

Megatrends and the Australian Forest and Wood Products Sector

Opportunities and
challenges for
sustainable growth

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16 March 2016

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Dear Ric

Thank you for the opportunity to prepare a report to assess global megatrends and the opportunities and challenges for the Australian Forest and Wood Products Sector ("Report") for Forest and Wood Products Australia ("FWPA" or "client"). In accordance with our engagement agreement dated 23 February 2015, we are pleased to present you with the findings from this Report.

To conduct the analysis of the Australian forestry industry we have drawn upon the megatrends affecting the global economy identified by RIRDC and CSIRO for the Australian agricultural sector. These five megatrends are: a hungrier world; a wealthier world; choosy customers; transformative technologies; and a bumpier ride.

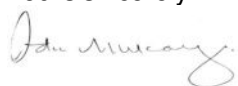
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Yours sincerely



Andrew Metcalfe AO
Partner

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Executive Summary

The forest products industry makes a significant contribution to Australia's economy and rural community. According to the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES), the industry contributed \$7.7 billion to GDP in 2013/14.¹ Forest products exports were worth \$2.8 billion and imports \$5.1 billion. Over 70,500 people were employed by the sector in 2013-14.

EY has been engaged by Forest and Wood Products Australia Limited ("FWPA") to conduct an analysis of the Australian forestry industry drawing on the *megatrends* affecting the global economy identified by RIRDC and CSIRO for the Australian agricultural sector.² The five megatrends outlined by RIRDC and CSIRO are:

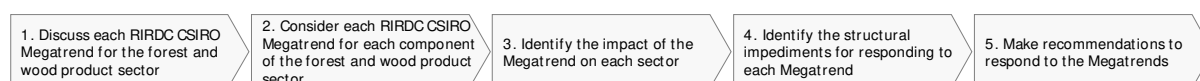
- ▶ A hungrier world—population growth driving global demand for food and fibre
- ▶ A wealthier world—emergence of a new middle class increasing food consumption
- ▶ Choosy customers—information empowered consumers demanding particular ethics, provenance, sustainability or health attributes
- ▶ Transformative technologies—advances in food and fibre production and transport
- ▶ A bumpier ride—changes resulting from globalisation and a changing climate

This report addresses four key segments of the Australian forest and wood products industry. These are:

- ▶ Commercial forestry
- ▶ Paper and packaging
- ▶ Construction materials
- ▶ Energy and bio-chemicals

The report undertakes five key steps in analysing the Megatrends on the forest and wood products sector as set out in Figure 1.

Figure 1: Steps in EY analysis



A summary of the megatrends and the impact and ability of each segment to respond to the megatrend is set out below.

¹ ABARES (2015), *Australian forest and wood products statistics*, November 2015

² Hajkowicz SA & Eady S forthcoming, *Rural industry futures: megatrends impacting Australian agriculture over the coming twenty years*, a research report prepared by CSIRO for the Rural Industries Research and Development Corporation, RIRDC, Canberra.

