issues insights

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Future directions for the Australian forest industry

Kah Low and Sinniah Mahendrarajah

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Australian Bureau of Agricultural and Resource Economics

Postal address	GPO Box 1563 Canberra ACT 2601 Australia
Location	7B London Circuit Canberra ACT 2601
Switchboard	+61 2 6272 2000
Facsimile	+61 2 6272 2001

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Introduction

The forest sector is of growing importance to Australia and has received intensive policy focus since the early 1990s. This focus led to the development of a National Forest Policy Statement and to commitments by federal and state governments to achieve sustainable management of native forests for multiple benefits and increased reliance on planted forests for the expansion of the forest industry. Under the proposed Carbon Pollution Reduction Scheme (CPRS), forests are recognised as having a significant role in carbon sequestration and greenhouse gas mitigation efforts.

Australia is currently a net importer of traditional forest products. Further, population growth can potentially increase future domestic demand for forest products. Although its share in global trade is small, there are also new opportunities such as trade in forest wastes in the growing bioenergy market in Europe.

The Australian forest sector has not been spared the effects of the global economic downturn. Over the past few years, a downward trend has been recorded in the export markets for forest products such as woodchips, pulp and paper products. A drop has been reported in domestic production of logs, along with a significant reduction in domestic consumption of wood. In the past year, two large companies which administered forest managed investment schemes (MIS) also collapsed.

However, leading economic indicators suggest that the Australian domestic market for forest products is recovering, with stronger than expected consumer confidence, expanding housing and public infrastructure spending, and overall improvements in the Australian labour market (Stevens 2009).

Although the market for forest products is showing signs of recovery, there are still uncertainties that could influence the future behaviour of major stakeholders. Among other factors, potential effects of climate change on forest productivity and the forest industry are of concern to stakeholders.

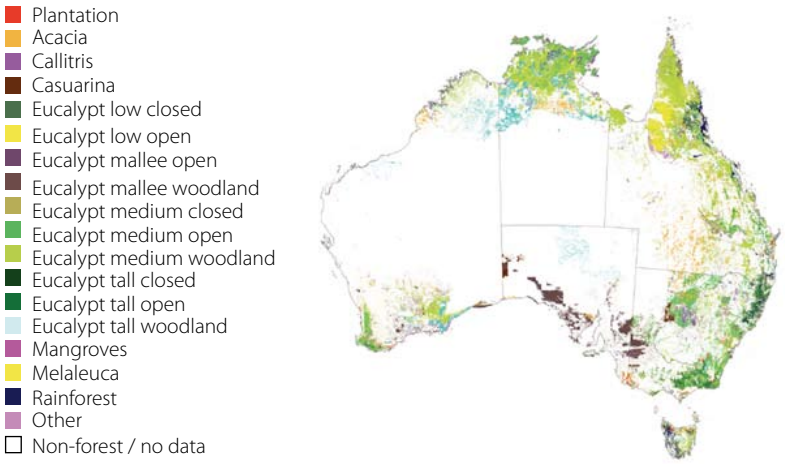
This paper outlines the issues likely to affect growth in the industry over the next five years. First, the structure of the forest estate and nature of timber supply are described. This is followed by the outlook for timber processing and markets. The role of technological advancements is then discussed. In the final section forest policy is discussed with particular reference to incentives and climate change policy.

Plantation and native forest estate

Forests cover approximately 149.4 million hectares or 19 per cent of Australia's land area. Of this, native forest accounts for 147.4 million hectares or 99 per cent of the total area, with a further 2.02 million hectares of forest plantations, including hardwood and softwood species. Since the late 1990s the extent of forest plantation has almost doubled. The geographic distribution of native forests and plantations is presented in figure a.

Australia's native forests are mainly open woodlands, dominated by Eucalyptus species (79 per cent), followed by Acacia (7 per cent), Melaleuca (5 per cent) and other species (9 per cent). There are also around 3.2 million hectares of rainforests, with more than half of this located in Queensland (ABARE 2009). Native forests serve a range of allocated roles such as conservation, wood production and reserved areas for Indigenous communities. Around 66 per cent of native forest land is classified as woodlands, which have forest cover of between 20 and 50 per cent.

a Forest cover, 2008



Source: MPICA 2008.

Plantation forests, both softwood and hardwood, are distributed in arable land in medium to high rainfall areas (receiving more than 600 millimetres of rainfall a year) and account for around 1.4 per cent of the total area under forest. Recent expansion has essentially been in short rotation hardwood plantations. At present, approximately 49 per cent of the plantation area is under hardwood species.

