Tasmanian Forest Industry Growth Potential to 2010 and 2020

Page last reviewed on 13 August 2002
For more information contact Internet Development Team rfa@affa.gov.au

Disclaimer

This document is issued by Margules Pöyry Pty Ltd for the Australian Bureau of Agricultural and Resource Economics (ABARE) for their own use. No responsibility is accepted for any other use.

The document contains the opinion of Margules Pöyry Pty Ltd as to the Tasmanian forest industry growth potential to 2010 and 2020. Nothing in this document is, or should be relied upon as, a promise by Margules Pöyry Pty Ltd as to the future growth, yields, costs or returns of the forests or forest industry projects. Actual results may be different from the opinions contained in this document, as anticipated events may not occur as expected and the variation may be significant. Margules Pöyry Pty Ltd has no responsibility to update this document for events and circumstances occurring after the date of issue.

MARGULES PÖYRY PTY LTD

Rob de Fégely
MANAGING DIRECTOR

3 March 1997

Glossary

ABARE	Australian Bureau of Agricultural and Resource Economics
ADt	air dry tonnes
BDt	bone dry tonnes
BHKP	bleached hardwood kraft pulp (or bleached hardwood market pulp)
BKP	bleached kraft pulp
BSKP	bleached softwood kraft pulp
CRA	Comprehensive Regional Assessment
FFIS	Forests and Forest Industries Strategy
FT	Forestry Tasmania
HB	hardboard
HWC	heavyweight coated paper
LVL	laminated veneer lumber
LWC	lightweight coated paper
MDF	medium density fibreboard
Mt	million tonnes
MWC	medium weight coated paper
OSB	oriented strand board
PB	particleboard
PFC	Private Forests Council
PFT	Private Forests Tasmania
PGW	pressurised groundwood pulp
RCP	recovered paper
RFA	Regional Forest Agreement
ROI	return on investment
Sawlog HQ	sawlog high quality
Sawlog LQ	sawlog low quality
SC	supercalendered paper
TDR	Tasmanian Development and Resources
TEF	totally effluent free
TMP	thermo-mechanical pulp

Woodfree pulp/paper	chemically produced pulp/paper

Definitions

Paper and paperboard are divided into the following main groups:

- newsprint
- printing and writing papers
- industrial grades.

Papermaking pulps are divided into the following main groups:

- Mechanical pulp
- Semi-chemical pulp
- Chemical pulp (including bleached sulphate, unbleached sulphate, bleached sulphite and unbleached sulphite)
- Recovered paper refers to unprocessed scrap paper (*before* processing losses)
- Recycled fibre (pulp) refers to processed scrap paper (*after* processing losses).

Dissolving pulp is not a papermaking fibre, but used for textiles such as rayon.

Pulpwood in this report includes both roundwood and chips used by the pulp, paper and reconstituted wood industries.

Wood-based panels are divided into two groups:

1. Solid wood being plywood, made up of thin veneers

2. Reconstituted wood being other wood-based panels (all kinds of particleboard and fibreboard).

Net trade is defined as the value of (imports – exports).

Grade classification for printing and writing papers

General

Printing and writing papers consist of four major product categories:

1. Uncoated woodfree papers

2. Uncoated mechanical papers

3. Coated woodfree papers

4. Coated mechanical papers

Uncoated woodfree

- Uncoated woodfree are printing papers made by chemically removing most of the lignin from the wood and producing a "chemical pulp".

- Typical end uses of uncoated woodfree paper are offset printing paper, copy paper, computer listing paper, business forms, writing/educational papers, envelope stock and specialty grades.

Uncoated mechanical

- Mechanical pulp is an essential element in uncoated mechanical printing papers, accounting for 70-100% of the fibre content, depending on the grade. Mechanical pulp is made by grinding roundwood logs or refining woodchips.
- The main end uses include magazines, catalogues, directories, commercial printing, comic books, pocket books and newspaper supplements.

Coated woodfree

- Coated woodfree papers contain less than 10% of mechanical fibres with most of the fibre being bleached chemical pulp.
- Coated woodfree printing papers are used for high quality printing applications such as advertising materials, catalogues, high quality magazines and company annual reports.

Coated Mechanical

- The fibre furnish of coated mechanical papers contains, by definition, more than 10% mechanical fibres such as thermo-mechanical pulp (TMP) or pressurised groundwood pulp (PGW).
- The main end uses include magazines, catalogues and commercial printing.

Introduction

The Australian Bureau of Agricultural and Resource Economics (ABARE) assisted by Tasmanian Development and Resources (TDR) have engaged Margules Pöyry Pty Ltd (Margules) to identify the growth potential for the Tasmanian forest industry illustrated by long term scenarios to 2010 and 2020.

The background to this study is the inquiry into areas to be reserved under the Tasmania/Commonwealth Regional Forest Agreement, otherwise known as the RFA process. As part of a Comprehensive Regional Assessment (CRA), the value of economic and industry development is to be evaluated. Given predictions on resource availability and technological advances in processing and marketing forest products, it is possible to construct long term scenarios which illustrate what the industry might look like.

This study presents such illustrative development scenarios for the years 2010 and 2020. It must be understood that these scenarios simply illustrate patterns of development which are commercially feasible. There are many other patterns which differ in terms of the specific mix of products and mill types, and the specific locations of mills, which might be equally feasible.

The study covered three sectors:

§ Hardwood resource supply

§ Wood-based product competitiveness and potential markets

§ Industry development options including solid wood products, reconstituted panels, and pulp and paper products.

Resource

Resource assessment and forecasts of development are restricted to hardwood from native forests and plantations, and include both public and private growers. Volume and quality of resource is characterised (at both a statewide and regional level) and will assume the productive forest estate which is currently available, will still be available in 2010 and 2020 together with such hardwood plantations as are currently projected. In the event available volumes of particular forest products (eg sawlogs, veneer logs) exceed the levels assumed here, as may be possible with intensive forest management, the potential scale of production related to those products (eg sawn timber, veneer, plywood) could be greater.

Competitiveness and markets

Given the background of resource availability and the feasibility of processing the resource into various products, an assessment of Tasmania's competitiveness in both the domestic and world markets, particularly the Asia-Pacific region, is important.

The market assessment is undertaken on available data; utilising the databases within Margules Pöyry and the wider Jaakko Pöyry Consulting Network. Market trends have been predicted to 2010. As Jaakko Pöyry has no forecasts beyond this time, trends in markets for specific products have been established and,

unless otherwise stated, will be extrapolated to 2020. Hence, there is an assumption of "business as usual" from 2010 to 2020.

The cost competitiveness assessment is based on the comparison of mills in Tasmania with hypothetical new mills in the selected main competing countries.

Industry development options

Industry options will include those that are technically feasible and likely to be economically viable for utilisation of the resource available from 1996-2020. Various assumptions are made about improvements in technology such as in sawing, kiln drying, finger jointing and further solid wood processing, and in the manufacture of panelboards and pulp and paper.

The development options having the best market potential and likely to be competitive were presented to a workshop, including senior representatives of industry, Forestry Tasmania and Private Forests Tasmania, on 31 October 1996. The workshop participants then examined and evaluated these options to identify the most likely scenarios in 2010 and 2020.

The workshop participants considered these options in the context of their own knowledge of resource distribution and its characteristics, and the development infrastructure, and generated illustrative scenarios for 2010 and 2020.

As noted above, the scenarios represent commercially feasible patterns of development which make good use of the project resource. Different scenarios might equally well be proposed.

Forest Resources

2.1 Global

The world's closed forest area consists of about 3.4 billion hectares with a total growing stock of around 385 billion cubic metres (m^3). Approximately 40% of this growing stock is softwood and 60% hardwood. The main hardwood resources are the equatorial rainforests. The vast majority of softwood resources are in the boreal and northern temperate zones, mostly Russia (50%) and North America. These forests have been the source of 70% of the world's industrial wood supply.

In 1995, the annual global harvest was around 3.6 billion m^3 of which 2.0 billion m^3 was for fuelwood and 1.6 billion m^3 for industrial purposes (sawlogs, veneer logs and pulp logs). Two-thirds of industrial roundwood is softwood and fuelwood is predominantly hardwood of which around 90% is harvested and consumed in developing countries.

The global fibre usage is approximately as follows:

Fuelwood 54%

Sawlog and veneer logs 28%

Pulpwood 13%

Other products 5%

Commercial plantations will play an increasing role in the world's developing wood fibre supply:

§ The global area of plantations covers about 135 million hectares, or 4% of the total forest area. Some 60% are coniferous and 40% broadleaf. The vast majority are located in the northern hemisphere with China accounting for 20%, Russia 15% and Europe, Japan and North America 10% each.

§ Industrial fast growing plantations (those with MAI's >12) cover 17 million hectares (or about 0.5% of the total forest area), roughly evenly divided between hardwoods and softwoods. The area of industrial fast growing plantations is expanding at an annual rate of 600-800,000 hectares, mainly in Latin America, Oceania and Southeast Asia.

§ Fast growing plantations supply about 7% of the world's industrial wood harvest. This is expected to double by 2010, but still be less than 20% by 2020.

2.2 Asia-Pacific

Over recent decades, the Asia-Pacific forests have been heavily overcut. Rapid depletion of forest cover and growing stock passed a critical milestone in the early 1980s when the region's wood raw material trade balance turned from an export surplus into an import deficit. The current annual harvest is around 90-95 million m^3 of softwood and 140-145 million m^3 of hardwood. The net supply deficit for the region is around 21 million m^3.

Though heavily utilised, the forests with the most significant supply potential are found in Indonesia, Malaysia and Indochina. The wood species in Southeast Asia's native forests are mainly medium to dense hardwoods which are excellent for solid wood products such as sawntimber and plywood. These forests make poor raw material for mechanical pulping, but are increasingly being used for bleached chemical pulp manufacture.

2.3 Australia

Australia has a total standing forest area of approximately 43 million hectares, representing 5% of the total land area. This is largely distributed in an arc around the eastern, southeastern and southwestern coasts of mainland Australia, and in Tasmania. The total forest harvest in 1994 was 18 million m^3, approximately 60% of which was from native forest. The forested estate may be broadly divided into four tenures, state forest (11.5 million hectares), conservation reserves (9.8 million hectares), other crown land (10.6 million hectares), and privately owned forest (11.3 million hectares). Within state forest and other crown land, approximately 13.8 million hectares are technically available for harvesting, excluding areas that are inaccessible, currently uneconomic for timber production or reserved under forestry management codes of practice. On private lands, approximately 7.6 million hectares are technically available for harvesting.

Source: RAC 1992; ABARE 1995

Australia also has about 1.1 million hectares of plantation forest, most of which is softwood (950,000 hectares). Of the total plantation resource, 65% is radiata pine, 22% other softwoods, 12% eucalypt, and 1% other hardwood.

The annual harvest of hardwood has varied between 9.2 million m^3 and 11.4 million m^3 over the last 15 years and is currently around 9.8 million m^3. Softwood harvest levels have virtually doubled from 4.5 million m^3 in 1980 to nearly 9.0 million m^3 in 1994-95.

2.4 Tasmania

The Tasmanian hardwood forest resource may be broadly divided into two categories: State Forest and private property. State Forest comprises about 1.6 million hectares, 89% of which is forested. Private property comprises about 2.7 million hectares, 45% of which is forested. Of the total area of State Forest, about 556,000 hectares is mature/predominantly mature forest, 302,000 hectares regrowth/predominantly regrowth forest, 126,000 hectares "other native forest", 194,000 hectares rainforest, 185,000 hectares silvicultural regeneration, 67,000 hectares of combined softwood/hardwood plantation and 171,000 hectares classified as "non-forest" or not classified. About 14,000 hectares of eucalypt plantation have been established to date, of which about 75 percent has been established over the last decade using advanced silvicultural practices.

Source: Forestry Tasmania, November 1996

Of the total area of private property, about 525,000 hectares are mature/predominantly mature forest, 371,000 hectares are regrowth/predominantly regrowth forest, 221,000 hectares "other native forest", 2,000 hectares are silvicultural regeneration, 1,469,000 hectares are "non-forest", 75,000 hectares combined softwood/hardwood plantation, and 26,000 hectares are rainforest. About 44,000 hectares of eucalypt plantation have been established to date on private lands.

Source: Forestry Tasmania, November 1996

2.4.1 Forest definition

Mature forest is generally defined as over 110 years old and/or has reached ecological maturity. The harvesting of mature forest currently accounts for between 80 and 90 per cent of sawlog and veneer log production on both State Forest and private property.

Regrowth forest is generally up to 110 years old. While at present the commercial importance of this forest type is not as significant as mature forest, the balance will change over time as less mature forest becomes available for harvesting.

Silvicultural regeneration is derived from forest management, primarily after forest harvesting.

