltd	P	M	93
Brambles Records Management	P		249
Brian Stafford & Associates Pty Ltd	M,P	H	39
Brickwood Holdings Pty Ltd	M	M	72
Broken Hill City Council	M		141
Browning-Ferris Industries (Australia) Pty Ltd	M		211
Bunge Bioproducts Pty Ltd	M	M	215
Bunnings Ltd	P	P	22
Bureau of Rural Resources	F	S	147
Cabinet Office of NSW	M,P		178
Caring for Creation	M,P		197
Ms Patricia J Carter	P		208
Cellulose Industries Pty Ltd	P	M	81
Centre for Human Aspects of Science and Technology	M	S	121
City of Altona	M		241
City of Box Hill	M	M	98
City of Brunswick	M,P	M	84
City of Croydon	M		205
City of Devonport	M		126
City of Fitzroy	P		109
City of Footscray	M		44
City of Fremantle	M,P,F		30
City of Gosnells29	M,P,F	P	29
City of Happy Valley	M	A	35
City of Malvern	M		9
City of Prahran	M	M	91
City of South Melbourne	M	M	96
City of St Kilda	M	M	229
City of Wagga Wagga	M		129
City of Waverley	M	M	75
City of Werribee	P,F		17
Clough Engineering Group	M	P	33

Company\Organisation	Inquiry[1]	Hearing Attended[2]	Sub No
Coca-Cola Amatil Limited	P		180
Columbus Corporation Pty Ltd	P	P	54
Comalco Limited	M	S	146
Commercial Polymers Pty Ltd.	M		184
Conservation Council of SA	M	A	63
Conservation Council of the South-East Region and Canberra Inc	M,P,F	C	58
Coolum Wastebusters	P	B	128
Corkhill Bros Sales Pty Ltd	M	C	42
CRA Limited	M	S	169
Crooks Michell Peacock Stewart Pty Limited	P	M	209
Crooks Michell Peacock Stewart Pty Ltd	P	M	100
CSIRO - Division of Building, Construction and Engineering	M		108
CSIRO - Division of Forestry and Forest Products (Dr G Gartside)	P,F	M	107
CSIRO - Division of Forestry and Forest Products	P,F	M	83
CSIRO - Division of Tropical Crops and Pastures	F		182
CSR Ltd	F	B	14
David Syme & Co. Ltd	P	M	86
Davies Bros. Ltd (News Ltd - Hobart)	P	H	64
Department of Administrative Services	M,P,F	C	61
Department of Immigration, Local Government & Ethnic Affairs	M		190
Department of Primary Industry & Fisheries (Northern Territory)	F	S	166
Department of the Arts, Sport, the Environment, Tourism and Territories	P	C	24
Department of the Arts, Sport, the Environment, Tourism and Territories	P,F		242
Department of State Development of NSW	P		244
District Council of Minlaton	M		6
District Council of Orroroo	P		10
Dr Andrew J. Katelaris	F	S	114
Dr Glenn Watkins (University of WA)	M	P	62
Drum Reconditioners (NSW) Pty Ltd	M	S	201
Eastern Regional Refuse Disposal Group	M		135
Ecopaper Pty Ltd	M,P,F	S	106
Enterprise Metals (CRA) (confidential)	M	S	105
Esperance Shire Council	M		55
F.T. Wimble & Co. Limited	P	S	163
Forestry Commission of NSW	P	S	155

Company\Organisation	Inquiry[1]	Hearing Attended[2]	Sub No
Fractionated Cane Technology Ltd	P,F	B	124
Friends of the Earth (Fitzroy)	M,P,F,	M	73
Friends of the Earth (Fitzroy)	M		238
Friends of the Earth (Perth)	P		183
Friends of the Earth (Melbourne)	P,F	M	101
Friends of the Earth (Sydney)	P	S	103
Friends of the Earth (Sydney)	M	S	191
Geelong Waste Management Committee	M		176
Gosford City Council	M	S	110
Great Lakes Environmental Association	M		246
Greenhouse Action Australia	P	M	102
Hastings Environment Council	M		140
Herald and Weekly Times Ltd			
Higgins Trading Company Pty Ltd	P	B	115
Higgins Trading Company Pty Ltd.	P	S	161
Hobart City Council	M	H	27
Holroyd Municipal Council, Merrylands - Mr Peter Rimmer	M		48
Intershred Pty Ltd	M	S	152
John Fairfax Group Pty Ltd	P	A	60
John Fairfax Group Pty Ltd	P	S	153
Keep Australian Beautiful Council (Qld)	M	B	68
Kempsey Shire Council	P,F		13
Kesab Inc	M,P	A	16
Kimberly-Clark Australia Pty Limited	P	S	170
Kimberly-Clark Australia Pty Limited	P,F		220
Mr David Kuhne	P		18
Ku-ring-gai Municipal Counci	M	S	143
Leighton Group (Process Services Division)	P		226
Litchfield Shire Council	M		113
Ms Janet Mackenzie	M		207
Mackay Sugar Co-operative Association Ltd	F		133
Maleny Waste Busters	M,P	B	120
Manly Municipal Council	P		230
Marine Collectors Association	M		204
Marrickville Municipal Council	P,F		12
Minister for Natural Resources (Dept. of Lands)	P		202
MRI Pty Ltd	M		187
Municipality of Deniliquin	M		233
Murdoch University - Dr Ho	M		200
Muswellbrook Shire Council	P		5
Nambucca Valley Association	M		77
National Association of Forest Industries Ltd	P,F		237

Company\Organisation	Inquiry[1]	Hearing Attended[2]	Sub No
Nationwide News (News Ltd - Perth)	P,F	P	31
Neutralysis Industries Pty Ltd	M	B	112
News Limited	P,F	P	32
News Limited	P	S	198
News Limited	P	S	171
News Limited - Melbourne	M,P	M	99
News Limited – Sydney (Mirror Australian Telegraph)	P	S	159
Nonferral Pty Ltd	M		206
Norstar Steel Recyclers	M		188
North Coast Environment Council	M,P		186
North Sydney Municipality	M	S	139
Northern Regional Refuse Disposal Group	M,P,F		52
NSW Recyclers Association	P	S	70
of South Sydney	M	S	87
Oil and Chemical Industries Pty Ltd	M	B	148
Mr R J O'Reilly	P		225
Mr R J O'Reilly	M		59
Outer Eastern Municipalities Association	M		247
Pacific Waste Management	M		125
Packaging Council of Australia Inc	M,P		212
Paper & Pulp International (Confidential)	F	P	26
Paper-go-round	P	S	175
People Against Dioxins in Sanitary Products	P,F	S	156
Plastics Industry Association	M		89
Pratt Group	P	S	150
Printing and Allied Trades Employers Federation of Australia	P,F	S	165
Public Record Office of SA	P,F		25
Public Record Office of Victoria	M,P,F		51
Queensland Bagasse	P,F	P	45
Queensland Press Ltd (News Ltd - Brisbane)	P	B	151
Queensland Wilderness Society	M	B	104
Rainbow Alliance	M	M	78
Re-Solv Liquids	M		231
Recycle Aid	M	A	47
Recycling & Treatment Industries Assoc	M,P,F	P	34
Regional Dailies of Australia Ltd	P	M	217
Robinvale Co-ordinating Group	M,P		15
Shire of Ballarat	M	M	82
Shire of Eltham	M		117
Shire of Gisborne	M		43
Shire of Hastings	P,F		213
Shire of Marong	M		189