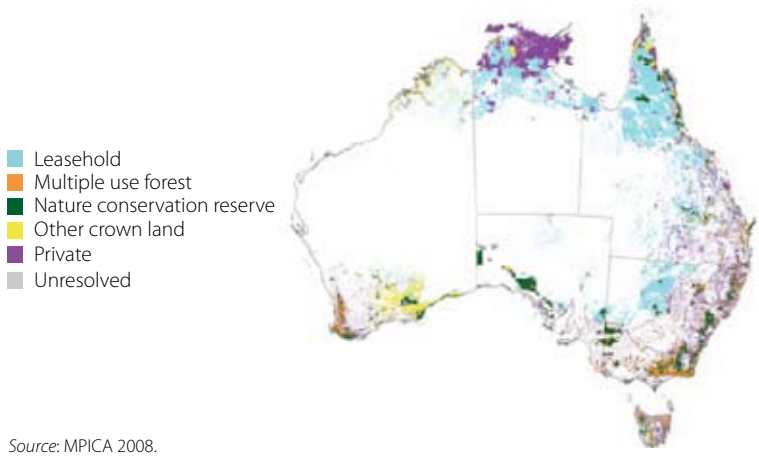
Current land tenure arrangements

Australia's tenure arrangement facilitates efficient use of forests across multiple uses. The forest tenure falls into six different types: leasehold, multiple use forest, nature conservation reserves, other Crown land, private, and unresolved (figure b). There is an increasing role for the private sector in the management of forests. At present, approximately 70 per cent of Australia's forest is privately managed. Of this, around 44 per cent is managed under leasehold land and the remaining 26 per cent is managed under freehold private titles or by Indigenous groups (MPICA 2008).

Wood production can occur in all native forest areas. However, the restrictions on the type of forest products permitted for harvest and the scale of harvesting varies. The area of multiple use forests, which can be used for timber production, accounts for only 9.4 million hectares of native forest land (ABARE 2009).

The multiple use forests are managed by state and territory agencies and are subject to regulations on sustainable harvest rates and harvesting practices. Harvesting of timber and non-timber forest products can also occur in the nature conservation reserves, but is generally not permitted (MPICA 2008). Areas classified as other Crown land are predominantly used for education, mining, defence purposes and by Indigenous communities.

b Forest tenure status, 2008



Source: MPICA 2008.

Private native forests and leasehold land account for approximately 38 million hectares and 65 million hectares, respectively, of Australia's total native forest (ABARE 2009). Wood production can occur within private native forests, but such production activities often have

special conditions attached to them, including those for designated Indigenous communities (MPICA 2008; URS 2007). Further, leasehold land requires approval from state and territory agencies before forest can be harvested or cleared.

Plantations

Plantation ownership falls into three categories: public plantations, private plantations, and jointly owned plantations. Financing of these plantations comes from five main sources: superannuation funds, timber industry companies, Managed Investment Schemes (MIS), government and joint ventures. In 2008, government-financed plantations, including those from joint ventures, held 37 per cent of the plantation estate in Australia. These plantations include forests established by government on farmland for sawlog production or salinity management. Of the remainder, 34 per cent of the plantation estate was owned by MIS companies, 9 per cent by superannuation funds, 9 per cent by timber industries and 11 per cent by other private owners (Gavran and Parsons 2009).

Wood supply

Wood supplies are projected to increase in the medium term because of strong growth in plantations, ranging from 30 000 to 140 000 hectares annually, since the mid-1990s, as a result of Australian Government policies such as the *Plantations for Australia – 2020 Vision*. However, the increase in forest conservation efforts by state governments, along with potential development prospects for a carbon forest market, may in future reduce the overall wood supply available to the timber industry.

The rate of establishment of new plantations is a leading indicator of future wood supply. Since 2004, establishment of broadleaved plantations increased and remained high up to 2008 (table 1). New coniferous or softwood plantings varied from 11 000 hectares in 2006 to slightly more than 6000 hectares in both 2008 and 2009.

1 Plantation establishment by forest type

New areas planted (excludes replanting)

	2002 '000 ha	2003 '000 ha	2004 '000 ha	2005 '000 ha	2006 '000 ha	2007 '000 ha	2008 '000 ha	2009 '000 ha
Broadleaved	49.18	31.38	46.26	65.55	67.28	76.06	66.01	43.23
Coniferous	5.2	10.94	7.32	6.48	11.11	10.51	6.31	6.4
Total	54.38	42.32	53.59	72.03	78.39	86.57	72.32	49.7

Source: Gavran and Parsons 2009.

Wood supply projections

Wood supply projections are derived from best estimates provided by plantation owners and forest managers and from industry knowledge (Parsons et al. 2007). The projections also take into account the establishment and growth rate of each plantation type. However, several unforeseeable factors will significantly affect these projections including environmental factors such as rainfall, heatwaves and bushfires, as well as market factors such as changes in demand for Australian timber products internationally and changes in investment confidence in plantation development.

Wood supply in Australia is projected to increase to more than 29 million cubic metres by 2020 (table 2). Because of the high establishment rate of broadleaved plantations since 2000, driven by the rapidly expanding market for Australian woodchips, it is expected that the available hardwood supply will increase in the future.

2 Wood supply from plantations: 2005-09 to 2015-19

Thousand cubic metres per year average for each five year period

Resource base	Broadleaved '000 m^3	Coniferous '000 m^3	Total '000 m^3
2005-09	4 819	15 524	20 342
2010-14	14 118	15 611	29 729
2015-19	13 405	15 920	29 325

Source: Parsons et al. 2007.