Table 1: Impact of megatrend by segment

	Commercial forestry	Paper and packaging	Construction materials	Energy and bio-chemicals
Megatrend 1: A hungrier world - population driving global demand from food and fibre	<p>Opportunity</p> <p>There will be increased demand for wood fibre, with new markets opening up for lower value logs.</p> <p>Challenge</p> <p>There will be increasing competition for agricultural land for food production.</p> <p>Increased investment in commercial forestry research to improve yields is required to meet demand.</p>	<p>Opportunity</p> <p>There will be increased demand for cardboard for packaging, tissue and towelling for sanitation products.</p> <p>Challenge</p> <p>Communication papers are expected to slowly decline in demand.</p> <p>Some expansion of paper and packaging processing has occurred in Australia, however further expansion is restricted due to insufficient fibre supplies.</p>	<p>Opportunity</p> <p>There is expected to be increased demand for wood panels, engineered wood products and plantation-sourced timber for house construction.</p> <p>Challenge</p> <p>A number of challenges restrict Australia's competitiveness in this segment including not meeting structural grade standards and incremental log supply requirements.</p>	<p>Opportunity</p> <p>There is expected to be increased demand for wood fibre to supply new energy and bio-chemical products.</p> <p>Challenge</p> <p>Australia's bio-energy and bio-chemical's sector is small, but is expanding rapidly. It faces challenges including a shortage of biomass resources located sufficiently close to a port to permit efficient on-land transport of the manufactured product.</p>
Megatrend 2: A wealthier world – emergence of a new middle class increasing consumption	<p>Opportunity</p> <p>Projected increase in middle class population in the Asia Pacific region to over 3 billion people will occur by 2030.</p> <p>There is less than 15 years for forest product supply systems to ramp up to higher demand.</p> <p>Challenge</p> <p>There will be increasing competition for agricultural land and increased need for investment in commercial forestry (e.g. research to improve yields).</p>	<p>Opportunity</p> <p>Middle class consumers are projected to increase consumption of processed foods including frozen and refrigerated foods requiring paper and paperboard packaging. Demand for tissue and towelling products is also expected to increase with increased access to better hygiene facilities.</p> <p>Challenge</p> <p>Australia will face increasing competition from overseas for wood chips and recycled fibre.</p>	<p>Opportunity</p> <p>Growth in middle class households will increase demand for higher quality housing. Structural wood panels, industrial wood panels, solid structural timber and engineered wood products are most likely to benefit.</p> <p>Challenge</p> <p>Australia is currently a net importer of all the major categories of construction products. There may be opportunities to redirect logs and chips currently exported to use as inputs to high value construction materials.</p>	<p>Opportunity</p> <p>A wealthier world is expected to increase per-capita energy consumption however, government undertakings to reduce carbon emissions will shift demand towards renewable energy sources.</p> <p>Australia is well positioned to increase exports of these products as demand grows provided sufficient biomass resources are available close to ports.</p>
Megatrend 3: Choosy customers – information empowered consumers demanding particular ethics, provenance, sustainability or health attributes	<p>Opportunity</p> <p>Choosy customers will seek sustainable forestry products.</p> <p>Challenge</p> <p>Two certification schemes are in operation in Australia, the international forest stewardship council (FSC), and the Australian forestry standard (AFS). However, no Australian native forest operations have obtained full FSC certification.</p>	<p>Opportunity</p> <p>Choosier customers are seeking FSC or other certified sources of virgin fibre.</p> <p>Challenge</p> <p>The choosier customer's preferences move quickly and the industry will need to understand and respond to changing customer preferences.</p>	<p>Opportunity</p> <p>Choosier customers are having an impact on sourcing of construction materials. To date, adoption of certification in construction and furniture products has been driven by large retail chains and green building rating schemes and individual consumer pull through has been limited. More proactive adoption of certification schemes would respond to choosier customers.</p>	<p>Opportunity</p> <p>Increasingly choosier customers are moving away from fossil fuels and towards renewable industrial feedstock.</p> <p>Nearly all of Australia's commercial forests are independently certified to one or both systems and thus well placed to be a supplier to domestic or international bioenergy or bio-chemical suppliers.</p>

	Commercial forestry	Paper and packaging	Construction materials	Energy and bio-chemicals
Megatrend 4: Transformative technologies—advances in food and fibre production and transport	<p>Opportunity</p> <p>Transformative technologies are having a significant impact on the commercial forestry segment in terms of better growth rates, increased utilisation and improvements in process.</p> <p>We expect to see greater take up of technologies such as x-ray scanning across forestry and sawmilling industries.</p>	<p>Opportunity</p> <p>Moving away from paper based communication.</p> <p>Challenge</p> <p>To remain competitive in a market where domestic consumption of paper and packaging is stabilised, investment in new technologies and export supply chains is required.</p>	<p>Opportunity</p> <p>Transformative technologies have driven advances in bio-products/engineered wood products in this segment.</p> <p>In Australia wood is gaining recognition for its utility in development of commercially viable pre-fabricated building systems, and its lightness in comparison to steel. Engineered wood products will increasingly be used to create eco-efficient buildings.</p>	<p>Opportunity</p> <p>Transformative technologies have been developed to use relatively low cost forest residues, small logs and residues from processors for energy and bio-chemicals.</p> <p>Some mills are already making use of bio-fuels in energy production in their plants. Commercially viable bioenergy plants will require feedstock, efficient collection and logistics and to be able to compete against existing energy costs.</p>
Megatrend 5: A bumpier ride – globalisation, climate change and environmental change will reshape the risk profile for the forest industry	<p>Opportunity</p> <p>Modelling by CSIRO predicts likely increases in fire-weather risk at most south east Australian commercial forestry sites in 2020 and 2050. The heightened risk may have significant implications for forest management and costs for native forests and plantations alike.</p> <p>Challenge</p> <p>Climate change is predicted to reduce rainfall in key plantation areas. As a consequence, tree breeding efforts will select for trees capable of growing under drier conditions as well as for productivity gains.</p>	<p>Opportunity</p> <p>Climate change on the forest resource sector is likely to flow through to the paper and packaging sector in Australia as many operators in the sector continues to operate in an environment with low resource availability and long term certainty.</p> <p>Challenge</p> <p>Globalisation will increase competition for imported products and test the sustainability of the sector.</p>	<p>Opportunity</p> <p>There is also an increasing trend to import plywood, and also a smaller, but growing, proportion of softwood sawnwood consumption and miscellaneous forest products that is met by imports.</p> <p>There may be opportunities for the sector to invest in new technologies and to expand into products such as cross laminated timber that deliver lower carbon building options likely to be attractive in a carbon constrained world.</p>	<p>Opportunity</p> <p>Climate change, and policy to reduce climate change, has an effect on the energy and bio-chemicals sector. As more people seek alternative, cleaner, energy sources the demand for bio-fuels increases.</p> <p>Increased research into alternative fuels to reduce carbon emissions is helping to develop a viable industry.</p>