Company\Organisation	Inquiry[1]	Hearing Attended[2]	Sub No
Shire of Rochester	M		74
Shire of Swan	M		56
Shire of Victoria Plains	M		11
Shire of Wangaratta	M		1
Mr Lance C. Simpson	M		127
Simsmetal Ltd	M		122
Smorgon Glass	M		240
Smorgon Plastics	M	S	160
Ms J B Stokes	P		199
South Australian Waste Management Commission	M	A	67
South Coast Co-operative Dairy Assoc. Ltd	M		85
South Eastern Regional Refuse Disposal Group	M		235 236
Southern Region of Councils	M		79
Southern Tablelands Regional Councils	M	S	149
Spree International Pty Ltd	M	S	142
Stationery Manufacturers of Australia	P,F	S	138
Superburn	M,P		214
Mr Algis Sutas	M		76
Tasman Pulp & Paper Company	M,P		46
Tasmanian Conservation Trust	M	H	28
Tasmanian Government	M,P	H	49
Tetra Pak Pty Limited	M,P		210
The Australian Brass Extrusion Industry Group	M	S	196
The Brady Group of Companies	M	S	173
The City of Noarlunga	M		234
The Council of the City of South Sydney	M	S	87
The Council of the City of Lismore	M	S	80
The Council of the City of Sydney	M		130
The District Council of Lameroo	M		57
The Environment Centre NT Inc	M,P		8
The Institution of Engineers, Australia	M	A	36
The National Paper Marketing Council of Australia	P,F	S	132
The Pratt Group	P,F		227
The Pulp & Paper Manufacturers' Federation of Australia Ltd	P,F		219

Company\Organisation	Inquiry[1]	Hearing Attended[2]	Sub No
The Pulp & Paper Manufacturers' Federation of Australia Ltd	P	M	94
The Pulp & Paper Manufacturers' … Federation of Australia Ltd	F	M	95
The River House Group Pty Ltd	F	P	20
The Wilderness Society	P	M	69
Tom's Trash Paks Pty Ltd	M		2
Toxic Chemicals Committee	P	S	137
Trans Asia Trading Co Pty Ltd	P	S	164
Tredex	P	H	66
Universal Understanding	P		118
University of Tasmania	P		38
Victorian Government (Premier of Victoria)	M		243
WA Municipal Association	M	P	40
Waste Not Pty Ltd	M	S	174
Wedderburn & District Environment Protection Association	M		203
Western Australian Government	M,P,F		228
Western Region Waste Management Authority	M		123
Western Regional Refuse Disposal Group	M		116
Wingecarribee Shire Council	M,P		3
Wollongong City Council	M		111
Women's Abode	M	C	41
Women's Environment Action Group	M		245

(1) The "Inquiry" column indicates the main focus of interest of the participants, ie M = Main Recycling inquiry; P = Interim inquiry into Paper Recycling; and F = Short term inquiry into Pulp and Paper: Bleaching and the Environment.

(2) In the "Hearing Attended" column, A indicates Adelaide; C = Canberra; H = Hobart; P = Perth; S = Sydney; M = Melbourne and B = Brisbane.

APPENDIX E: WOOD PULPING AND PAPER MAKING PROCESSES

PULPING PROCESSES

The production of pulp involves the breaking down of fibrous vegetable material by either mechanical or chemical means, or by a combination of both. Table E1 shows that a variety of pulping processes are used in Australia. The table also presents information about the location and capacities of pulp and paper mills, fibre feedstocks used and the type of bleaching undertaken. The following description assumes that woodchips are the primary source of vegetable material, though in the companion report on *Paper and pulp: bleaching and the environment*, non-wood fibre sources are discussed.

Chemical pulping

Chemical pulping breaks down the fibre source by dissolving most of the lignin. In this process, the woodchips are mixed with strong acids or alkalis, with or without pressure and heat. Various chemicals and processes can be used to produce different types of chemical pulp, for example, kraft, soda anthraquinone, and sulphite pulp.

Kraft pulping

Kraft pulp, sometimes referred to as sulphate pulp, is made by cooking woodchips under pressure with a hot alkaline chemical solution. Under these conditions the woodchips break down into cellulose fibres in a 'black liquor' consisting of dissolved wood substances and cooking chemicals. Much of the lignin is dissolved. The fibres are separated from the 'black liquor' by washing. The 'black liquor' is then concentrated and burnt in a furnace. This allows the cooking chemicals to be recovered for recycling and produces energy to drive the pulp mill.

The kraft process can be modified at various stages. For example, extended delignification or modified continuous cooking removes a greater proportion of lignin than conventional pulping, with consequent reductions in the amount of chlorine required if bleaching subsequently takes place. This and other modifications are considered in Appendix D of the companion report on *Pulp and paper: bleaching and the environment*.

Soda anthraquinone pulping

The soda anthraquinone pulping process is similar to the kraft process. However, sulphur chemicals are not used. Instead the pulping chemicals are caustic soda and soda anthraquinone.

Sulphite pulping

There are various kinds of sulphite processes. These are generally acidic and mainly use bisulphites of sodium, calcium or magnesium.

For most sulphite processes, recovery of cooking chemicals from spent liquors is more difficult than for the kraft and soda processes.

Mechanical pulping

Mechanical pulping separates the fibres by abrasive action, usually by passing woodchips between rotating metal discs (refiner groundwood). Other mechanical processes include stone groundwood and pressurised groundwood. Thermo-mechanical pulping involves the softening of lignin by heating prior to mechanical processing. Chemi-mechanical pulping involves a chemical pre-treatment to soften the woodchips (for example, with sodium sulphite) before mechanically pulping. The chemi-thermo-mechanical pulping process is similar to the chemi-mechanical process except that the chemically treated woodchips are mechanically pulped at high temperatures.

Because lignin is retained in mechanical pulps, these processes result in a higher pulp yield from pulpwood than do chemical processes. However, mechanical pulping requires a greater input of external energy per tonne of pulp produced.

Semi-chemical pulping

Semi-chemical pulping combines both chemical and mechanical methods. Compared with chemi-mechanical pulping, semi-chemical pulping makes greater use of chemical processes. It consists of chemically treating the wood prior to mechanical processing. Chemicals such as caustic soda or alkaline sulphite liquor act to partially delignify and break down the lignin bonding in the woodchips.

Semi-chemical pulping processes include neutral sulphite semi-chemical and cold soda pulping.

In neutral sulphite semi-chemical pulping, woodchips are briefly cooked with sodium sulphite and bicarbonate or carbonate until about half of the lignin is dissolved. Then the fibres are further separated by mechanical refining.

Cold soda pulps are made by pre-treating woodchips with sodium hydroxide at ambient temperatures before mechanical processing.

Table E1: **Pulp and paper mills in Australia**

Firm	*Mill location*	*Facility (tonnes per annum)*	*Pulp type*[a]	*Fibre feedstock*	*Bleaching process*	*Major products*
ANM	Boyer (Tas)	Intergrated mill. Ground-wood, CCS, thermo-mechanical pulping. Pulping capacity is about 290 000 tpa. Two paper machines. Paper making capacity is 224 000 tpa.[d]	Purchased kraft	-	Chlorine bleaching.[b]	Newsprint, directory, offset.
			CCS[c]	Eucalypt	Chlorine bleaching	
			Thermo-mechanical	Pine	Non-chlorine bleaching	
			Groundwood	Eucalypt	Non-chlorine bleaching	
	Albury (NSW)	Integrated mill. Thermo-mechanical pulping. Pulping capacity is about 185 000 tpa. One paper machine. Paper making capacity is 200 000 tpa.[f]	Thermo-mechanical	Pine	Not bleached.[e]	Newsprint

continued

Table E1: **Continued**

Firm	*Mill location*	*Facility (tonnes per annum)*	*Pulp type*[a]	*Fibre feedstock*	*Bleaching process*	*Major products*
APM	Maryvale (Vic)	Integrated mill. 250 000 tpa kraft pulp mill and 100 000 tpa NSSC pulp mill. Four paper machines. Paper making capacity is 280 000 tpa.	Kraft	Eucalypt	Some is chlorine bleached. Some is not bleached.	Wrapping and packaging papers.
			NSSC	Eucalypt	Not bleached.	
			Kraft	Pine	Not bleached.	
	Fairfield (Vic)	Paper mill. Three machines. Paper making capacity is 150 000 tpa.	-	Waste paper	Not bleached.	Wrapping and packaging papers.
	Botany (NSW)	Paper mill. One of two machines operating. Capacity is 170 000 tpa.	-	Waste paper	Not bleached.	Wrapping and packaging papers.
	Petrie (Qld)	Integrated mill. 29 000 tpa chemi-mechanical pulp mill. One paper machine. Paper making capacity is 100 000 tpa.	Chemi-mechanical	Pine	Not bleached.	Wrapping and packaging papers.