The area of native forests available for wood production is projected to fall in the future because of government policy and as a consequence of extreme climate events such as forest fires. For example, the Queensland Government has made a policy commitment to stop wood harvesting from native hardwood forests by 2025. It is expected that the shortfall in native wood supply for pulp will be met by an increase in forest plantation resources (URS 2007). The Western Australian Government has similar plans to cease production from old growth forests. However, since most recent forest plantations have predominantly been for pulp logs, there could potentially be a decline in overall sawlog production.

Destruction of native forests caused by bushfire will also reduce future wood supply. For example, several devastating forest fires in Victoria including the 2003 Eastern Victorian Alpine bushfires and the 2009 Black Saturday bushfires, have reduced the available native forest for wood production.

Markets for forest products

The Australian forest industry is experiencing a tough trading environment as a consequence of the global economic downturn. Although conditions for some forest products, such as woodchips and sawnwood, improved at the beginning of 2009, the strong Australian dollar has adversely affected international competitiveness of Australian forest products.

Australian market

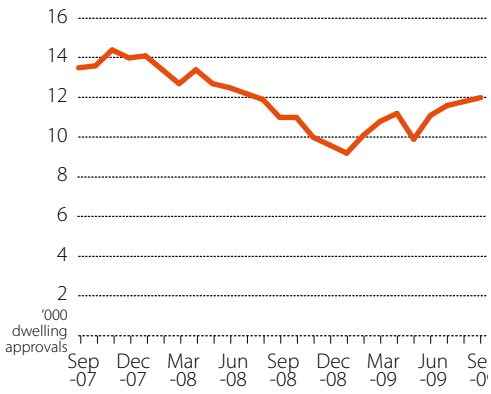
Domestic demand for forest products experienced tough conditions during 2008-09. Consumption of Australian structural wood products and wood-based panels was down 17 per cent and 11 per cent, respectively, on the previous year (ABARE 2009). Dwelling commencements also fell because of poor investor confidence. However, production of several wood products has increased over the past year. For example, veneer production increased in 2008-09 despite the overall downturn in domestic demand for structural wood products. The increase in veneer production is attributed to the opening of two new veneer mills in Tasmania, owned by the Malaysian company Ta Ann. However, these mills aim specifically at supplying export markets.

Outlook for the Australian forest industry

There are some indications that hardwood sawmills will continue to consolidate and modernise as a consequence of conservation efforts in RFA areas (Burns et al. 2009). Other processing industries, such as pulp and paper production, may also expand in the future because of several projects currently under development. The expansion in capacity may lower the unit cost of production because of scale economies and improve the international competitiveness of the products.

C Dwelling unit approvals in Australia, September 2007 to September 2009

Seasonally adjusted estimates



Source: ABS, *Building Approvals, Australia*, cat. no. 8731, Canberra.

Housing construction

Dwelling unit commencements declined in 2008-09, following record rates prior to the global financial crisis (ABARE 2009; ABS 2009b). However, the increasing number of dwelling approvals in 2009 provides some evidence of a recovery in housing construction in the near future (figure c). The increase in dwelling approvals can be attributed to several factors, including an easing of the official interest rate in 2009 and the continuation of the First Home Owner's Grant scheme.

Dwelling alterations and additions are another source of structural wood demand in Australia. In general, housing renovations use more hardwood products for aesthetic purposes, whereas softwood is used widely as a structural building material. Further, timber demand for building alterations and additions can sometimes be countercyclical, as people may choose to invest less by upgrading existing dwellings instead of rebuilding. However, spending on dwelling alterations and additions is generally highly discretionary and can also fall during an economic downturn (URS Forestry 2009).

Since September 2008, dwelling alterations and additions have fallen because of the global economic downturn. The decline in the dwelling alterations and additions market has been less severe than in housing construction (URS Forestry 2009).

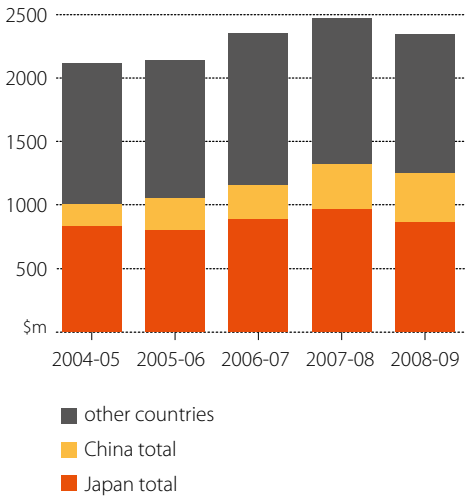
International markets

Demand for forest products internationally has been driven to a large extent by growth in building construction. Hence, recovery in the international forest sector will most likely be led by demand (ITTO 2009).