2.4.2 Forest types

Ash group

Of the native eucalypt forests, the most important from a commercial viewpoint are the "Ash" group - *Eucalyptus regnans* ("Swamp Gum" or "Mountain Ash"), *E. delegatensis* ("White-topped Stringybark" or "Alpine Ash") and *E. obliqua* ("Brown-topped Stringybark" or "Messmate"). These three species comprise about 70% of the total pulpwood and 85% of the total sawlog annual harvest, as well as a significant proportion of the total forest resource in Tasmania. This is predicted to continue to 2010 and 2020.

Other eucalypts

Other eucalypts, primarily *E. globulus, E. viminalis, E. sieberi* and *E. dalrympleana* comprise another 15% of the total pulpwood resource, and approximately 10-12% of the total sawlog resource. Non-eucalypts, primarily *Nothofagus cunninghamii*, comprise the remaining 15% of the total pulpwood resource and 3-5% of the total sawlog resource respectively.

Special species

These include Blackwood (*Acacia melanoxylon*), Myrtle (*Nothofagus cunninghamii),* Huon Pine (*Lagarostrobus franklinii*), King William Pine (*Athrotaxis selaginoides*), Celery Top Pine (*Phyllocladus aspleniifolius*) and Sassafras (*Atherosperma moschatum*). They are highly sought after for furniture manufacture, panelling and veneer, craftwood and as poles for construction. All are very attractive for their respective end uses. Availability of these species from

State Forest is expected to remain static, but may decline somewhat on private property.

2.4.3 Hardwood forest yield

Table 2-1: Actual and predicted roundwood supply by forest product for Tasmania, based on existing forest management arrangements (million m³ sawlog, million tonnes pulpwood)

	Current consumption	Current potential supply	2010	2020
Sawlogs (incl. veneer logs):	0.67	0.85	0.8	0.66
Pulpwood:	3.2	4.7	5.95	5.82
GRAND TOTAL	**3.87**	**5.55**	**6.75**	**6.48**

Source: PFC, FFIS, Forestry Tasmania, Private Forests Tasmania (1996)

Table 2-1 summarises a basic resource scenario including provision for current rates of plantation development on State Forest and private property. The table shows roundwood supplies to 2020 for both pulpwood and sawlog throughout Tasmania.

The significant increase in the availability of pulpwood over the period reflects, in 2010 and 2020, increasing yields from existing plantations and from future plantations (at current rates of plantation establishment, ie 7,500 hectares per year on State Forest and private property).

The trend for sawlog supply indicates a gradual decrease in annual availability over time. There is also a trend towards an increasing proportion of regrowth logs for which lower sawnwood or veneer recovery is typical.

Any increase in resource resulting from further silvicultural improvements and plantation establishment would be additional to the above.

Investment Risk - Implications for Forest Development

In assessing the feasibility of development options for Tasmania, it is important to understand the impact of investor uncertainty on investment decisions, and what factors can reduce uncertainty and thereby enhance the likelihood of investment.

Fundamentally, what drives most companies to invest in forestry processing ventures, whether a small sawmill or a pulp and paper mill, is the prospect of making an acceptable financial return on the capital invested (ROI).

What represents an "adequate return" or, as it is often termed, the "hurdle rate" ROI varies with different investors, but at the very least, it must be more than can be achieved in passive investment options such as risk free bank accounts. More generally, it may be defined as a rate of return which cannot be bettered by other options open to the investor that entail similar levels of risk. In general, the higher the perceived risk in a project, the higher the "hurdle rate".

A risk assessment and risk minimisation strategy is critical to any prudent analysis of an investment.

In a general sense, risks associated with new forestry projects are viewed from three perspectives:

i. business risks - eg the capacity to meet supply agreements in both volume and quality terms, log pricing policies, infrastructural impediments, fluctuations in the cost of utilities and inputs, financial risks and market fluctuations in end products.

ii. environmental risks - drought, fire, wind, pests etc are included in this context.

iii. political or sovereign risks - risks associated with political forces, for example, changes that may occur in forest policy, resource access, taxation, licences, duties etc. These risks are difficult to quantify but are nonetheless real and may include impacts on either the market or raw material supply (resource access) or through unforeseen environmental problems or changes in regulations on processing etc. These risks can include both perception and reality.

Key factors on which forest product investors focus are:

§ end product price

§ production cost

§ security of necessary raw material supply

§ security of access to key markets.

Uncertainty or risk associated with any of these factors will affect the likelihood of investment.

Market Review

4.1 Factors driving the demand for and supply of wood

The following section reviews the major drivers impacting on the demand and supply of wood products. This is followed by a market review of mechanical wood products, wood based panels and pulp and paper products.

4.1.1 Demand drivers for wood products

Factors influencing demand include:

Strong correlation between economic growth and per capita consumption of wood and paper products.

Asia will be responsible for the majority of the 1.5 billion additional people in the world in 15 years' time. The total global population at that time will be about 7 billion. Currently, 60% of the Asian population is under 25 years of age: this age class represents the key emerging market.

Urban people use more industrial wood per capita than rural people. By 2001, more people will live in towns and cities than in the countryside. Over the last 3 decades, urban populations of developing countries have tripled to 1.3 billion.

Not only will populations increase, but also in many parts of the world, especially the Asia-Pacific region, living standards, as expressed by real net disposable income per capita, will also increase. This almost invariably gives rise to an increased demand for wood and paper products.

Other factors which could influence demand include:

§ Trade barriers are decreasing.

§ There is a general world recovery underway.

§ Key industry people are increasingly international in their perspective.

§ Pricing of forest products is becoming increasingly determined by international market forces.

4.1.2 Supply drivers for wood products

Factors influencing supply include:

Far east Russia has a large resource base but low availability to the marketplace due to infrastructural and political difficulties.

Tropical Asia will have substantially reduced export potential due to reduced harvests of tropical logs and increasing domestic demand.

The level of Japanese log imports affects domestic supplies of residue; a fall in log imports into Japan causes a corresponding fall in residues and higher demand for imported woodchips for pulp and paper products.

The Pacific northwest of the United States and Canada will reduce harvests for environmental reasons, thus reducing their export capacity.

New sources of supply in Chile and New Zealand have the potential for increased net exports, but will not make up supply losses elsewhere.

Australia and the US South will continue to dominate export chip supplies. It is predicted that South Africa will gradually fade from this market as domestic consumption balances net trade.

China will continue with chip exports to generate foreign currency despite domestic demand.

The roundwood supply/demand imbalance in the Asia-Pacific region will increase to a predicted 40-60 million m^3 deficit by 2005-2010.

4.2 Mechanical wood products

Mechanical wood products include rough sawn timber as well as further processed products such as mouldings, and timber components. Hardwood mechanical wood products markets are analysed and presented in the following section.

4.2.1 Global sawn hardwood

Globally, hardwood sawnwood is an important product both for structural and appearance type applications. Major end user groups for hardwood sawn lumber are:

Furniture 29%

Mouldings 20%

Housing 18%

Flooring/Panelling 8%

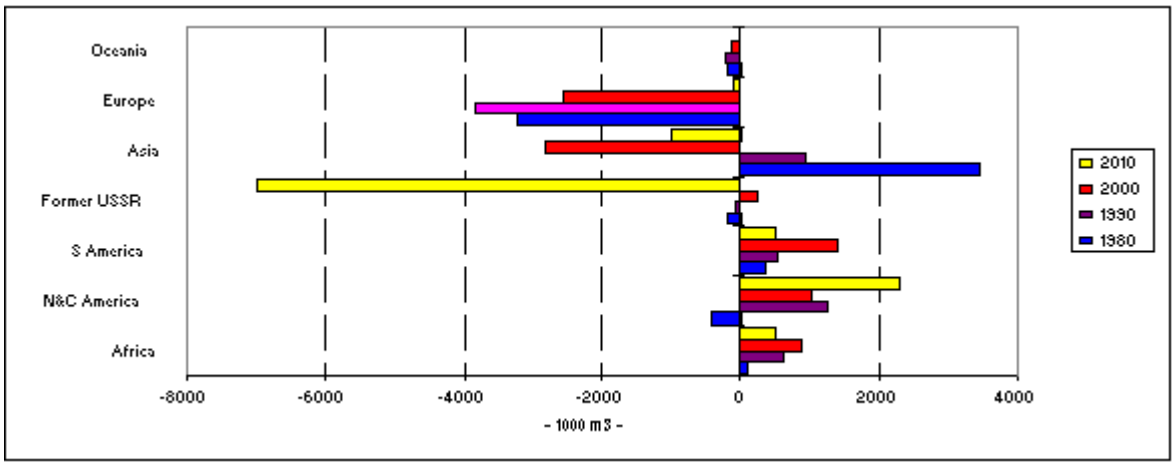
Decorative 4%

Sawn hardwood production is traditionally influenced by availability of local resources. Presently the largest production of sawn hardwood is in Asia, utilising tropical hardwood resources, followed by North America utilising temperate hardwood resources.

Global production of sawn hardwood increased from 110 million m^3 in 1980 to 130 million m^3 in 1991. Since then production has declined slightly. Production in North and Central America is anticipated to increase as the expanding North American hardwood resource is increasingly utilised. Production of sawn hardwood in Asia is expected to decline, due to the decreasing availability of tropical hardwood logs. The trend is expected to continue for the period 2010 to 2020.

Sawn hardwood consumption has followed a similar trend to production.

Figure 4-1: Global sawn hardwood net trade



Net trade developments in the different regions illustrate changes in the ability of the regional industry to maintain supplies to regional markets (Figure 4-1).

Europe, traditionally a large importer of sawn hardwood, is expected to become increasingly self sufficient. Asia's exports have declined dramatically over the past years, and the region is expected to become a major net importer of sawn hardwood. South America and Africa are both expected to increase exports, although total available volumes are expected to remain limited.

4.2.2 Asia Pacific Sawn Hardwood

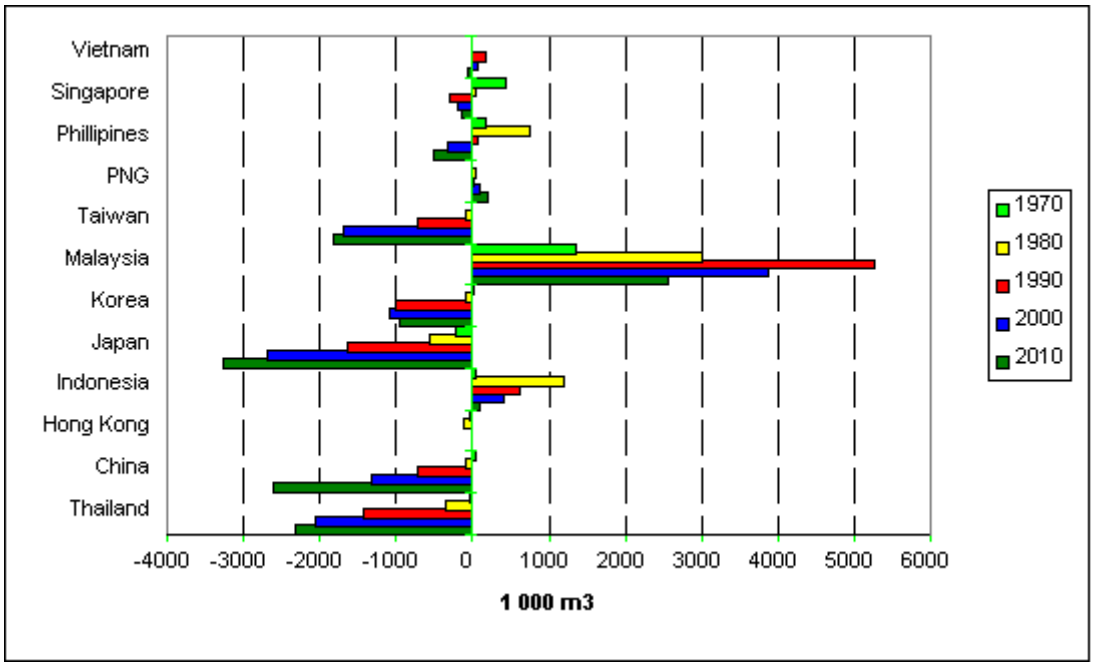
Asia has traditionally been the most important global consumer of sawn hardwood, and production has increased rapidly in recent decades. In future, consumption in Asia is expected to increase against a falling supply scenario, causing a significant regional deficit. Sawn hardwood is utilised for a wide range of applications from structural materials for house construction and concrete formwork to furniture and decorative uses.

Production of sawn hardwood developed rapidly in Japan, principally on the basis of imported tropical hardwood logs. However, the declining availability of tropical logs has resulted in a strong decrease in sawn hardwood production in Japan during the 1980's and 1990's. Domestic production has been replaced by sawn timber imports, particularly softwood. Production of sawn hardwood in China, where both domestic and imported logs are used, has developed more slowly.

Sawn hardwood production in Indonesia and Malaysia developed rapidly during the 1980's as log export bans forced domestic processing of logs.

Consumption of sawn hardwood has continued to increase in the Asia-Pacific region. Main consumers are China, Indonesia and Japan.