continued

Table E1: **Continued**

Firm	*Mill location*	*Facility (tonnes per annum)*	*Pulp type*[a]	*Fibre feedstock*	*Bleaching process*	*Major products*
APM	Port Huon (Tas)	NSSC pulping capacity is 94 000 tpa.	NSSC	Eucalypt	Not bleached.	NSSC pulp.
	Spearwood (WA)	Paper mill, 40 000 tpa	-	Waste paper	Not bleached.	Wrapping and packaging papers.
	Broadford (Vic)	Paper mill, 40 000 tpa.	-	Waste paper	Not bleached.	Wrapping and packaging papers.
	Millicent (SA)	21 000 tpa mechanical pulp mill. Paper machine closed.	Mechanical	Pine	Not bleached.	Mechanical pulp.
APPM	Burnie (Tas)	Integrated mill. 85 000 tpa soda. anthraquinone pulp mill and 10 000 tpa semi-chemical pulp mill. Four paper machines. Paper making capacity is 160 000 tpa.	Soda anthra-quinone Semi-chemical	Eucalypt/ pine blend Eucalypt	Chlorine bleaching. Chlorine bleaching.	Uncoated wood-free papers, base papers, coated wood-free base papers and boards.

continued

Table E1: **Continued**

Firm	*Mill location*	*Facility (tonnes per annum)*	*Pulp type*[a]	*Fibre feedstock*	*Bleaching process*	*Major products*
APPM	Wesley Vale (Tas)	Integrated mill. 36 000 tpa cold soda pulp mill, 7 000 tpa groundwood pulp mill. One paper machine. Paper making capacity is 70 000 tpa. Coating capacity 42 000 tpa.	Groundwood Cold soda	Pine Eucalypt	Non-chlorine bleaching Chlorine bleaching.[g]	Uncoated mechanical papers, telephone directory, coated mechanical and wood-free papers.
	Shoalhaven (NSW)	Paper mill with three paper machines. Paper making capacity is 70 000 tpa. [i]	- Soda	Waste paper Cotton linters	Chlorine bleaching. [h] Chlorine bleaching.	Uncoated wood-free papers and boards.
Austissue	Canning Vale (WA)	Paper making capicity 6 000 tpa.	-	Waste paper	-	Tissue paper.
Bowater	Myrtleford (Vic)	30 000 tpa mechanical pulp mill.[j]	Refiner mechanical	Pine	Non-chlorine bleaching	Mechanical pulp.

continued

Table E1: **Continued**

Firm	*Mill location*	*Facility (tonnes per annum)*	*Pulp type*[a]	*Fibre feedstock*	*Bleaching process*	*Major products*
Bowater	Box Hill (Vic)	Three current paper machines, one in construction, fourteen converting machines. 55 000 tpa paper making capacity.[k]	Pulp from the mill in Myrtleford and imported pulp.	-	-	Tissue paper and converted products.
Cosco	Ipswich (Qld)	Paper making capacity is 20 000 tpa.	Imported pulp.	-	-	Tissue products.
KCA	Millicent (SA)	Integrated facility. 54 000 tpa bisulphite pulp mill and 23 000 tpa thermo-mechanical pulp mill. Four tissue machines and conversion facilities. Paper making capacity about 100 000 tpa.	Bisulphite Thermo-mechanical	Pine Pine	Chlorine bleaching.[l] Non-chlorine bleaching.	Tissue paper and converted products.
The Pratt Group [m]	Reservoir (Vic)	One plant adjoining corrugating facilities.	-	Waste paper	Not bleached.	Packaging papers.

continued

Table E1: **Continued**

Firm	*Mill location*	*Facility (tonnes per annum)*	*Pulp type*[a]	*Fibre feedstock*	*Bleaching process*	*Major products*
The Pratt Group	Warwick Farm (NSW)	One plant adjoining corrugating facilities.	-	Waste paper	Not bleached.	Packaging papers.
	Smithfield (NSW)	Two plant adjoining corrugating facilities.	-	Waste paper	Not bleached.	Packaging papers.
	Coolaroo (Vic)	Two plant adjoining corrugating facilities.	-	Waste paper	Not bleached.	Packaging papers.

a) Unless otherwise stated, the pulp is produced at the mill site. Some of these mills use pulps purchased from other mills or imported. b) Chlorine bleaching is defined as bleaching with elemental chlorine and/or chlorine based compounds. c) CCS pulp is a cold soda pulp. d) ANM is investigating the installation of a recycling facility at Boyer that processes 65 000 tpa of waste paper. e) In addition to the de-inking facility, ANM is considering installing a hydrogen peroxide bleaching plant. f) ANM is proposing to install a de-inking facility at Albury that will use 90 000 tpa of waste newsprint and 40 000 tpa of waste magazines. Some of the recycled fibre will then be combined with the TMP in the manufacture of newsprint. Hydrogen peroxide treatment is an integral part of the de-inking process. g) APPM at Wesley Vale is currently examining the technical and economic feasibility of bleaching its cold soda pulp with hydrogen peroxide only. h) APPM is considering alternative non-chlorine bleaching methods. i) APPM is reviewing cotton linters pulping and bleaching at Shoalhaven. j) Bowater is intending to produce chemi-mechanical refiner pulp at Myrtleford from a blend of pine and eucalypt. This will be bleached with hydrogen peroxide. k) Bowater is increasing paper-making capacity at Box Hill to 105 000 tpa from late 1990. l) KCA intends to bleach its bisulphite stock at Millicent with hydrogen peroxide in 1990. m) The Pratt Group is proposing to make unbleached recycled newsprint in Victoria or New South Wales. This would require the construction of a de-inking plant. It is also proposing to make ‘white’ unbleached board from recycled paper.

Sources: Submissions and information supplied by participants

Pulp production and consumption

Table E2 shows domestic wood pulp production and apparent consumption for the years 1985-86 to 1987-88.

Apparent consumption increased by 9 per cent in 1987-88 compared with 12 per cent in 1986-87. Imports accounted for 23 per cent of consumption in 1987-88.

Very little pulp is exported and no break up is available.

Table E2: **Domestic Pulp Production and Apparent Consumption, 1985-86 to 1987-88,** ('000 tonnes)

Pulp type	*1985-86*	*Per cent of Total*	*1986-87*	*Per cent of Total*	*1987-88*	*Per cent of Total*
Production						
Mechanical	361	41	371	41	414	42
Chemical	517	59	534	59	580	58
Total[a]	878	100	906	100	994	100
Imports						
Mechanical	3	1	4	2	9	3
Chemical	220	99	257	98	274	97
Total[a]	223	100	261	100	283	100
Exports						
Total	20		48		57	
Apparent Consumption	1 080		1 119		1 221	

a) Totals may not add due to rounding.