Australian forest product exports reached $2.3 billion in 2008-09, down 5.2 per cent relative to the previous year. The decline was driven mainly by a significant drop in the value of woodchips, packaging and industrial paper. In contrast, forest product imports reached $4.5 billion, up 1.1 per cent relative to the previous year. The increase in imports was because of a rise in the unit value of paper as well a large increase in imports of miscellaneous forest products (ABARE 2009).

There is uncertainty with regard to the future wood demand from Australia's major trading partners. Demand from Japan, the major market for Australian woodchips, declined substantially in late 2009. However, Australian exports of woodchips to China increased by 74 per cent in the same period. While China currently purchases only a small proportion of Australia's woodchips, there are indications that the Chinese market will offer significant export potential in the future (ABARE 2009).

d Forest product export trade, Australian exports



Source: ABARE 2009.

Asia

The strongest growth in exports of forest products is currently from Asian markets. Chinese domestic demand for wood, particularly recovered paper, is strong. Japanese demand for wood products declined in 2009, which is attributed to lower dwelling commencement rates and rising costs of ocean transportation (ITTO 2009). However, the trade press has reported that the Japanese Minister for Agriculture, Forestry and Fisheries plans to propose a Bill aimed at promoting the use of wood in buildings (ITTO 2010a). If enacted, this Bill will generate greater demand for wood products.

Japanese importers have been willing to pay higher prices for hardwood woodchips than competitors. They also have placed increasing emphasis on sourcing timber from plantations rather than native forests (URS 2007).

The trend in Australia's forest product exports is presented in figure d. Since 2004-05, Japan has been the dominant export market, accounting for around 30 per cent of total forest product exports each year. However, more than 90 per cent of exports to Japan were comprised of woodchips, which may potentially expose the Australian forest industry to significant risks if there are changes in the Japanese pulp and paper sector. The growth in Chinese imports of Australian forest products has also been strong since 2004-05. Further, China imports a relatively more diverse range of forest products than Japan. These products include recovered paper, woodchips, logs, packaging material and medium-density fibreboards.

United States

Australia does not have significant trade in timber products with the United States. However, since the United States is a major consumer of timber products internationally, changes in US demand can have an indirect effect on Australian markets.

In the United States, demand for timber products has been adversely affected by mortgage foreclosures and marked increases in the number of unsold houses on the market. In response to the weak housing market, the US Congress has recently passed legislation to extend the Homebuyer Credit program, as a way to support new housing construction.

In other US markets, there has been a decline in demand for logs from sawmills, pulp mills, and oriented stand board (OSB) producers. Further, poor logging conditions in the southern United States have reduced inventory holdings by timber producers. However, there has not been much upward price pressure on logs (MTIB 2009). In addition, there has been growing environmental interest in forest production in the United States. This is reflected by, among other things, the establishment of a certification process to ensure imported timber is sourced from sustainably managed forests.

Europe

There are signs of recovery in Europe from the global economic downturn, but the pace of recovery is expected to be relatively slow compared with other economies. Several European economies, particularly Spain, Finland and the United Kingdom, have been adversely affected by domestic property market collapses (ITTO 2009; ITTO 2010b). Further, a weaker banking sector, continued job losses and low consumer confidence have been deterring a steady recovery of growth in Europe (ITTO 2009).

The European Union's veneer plants are reportedly facing significant capacity utilisation problems, operating at no more than 50 to 70 per cent of available capacity (ITTO 2010b). The underutilisation of the production capacity is attributed mainly to low market demand for veneer. The lack of supply of quality veneer logs is also exacerbating this problem.

Rest of the world

In the rest of the world, production of timber products has been adversely affected by contractions in developed economies. In South America, Chile and Brazil experienced a contraction in timber exports, particularly because of a fall in demand from the United States.

However, efforts have been made to redirect exports toward growth markets, such as China (Random Lengths 2010). Similar conditions and responses have also been reported in New Zealand. Overall, there are expectations that the international demand for timber products is recovering (ITTO 2009).

Outlook for timber processing

The timber processing industry in Australia has expanded significantly over the past decade (NAFI 2008). Most of Australia's processed forest products are consumed domestically and used in construction, such as flooring, decking and housing frames.

There are signs that the timber processing industry will grow steadily over the next few years. These indicators include recent and planned increases in pulp production capacity to support plantation expansion, growth in capacity of softwood sawnwood production, and strong export growth in the recovered paper industry.

Sawnwood production

Recent expansions in the sawnwood industry have focused primarily on softwood timber production. The trend toward increased softwood sawmill capacity has helped reduce unit costs and maintain international competiveness (URS 2007).

The number of hardwood sawmills has declined over recent years. Between 1997 and 2007, the number of hardwood sawmills in Australia fell by 43 per cent, with the decline occurring principally as a result of the loss of smaller operators (Burns et al. 2009). The decline in hardwood sawmills is associated with the consolidation and modernisation of sawmills for native timber processing. The RFA process has established sustainable yields and conservation areas in hardwood native forests and reduced the forest available for harvest in certain areas. Further, the sawnwood industry has difficulties in attracting investment in long-rotation hardwood plantations (Burns et al. 2009; URS 2007).