Figure 4-2: Asia-Pacific sawn hardwood net trade



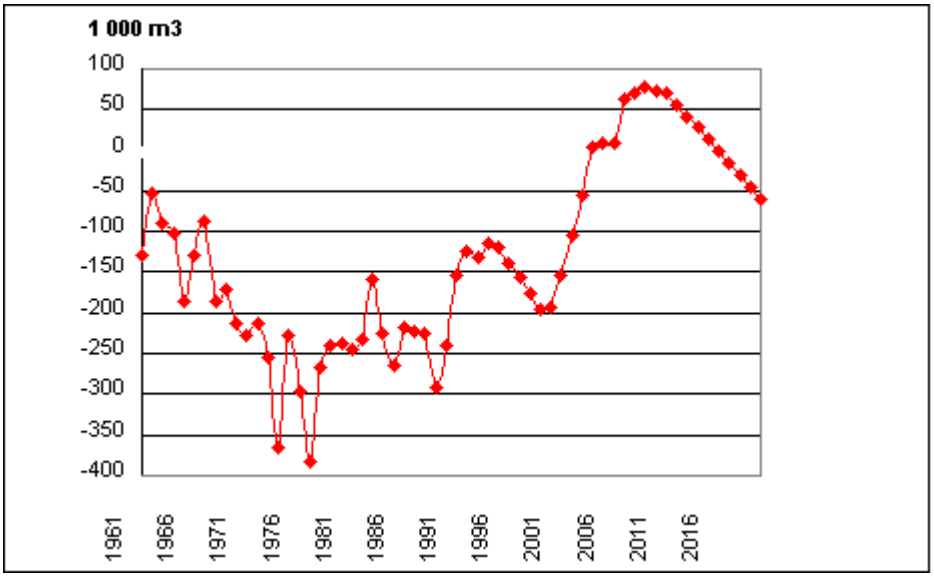
Net-trade in sawn hardwood in the Asia-Pacific region shows a decline in exports for all present exporters, and an increase in net imports
(Figure 4-2). Japan will remain the largest net importer, followed by Thailand and Taiwan. By 2010, China is expected to be the major net importer of sawn hardwood.

4.2.3 Australian Sawn Hardwood

Sawn hardwood production in Australia has been declining since the peak of 2.65 million m^3 in 1968. In 1995, Australian production of sawn hardwood was some 1.5 million m^3.

Consumption of sawn hardwood in Australia has continually exceeded production. However, total consumption levels have declined and reached 1.6 million m^3 in 1995. Consumption is expected to decline only slightly over the next few years followed by a gradual increase over time.

Figure 4-3: Australian sawn hardwood net trade



Australia has recently imported sawn hardwood, principally from tropical countries such as Malaysia and Indonesia. Import levels peaked in the 1970's, and are now declining as supply is limited and production in Australia is increasing. This will result in a decline of net imports and, depending on domestic consumption, Australia may become a net exporter.

Hardwood sawnwood production in Australia has traditionally been focused on producing structural timber. Increasingly the focus will be on the production of appearance grades of timber used in furniture and joinery. These grades will create the greatest opportunities for exports.

The ability of Tasmania to maintain supplies of sawn hardwood into a market where demand is expected to exceed supply will benefit the suppliers. Additionally, developments in downstream processing and further value adding will increase over time. These developments will be driven by entrepreneurial skills and product innovation.

Value-adding

The developments in further value-adding industries in Tasmania will depend on the ability of the local industry to produce and market components and/or finished products. Successful development of this industry can be assisted through creating a strong business environment.

4.2.4 Conclusions

Production of sawn hardwood is predicted to be at its lowest point around 2001, as softwood substitution will be at its highest, and traditional markets for structural sawn hardwood are in transition to appearance-based markets such as flooring and specialty grades. Production will then gradually increase as larger volumes of regrowth eucalypt sawlog become available. Marketing opportunities exist for both appearance and structural-type hardwood production in export substitution. The primary focus will, however, be in markets for appearance grade sawn hardwood.

4.3 Wood-based Panels

The two major determinants of demand for wood panels are economic growth with implications for building (new houses and alterations) and furniture. The second determinant is substitution between panels, particularly reconstituted panels, replacing plywood in some traditional end uses.

4.3.1 Global Wood-based Panels

The global consumption of wood-based panels has shown remarkable development in the past decades. Total consumption increased from 25 million m^3 in 1960 to 125 million m^3 in 1995. Plywood, the most important product in 1960, continued to play an important role until the mid 1970's. By that time particleboard had become an important panel. By the early 1980's, new products such as OSB and MDF entered the marketplace, and consumption of these products has developed until 1995. By 1995, plywood production started to decline due to a world wide decline in the availability of high-quality peeler logs. Particleboard was still developing strongly, as are MDF and OSB, although from a relatively small market share. Fibreboard (hardboard and soft fibreboard) consumption has declined in the past years and this trend is expected to continue.

North America and Western Europe consumed the majority of wood based panels in recent decades. In the past decade, Asia developed strongly and this development is expected to continue. Consumption of wood-based panels in all other areas is expected to develop at a moderate rate.

4.3.2 Asia-Pacific Wood-based Panels

The economic outlook for the Asia-Pacific region is good as the region contains some of the fastest growing economies in the world. However, future growth in the region is expected to slow as economies begin to mature, particularly Japan, Korea and Taiwan. "Wild cards" for high growth are China and Vietnam, but these will depend on how well they embrace the market economy. In addition, Indonesia, Thailand and Malaysia are expected to show good growth which will attract increasing domestic demand at the expense of some exports.

Production of wood-based panels has developed strongly over the past decade in the Asia-Pacific region. By far the most important panel produced has been plywood, accounting for some 70% of total production in 1995. Production of particleboard has been increasing over the past years, as has MDF production. Production of fibreboard (hardboard) has been static over the past decade, and is expected to remain at a similar level.

Future production and exports of plywood within the Asia-Pacific region are expected to decline in line with decreasing availability of high quality peeler logs and increasing volumes required domestically. Growth is expected for

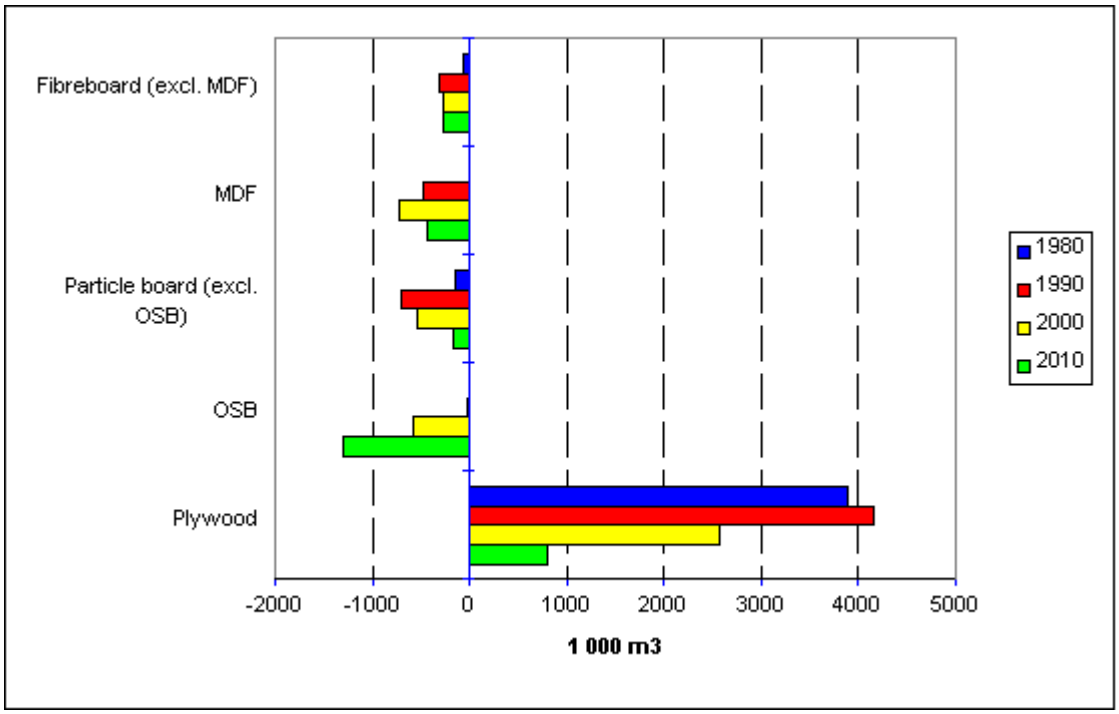
particleboard and MDF. No OSB is presently produced in the Asia-Pacific region and only limited opportunities exist for development of OSB production in the region.

Consumption of wood-based panels in the Asia-Pacific region has developed strongly in the past decade. Future panel consumption for use in construction will be driven by China, Malaysia, Indonesia and Thailand, and the Asian furniture industry in general.

Total consumption nearly doubled from 16 million m³ in 1985 to 31 million m³ in 1995. Traditionally, plywood accounts for the majority of the wood based panels consumed, although particleboard and MDF consumption is developing rapidly.

Apart from plywood, the region is a net importer of all other wood-based panels (Figure 4-4).

Figure 4-4: Asia-Pacific wood-based panels net trade

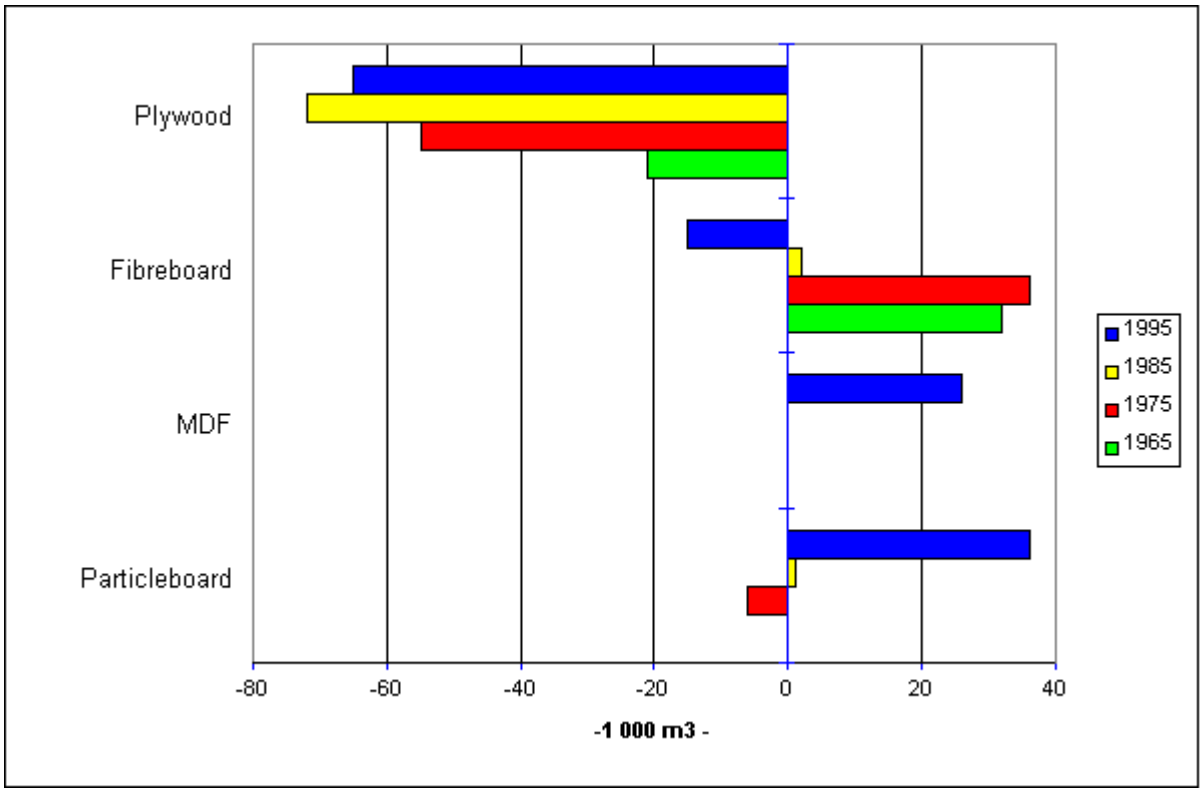


4.3.3 Australian Wood-based Panels

The wood-based panels industry in Australia has developed strongly since the early 1960's. In the past two decades, the particleboard industry in particular has expanded and presently 8 mills are in operation in Australia. Total production reached 850,000 m³ in 1995. However, it is unlikely to expand much further. More recently the MDF industry has developed, and with a total of 5 mills in operation, production has increased rapidly over the past years and reached 438,000 m³ in 1995.

Consumption has been increasing equally as rapidly as production. Total consumption increased from just over 200,000 m³ in 1961 to 1.5 million m³ in 1995. Plywood has decreased in importance from accounting for close to 50% of all panels consumed to less than 14% in 1995.