Source: ABS publications, Production Bulletin No.6, Chemicals and By-Products Australia (cat. no. 8362.0), Imports Australia (cat. no. 5406.0), Exports Australia (cat. no. 5411.0).

PAPER MAKING

The production of paper from pulp may involve a number of processes. These include bleaching, stock preparation, sizing and adding fillers and/or colouring materials, and finishing processes.

Bleaching

Unbleached pulps contain lignin and coloured impurities. Bleaching improves the brightness of wood pulp as well as serving a purifying and softening function and increasing fibre stability.

While bleached pulps are used in packaging and newsprint to some extent, the major use of bleached pulps is in printing and writing papers and tissue papers.

Commonly used bleaching agents are elemental chlorine, calcium and sodium hypochloride, chlorine dioxide and hydrogen peroxide. Oxygen, ozone and nitrogen dioxide may also be used. Much of the environmental concern over pulp mill effluents relates to organochlorines discharged into the environment when chlorine compounds are used for bleaching.

Mechanical pulps, which contain a high volume of lignin and other coloured impurities, are bleached in order to brighten them. The brightness is not permanent and it does not increase the chemical stability of the pulp. These pulps are only suitable for products with short life spans such as newspapers, magazines, paper towels etc.

Bleaching of chemical pulps, which have already had most of the lignin and coloured impurities removed in the pulping process, is done mainly for purification and stability purposes. Paper products produced from fully bleached chemical pulp are suitable for long term storage.

Stock preparation

During this stage, pulps and fibres of different qualities are blended in proportions appropriate to the characteristics of the grade of paper which is to be produced.

Fibres are immersed in a water suspension and exposed to squeezing, beating, cutting and shearing actions to make them more flexible and improve their strength. Paper made from unrefined fibres is poorly bonded, weak and porous.

The resulting stock - fibres suspended in water in a concentration of 0.1 to 0.5 per cent by volume - is then fed on to a horizontally moving section of a paper machine. The water is drained and a sheet is formed by a system of press rollers. From the press rollers, the sheet passes to the drying section of the paper machine. At the end of the machine, the web of paper is wound into a large roll.

Sizing and fillers

Sizing materials reduce the absorbency of fibres making the product suitable for writing and printing. They also add strength and produce resistance to water and other liquids. This is particularly desirable for packaging materials.

These sizing materials can be added to the pulp during the aqueous suspension stage or to the surface of the paper while on the papermaking machine. There are a variety of acidic, neutral and alkaline sizes. Acidic conditions during the paper making process have the effect of accelerating paper deterioration. The process of pulping waste paper requires acidic conditions. This makes it unsuitable for use in the manufacture of paper required for long term storage.

Fillers are generally used for papers intended for writing or printing. They improve brightness, opacity, smoothness and ink receptivity. The most commonly used include china clay, titanium dioxide, calcium carbonate and zinc oxide. Calcium carbonate can also serve to neutralise acid and thereby improves resistance to ageing.

Finishing processes

Calendering is a treatment carried out on partially dried paper which improves the smoothness and gloss characteristics of the paper's surface.

The calender is a system of rolls which smoothes the paper at the dry end of the paper machine.

For a very high gloss, the paper - after leaving the paper machine - may be passed through a separate machine called a supercalender. Very smooth surface and gloss may be necessary for some reproductive and printing processes.

Coatings consist of a white pigment, such as china clay or titanium dioxide, suspended in an adhesive. A coating may be applied to both surfaces of the paper. Coatings improve surface smoothness, the definition of full-colour work and high quality printing. They also improve opacity, brightness and appearance.

APPENDIX F: SOME PAPER RECYCLING INITIATIVES OVERSEAS

NORTH AMERICA

Government initiatives

In the United States both state and federal government initiatives encourage paper recycling. A number of States have government procurement policies which give preference to paper products containing recycled fibre. Some of these policies are legislated; others are in the form of guidelines.

One form of legislation involves targets for the proportion of waste fibre used in paper products purchased. Another form provides for a percentage price preference for recycled paper products. One program sets a target level for consumption of recycled paper. Most schemes have been in place since the late 1970s or early 1980s. A number are combined with programs for selling office waste paper.

California has legislation requiring newspaper publishers to use at least 25 per cent recycled newsprint by 1 January 1991 and 50 per cent by the year 2000. The definition of recycled newsprint used is a 40 per cent or higher content of recycled fibre. However, publishers do not have to buy recycled newsprint if it costs more than new newsprint.

Major problems are reported to have been encountered due to an excess supply of old newspapers. This imbalance has arisen because States and municipalities have mandated the separation of used newsprint from other waste by consumers and its collection, without regard for the level of demand from paper mills. As a consequence used newsprint prices have fallen and many community recycling programs have been forced to shut down, with many recycling plants not accepting, or charging to take, old newspapers.

These difficulties have led to demands for the repeal or revision of existing legislation. In Connecticut a task force studying ways of achieving greater use of recycled newsprint has called for the overturning of a 1989 law which mandates that newspapers make 20 per cent of their newsprint consumption from recycled newsprint by 1993 and increase that to 90 per cent by 1998. The task force has recommended that newspaper publishers instead be asked to gradually increase their recycled fibre content to 50 per cent by 1999, and that the definition of recycled newsprint be widened to allow a combination of both secondary and virgin fibre in its secondary fibre content (Pulp and Paper Week 1990).

Government Procurement Policies

US Federal legislation of the 1970s specified that guidelines for procurement of paper products were to be developed by 1 May 1981. Delays led to a new deadline being set for May 1985. Apparently Federal agency use of recycled paper actually declined during the period 1976 to 1985.

Some States experienced problems with delays in delivery of recycled papers. Some schemes never got off the ground because of opposition from paper manufacturers, mainly in those States where paper mills did not utilise waste paper. However, in the printing and writing paper field, total government paper orders have often been too small for manufacturers to set up the necessary facilities. The variability in supplies of high grade waste paper and difficulties in achieving the quality required have also been cited by paper manufacturers as reasons why they have not set up recycling facilities.

Industry Initiatives

Fletcher Challenge Ltd, the world's largest newsprint producer, is planning to establish de-inking plants in British Columbia as is Bowater Inc. in Tennessee. Other companies are looking at the issue, and existing

producers of recycled newsprint such as Giant Group Ltd in California, owner of the Golden State newspaper recycling mill in Pomona, are considering further expansion.

However, of 12 new newsprint machines expected to come on stream in North America between now and 1991, only two are expected to use old newsprint as raw material. One of them will have a production capacity of 450 000 tonnes of newsprint a year.

Although the transport costs for used newsprint of mills located near cities are low - shipping costs of used newspaper are up to US$100/t for existing mill locations - problems of disposal of residual fibre and ink from the process are a major consideration, mitigating against the establishment of recycled newsprint mills in these locations.

Due to recent investment in newsprint production from virgin fibre, newsprint prices in 1989 fell some 20 per cent from their 1988 peak of US$650/t.

In the United States and Canada there are nine mills that produce recycled newsprint, producing some 2.2 million tons of newsprint or 13 per cent of industry capacity each year. Canada is the largest newsprint maker in the world and supplies about 58 per cent of United States newsprint requirements. Since Canadian newsprint mills would be disadvantaged by their location and consequent high transport costs in producing recycled newsprint, some shift in production towards the United States is anticipated as a result of US State and Federal Government measures to increase recycling of newsprint.

The Thorold Mill in Canada produces 50 per cent recycled fibre newsprint for the Chicago Tribune Newspaper. John Fairfax and Sons Ltd considered that this paper was well up to their own specifications in terms of whiteness and brightness.