New sawlog technologies capable of processing plantation hardwood can potentially support sawnwood production in the future. For example, in 2008 Forest Enterprise Australia established a large-scale sawmill using plantation hardwood.

Pulp and paper production

The Australian pulp and paper industry faces tough competition from cheaper international producers. However, competitiveness varies across different market segments in the pulp and paper industry. For example, Visy, an Australian company, has established a new standard in smaller scale unbleached chemical pulp mills, which has helped encourage Australian paperboard exports. Additional planned expansions to the mill will encourage further exports of paperboard from Australia (URS 2007). Over the past decade, several major pulp and paper companies have made significant investments in improving plant efficiency (URS 2008). For example, the use of oxygen has largely replaced the use of chlorine in the bleaching process. This substitution has helped improve energy efficiency and allows the use of recycled materials in the bleaching process (Commonwealth of Australia 2009b).

Although Australia has several bleach pulp mills in operation, many of these mills predominantly supply domestic markets. Several major proposed new projects, such as the Bell Bay pulp mill in Tasmania and the Penola pulp mill in South Australia, once completed, could increase Australia's pulp and paper production capacity (URS 2007). However, there are concerns about the cost effectiveness of developing some of these pulp mills.

There is an overcapacity of newsprint in Australia and internationally. Domestically, this overcapacity is currently being managed by implementing machine downtimes. However, persistent imbalances between the global production of newsprint and demand may result in permanent closure of at least one newsprint facility in either Australia or New Zealand, or conversion to different paper grades such as tissue or cardboard (Commonwealth of Australia 2009b).

The international market for pulp is highly competitive and prices are extremely volatile. The highly competitive market has had an effect on investment in the pulp industry. This is evident in recent decisions relating to pulp mill development. For example, the proposed bleached chemi-thermo-mechanical pulp (BCTMP) mill at Collie in Western Australia was dropped because it could not achieve an internationally competitive unit cost of production (URS 2008). Hence, there is a need to encourage cost-effective investment in the pulp and paper industry to remain competitive in the international market.

Production of other engineered products

The production of engineered products, such as particleboard and medium-density fibreboard, has expanded only modestly over recent years. However, domestic consumption of these products has been increasing at a comparatively faster rate (URS 2007).

One of the largest expansions in the production capacity of timber in recent years has been from the opening of two veneer mills in 2007 by Ta Ann. As a result, total volume of exported veneer increased significantly, from an estimated 35 000 cubic metres in 2007-08, to 86 000 cubic metres in 2008-09 (ABARE 2009).

Outlook for Australian forest policy

The forest resource base has expanded substantially since the introduction of the *2020 Vision* in 1997. Other programs, including the Farm Forestry Program (FFP), Joint Venture Agroforestry Program (JVAP) and the Forest Industries Structural Adjustment Package (FISAP) have all supported forest development efforts, but at a much smaller scale than the *2020 Vision* initiative.

Reviews and revisions to Regional Forest Agreements (RFAs), Managed Investment Schemes (MIS) and other investment models, and the changing role of forests in response to

greenhouse gas mitigation efforts are identified as key factors influencing Australia's future forest policy. Policy responses to mitigating greenhouse gas emissions are also expected to encourage additional forest plantings for carbon sequestration.

Regional Forest Agreements

The RFAs are 20 year plans designed to support the conservation and management of native forests in Australia. Currently, there are 10 RFAs covering four states— Western Australia, New South Wales, Victoria and Tasmania (figure e). The agreements cover only specified forest areas determined through a comprehensive regional assessment. This assessment aims to determine the economic, social and environmental value of the forest and involves the stakeholders. Regions not covered by RFAs, such as the states of South Australia and Queensland, are subject to the Australian Government *Environment Protection and Biodiversity Conservation* (EPBC) *Act* with regard to the management of native forests.

The EPBC Act was implemented in 1999 to allow Australian Government involvement in environmental matters. Because the EPBC Act invokes residual powers which are not stated in section 51 of the Australian Constitution, some sections of the EPBC are rejected if there is a prevailing RFA in a particular region. Currently, there are concerns about the effectiveness of RFAs in delivering on environmental and sustainable resource management objectives (Hawke 2009; SSCECA 2009). Several national issues, including climate change, environmental heritage, water conservation and the protection of endangered species, have become more important since the implementation of the National Forest Policy Statement in 1992. Several stakeholders are interested in having increased Australian Government intervention to coordinate a strategy to address the national issues that are independent of the RFA process (SSCECA 2009).

e Regions with a completed Regional Forest Agreement

Source: DAFF 2009.

At a Senate inquiry in April 2009 into the operation of the EPBC Act, several concerns were raised about the effectiveness of RFAs in conserving biodiversity and protecting threatened species, specifically those found in Western Australia, Victoria and New South Wales. Other concerns included the management of invasive species, heritage protection and the lack of environmental objectives in development activities. The Senate committee also recognised that some stakeholders had never accepted the RFA process, and was concerned that the RFA could not deliver adequate protection for both threatened species and threatened ecological communities (SSCECA 2009). The committee recommended that further efforts to help ensure that the environmental standards sought through the EPBC Act are better realised within RFA areas.