Figure 4-5: Australian wood-based panels net trade



Plywood has been the main panel imported into Australia. Imports of plywood have increased from 20,000 m³ in 1965 to over 60,000 m³ in 1995. Net trade of most other products is relatively small (Figure 4-5).

Limited marketing opportunities exist for a new panel producer in the Australian market. Any new producer would have to rely on exports. The main market for a new Australian panel producer would be the fast growing Asia-Pacific region. Markets for MDF and particleboard are developing rapidly. Demand for plywood is expected to remain strong while availability is declining which would present opportunities for new entries to this market.

4.3.4 Conclusions

Within the Australian mainland states, demand for wood-based panels is expected to remain stable. Existing production will satisfy this demand.

Within the Asia-Pacific region, demand for MDF and particleboard is strong, and is predicted to continue in the medium-term. These sectors therefore represent the best opportunities for industry expansion.

Availability of plywood from the Asia-Pacific region will decrease as a direct result of the declining supply of mixed tropical hardwood logs from Indonesia, hence creating opportunities for expansion in this sector. The Tasmanian resource characteristics may pose limitations on expansion of this specific industry.

Any extensive developments of the OSB and fibreboard markets are unlikely to occur as these are currently stagnant and predicted to decline throughout the Asia-Pacific region.

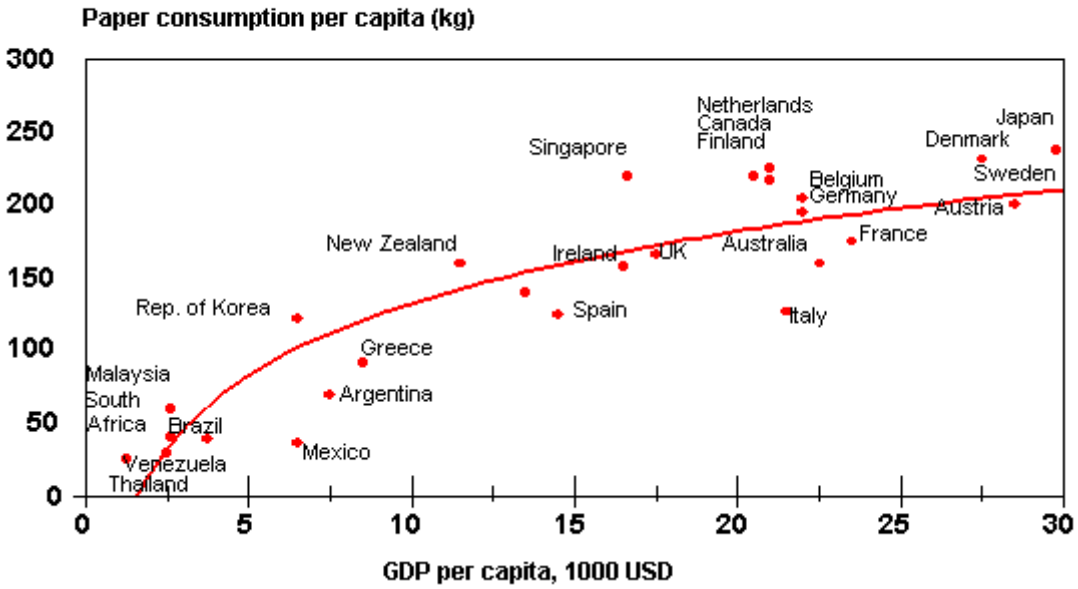
4.4 Pulp and paper

4.4.1 Global and Asia-Pacific market trends

In broad terms, the growth of paper consumption follows economic growth and consumption levels equate to standards of living.

The per capita paper consumption correlates well, on average, with Gross Domestic Product (GDP) per capita levels, with certain country specific deviations. The paper consumption growth in the lower GDP regions is typically higher than the GDP growth, while in the developed economies it has been lower (Figure 4-6).

Figure 4-6: Global paper consumption and GDP - 1992



Paper consumption in the USA is significantly higher than in other countries. Per capita consumption of paper is approximately 340 kg at a GDP per capita of USD26,000.

Future paper demand forecasts to 2010 are based on the forecast average global GDP growth of slightly more than 3% per annum, resulting in slightly less than 3% per annum growth in paper demand.

Demand growth beyond 2010 is expected, in broad terms, to follow the same general pattern as before, ie paper consumption will grow along with economic growth. In relative terms, the growth may be somewhat slower than the forecast growth for the period 1996-2010.

Total paper and paperboard consumption is forecast to grow from the current level of about 280 million tonnes per annum to a level of around 420 million tonnes per annum by 2010. The average annual growth would be over 9 million tonnes per annum. The highest growth in paper demand is forecast in Asia, due

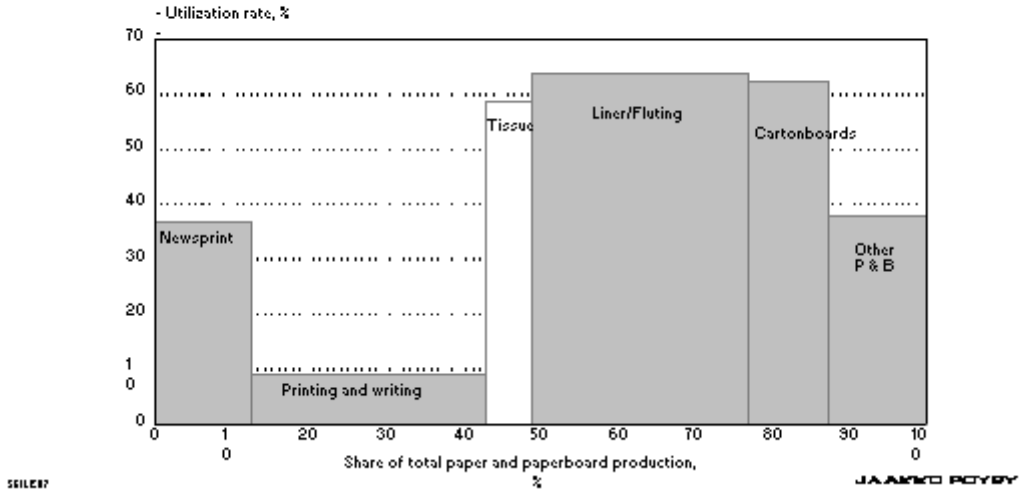
to high population growth and higher economic growth from a relatively low current level.

Paper demand growth in Asia, excluding Japan, is forecast at 5% per annum, while in the traditional developed regions, the forecast growth is estimated at about 2% per annum.

The share of recovered paper in the world fibre consumption for paper production is forecast to grow further from the present level.

The recovered paper utilisation will continue to vary widely by product group, as shown in Figure 4-7.

Figure 4-7: Utilisation of recovered paper in the world by product, 1994



The utilisation rate of recovered paper is currently very low in printing and writing papers. The main reasons are:

§ high printing quality requirements (high brightness, good paper surface properties, etc) of most printing and writing paper grades.

§ limited availability of high quality recovered paper.

When considering the future prospects of the Tasmanian pulp and paper industry to compete in the Australian and/or export markets, the printing and writing paper sector offers the best possibilities. In this sector, competing producers cannot benefit from a local low cost supply of recovered paper; thus Tasmanian producers can compete almost on an equal basis with other producers. In other paper sectors, Tasmanian paper producers would have difficulties in competing. Future development of the Tasmanian pulp and paper industry should therefore be based on the printing and writing paper sector, assuming market prospects and the general cost competitive factors in Tasmania remain favourable in this sector.

4.4.2 Printing and writing paper markets

The demand growth prospects for printing and writing paper are better than average for paper and paperboard, both globally and in the Asia-Pacific/India region.

The demand growth forecast for woodfree printing paper (paper made from chemical pulp only) is close to 6% per annum, while for coated mechanical printing papers it is 11% per annum.

The demand for the uncoated and coated woodfree paper grades in the Asia-Pacific region and the Indian subcontinent is forecast to grow from the current 20 million tonnes per annum to over 35 million tonnes per annum by 2010, ie an average of 5% per annum.

Known capacity increases from confirmed paper mill development projects in the Asia-Pacific region amount to approximately 3 million tonnes per annum, providing sufficient product to satisfy demand growth for the next two years. Most of the projects are in Indonesia, P.R. China and Thailand. The demand growth for woodfree papers is largely concentrated in the Chinese markets.

New capacity will obviously be constructed as long as Australian producers can be cost competitive and remain in the lower half of the cost curve. This market should present good opportunities.

In contrast to woodfree papers, the demand growth for coated mechanical papers in the Asia-Pacific region is concentrated in the Japanese markets, followed by the Australian markets. The market volumes are clearly smaller than in the woodfree paper sector, demand growth being only some 1.5 million tonnes per annum up to 2010.

4.4.3 Australian paper markets

The current paper and paperboard demand in Australia is close to 3.5 million t/a; production is around 2.3 million t/a. The balance is imported. Total consumption of printing and writing papers is about 1.1 million tonnes and accounts for over half the imports.

The current consumption of these papers in Australia is about 500,000 tonnes per annum. Practically all coated mechanical printing paper and about 30% of uncoated woodfree paper is imported. Total imports of all printing papers to Australia are about 700,000 tonnes per annum.

Australian Paper have announced plans to build a 160,000 t/a uncoated woodfree paper machine at the Maryvale mill in Victoria which will decrease this import requirement.

4.4.4 Market Pulp - Bleached Hardwood Kraft (BHKP)

Forecast demand growth for BHKP in the Asia-Pacific region and the Indian subcontinent is around 4 million tonnes per annum from now to 2010. The highest demand growth for market pulp is forecast in Northeast Asia.

Compared with the total growth in fibre demand, demand growth for market BHKP is relatively small, as much of the predicted new pulping capacity will be

integrated with paper production. Planned new market pulp capacity, mainly in Indonesia, could satisfy the forecast increase in regional demand. There is thus a possibility for the region to become, at least temporarily, a net exporter of BHKP. However, pulpwood availability and possible financing difficulties for worldscale pulp mill projects may delay proposed projects, and capacity growth may therefore remain less than forecast.

Current consumption of BHKP in Australia is relatively small, around 50,000 ADt/a. Future domestic demand for BHKP is forecast to increase only slightly, even if a new BHKP pulp mill is built in Tasmania. The additional pulp required by the new Maryvale machine will be supplied partly by new recycled fibre pulp capacity coming on line at the mill. Because of the economies of integration, production costs of woodfree paper are much lower in integrated operations. It is assumed that practically all new woodfree paper production in Australia would be integrated.

4.4.5 Chemi-mechanical pulp

Bleached chemi-mechanical pulp (BCMP) should be considered since, by 2010, difficulties associated with marketing the product are likely to have been resolved. A BCMP mill is well adapted to eucalypts as a raw material and has an advantage over a BHKP mill in that it can be smaller in terms of log input, ie 500,000 to 700,000 t/a of wood, roughly less than one-third that required by a BHKP mill (about half as much wood per tonne of air dried pulp). However, there is not yet an established market for BCMP. BCMP can be used as a less expensive replacement for BHKP, particularly in printing and writing grades. At this stage, demand in the Asia-Pacific region is not clear, but is probably around 200,000 ADt/a.

4.4.6 Conclusions

The market review indicates promising prospects for printing and writing papers, the main findings being:

§ a limited amount of recovered fibre will be used in the long term for printing and writing papers, giving the Tasmanian printing paper industry the possibility of competing in the Australian and export markets.

§ there are good demand growth prospects in the Asia-Pacific markets and large import substitution possibilities in the Australian markets in the printing and writing paper sector.

§ bleached chemi-mechanical pulp should be considered as an option for the future, especially if it was combined with a new printing and writing paper machine in Tasmania.

Production of market BHKP and woodfree paper can be combined. The market pulp volumes depend on the actual export requirements; the rest of the pulp production can be utilised in woodfree paper production in Tasmania.