WESTERN EUROPE

In the Federal Republic of Germany relatively high recovery and utilisation rates have been achieved, as indicated in Chapter 1. In 1987-88 the utilisation rate of wastepaper was 90 per cent for packaging and board, and 50 per cent for newsprint.

A major reason for these high levels of wastepaper incorporation is the high cost of wood pulp relative to recycled pulp, as indicated by figures submitted by Leighton regarding the Steinbeis mill in Table F.1.

Table F.1: **Production cost of recycled and virgin fibre, West Germany 1988**[a]

Type of pulp	*US$/ton*	*As % of de-inked pulp*
De-inked pulp	285	100
Mechanical pulp (groundwood in-house)	412	145
Bleached chemical pulp	765	268
Chemical pulp incl. refining	918	322

Source: Steinbeis

a) These are cost figures for a Steinbeis mill in 1988; the costs include both variable and fixed costs.

APPENDIX G: USE OF FORESTS FOR PULP AND PAPER PRODUCTION

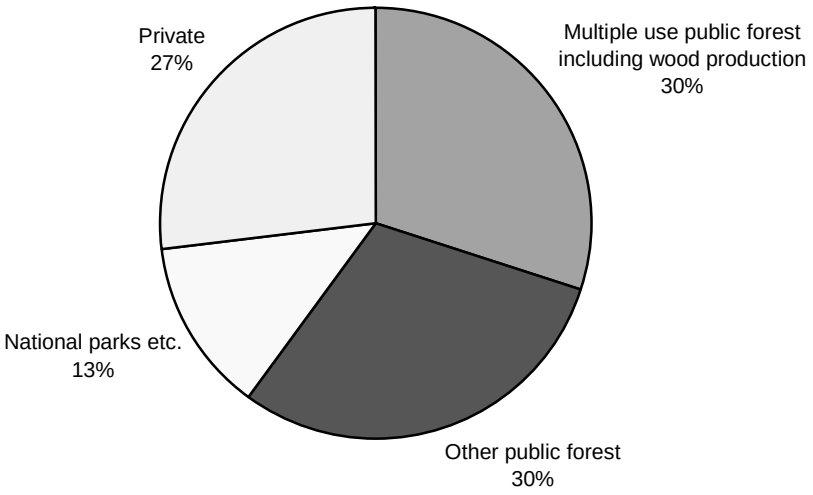
Seventy per cent of Australia's forests are under public ownership (see Figures G.1 and G.2), and a high proportion of pulp and paper producers' wood fibre is supplied from these public forests. The way in which State forest services allocate harvesting concessions, and the royalties they charge, can thus have important implications for the pulp and paper industry.

ACCESS TO FORESTS

Sources of fibre other than government controlled forests include private forests, wastepaper, non-wood feedstocks and imported pulp or woodchips. However, pulp and paper producers operate under long-term agreements for access to State forests. For example, most forest concessions in Tasmania are for an 80 year duration and are sanctioned by Acts of Parliament - Table G.1 gives details of Tasmanian pulpwood concessions. In Victoria, forest concessions are also bound by Acts of Parliament and are for durations of 30 to 40 years. In New South Wales pulp and paper producers are required to tender for long-term agreements, usually of 20 years duration, with the Forestry Commission for the supply of pulpwood. In South Australia, pulp and paper producers negotiate long term agreements with the Woods and Forests Department.

Some of the Tasmanian and Victorian agreements, for example Bowater's agreement, have provisions for the separate supply of sawlogs and pulpwood, and have to comply with forestry guidelines which classify sawlogs and pulplogs on physical criteria. Thus they provide no flexibility for pulp and paper companies to alter the ratio of sawlogs to pulplogs in response to a change in their relative prices. In South Australia, pulplog prices are set equivalent to the lowest price for sawlogs. This inflexible use of forest resources is avoided on private plantations. For example, ANM has used sawlogs from its plantation in southern Tasmania for pulpwood when warranted by market conditions.

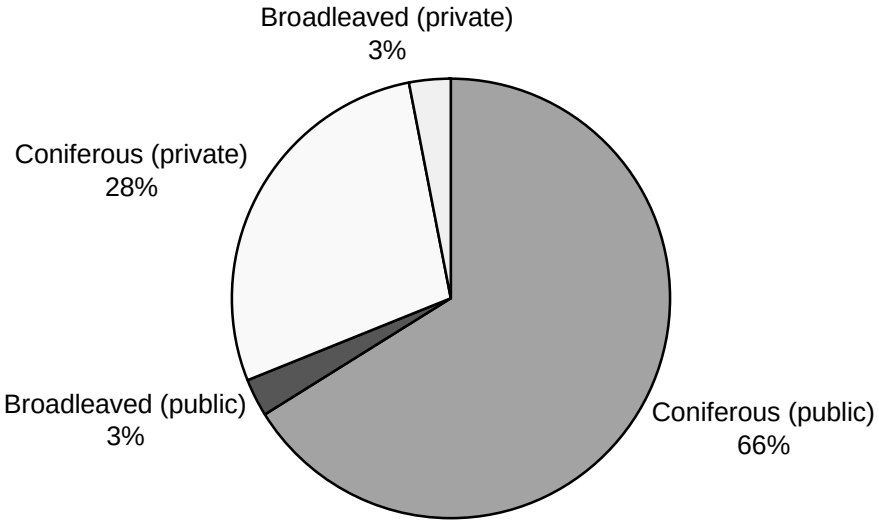
Figure G.1: Native forest areas by ownership - June 1988



Note: Total native forest area is 40 828 000 hectares.

Source: ABARE, Australian Forest Resources, 1988, p. 2.

Figure G.2: Ownership of plantation areas by species - March 1988



Note: Total plantation area is 941 959 hectares.

Source: ABARE, Australian Forest Resources, 1988, p. 2.

In general, pulp and paper companies did not express concern about access to adequate supplies of pulpwood. However, ANM said that part of its concession supplying old-growth eucalypt for its mill at Boyer had been subject to national park and world heritage listing. The company has started negotiations with the Tasmanian Government to secure its supply over the next 40 years. ANM expressed concern over the Victorian Government's ban on clearing native forest to establish pine plantations, and the requirement of some councils in New South Wales that companies secure planning approval to establish plantations. ANM did not expect these restrictions to hinder the expansion of the Albury mill because of the surplus of thinnings from government-owned plantations.

THE COST OF WOOD FROM PUBLIC FORESTS

Claims have been made that royalties for pulplogs supplied to the pulp and paper industry from public forests, are too low. Pulplogs and sawlogs are often produced together during harvesting operations, and it is difficult to assess whether pulplogs are under-priced without first looking at whether sawlogs are under-priced.

One way of examining whether sawlog royalties are too low is to compare the actual royalties charged with estimates of residual prices for sawlogs.

Residual prices can be calculated by subtracting the costs of labour, capital, and intermediate inputs such as materials and energy, from the value of output. Estimates of residual prices are shown in Table G.2.

The cost of capital used here includes an allowance for depreciation, interest expenses and a normal return to equity. The residual is therefore an estimate of the average return to timber which could be captured by forest services. Although such returns could be cyclical or transitory, the estimates below for the early to mid 1980s are consistent with previous estimates for the late 1970s (Byron and Douglas, 1981).