Future development of Regional Forest Agreements

Concerns about the effectiveness of RFAs in delivering on environmental objectives may have adverse implications for the forest industry. If more stringent conservation requirements are enforced on Australia's forests, the availability of raw resources for timber production will decline. Evidence of increasing environmental interest is found both in the reviews of RFAs and in the Senate inquiry into the operation of the EPBC Act. For example, in the second five year review of the Tasmanian RFA, it was identified that environmental matters, including climate change and resource availability, have become more significant issues since the signing of the National Forest Policy Statement. These issues are also of growing importance in other RFA regions.

There is also interest from forest stakeholders in expanding the role of the EPBC Act in environmental protection. Submissions to the April 2009 Senate inquiry on the EPBC Act included recommendations for logging activities in RFA areas to be directly assessed and approved through EPBC Act processes. The National Association of Forest Industries (NAFI) strongly opposed the recommendation, arguing that this change would have serious implications for the operations of the forestry sector.

Managed Investment Schemes

Managed Investment Schemes (MIS) have contributed to the expansion of the timber plantation estate since 1997. In 2008, MIS companies owned roughly 670 000 hectares of plantations (Gavran and Parsons 2009). However, the sustainability of the existing MIS finance structure has been subject to considerable debate, especially since the collapse of Timbercorp and Great Southern in 2009.

The up-front tax deductions offered under MIS were originally introduced because of the long-term nature of forest investments. It takes from 8 to 25 years for forest investments to mature, which is significantly longer than for some other agribusiness ventures. Under MIS, investors are offered 100 per cent up front tax deductions, which, in addition to up-front commissions to financial advisers, have resulted in significant sales of MIS instruments as a means to promote plantation development.

As investment confidence declined because of the global economic downturn, the flow of new funds into forest MIS also declined. Although some MIS companies were able to maintain their solvency, several MIS companies were unable to pay the returns promised to investors (Frost 2009). Investors may have to invest more funds into the insolvent MIS companies to get the timber harvested.

Since the collapse of Timbercorp and Great Southern, several reviews into MIS have been conducted. A recent study argued that existing MIS arrangements provided substantially more assistance to forestry than other industries such as food growing (Ajani 2010). In submissions to the Parliamentary inquiry into MIS in September 2009, the committee heard similar concerns about how MIS is distorting rural investment, especially with regard to water allocation, land values and agricultural labour (PJCCFS 2009). However, the committee also heard that the high price of land has enabled some retiring farmers to exit the market at good prices.

The outlook for MIS is uncertain. Based on the recommendations presented in the September Parliamentary Joint Committee on Corporations and Financial Services (PJCCFS) inquiry into MIS, there may be increased disclosure requirements of MIS financial records to improve investor protection. There are also indications that the Australian Securities Investment Commission (ASIC) may have an increased role in the regulation of MIS activities (PJCCFS 2009)

Emerging markets and technologies for Australian timber

Recent technological advancements may potentially expand the use of Australian timber in non-traditional markets. These include use of timber in bioenergy and non-residential building construction. Although, several Australian timber companies are already producing these new timber products, there are still uncertainties about the size and maturity of these markets. Further, several timber industries domiciled in other countries are already established suppliers to these markets.

Bioenergy

Several technologies have been developed to process sawmill residue into bioenergy products. One of the more widely adopted processes in Australia is pelletising. Pellets can be used for domestic heating and for fuelling small-scale power plants. Briquettes are also produced in Australia, but are used less widely than pellets. Timber residue is also used as fuel in combined heat and power generators (Goble and Jarvis 2007).

Pellets and briquettes have an advantage over other fuel types in that they are renewable, burn cleaner than other fuels and offer higher energy and steadier combustion rates. Raw material sources used in the production of pellets and briquettes are also generally abundant,

as significant quantities of residue and waste are produced from sawmills, wood chipping and other timber processing (Fung et al. 2002). However, the cost associated with the production of pellets and briquettes, such as drying, chipping and grinding have made these wood-based bioenergy products more expensive than other fuel types, such as coal or kerosene (Goble and Jarvis 2007).

Bioenergy derived from wood residue is not widely used in Australia. In general, energy generation is geared more toward natural gas and other fossil fuels, which are more competitive and better commercialised in the domestic market than wood based bioenergy. The wood-based bioenergy market could potentially be expanded through increased consumption in small local communities or through increased exports to South-East Asia, Europe and the United States (Hillring 2006).

Plantation Energy Australia is currently Australia's largest manufacturer and exporter of wood pellets. In May 2009, Plantation Energy Australia entered a three year $60 million wood pellet supply agreement with Essent Trading, an international energy trading company based in Switzerland. This supply agreement is in addition to other export deals undertaken by Plantation Energy Australia (Plantation Energy 2009). Other companies have also demonstrated interest in producing wood pellets in Australia (Featherstone 2009).