Cost Competitiveness

5.1 Cost Comparisons

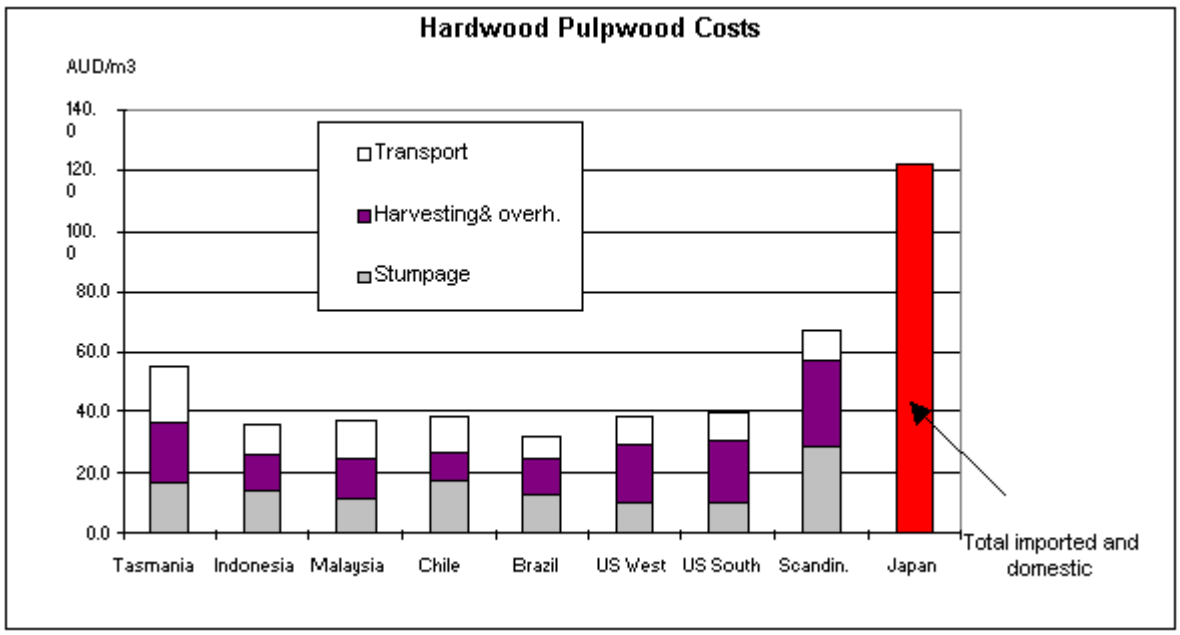
Regional cost comparisons are restricted to those countries producing similar products and which are most likely to be competitive with Tasmania. These include Indonesia, Malaysia, Chile, Brazil, US Northwest, US South, Scandinavia and Japan.

Cost estimates are based on the 1996 average cost level and exchange rates. The value of one Australian dollar is set at 0.78 USD.

5.1.1 Pulpwood

The current mill gate cost of hardwood pulpwood in Tasmania is higher than for Indonesia, Malaysia, Brazil, Chile, the US Southeast and US Northwest but below that of Scandinavia and Japan.

Figure 5-1: Comparison of hardwood pulpwood costs



The low pulpwood costs in Indonesia are forecast to increase gradually as wood supply changes from the mixed tropical hardwoods to plantation wood (mainly *Acacia mangium*). However, pulping yields and quality will also increase, which will partly compensate for the expected increase in wood cost. Tasmanian plantation wood costs are also estimated to be higher than the current wood costs, due to higher establishment and maintenance costs.

5.1.2 Energy

Current electric power rates in Tasmania are internationally competitive. In most of Canada and in the US Northwest, power prices are somewhat lower. In Scandinavia and the US South, prices are a little higher. In other regions, especially in Japan, power prices are significantly higher.

Purchased fuel prices in Tasmania are currently high due to the lack of local resources. In Scandinavia, fuel prices are at the same level as in Tasmania, in Japan a little higher, in Chile and Brazil somewhat lower, and in Indonesia and the US lower still.

5.1.3 Personnel costs

Personnel costs in Tasmania are average. Costs are lower in Indonesia and South America where labour productivity is correspondingly lower. In North America, Japan and Scandinavia, the personnel costs are higher but labour productivity is typically high.

5.1.4 Product transport costs

The current end product transport costs from Tasmania are relatively high due to low sales volumes and the high cost of harbour operations. It is assumed that in the longer term, with significantly higher product volumes, transport will be more efficient and lower harbour costs will apply through economies of scale.

With larger export volumes and efficient transport operations, Tasmanian producers would have a clear transport cost advantage against importers to the Australian markets. In exporting to the major Asian markets, Indonesian producers will have a transport cost advantage against other exporters. The estimated transport costs from the US West are also estimated to be lower than from Tasmania, while the costs from other regions are higher.

5.1.5 Capital charges

Capital charges for hypothetical new mills are calculated according to a required return on investment (ROI) using the estimated regional investment cost level. The likely investors in countries of higher than average risk or unstable economic or political conditions are typically the local producers, who have lower country risks than foreign companies have in the same area. The above average ROI requirement in these regions is thus mainly a result of the degree of international project financing, where such financing will be exposed to exchange rate variations and inflation. Thus, for example, the ROI requirement of a typical Indonesian project is not significantly higher than elsewhere, as the projects are mostly implemented by large local companies not heavily dependent on foreign financing. Capital charges are calculated at 17% per annum of the total investment requirement in Indonesia, Malaysia, Brazil and Chile, and 15% per annum in other regions studied.

The investment costs of new mills in the regions studied are at current exchange rates. The low cost of labour and construction materials in many less developed regions decreases the investment cost requirements, but higher infrastructural requirements partly compensate for this cost advantage.

5.2 Mechanical wood products

5.2.1 Sawn Hardwood

The traditional market for sawn hardwood from Tasmania is in the construction and framing sector. The forest industry was, and still is, an important supplier of framing timber.

However, this has increasingly become the domain of sawn softwood. As a result, the industry has had to intensify its efforts to supply sawn hardwood into the appearance grade product market. Within these markets, the Tasmanian industry is competing internationally with suppliers from Malaysia, Indonesia and the United States.

Globally, and within the Pacific Rim, availability of sawn timber is declining while markets are expected to see continued growth. Growth will be within the appearance grade products used for furniture, mouldings and flooring. It is in these grades that Tasmania will be competitive in the international market.

The resource available to hardwood sawmills in Tasmania allows for the successful development of downstream processing. Downstream processing options open to the industry are wide and varied, from simple furniture components to flooring and high value finished furniture. The competitive position of this industry will be dependent on:

§ Availability of good quality, competitively priced sawn hardwood.

§ Free competitive market for labour, transport etc as discussed.

§ Availability of skilled and knowledgeable personnel.

§ Highly developed design skills.

§ Good marketing and market development skills.

Within Tasmania, the resource is available to support such industry. Many of the other key success factors are being developed by the forest industry in Tasmania. If the industry is further allowed to continue this development, a competitive and successful sawn hardwood industry will remain and develop further.

5.3 Wood-based panels

Market opportunities exist for a number of wood-based panels. Demand growth is expected in MDF and particleboard. Plywood demand growth will be limited by raw material availability, while expected growth in OSB consumption will be limited by market perceptions.

5.3.1 Particleboard

Tasmania does not appear to have a cost competitive advantage producing particleboard for the Japanese market. Although direct production costs for particleboard, including financial charges, in Tasmania are lower than in Japan and Malaysia, the transport costs on this relatively low cost product make Tasmania the highest cost supplier to the Japanese market. In addition, the resource is low quality and the domestic market is over supplied with a higher quality product.

5.3.2 Medium Density Fibreboard (MDF)

Demand for MDF is growing rapidly and is expected to be sustained as the Asian markets continue to expand and end uses for MDF increase.

The cost competitive position of a worldscale MDF facility shows a relatively good position for a Tasmanian-based mill. Indonesia and Malaysia are only marginally more competitive. Future developments in production costs in Malaysia and Indonesia are expected to increase their cost levels, ensuring a competitive position for a Tasmanian-based mill.

5.3.3 Oriented Strand Board (OSB)

The market for OSB is expected to develop slowly in Asia, restricting the ability of a new player to enter the market. Additionally, Tasmanian hardwoods have been tested for suitability for OSB production and, although it is possible to produce OSB, their ability to meet the required standards as a raw material have yet to be proven.

5.3.4 Plywood

Although demand will remain strong, overall consumption is not expected to increase, largely because of supply constraints.

A plywood mill located in Tasmania would be strongly competitive. The main advantage of a Tasmanian located mill would be the relatively low wood costs compared to mills located in Indonesia, Malaysia and Japan.

5.3.5 LVL

Tasmania has a clear advantage in wood costs but fixed and distribution costs are higher than in Indonesia and Malaysia. Long term, the position is not so clear especially if, for example, exchange rates move in Australia's favour. However, the most likely scenario is that Tasmania will remain at a cost disadvantage in supplying LVL to the Asian markets.

5.4 Pulp and paper

5.4.1 Bleached Hardwood Kraft Pulp (BHKP)

Cost comparisons of hypothetical new BHKP mills in the selected areas are based on a mill size of 600,000 ADt/a. The mill concept for different regions is the same, except that on-site preparation of bleaching chemicals (oxygen, caustic soda, sodium chlorate) is assumed in Tasmania, Indonesia, Chile and Brazil, increasing the investment requirements and energy consumption of mills in these countries.

The capital charges are calculated according to the required minimum Return on Investment (ROI) principle, covering the following:

§ interest, dividends and depreciation, 15% per annum on total investment requirement in Tasmania, North America, Japan and Scandinavia.

§ 17% per annum elsewhere.

A cost comparison based on these assumptions indicates that the Tasmanian mill is competitive in the Australian market. In the Japanese and Chinese markets, the cost advantage of the Indonesian mill over the Tasmanian mill is estimated to be about USD100/ADt (largely due to an increase in transport costs, which for other exporters would remain about the same). However, the total costs of a new integrated pulp mill in Japan would be higher, almost USD 700/ADt, as compared with USD 600/ADt for a Tasmanian mill.

Economy of scale is a more critical cost factor in the market pulp industry than in other pulp and paper sectors.

While variable costs increase slightly with an increase in scale, these increases are more than offset by more pronounced decreases in fixed costs. Specific investment also decreases quite markedly.

Developments in pulping and bleaching technologies in the 1990s have also resulted in significantly lower environmental impacts compared with the average for the existing industry. Environmental impacts have decreased both directly via lower effluent loads and emissions to the air and indirectly through better energy balances and lower requirements for purchased energy.

5.4.2 Uncoated woodfree printing and writing paper

Currently the international trade in woodfree papers in the Asia-Pacific region has been relatively small. During recent years Indonesia has become a significant exporter of woodfree paper and major expansion projects are underway. They are the benchmark to evaluate the cost competitiveness of a corresponding new mill in Tasmania. A paper mill of 300,000 t/a is assumed to be integrated with a new pulp mill of 600,000 ADt/a. In order to assess economies of scale, a smaller pulp mill of 400,000 ADt/a in Tasmania was also analysed for cost competitiveness. The smaller pulp mill is also assumed to be integrated with a new paper mill of 300,000 t/a.

The cost comparisons indicate that a new mill in Indonesia would be slightly more competitive than a similar mill built in Tasmania even when servicing Australian markets, but the difference is insignificant (AUD 65/t). There is a significant cost difference between a large mill in Indonesia and a paper mill integrated with a 400,000 ADt/a pulp mill in Tasmania: approximately AUD 110/t, or about 10% of the sales price.

5.4.3 Coated mechanical printing paper

The main source of imported coated mechanical printing paper for Australia is Finland, which has been taken as one benchmark in the cost comparison. The other source is the Pacific Northwest of North America which may start exporting larger volumes to the Asia-Pacific markets, including Australia.

The delivered costs to Australian markets would be competitive for a large, 300,000 t/a one-machine paper mill in Tasmania.

Hypothetical comparisons for new hypothetical coated mechanical paper mills indicate almost equal costs in the Australian market. Other factors of competition will thus largely determine market success, such as client service and delivery times which, for domestic producers, are typically more favourable than for importers. Also quality and the ability to produce lower grammages are important factors of competitiveness. To ensure good paper quality, the raw material base for chemi-mechanical pulping in Tasmania must consist of lower density, juvenile wood.

The economies of scale for new mills producing printing paper are also very significant, almost as large as for a market pulp mill. A state-of-the-art, one-machine mill has a current capacity of about 400,000 t/a.

TOP

Growth Scenario of the Tasmanian Forest Industry

6.1 Growth Scenario

The growth scenario for the development of the wood-based industry in Tasmania is governed by availability and quality of the Tasmanian hardwood resource, as well as its competitive position and market opportunities.

A working group was established to identify opportunities for expansion of the forest products industry and to examine the options associated with each of the outcomes. This comprised representatives from ABARE, TDR, Margules/Jaakko Pöyry, the Tasmanian sawmilling, veneer, pulp and paper, panel and woodchipping industries, the Forestry Industries Association of Tasmania (FIAT), Forestry Tasmania and Private Forests Tasmania. The procedure for assessment and evaluation of investment and development options was as follows:

§ industry and forest grower resource and cost data postulated and collated;

§ market review provided by Margules to evaluate current cost competitiveness of the industry for the range of potential product/process options;

§ options presented to the working group to determine which industries represented the most viable opportunities for expansion, and;

§ decisions made on the industries for which expansion/development is likely to be most feasible.

The scenario represents a possible development pattern. It illustrates what might reasonably be achieved in Tasmania. However, a number of other scenarios based on the same product/process options could be just as feasible.

6.2 Current structure of the industry

The main characteristics of the current industry structure are schematically presented in Figure 6-1. Production levels and wood intake by the main production lines in 1996 illustrates the dominance of chip exports, as well as the proportion of the wood supply which is in sawlogs/veneer logs. The current production level does not represent the total sustainable wood supply of forests, or the production capacity of the industry, but more the actual prevailing market situation.