Table G.1: Features of Tasmanian forestry concessions

Concession Legislation	*APM*	*ANM*	*TPFH*
Date of Legislation	1954/1959	1935	1968
Area of Crown Land (ha)	241 300	178 200	736 300
as per cent of total Crown Land	5.8	4.3	17.7
Area of forested Crown Land (ha)	159 600	137 100	524 900
as per cent of total Crown Land	3.8	3.3	12.6
Area of loggable eucalypt forest (ha)	128 000	98 000	382 000
as per cent of total Crown Land	3.1	2.3	9.2
Concession Rights	Pulpwood (sound timber other than sawlog)	All timber except 30 100 m3 sawlog	Pulpwood (sound timber other than sawlog)
Concession Obligations	To establish a pulp mill	To establish pulp and paper mill and cognate manufacturing	Woodchip export harvest pulpwood and pulp manufacture. Feasibility study
Forest Management Responsibilities	Forestry Commission responsible for regeneration, fire protection and most roading	ANM responsible for regeneration, fire protection and roading	Forestry Commission responsible for fire protection and regeneration; TPFH responsible for roading
Nature of Concession	Exclusive	Exclusive	Exclusive
Period of Right and Review	80 years	80 years	Initial right of 18 yrs. Long-term - 80 yrs
Method of Determining Royalty	Special Licence negotiation	Act sets royalty unless agreed	Special Licence negotiation
Method of Reviewing Royalty	Special Licence allows for periodic review	Act does not allow for review - royalties may be increased by CPI	Special Licence allows no review. Royalties may be increased by CPI

Table G.1: Features of each Tasmanian concession (cont'd)

Concession Legislation	*WESLEY VALE*	*BURNIE*
Date of Legislation	1961	1926/1936
Area of forested Crown Land (ha), and as per cent of total Crown Land	416 300 9.9	178 700 4.3
Area of loggable eucalypt forest (ha) as per cent of total Crown Land	281 000 8.0	52 000 1.2
Concession Rights	Pulpwood (sound timber other than sawlog)	All timber except sawlog rights previously granted
Concession Obligations	Establish the industry	Establish Burnie factory for pulp and paper manufacturing
Forest Management Responsibilities	Forestry Commission responsible for fire protection, regeneration: both APPM and Forestry Commission responsible for roads	APPM mostly responsible for fire protection with some assistance from Forestry Commission. APPM responsible for roads. Regeneration is joint APPM/ Forestry Commission responsibility
Nature of Concession	Exclusive	Exclusive
Period of Right and Review	80 years	No limit
Method of Determining Royalty	Special Licence negotiation	Act sets royalty
Method of Reviewing Royalty	Special Licence: Export - inflation only; Local - periodic	Act allows no review

Sources: Legislative Council Select Committee, Parliament of Tasmania, State Forestry, 1984; statistics updated from the Forestry Commission of Tasmania.

These residuals are an average for sawlogs from all publicly owned plantation and native forests. They also take the structure of the sawmilling industry as given. Thus they do not indicate what the 'correct' royalty rate is. Rather, they are one method of estimating a reserve, or minimum, price at which harvesting rights could be sold. Given the evidence in Byron and Douglas that residuals under-estimate the market value of timber, the estimates can be taken as the average minimum royalty rate increase which could have been imposed. They do not indicate the level of under-pricing for particular tree species from particular forests. Nor do they illustrate whether the royalty per cubic metre should vary depending upon whether trees are harvested for sawlogs, veneer logs or other timber products.

Over the period 1981-82 to 1984-85, these estimates suggest that, on average, royalties could have been at least 90 per cent higher than the royalties actually charged (refer Table G.2). Royalties should have been at least 60 to 70 per cent higher in New South Wales, Victoria and Tasmania and some 170 per cent higher in Queensland.

Estimates of residual prices using an alternative measure of capital costs are shown in Table G.3. As a sensitivity test, residual prices were also calculated under the assumption that sawmilling should earn a 5 per cent higher mark-up than other industries. These results are shown in Table G.4.

It can be seen that the differences between residual value and actual royalty rates declined substantially in all States between 1983-84 and 1984-85, largely because of the increase in the cost of capital between those two years. Interest rates and the general rental rate on capital assets were not significantly different in 1987-88 from 1984-85 (Reserve Bank of Australia, 1989), and although interest rates rose in 1988-89, they have since fallen somewhat. Thus it is not clear how current residual values may have changed relative to those shown in the tables. While some States have increased royalties in recent years, the orders of magnitude of the residuals from these calculations suggest that royalties may still be too low.

ESTIMATING RESIDUAL PRICES

Residual prices can be calculated by subtracting all variable input costs from total revenues of the sawmilling industry.

Output: estimates of sawntimber production by species and by State were provided by ABARE (1987), from which series of aggregate softwood and hardwood production quantities was constructed. These series excluded railway sleepers but included the sawn equivalent of plywood and veneer.

From the ABS census of manufacturing establishments by industry (ABS, 1984-85), the values of turnover, and opening and closing stocks were used to approximate the value of sawntimber production. An estimate of sawntimber prices, or the unit value of output, was derived by dividing the value by the quantity of sawntimber production.

Labour: the unit cost of labour was estimated as the total wage bill (ABS, 1984-85) divided by the quantity of sawntimber output.

Capital: the level of capital costs for sawmills in 1984-85 was taken from Jaakko Poyry (1986). Jaakko Poyry's estimate included a 15 per cent return on total investment, which includes working capital and interest costs. As this was the only year for which an estimate of capital costs were available, interest and depreciation rates were used to calculate the variation in capital costs in other years. Since these estimates were based on capital costs for sawmills, they include a risk premium appropriate to sawmilling, and are consistent with the alternative estimates based on the mark-up rate.

The capital service flow from a given capital stock was defined as the rental rate of capital multiplied by the quantity flow of capital in year t (IAC, 1989):

$$SF_t = (r_t + g_t - pt)P_tK_t/ (1 - T_t), \quad (1)$$

where

SF_t = the value of the capital service flow;

r_t = the nominal rate of return on capital in the next best alternative use in year t, and was assumed to be the 10 year treasury bond rate (RBA, 1989);

g_t = the rate of physical depreciation (normally 8-9 per cent) in year t, approximated by the actual manufacturing depreciation rate on fixed assets (ABS, 1987-88);

p_t = the rate of asset appreciation in year t, equal to the rate change in P_t;

P_t = the price of capital assets.

K_t = the quantity of the capital service flow in year t; and

T_t = the company tax rate (Treasury, personal communication)

The unit capital service flow was derived by dividing equation (1) by the quantity of sawntimber output (Q_t). P_t was approximated by $PI_t\delta$, where PI_t was the manufacturing fixed capital expenditure price index (ABS, 1987-88), with δ as an index scalar:

$$SF_t/Q_t = (r_t + g_t - p_t)PI_t(\delta K_t/Q_t) / (1 - T_t), \quad (2)$$

The rental rate of capital is the expression $(r_t + g_t - p_t)PI_t/(1 - T_t)$. It has been estimated that the unit capital service flow (or capital charges) in 1984-85 for new mills was $39.90 per cubic metre (Jaakko Poyry, 1986). This estimate is for a state-of-the-art mill with an annual capacity of 180 000 cubic metres. Although this may not represent existing mills, an efficient scale of operation does provide an appropriate benchmark for the cost of capital. The ratio $\delta K_t/Q_t$ was calculated using equation (2):

$$\delta K_t/Q_t = (SF_t/Q_t)/R_t = 106.45, \quad (3)$$

where

$$R_t = (r_t + g_t - p_t)PI_t/(1 - T_t),$$

The $\delta K_t/Q_t$ ratio was assumed to be constant and was used to derive the unit capital service flow or unit cost of capital for other years:

$$SF_t/Q_t = 106.45R_t, \quad (4)$$

Other Inputs: the costs of other inputs included the costs of materials, fuel, charges for subcontract work and all other expenses (ABS, 1984-85), but excluded the royalty cost of sawlog inputs. The unit cost of

'other-input' was equal to the total cost of the other inputs divided by the quantity of sawntimber production.