Multistorey building development

The lack of timber use in non-residential building construction is attributed to perceptions about its cost, risks in commercial applications, durability, long construction times and a lack of tertiary level training in the use of timber in construction (Bayne and Taylor 2006). However, a study prepared for Forest and Wood Products Australia found that the main potential for expansion into non-residential construction lies in medium to multistorey apartments, particularly in partitioning projects, and in the structural development of education and aged care buildings (Bayne et al. 2008).

Emerging technologies

Several emerging technologies can potentially help improve the productivity of timber processing in Australia. These improvements could come from a variety of areas including energy efficiency or adopting technologies that can generate a revenue stream from wood wastes. Examples of such technologies include fluidised bed combustion technology, high intensive drying techniques and black liquor gasification (Gurney et al. 2007).

Fluidised bed combustion technology

Fluidised bed combustion technologies involve suspending solid fuels in air so that they behave more like fluids in the energy generation process. This process provides more effective chemical reactions and heat transfer, resulting in higher energy output.

The advantage of fluidised bed combustion technologies is that the generator can accommodate almost any combustible material, including wood waste. Further, the nature of the process allows improved capture of various greenhouse gas emissions, such as sulphur and nitrogen oxide. The adoption of fluidised bed combustion technology may also offer the potential to reduce Australia's fossil fuel use in the future (Gurney et al. 2007).

High intensive drying techniques

Pulp and paper production has a drying component that has significant energy requirements for heat generation. Over recent years, several technologies have been developed to reduce the overall energy requirement in pulp production. However, much of the past improvements in energy efficiency have been geared toward recovering heat generated from other production processes. Mills that have adopted these types of heat recovery technologies are able to transform up to 90 per cent of electricity used in mechanical pulping processes into heat. The energy is then used to contribute to the drying requirements in pulp and paper production. Depending on the grade of paper produced, pulp mills that have adopted such heat recovery technologies have energy efficiency ratings around 10 to 50 per cent higher than standard mills (IEA 2008).

In addition to heat recovery, new pulp processing designs have been geared toward more efficient water removal techniques. These include combining the pressing and thermal drying stages of pulp production (IEA 2008).

Black liquor gasification

The paper industry produces a by-product known as black liquor. This by-product is usually burned in the recovery boiler to generate additional energy. However, the high water content in black liquor limits the efficiency of these recovery boilers (IEA 2008).

There are prospects to convert black liquor into syngas that can be used for gas-turbine power generation. Black liquor gasification has been demonstrated to reduce energy consumption by around 10–15 per cent throughout a typical kraft process. Further, syngas can also be used as raw feedstock into the production of chemicals. However, black liquor gasification is still in the demonstration stages and it is not likely that the technology will be commercialised in the short term (Gurney et al. 2007; IEA 2008).

Economic implications of climate change and policy on the forestry sector

There is substantial consensus that increases in anthropogenic (human induced) greenhouse gas emissions is resulting in changes to the climate (CSIRO and BoM 2007; IPCC 2007). In

Australia, these changes include increases in average temperatures, reductions in rainfall and water availability, and increases in the incidence of extreme climatic events such as fires and floods.

Climate change is expected to have biophysical effects on forest growth associated with changes in temperatures, water availability and carbon fertilisation. However, the magnitude of the effects of climate change on forest productivity and regions is still unclear.

Effects of climate change on Australian forests

An increase in average temperatures because of climate change may potentially encourage forest growth. However, the vulnerability of forests to heat stress may also increase, especially if there are reductions in rainfall and water availability. Further, reduced rainfall, warmer average temperatures and an increased incidence of extreme climatic events can have secondary effects on forests. These secondary effects include elevated water stress, increased incidence of pest incursions, and forest fires (Buchanan et al. 2008; McDonald et al. 2006).

The projected effects of climate change on forests vary across different models, study areas and model resolutions (Kirilenko and Sedjo 2007). The variation can be attributed to different model assumptions including growth rates of different tree species and projected changes in rainfall and temperature. Previous modelling work suggests that some forest areas may expand under future climate change. However, previous modelling work also suggests that some forest areas will be adversely affected (Battaglia et al. 2009).

Carbon fertilisation

In addition to the climatic impacts, forest growth may also be affected by the increase in greenhouse gas emissions. Higher greenhouse gas emissions will generally increase the concentration of carbon dioxide in the atmosphere. The high concentration of carbon dioxide could potentially enhance plant growth because of increases in water use efficiency (Steffen and Canadell 2005).

Carbon fertilisation has been demonstrated in numerous Free Air Carbon Dioxide Enrichment (FACE) experiments, which typically run for up to five years. However, these experiments provide only a broad indication of the likely effects of carbon fertilisation on forest growth. Further, such experiments are unable to determine the long-term effects (greater than five years) of carbon dioxide enrichment on plants. Higher carbon dioxide concentrations in the atmosphere can also potentially change the incidences of insect incursions, require changed management practices or affect the nitrogen dynamics in soils.