The general cost level in Tasmania, compared with the main competitors, is somewhat higher than average, especially regarding the cost of wood and

transport costs to the markets. However, in future, with increasing export quantities, more efficient transport methods and reforms in harbour operations, transport costs are likely to decrease significantly, thus giving a better competitive position for the industry. Still it is likely that the cost level for the forest industry in Tasmania will, in the long term, remain average.

Despite of the average cost level in Tasmania a strong competitive position can be achieved by utilising the full benefits of economies of scale and/or integration in future investments.

6.3 Forecast for 2010 and 2020

6.3.1 Basic assumptions

In formulating the potential future structure of the industry, it is assumed that by 2010 there is a free competitive investment environment in Tasmania. This, for example, means the following:

§ There is free competition in the energy supply markets in Tasmania. The possible increased power requirements for the forest industry are supplied at competitive prices so that power supply does not limit the growth possibilities of the industry.

§ Rational, efficient transport methods and harbour operations are applied so that the short distances from Tasmania to the Australian mainland, as compared with importers, can be fully exploited to support the growth of the industry.

§ Realistic wood royalties, road tolls, fuel and other taxes are applied which do not place Tasmania at a competitive disadvantage.

§ There are no import duties, import quotas or other direct or indirect import barriers for forest product imports to Australia to protect the local producers.

In addition to the above, there must be long term security of wood supply to enable industry to make large-scale investments in processing and in plantation programs.

This investment environment will mean that within the physical limits of the wood supply, those product/process options having good market prospects and competitive strength can be implemented in Tasmania in the medium to long term.

Based on the findings of the market review and competition possibilities, the following development options and strategies for the Tasmanian forest industry are outlined:

§ developing sawnwood and veneer reprocessing, and adjustment of operations to utilise the increasing supply of regrowth eucalypt sawlogs.

§ expansion of reconstituted panel (MDF) production.

§ expansion of printing paper production, both in the woodfree printing and writing paper sector (based on chemical pulp) and in the mechanical printing paper sector (based partly on mechanical pulp).

§ building worldscale production units as allowed by the forest resources for achieving full economies of scale.

§ integrating chemical and mechanical pulp mills with paper mills for achieving full cost benefits of integration.

6.3.2 Mechanical wood products industry development

Sawnwood

Sawnwood and veneer operations will have to develop their businesses with a focus on value-added reprocessing, such as production of various appearance products and components. The development of value-adding has a high employment multiplier effect, and can easily compensate for the predicted decrease of employment in basic sawnwood production. Success in these markets may be more dependent on product development and marketing skills than generic market prospects or cost competitiveness of production. Tasmanian based reprocessing can be as feasible as elsewhere in Australia.

The present sawmilling and veneer milling industry in Tasmania fully utilises the currently available high quality sawlog/veneer log resource and about half of the currently available low quality sawlog resource (under current specifications). Expected developments within the existing industry, based on the currently available resource, include:

§ Expansion will be restricted to increased utilisation of lower quality logs and/or plantation logs to maintain or increase productivity.

§ Rationalisation whereby some sawmilling operations will be centralised.

§ Downstream investments, leading to further value-adding, to be undertaken within Tasmania, with increased export potential.

§ Improvements in kiln-drying techniques and remanufacturing for appearance and structural grades.

With the reduced risk environment which would exist with improved resource security and micro-economic reforms, the necessary investment in plant and marketing for these developments is more likely to be forthcoming.

As indicated in the discussion under Table 2-1, an increase in intensive silviculture and/or rates of plantation establishment would allow expansion in this sector.

6.3.3 Wood-based Panel Products

The long term markets for hardwood based panel products both in Australia and in the Asia-Pacific region are facing a diminishing supply of large diameter logs. These markets can only be partly supplied by smaller diameter logs, and the prospects for panels such as MDF (medium density fibreboard) and LVL to substitute for the decreasing supply of solid wood products are very good. The production of MDF in Tasmania, especially if based on lower wood density raw material is feasible, as the first MDF plant (Starwood) currently under construction is expected to demonstrate.

MDF

The first MDF mill in Tasmania is expected to be operational in 1997. This mill will utilise a mixture of softwood and hardwood. It is assumed that additional mills will use a 100% hardwood resource. In the development of the industry, it has been assumed that, by 2010, a second line will have been added to the present MDF mill, utilising some 250,000 m^3 of additional hardwood. Additionally, by 2020 a new mill will have been constructed in the south of Tasmania, also with an annual log intake of 250,000 m^3.

The production of MDF in Tasmania is forecast to grow significantly, based on solid long term demand growth prospects both in the Asia-Pacific and Australian markets. The product quality and consequent sale price of MDF depends on the raw material. The preferred raw material for MDF is low density hardwood or radiata pine pulpwood.

Plywood and veneer

By 2010, there is potential for a plywood mill to be developed in the south of Tasmania, utilising regrowth material (150,000 m^3/a). Development of the mill would be a staged process ultimately combining with the veneer production. Production would build up from 65,000 m^3/a to 75,000 m^3/a. Further expansion would depend on the availability of additional suitable plywood and veneer resource.

6.3.4 Pulp and paper industry development

In paper markets, long term demand growth closely follows economic growth. Because of high economic and population growth, paper demand in the Asia-Pacific region is forecast to grow more than elsewhere in the world. The current estimates are for about 5% growth per annum during the next 10 to 15 years, giving a solid basis for considering the expansion of the paper industry in Tasmania.

The share of recovered paper in the consumption of fibrous raw materials in papermaking is forecast to grow further. However, the increase in recovered paper supply will be concentrated in lower quality grades. The utilisation of recovered paper in printing papers is currently low because of quality requirements and the limited supply of high quality recovered paper. For this reason utilisation of recovered paper in printing grades will remain low in the long term, as compared with other paper grades.

The paper industry in Tasmania could be competitive in printing grades. Since Australia is importing large volumes of printing paper, currently some 700,000 tonnes per annum, the main market for Tasmanian producers would be the domestic market. In other paper and paperboard grades, the potential for competing producers to utilise the low cost supply of recovered paper as well as their location close to the markets will give them a superior competitive position against possible Tasmanian production.

The increased volume of plantation pulpwood in combination with about 1.8 Mt of wood from native forests will supply the raw material for expansion of development in the paper industry.

Woodchip exports will continue to play an important role under the proposed development scenarios illustrated in Figures 6.1, 6.2 and 6.3. It is estimated that by 2020, chip exports could still comprise some 1.9 Mt per annum.

The major investment projects will be in the pulp and paper sector. Because of economies of scale, a maximum possible chemical pulp mill size of up to 750,000 ADt/a would have the highest profitability potential under a constant wood stumpage assumption. However, a potential investor may have to compromise on scale to keep log transport costs reasonable and minimise costs of wood procurement. A pulp mill size of 600,000 ADt/a is therefore assumed in the forecast.

Chemical pulp and woodfree paper

The investment in a pulp mill project is large, probably over AUD 1 billion, and requires demanding project management. It is often not considered practical to construct a paper mill at the same time as a pulp mill. An example of an integrated pulp and paper mill project is:

1. build the pulp mill first as a market pulp mill only

2. after 2-3 years build the first paper machine

3. build the second paper machine when markets allow.

As concluded in the market review, domestic markets for woodfree papers will allow construction of a large scale woodfree paper operation. An integrated pulp and paper mill in Tasmania will have a good competitive position in the domestic market and is included in the scenario as a two-machine paper mill; total production 600,000 tonnes per annum. The first paper machine is assumed to be implemented by 2010 and the second by 2020. The fibre furnish of woodfree paper will contain some BSKP. About 225,000 ADt/a BHKP from the pulp mill will be surplus to the requirements of the paper mill and can be sold as market pulp. Depending on, for example, the ownership structure of the mill, the amount of market pulp may have to be higher, and in that case, a one-machine paper mill of 300,000 tonnes per annum would be an optional setup for the pulp and paper operations, leaving some 410,000 ADt/a market pulp for sale.

Mechanical pulp and coated mechanical paper

Because mechanical pulp is not a feasible product as market pulp, the pulp and paper mill investments are carried out at the same time. Project management of the mechanical pulping process is much simpler than the chemical process.

Because of good prospects and competitiveness in the Australian market, the production of mechanical printing papers is forecast to increase by installing a coated mechanical printing paper mill having two machines with a total capacity of 600,000 tonnes per annum. The first paper machine is assumed to be implemented by 2010 and the second by 2020. Depending on the ownership structure, the project could be implemented either as a new greenfield project or integrated with current operations. As the yield of mechanical pulp is high, the wood requirements even for a large scale paper mill are relatively low. However, for securing high product quality, the preferred raw material is low density eucalypt wood, eg: thinnings from regrowth/regenerated or plantation forests. Thinnings from radiata pine plantations could also be used. The wood quality

requirements of mechanical pulping may become an important factor in considering a suitable location for the mill in Tasmania.

Environmental considerations

By the time the proposed chemical pulp mill is implemented in Tasmania around 2010, a totally effluent free (TEF) pulping process will have been developed on a commercial scale. This will give more options for selecting a suitable pulp mill site. However, as the pulp mill would be ultimately integrated with paper production, the availability of fresh water would remain a consideration in selecting the mill site.

6.3.5 Forecast structure for 2010 and 2020

The forecast forest industry structure in 2010 and 2020 is illustrated in Figures 6-2 and 6-3.

The estimated total investment required for implementing the growth plan is about AUD 3.5 billion, of which about AUD 2.3 billion would be required before 2010.

The employment effect during the construction period of the mills will be significant. Direct permanent employment in operating the new mills is about 1,200 people by 2010 and will be about 1,500 by 2020. In addition, indirect employment will be about 5,000 people. Thus total employment will be around 6,500 people.

Summary

A summary of the expected industry expansion in Tasmania under the selected growth scenario is shown in Table 6-1. Predicted gross value of outputs and employment effects under the proposed scenario are detailed in Table 6-2.

Table 6-1: Summary of industry expansion under proposed scenario

Current	**2010**	**2020**
Existing Industry	**New Industry**	**New Industry**
Sawmilling	Expansions of existing	Expansions of existing
Veneer and plywood	– Sawmilling and veneer	– 2nd paper machines
MDF (under construction)	– MDF, 2nd line	– Woodfree printing and writing paper
Office paper and newsprint from chemical and mechanical pulp	New plants	– Coated mechanical printing paper
Woodchip exports	– Plywood mill	New plants
	– Chemical pulp	– MDF
	– Mechanical pulp	– Mechanical pulp (possible)

	– Woodfree printing and writing paper	
	– Coated mechanical printing paper	

Table 6-2: Predicted industry output and direct employment effects in processing industries under proposed scenario

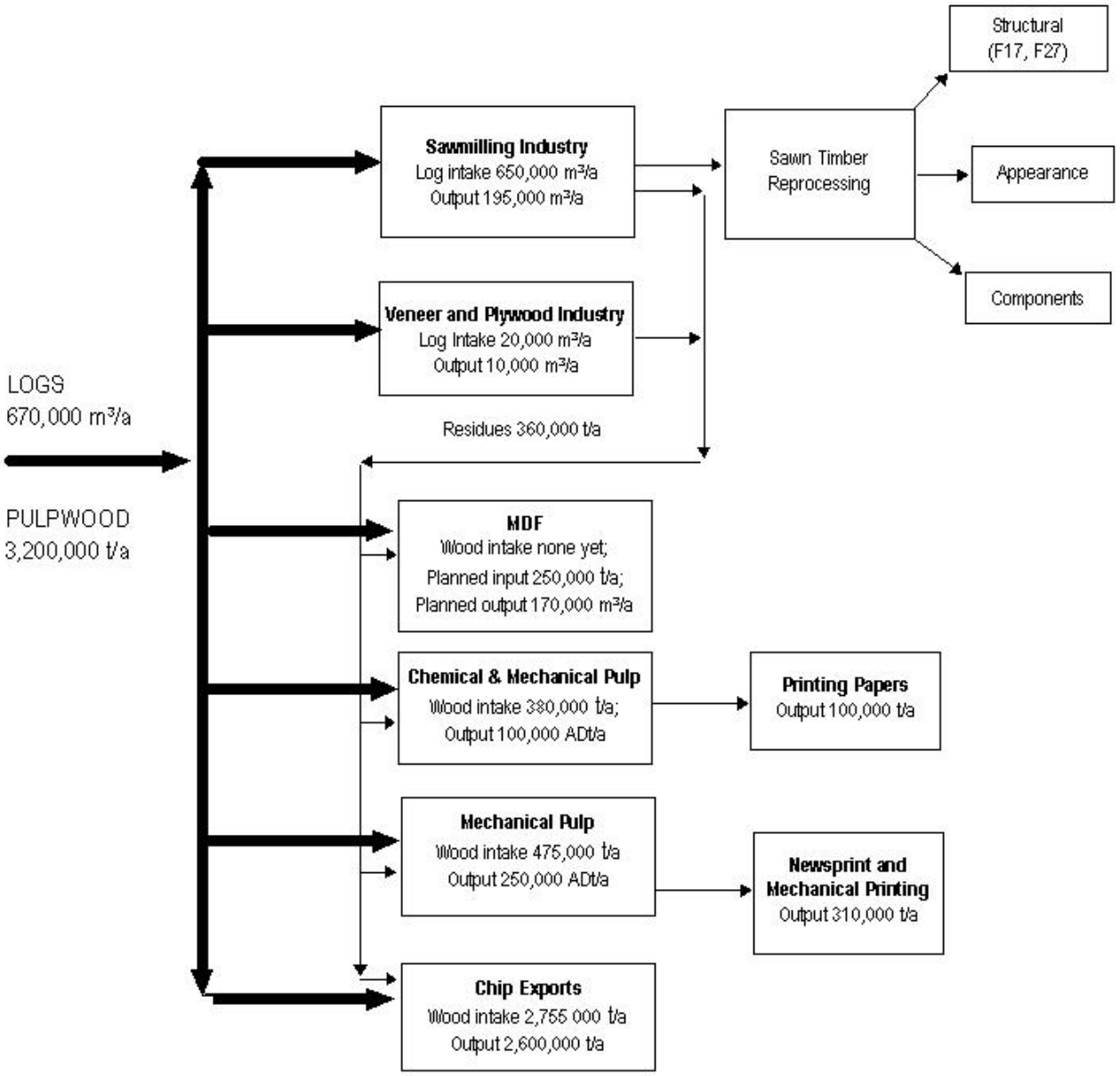
* Starwood plans to commence production mid 1997.