Residual Value: this is simply the difference between the value of output and the cost of all inputs. It is converted to a residual value for sawlogs by dividing the residual value for sawntimber by the conversion factor.

Conversion Factor: A survey of wood processing firms by ABARE (1987) revealed that, under existing royalty and harvest levels, firms were using 2.558 cubic metres of sawlogs to produce one cubic metre of sawntimber. Using this as a conversion factor, the sawlog inputs were derived from the quantity of sawntimber production.

Royalty Rates: actual royalty rates were obtained from State forestry services directly or from their annual reports. The royalty rates supplied by the Forestry Commission of New South Wales are the actual prices of standing trees for sales of softwood or hardwood sawlogs from crown land, net of logging and hauling costs. The mean royalties for total sawlogs were derived as the production-weighted averages of the softwood and hardwood rates. The above methodology was also applied to other States in obtaining actual royalties and in calculating mean rates for total sawlogs. However, for Victoria in 1983-84, the royalties for both softwood and hardwood sawlogs were based on estimates from the Department of Conservation, Forests & Land. For Queensland, the information supplied by its forestry service consists of the average native forest hardwood sawlog stumpages as well as the average plantation softwood royalties for sawlog thinnings. The royalty rate for Australia in each year is assumed to be the production-weighted average rate across the four States.

An alternative approach to measuring the unit cost of capital is to use the mark-up rate for the total wood and wood products industry excluding log sawmilling (ABS, 1987-88). The mark-up rate is defined as the ratio of value added contributed by capital, over the total costs of labour and all intermediate inputs. Mark-up rates were 0.22, 0.20, 0.24 and 0.25 in 1981-82, 1982-83, 1983-84, and 1984-85 respectively. Using this approach, the estimated unit cost of capital was $38.50 per cubic metre of sawntimber on a nationwide basis for 1984-85, which is very close to the capital charge estimated by Jaakko Poyry. The alternative estimates are shown in Table G.3.

In order to test the sensitivity of the estimates to changes in capital costs, residual prices were also estimated by increasing the mark-up rates described above by 5 percentage points. For example, it may be the case that the risk premium required by investors in sawmilling has increased since 1984-1985. This would raise the required mark-up, although the Commission has no evidence that the risks in sawmilling have increased. As can be seen in Table G.4, higher mark-ups would reduce the size of the residuals. In general, however, the residuals are still substantial and, given the generous mark-up allowed, the estimates in Table G.4 would seem to provide fairly robust evidence of under-pricing of sawlogs.

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Table G .2: Royalty Rate Changes for Sawlogs implied by residual Pricing Calculations

Based on the capital costs for a new mill

	Unit Value of Output	Unit Cost of Labour	Unit Cost of Capital	Unit Cost of Other-Input	Residual Value	Conversion Factor	Residual Value for Sawlogs	Actual Royalty Rate for Sawlogs	Increase required
	$/m3	$/m3	$/m3	$/m3	$/m3	m3	$/m3	$/m3	%
Average for NSW, Vic, Qld & Tas									
1981-82	188.34	48.68	25.72	54.39	59.55	2.558	23.28	12.48	87
1982-83	205.49	53.64	23.99	58.22	69.63	2.558	27.22	14.76	84
1983-84	223.26	51.52	33.99	53.57	84.19	2.558	32.91	15.66	110
1984-85	225.53	52.67	39.90	56.85	76.12	2.558	29.76	17.31	72
Average									**88**
New South Wales									
1981-82	173.29	42.28	25.72	46.41	58.88	2.558	23.02	13.17	75
1982-83	199.42	48.88	23.99	43.30	83.25	2.558	32.55	16.96	92
1983-84	182.26	41.96	33.99	26.24	80.07	2.558	31.30	17.89	75
1984-85	188.04	41.58	39.90	41.14	65.42	2.558	25.57	18.81	36
Average									**69**
Victoria									
1981-82	148.18	36.84	25.72	26.62	59.01	2.558	23.07	13.95	65
1982-83	153.78	39.97	23.99	19.91	69.91	2.558	27.33	15.61	75
1983-84	161.72	37.09	33.99	12.17	78.46	2.558	30.67	17.31	77
1984-85	152.72	35.02	39.90	7.11	70.69	2.558	27.64	19.88	39
Average									**64**
Queensland									
1981-82	262.76	75.85	25.72	100.53	60.67	2.558	23.72	11.68	103
1982-83	310.59	87.73	23.99	128.06	70.80	2.558	27.68	11.54	140
1983-84	360.89	87.09	33.99	128.28	111.52	2.558	43.60	11.98	264
1984-85	328.65	83.85	39.90	110.83	94.07	2.558	36.77	13.70	168
Average									**169**
Tasmania									
1981-82	210.26	49.24	25.72	91.61	43.69	2.558	17.08	8.00	113
1982-83	207.55	50.26	23.99	110.06	23.24	2.558	9.08	8.90	2
1983-84	202.47	40.40	33.99	88.49	39.59	2.558	15.48	8.62	80
1984-85	247.68	42.14	39.90	116.69	48.94	2.558	19.13	10.17	88
Average									**71**

Source: Commission estimates based on data from ABS, ABARE, RBA,State forestry services & Jaakko Poyry (1986).

Table G .3: Royalty Rate Changes for Sawlogs implied by Residual Pricing Calculations

Based on the mark-up rate for capital of wood & wood products (excluding sawmilling).

	Unit Value of Output	Unit Cost of Labour	Unit Cost of Capital	Unit Cost of Other-Input	Residual Value	Conversion Factor	Residual Value for Sawlogs	Actual Royalty Rate for Sawlogs	Increase required
	$/m3	$/m3	$/m3	$/m3	$/m3	m3	$/m3	$/m3	%
					Average for NSW, Vic, Qld & Tas				
1981-82	188.34	48.68	29.39	54.39	55.88	2.558	21.85	12.48	75
1982-83	205.49	53.64	30.36	58.22	63.26	2.558	24.73	14.76	68
1983-84	223.26	51.52	35.35	53.57	82.83	2.558	32.38	15.66	107
1984-85	225.53	52.67	38.49	56.85	77.53	2.558	30.31	17.31	75
Average									**81**
					New South Wales				
1981-82	173.29	42.28	26.64	46.41	57.96	2.558	22.66	13.17	72
1982-83	199.42	48.88	27.51	43.30	79.74	2.558	31.17	16.96	84
1983-84	182.26	41.96	27.76	26.24	86.31	2.558	33.74	17.89	89
1984-85	188.04	41.58	32.75	41.14	72.57	2.558	28.37	18.81	51
Average									**74**
					Victoria				
1981-82	148.18	36.84	21.58	26.62	63.15	2.558	24.69	13.95	77
1982-83	153.78	39.97	20.25	19.91	73.65	2.558	28.79	15.61	84
1983-84	161.72	37.09	22.78	12.17	89.67	2.558	35.06	17.31	103
1984-85	152.72	35.02	23.27	7.11	87.32	2.558	34.14	19.88	72
Average									**84**
					Queensland				
1981-82	262.76	75.85	44.90	100.53	41.49	2.558	16.22	11.68	39
1982-83	310.59	87.73	49.78	128.06	45.01	2.558	17.60	11.54	52
1983-84	360.89	87.09	59.92	128.28	85.59	2.558	33.46	11.98	179
1984-85	328.65	83.85	57.49	110.83	76.48	2.558	29.90	13.70	118
Average									**97**
					Tasmania				
1981-82	210.26	49.24	35.12	91.61	34.29	2.558	13.40	8.00	68
1982-83	207.55	50.26	37.15	110.06	10.08	2.558	3.94	8.90	-56
1983-84	202.47	40.40	36.76	88.49	36.82	2.558	14.39	8.62	67
1984-85	247.68	42.14	46.26	116.69	42.58	2.558	16.65	10.17	64
Average									**36**

Source: Commission estimates based on data from ABS, ABARE & State forestry services.