Although only a few FACE experiments under simulated Australian environmental conditions have been completed, some insights can be gained on the likely effect of elevated carbon dioxide on forest systems. Based on international evidence, the effects of carbon fertilisation on growth becomes less influential as trees age (Steffen and Canadell 2005). This means that trees with a short rotation are likely to benefit more from carbon enrichment than older forests.

Carbon Pollution Reduction Scheme (CPRS)

Forests are treated differently to most sectors under the CPRS. Under the proposed framework, forest companies are allowed to participate in the CPRS on a voluntary opt-in basis. Companies that enter the scheme are able to receive permits for all forests which are Kyoto compliant; that is, forests established on land that was clear of forest as at 31 December 1989 (DCC 2009). Also, according to the November 2009 amendments to the CPRS, CPRS permits will be provided for forest regrowth and soil carbon on deforested land that was legally cleared between 1990 and 31 December 2008 (DCC 2009). However, the November 2009 amendments allow offset credits to be generated from agricultural activities which may improve their profitability relative to forestry (DCC 2009).

Under the framework, the Australian Government proposes to implement the National Carbon Offset Standard (NCOS), which will create a voluntary market for abatement credits that will transition into the CPRS once they become internationally recognised (Commonwealth of Australia 2009a). Abatement practices that will be recognised under the NCOS include enhanced forest management.

Future implications of the CPRS

The introduction of a carbon price under the CPRS will influence the expansion of new plantations in Australia. Several studies have found that there are opportunities for landholders to contribute toward forest carbon mitigation under the CPRS (Lawson et al. 2008; Polglase et al. 2008). Climate change, technological development and adaptation strategies may influence these opportunities in the future.

Lawson et al. (2008) present results on the area of land economically feasible for afforestation under a carbon price. Under a set of specific assumptions, it was projected that approximately 610 000 hectares of additional land would be economically suitable for afforestation between 2007 and 2050 under the business as usual scenario. Further, the attractiveness of undertaking afforestation activities is expected to improve if a carbon price is introduced. For example, using the Treasury CPRS-15 modelling assumptions (15 per cent reduction in emission levels by 2020 relative to 2000) the area of land economically suitable for timber plantation development between 2007 and 2050 is projected to reach more than 4.5 million hectares (Lawson et al. 2008). The introduction of a carbon price may also encourage the development of environmental plantings, which will have a primary role of sequestering carbon emissions.

In view of the recent amendments to the CPRS, and after taking into account factors such as water restrictions, native vegetation and nutrition, the potential for land use change to forestry presented in Lawson et al. (2008) may be lower.

Carbon market and building construction

Under Kyoto accounting rules, trees are assumed to release all sequestered carbon on harvest. However, there is some evidence to suggest that trees retain some carbon after the tree is harvested and processed (Kapambwe et al. 2009; MSAF 1992; Taylor and Langenberg 2003).

The international rules need to be changed to account for carbon in harvested wood and products. Applying a life cycle analysis, George (2008) estimated the emissions intensity of producing various building materials, and found that on average timber products produce lower emissions per tonne than other building materials (table 3). Further, a large proportion of emissions is generated indirectly from electricity use.

3 Net carbon emissions in producing a tonne of building material

Material	CO_2-e per tonne	Proportion of emissions from electricity %
Aluminium	22.4	83
Steel (blast furnace production)	2.55	5.9
Steel (scrap-based electric arc furnace production)	1.1	81.8
Cement	0.77	13
Hardwood (rough sawn kiln dried)	0.230	50
Softwood (rough sawn kiln dried)	0.234	64
MDF (medium-density fibreboard)	0.726	47
Particle board	0.982	9.9

Source: George 2008.

The relatively low emissions intensity of using framing timber can potentially develop a niche market for timber in the construction industry. The use of framing timber may increase if the prevailing accounting rules recognise the carbon stored in timber. However, the use of timber in some types of building construction is limited because of concerns about the timber's structural strength and vulnerability to pests, compared with materials such as steel or cement.

Conclusions

The Australian forest industry experienced a contraction from early 2008 through to 2009, largely as a result of the global economic downturn. However, growth in unit dwelling commencements suggests that the domestic timber market is recovering. While the future of the Japanese woodchip export market is uncertain, there are potentially large emerging markets for wood products in Asia, especially China. Technological advancements are likely to expand the use of wood in the form of new products such as bioenergy from wood waste and raise the profitability of the industry.

The forest resource base is projected to expand in the near to medium term because of the intensive plantation establishment since the mid-1990s. A 44 per cent increase in the volume of plantation timber by 2020 is projected. The slowdown in planting in the past year is not expected to have a noticeable effect on the forest industry in the medium term. Further, there is a strong indication of future investment in expanding processing capacity. There are uncertainties with regard to the potential effect of climate change on forests. However, afforestation can play an important role in meeting the Australian Government's commitments to greenhouse gas mitigation.

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