NB Numbers are rounded and production output figures indicative.

It is important to note that for industries in the early stages of processing where volatility in production volume/output is great, fluctuations in employment figures will be correspondingly significant. Some softwood and/or imported pulp is included in the current situation for MDF and the chemical and mechanical pulps.

Figure 6.1: Current structure of the Tasmanian forest industry

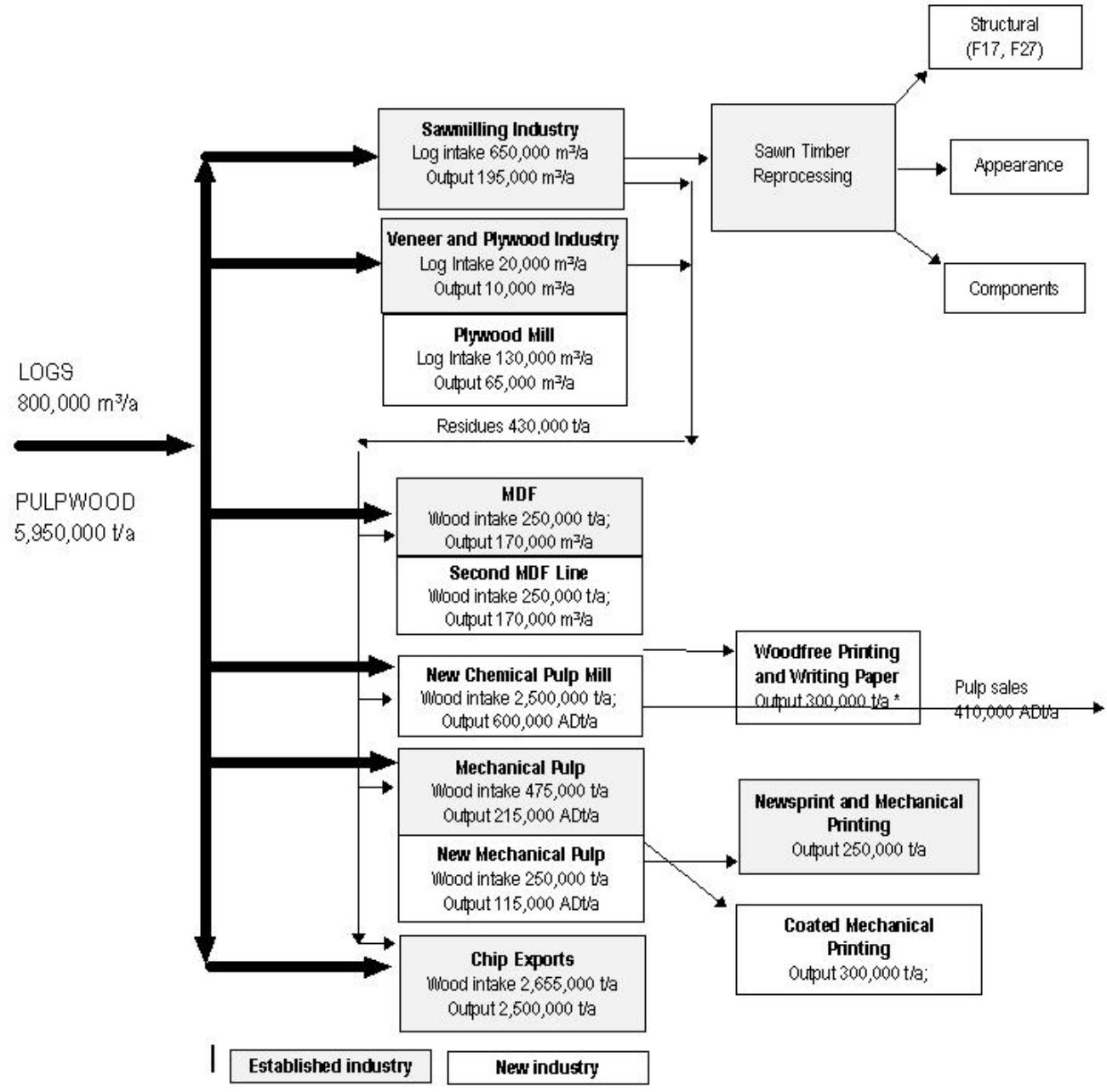
Figure 6-1: Current structure of the Tasmanian forest industry



NOTE: The high recovery of residues from sawlog and veneer logs is because of the increasing proportion of low quality logs being processed by these industries. Softwood and some imported pulp is included in the current pulpwood stream.

Figure 6.2: Forecast Tasmanian Forest Industry Structure in the Year 2010

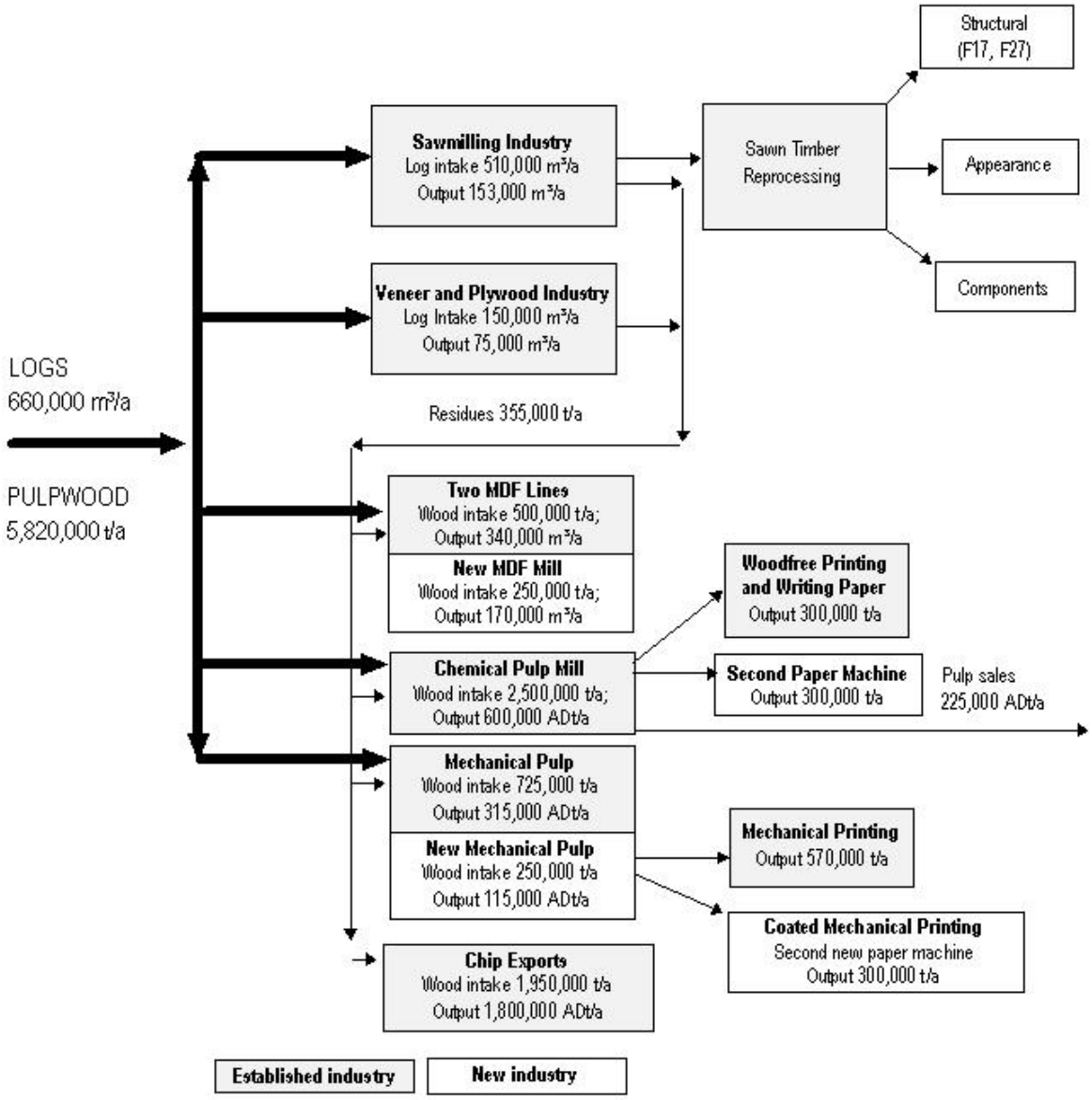
Figure 6-2: Forecast Tasmanian Forest Industry Structure in the Year 2010



* Requires 190,000 t of BHKP and 60,000 t of BSKP to produce 300,000 t of paper.

Figure 6.3: Forecast Tasmanian Forest Industry Structure in the Year 2020

Figure 6-3: Forecast Tasmanian Forest Industry Structure in the Year 2020



Other Factors with a bearing on the Development Scenarios

7.1.1 Alternative fibres

Alternatives to wood fibre or recycled paper fibre in paper manufacture have not been explicitly considered. This is because they are unlikely to have a significant bearing on the market for Tasmanian pulpwood as a furnish for printing and writing paper. However, because there is an awareness in the public at large of the fact that these alternative fibres can be used for paper manufacture, they are considered in this section.

The use of non-wood fibre, such as straw, reed, bagasse, bamboo, cotton, cotton rags, hemp and kenaf is limited, representing only about 5 to 6 % of the total fibre furnish in paper and paperboard production globally, and concentrated in developing countries, where the relative quality and economics tend to make their use more feasible.

Certain non-wood fibres like cotton, flax, hemp, *Abaca* (manila hemp), *Crotalaria* (sunn hemp) and sisal have long fibres and can be used in specialty papers, such as security papers. The markets for these paper grades are too small in Australia to justify a new paper machine and the export possibilities are very limited because of the specific characteristics of each market area.

The utilisation of straw generates a number of quality, techno-economic and environmental problems. The yield of straw harvesting is typically slightly over 2 BDt of straw per hectare, and the pulping yield is thus about 1 ADt pulp per hectare. A straw pulp mill would thus require a harvesting area of about 600,000 hectares to be economical. This normally leads to uneconomical transport distances. The high content of silica in straw makes the chemical recovery of the spent cooking liquor difficult. When considering high transport costs for straw and high investment costs for chemical recovery, the profitability of straw pulping is poor.

The straw pulp industry in the P.R. of China and in India is based on small-scale pulp mills without chemical recovery, resulting in huge environmental problems both directly in creating heavy effluent loads and indirectly in not recovering the cooking chemicals, nor the calorific value of spent cooking liquor.

The feasibility of a straw-based pulp mill in Tasmania would depend on the reliable availability of sufficient straw and the cost of collection.

The overall impact of non-wood fibres on future long-term development possibilities of the Tasmanian paper industry will remain insignificant.

7.1.2 Softwood

Forestry Tasmania's softwood forests consist of about 49,000 hectares of radiata pine, located for the most part in the north of the State and including some plantations established by ANM on State Forest in the south. The scale of the

plantation estate is not large by comparison to mainland states. Current sawlog sales from this resource exceed 250,000 m³ per annum, together with an additional 25,000 m³ per annum of small sawlog. The current softwood production is fully utilised by existing industries. Sawlog production is expected to increase to over 500,000 m³ per annum from the existing estate within 15 years. Forestry Tasmania has recently announced the proposed part privatisation of its softwood plantation estate, incorporating a significant expansion program. This program is expected to double the area of the radiata pine estate on State Forest and to increase future production from 500,000 cubic metres to one million cubic metres per year during the period of the Regional Forest Agreement.