Table G .4: Royalty Rate Changes for Sawlogs implied by Residual Pricing Calculations

Based on increasing the mark-up rate for capital of wood & wood products (excluding sawmilling).by 5 percentage points

	Unit Value of Output	Unit Cost of Labour	Unit Cost of Capital	Unit Cost of Other-Input	Residual Value	Conversion Factor	Residual Value for Sawlogs	Actual Royalty Rate for Sawlogs	Increase required
	$/m3	$/m3	$/m3	$/m3	$/m3	m3	$/m3	$/m3	%
					Average for NSW, Vic, Qld & Tas				
1981-82	188.34	48.68	36.14	54.39	49.13	2.558	19.21	12.48	54
1982-83	205.49	53.64	37.84	58.22	55.78	2.558	21.81	14.76	48
1983-84	223.26	51.52	42.60	53.57	75.57	2.558	29.54	15.66	89
1984-85	225.53	52.67	46.18	56.85	69.84	2.558	27.30	17.31	58
Average									**62**
					New South Wales				
1981-82	173.29	42.28	32.76	46.41	51.84	2.558	20.26	13.17	54
1982-83	199.42	48.88	34.28	43.30	72.96	2.558	28.52	16.96	68
1983-84	182.26	41.96	33.46	26.24	80.61	2.558	31.51	17.89	76
1984-85	188.04	41.58	39.29	41.14	66.03	2.558	25.81	18.81	37
Average									**59**
					Victoria				
1981-82	148.18	36.84	26.54	26.62	58.19	2.558	22.75	13.95	63
1982-83	153.78	39.97	25.24	19.91	68.66	2.558	26.84	15.61	72
1983-84	161.72	37.09	27.46	12.17	85.00	2.558	33.23	17.31	92
1984-85	152.72	35.02	27.92	7.11	82.67	2.558	32.32	19.88	63
Average									**72**
					Queensland				
1981-82	262.76	75.85	55.21	100.53	31.18	2.558	12.19	11.68	4
1982-83	310.59	87.73	62.04	128.06	32.75	2.558	12.80	11.54	11
1983-84	360.89	87.09	72.22	128.28	73.29	2.558	28.65	11.98	139
1984-85	328.65	83.85	68.98	110.83	64.99	2.558	25.41	13.70	85
Average									**60**
					Tasmania				
1981-82	210.26	49.24	43.18	91.61	26.22	2.558	10.25	8.00	28
1982-83	207.55	50.26	46.30	110.06	0.93	2.558	0.36	8.90	-96
1983-84	202.47	40.40	44.31	88.49	29.28	2.558	11.44	8.62	33
1984-85	247.68	42.14	55.50	116.69	33.34	2.558	13.03	10.17	28
Average									**-2**

Source: Commission estimates based on data from ABS, ABARE & State forestry services.

ABBREVIATIONS

ABARE - Australian Bureau of Agricultural and Resource Economics

ABS - Australian Bureau of Statistics

ACP - Australian Consolidated Press

AGPS - Australian Government Publishing Service

ANM - Australian Newsprint Mills Ltd

AOX - Adsorbable Organic Halides (see Glossary)

APM - Australian Paper Manufacturers

APPM - Associated Pulp and Paper Mills

BEK - bleached eucalypt kraft

BOD - biological oxygen demand (see Glossary)

CHAST - Centre for Human Aspects of Science and Technology

CMP - chemi-mechanical pulp (see Glossary)

CSIRO - Commonwealth Scientific and Industrial Research Organisation

CTMP - chemi-thermo-mechanical pulp (see Glossary)

DAS - Department of Administrative Services

DASETT - Department of the Arts, Sport, the Environment, Tourism and Territories

EPA - Environment Protection Authority

KCA - Kimberly-Clark Australia Pty Ltd

KESAB - Keep South Australia Beautiful

LWC - light weight coated (paper)

NFR - Non-filtrable residues

PADS - People Against Dioxins in Sanitary Products

PATEFA - Printing and Allied Trades Employers Federation of Australia

PPMFA - Pulp and Paper Manufacturers Federation of Australia

RBA - Reserve Bank of Australia

TMP - thermo-mechanical pulp (see Glossary)

tpa - tonnes per annum

GLOSSARY

AOX - adsorbable organic halides, a measure of the quantity of organochlorines

Bleaching - the process of removing, or brightening, residual lignin from pulp

BOD - biological oxygen demand, a measure of the capacity of effluent to consume oxygen

CCS pulp - eucalypt refiner pulp produced by Australian Newsprint Mills

Chemi-mechanical pulp - a mechanical pulp in which the woodchips are first subjected to chemical treatment

Chemi-thermo-mechanical pulp - a mechanical pulp in which woodchips are first subjected to chemical and heat treatment

Chemical pulping - pulp produced through the use of chemicals to break down the constituents of pulpwood

Chlorine bleaching - processes using elemental chlorine and/or chlorine compounds to bleach

Cold soda pulp - a semi-chemical pulp using caustic soda

Cotton linters - cotton waste from processing raw cotton

De-inking - the removal of printing ink from paper through a washing treatment

Dioxin - a class of organochlorine which is persistent in the environment

Elemental chlorine - chlorine gas

Extended delignification - processes designed to reduce residual lignin levels

Feedstocks - the raw material or input for a process

Furan - a class of organochlorine which is persistent in the environment

Groundwood pulp - mechanical pulp made by grinding wood against an abrasic surface

Hammermilled - a form of mechanical processing

Kraft pulp - chemical pulp produced with sodium hydroxide and sodium sulphide

Landfill - the disposal of waste as fill, for example by burying under earth or in disused quarries

Lignin - one of the major constituents of wood, the other being cellulose

Linerboard - packaging material

Mechanical pulping - pulp produced by a mechanical process (as opposed to chemical process) through grinding or refining

Non-wood feedstock - material, other than wood, which may be used for pulping

NSSC pulp - a semi-chemical pulp using neutral sulphite

Organochlorines - organic compounds containing chemically bound chlorine. They are formed whenever chlorine or chlorine based compounds are used to bleach pulp

Paperboard - packaging material

Pinus radiata - species of pine tree

Recovery rate - also called the collection rate, is the proportion of recyclable paper collected, expressed as a percentage of the total consumption of paper and paperboard

Refiner pulp - mechanical pulps produced through refining, ie passing wood chips through the small gaps between rapidly rotating metal discs

Residual lignin - lignin remaining in a pulp after the pulping process

Semi-chemical pulping - a pulping process in which the lignin content of wood is first partially disolved out before the fibres are separated by mechanical means

Silviculture - tree husbandry

Soda anthraquinone pulp - a chemical pulp in which the chemical agent is a mixture of sodium hydroxide and anthraquinone

Sulphate pulp - kraft pulp, a chemical pulp in which the chemical agent is a mixture of sodium hydroxide and sodium sulphide

Sulphite pulp - a chemical pulp in which the chemical agent is a sulphite such as calcium bisulphite

Supercalender - a machine that imparts a high degree of finish to paper

Thermo-mechanical pulp - a mechanical pulp in which the woodchips are first subjected to heat treatment

Thinnings - trees removed as part of the silviculture process

Utilisation rate - the amount of secondary fibre (recovered fibre) used in the manufacture of paper, expressed as a percentage of the total fibre used.

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