In addition, approximately 31,000 hectares of softwood forests have been established on private property. Much of this resource is committed to log and chip exports from the north of the state.

7.1.3 Technological developments

Between now and 2020, developments in technology will continue. This will in turn develop new opportunities and alter competitive positions within the global forest industry. For example, the economy of scale requirements of pulp mills and value-adding in solid wood products will probably increase.

7.1.4 Timber Certification

The driving force behind timber certification to date has been the desire by major environmental groups to ensure sustainable forest management by controlling marketing of finished products. In order to be effective, certification criteria must:

§ be voluntary, transparent and supported by forest owners, managers and the public

§ be connected to the RFA process

§ have clear links with international standards

§ involve wide survey/participation of forest users

§ enable comparison of environmental performance standards between regions.

Timber certification will become an issue in the future. The main drawbacks include the cost of third party auditing, a perception that consumers won't pay more for certified timber, and logistical difficulties of maintaining a documented "chain of custody" of timber from forest to hardware store.

Within Tasmania, standards for the conduct of forest operations (for example, road construction and forest harvesting), are determined by the Forest Practices Code. The Code forms part of a system of planning, supervision and review for forest operations both on State Forest and private property throughout Tasmania. Specific operational performance standards have been established under a consultative process with industry and forest users. In effect, this process has formed the basis for the potential implementation of a certification system within Tasmania that should not cause disruption to the forest products industry.

Industry Figures

Industry Tables

Table 6-2: Predicted industry output and direct employment effects in processing industries under proposed scenario

	CURRENT SITUATION (1996)			2010			2020		
Product	Production volume/output	Gross value of output ($'000)	Direct employment	Total production volume/output	Additional gross value of output ($'000)	Additional direct employment	Total production volume/output	Additional gross value of output ($'000)	Additional direct employment
Sawnwood, m^3/a	195,000	152,400	)	195,000	0	)	153,000	-32,800	)
Veneer, m^3/a	10,000	9,400	) 1,769	10,000	0	) 0	10,000	0	) -358
Plywood, m^3/a	0	0	0	65,000	35,800	150	65,000	0	0
MDF, m^3/a	0	* 0	0	340,000	119,000	204	510,000	59,500	102
Chip exports, m^3/a	2,600,000	211,800	570	2,500,000	-8,100	-22	1,800,000	-57,000	-150
Chemical pulp, t/a	80,000	0	)	600,000	316,000	370	600,000	-142,450	0
Mechanical pulp, t/a	270,000	0	)	330,000	0	71	445,000	0	71
Woodfree paper, t/a	100,000	123,000	) 1,735	300,000	246,000	200	600,000	369,000	300
Mechanical printing, t/a	310,000	364,300	)	550,000	288,000	264	850,000	360,000	330
TOTALS	**3,565,000**	**861,000**	**4,074**	**4,900,000**	**997,000**	**1,237**	**5,000,000**	**556,000**	**295**

* Starwood plans to commence production mid 1997.

Total websites: 92
Hyperlink #1
Hyperlink display text:
http://www.daff.gov.au/content/output.cfm?ObjectID=3E48F86-AA1A-11A1-B6300060B0AA00008&contType=outputs
Hyperlink #2
Hyperlink display text: Disclaimer
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02421
Hyperlink #3
Hyperlink display text: Glossary
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02422
Hyperlink #4
Hyperlink display text: Definitions
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02423
Hyperlink #5
Hyperlink display text: Introduction
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02424
Hyperlink #6
Hyperlink display text: Forest Resources
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02425
Hyperlink #7
Hyperlink display text: Investment Risk - Implications for Forest Development
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02426
Hyperlink #8
Hyperlink display text: Market Review
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02427
Hyperlink #9
Hyperlink display text: Growth Scenario of the Tasmanian Forest Industry
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02429
Hyperlink #10
Hyperlink display text: Other Factors with a bearing on the Development Scenarios
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02420
Hyperlink #11
Hyperlink display text: Industry Figures
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02504
Hyperlink #12
Hyperlink display text: Industry Tables
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02342
Hyperlink #13
Hyperlink display text: rfa@affa.gov.au
mailto:rfa@affa.gov.au
Hyperlink #14
Hyperlink display text: 2.1 Global
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02425
Hyperlink #15
Hyperlink display text: 2.2 Asia-Pacific

http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02425
Hyperlink #16
Hyperlink display text: 2.3 Australia
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02425
Hyperlink #17
Hyperlink display text: 2.4 Tasmania
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02425
Hyperlink #18
Hyperlink display text: 2.4.1 Forest definition
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02425
Hyperlink #19
Hyperlink display text:
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02425
Hyperlink #20
Hyperlink display text:
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02425
Hyperlink #21
Hyperlink display text: 2.4.3 Hardwood forest yield
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02425
Hyperlink #22
Hyperlink display text:
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02425
Hyperlink #23
Hyperlink display text: 4.1 Factors driving the demand for and supply of wood
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02427
Hyperlink #24
Hyperlink display text: 4.1.1 Demand drivers for wood products
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02427
Hyperlink #25
Hyperlink display text: 4.1.2 Supply drivers for wood products
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02427
Hyperlink #26
Hyperlink display text: 4.2 Mechanical wood products
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02427
Hyperlink #27
Hyperlink display text: 4.2.1 Global sawn hardwood
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02427
Hyperlink #28
Hyperlink display text: 4.2.2 Asia Pacific Sawn Hardwood
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02427
Hyperlink #29
Hyperlink display text: 4.2.3 Australian Sawn Hardwood
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02427

Hyperlink #30
Hyperlink display text: 4.2.4 Conclusions
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02427
Hyperlink #31
Hyperlink display text: 4.3 Wood-based Panels
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02427
Hyperlink #32
Hyperlink display text: 4.3.1 Global Wood-based Panels
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02427
Hyperlink #33
Hyperlink display text: 4.3.2 Asia-Pacific Wood-based Panels
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02427
Hyperlink #34
Hyperlink display text: 4.3.3 Australian Wood-based Panels
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02427
Hyperlink #35
Hyperlink display text: 4.3.4 Conclusions
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02427
Hyperlink #36
Hyperlink display text: 4.4 Pulp and paper
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02427
Hyperlink #37
Hyperlink display text: 4.4.1 Global and Asia-Pacific market trends
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02427
Hyperlink #38
Hyperlink display text: 4.4.2 Printing and writing paper markets
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02427
Hyperlink #39
Hyperlink display text: 4.4.3 Australian paper markets
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02427
Hyperlink #40
Hyperlink display text: 4.4.4 Market Pulp - Bleached Hardwood Kraft (BHKP)
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02427
Hyperlink #41
Hyperlink display text: 4.4.5 Chemi-mechanical pulp
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02427
Hyperlink #42
Hyperlink display text: 4.4.6 Conclusions
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02427
Hyperlink #43
Hyperlink display text: 5.1 Cost Comparisons
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02428
Hyperlink #44
Hyperlink display text: 5.1.1 Pulpwood

http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02428
Hyperlink #45
Hyperlink display text: 5.1.2 Energy
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02428
Hyperlink #46
Hyperlink display text: 5.1.3 Personnel costs
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02428
Hyperlink #47
Hyperlink display text: 5.1.4 Product transport costs
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02428
Hyperlink #48
Hyperlink display text: 5.1.5 Capital charges
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02428
Hyperlink #49
Hyperlink display text: 5.2 Mechanical wood products
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02428
Hyperlink #50
Hyperlink display text: 5.2.1 Sawn Hardwood
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02428
Hyperlink #51
Hyperlink display text: 5.3 Wood-based panels
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02428
Hyperlink #52
Hyperlink display text: 5.3.1 Particleboard
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02428
Hyperlink #53
Hyperlink display text: 5.3.2 Medium Density Fibreboard (MDF)
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02428
Hyperlink #54
Hyperlink display text: 5.3.3 Oriented Strand Board (OSB)
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02428
Hyperlink #55
Hyperlink display text: 5.3.4 Plywood
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02428
Hyperlink #56
Hyperlink display text: 5.3.5 LVL
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02428
Hyperlink #57
Hyperlink display text: 5.4 Pulp and paper
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02428
Hyperlink #58
Hyperlink display text: 5.4.1 Bleached Hardwood Kraft Pulp (BHKP)
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02428

Hyperlink #59
Hyperlink display text: 5.4.2 Uncoated woodfree printing and writing paper
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02428
Hyperlink #60
Hyperlink display text: 5.4.3 Coated mechanical printing paper
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02428
Hyperlink #61
Hyperlink display text:
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02428
Hyperlink #62
Hyperlink display text: 6.1 Growth Scenario
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02429
Hyperlink #63
Hyperlink display text: 6.2 Current structure of the industry
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02429
Hyperlink #64
Hyperlink display text: 6.3 Forecast for 2010 and 2020
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02429
Hyperlink #65
Hyperlink display text: 6.3.1 Basic assumptions
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02429
Hyperlink #66
Hyperlink display text: 6.3.2 Mechanical wood products industry development
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02429
Hyperlink #67
Hyperlink display text: 6.3.3 Wood-based Panel Products
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02429
Hyperlink #68
Hyperlink display text: 6.3.4 Pulp and paper industry development
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02429
Hyperlink #69
Hyperlink display text: 6.3.5 Forecast structure for 2010 and 2020
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02429
Hyperlink #70
Hyperlink display text: Table 6-2: Predicted industry output and direct employment effects in processing industries under proposed scenario
http://www.daff.gov.au/corporate_docs/publications/word/forestry/rfa/tables/tas_industr_tab6_2.doc
Hyperlink #71
Hyperlink display text: Figure 6.1: Current structure of the Tasmanian forest industry
http://www.daff.gov.au/image3/forestry/rfa/tas/tas_raa_industry_fig6_1.gif
Hyperlink #72
Hyperlink display text: Figure 6.2: Forecast Tasmanian Forest Industry Structure in the Year 2010
http://www.daff.gov.au/image3/forestry/rfa/tas/tas_raa_industry_fig6_2.gif
Hyperlink #73

Hyperlink display text: Figure 6.3: Forecast Tasmanian Forest Industry Structure in the Year 2020
http://www.daff.gov.au/image3/forestry/rfa/tas/tas_raa_industry_fig6_3.gif
Hyperlink #74
Hyperlink display text: 7.1.1 Alternative fibres
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02420
Hyperlink #75
Hyperlink display text: 7.1.2 Softwood
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02420
Hyperlink #76
Hyperlink display text: 7.1.3 Technological developments
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02420
Hyperlink #77
Hyperlink display text: 7.1.4 Timber Certification
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02420
Hyperlink #78
Hyperlink display text:
http://www.daff.gov.au/image3/forestry/rfa/tas/tas_raa_industry_fig6_3.gif
Hyperlink #79
Hyperlink display text: Global sawn hardwood net trade
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02427
Hyperlink #80
Hyperlink display text: Asia-Pacific sawn hardwood net trade
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02427
Hyperlink #81
Hyperlink display text: Australian sawn hardwood net trade
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02427
Hyperlink #82
Hyperlink display text: Asia-Pacific wood-based panels net trade
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02427
Hyperlink #83
Hyperlink display text: Australian wood-based panels net trade
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02427
Hyperlink #84
Hyperlink display text: Global paper consumption and GDP - 1992
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02427
Hyperlink #85
Hyperlink display text: Utilisation of recovered paper in the world by product, 1994
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02427
Hyperlink #86
Hyperlink display text: Comparison of hardwood pulpwood costs
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02428
Hyperlink #87
Hyperlink display text: Current structure of the Tasmanian forest industry
http://www.daff.gov.au/image3/forestry/rfa/tas/tas_raa_industry_fig6_1.gif
Hyperlink #88

Hyperlink display text: Forecast Tasmanian Forest Industry Structure in the Year 2010
http://www.daff.gov.au/image3/forestry/rfa/tas/tas_raa_industry_fig6_2.gif
Hyperlink #89
Hyperlink display text: Forecast Tasmanian Forest Industry Structure in the Year 2020
http://www.daff.gov.au/image3/forestry/rfa/tas/tas_raa_industry_fig6_3.gif
Hyperlink #90
Hyperlink display text: Actual and predicted roundwood supply by forest product for Tasmania, based on existing forest management arrangements (million m^3 sawlog, million tonnes pulpwood)
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02425
Hyperlink #91
Hyperlink display text: Summary of industry expansion under proposed scenario
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02429
Hyperlink #92
Hyperlink display text: Predicted industry output and direct employment effects in processing industries under proposed scenario
http://www.daff.gov.au/corporate_docs/publications/word/forestry/rfa/tables/tas_industr_tab6_2.doc

Total websites: 0