In October 2014 the Commonwealth Government established the Forestry Industry Advisory Council (“FIAC”) to provide advice from a cross-section of industry participants on issues affecting Australia’s forestry sector. An Issues Paper has been developed, however, no significant plans, policies or programs have yet been developed to grow and expand the sector.

Recommendations

In response to the identified global megatrends this paper sets out several recommendations that would stimulate growth and improve Australia’s ability to compete on a global stage. The recommendations are generally directed to the Commonwealth, state and territory governments as well as the forestry industry in Australia. The recommendations are necessarily broad as they reflect the nature of the industry, and as also reflect the need for further work. We hope that the recommendations suggest interventions that are complementary to the Terms of Reference of the Australian Government’s Forestry Industry Advisory Council (FIAC).

Short term

Objective: *Improve the international competitiveness of Australia's Forest and Wood Products sector to take advantage of the identified global megatrends Hungrier World and Wealthier World that identify the opportunity to respond to increased demand and an emerging new middle class*

Recommendation 1: A nationally coordinated strategy should be developed and communicated. The plan should showcase regionally developed plans (Recommendation 2). The Strategy should be targeted at attracting new capital investment for commercial forestry and downstream processing to respond to increased demand and an emerging middle class.

Recommendation 2: Regionally based plans should be developed by governments in coordination with industry to identify opportunities for new domestic processing. The Regional Plans should build on a nationally coordinated strategy (Recommendation 1) to respond to increased demand and an emerging middle class.

Recommendation 3: New business models should be developed by government in conjunction with industry to expand the productive forest estate in each supply region. This could include re-engaging with the farm sector to jointly identify the constraints that have held back previous efforts to expand farm forestry, and opportunities to encourage a commercially viable farm forestry sector without adversely impacting on prime agricultural land.

Recommendation 4: Government should work with industry to re-engineer existing wood supply chains to maximise value recovery. For example, development of:

- ▶ More accurate projections of log supplies for forest industry manufacturing centres or hubs
- ▶ Contract structures that recognise and incorporate wood performance potential into log pricing arrangements and incentivise sharing of benefits across the supply chain.
- ▶ Co-operative structures for farm forest growers to ensure that there is an incentive to replant and expand productive forests.
- ▶ Feedback loops for tree breeding, site selection and forest management to reflect best practice management changes needed to enhance wood strength characteristics.

Objective: *Ensure that Australian wood-based products are the preferred products to meet the needs of the megatrends:*

- ▶ *Choosy Customers that are demanding more information about their products; and*
- ▶ *Bumpier Ride that sets out the impact of globalisation and climate change.*

Recommendation 5: Australian governments should foster an innovative culture where the Australian industry leverages transformative technologies and proactively tackles challenges associated with the Bumpier Ride (including climate change).

Recommendation 6: Ongoing international market scans should be undertaken by the Australian government to identify opportunities and threats arising from increased trade liberalisation for both domestic and international markets.

Recommendation 7: Domestic and international marketing strategies should be developed and leveraged by the Australian government. Marketing strategies should leverage the environmental and social credentials of Australian commercial forestry and processing (e.g., independent certification) to compete with non-wood substitutes such as steel and concrete.

Medium term

Objective: Improve the ability of Australia's plantation forest estate to attract new investment and maintain productivity in the face of the Bumpier Ride due to projected changed climate, especially reduced rainfall. This may include the incorporation of the megatrend: Transformative Technologies to incorporate advances in technologies to respond to new markets.

Recommendation 8: Australian governments and industry should work with investor advocates and independent rating agencies to address information gaps and/or misconceptions. This should include ensuring that commercial forestry and down-stream investments are viewed as eligible assets for domestic and international socially responsible investment funds.

Recommendation 9: A comprehensive and robust research program should be developed by Australian governments in conjunction with industry to understand the requirements of commercial forest crops that are capable of increasing growth rates under drier conditions through identification of new species, breeding programs or other transformative technologies.

Recommendation 10: Efficient channels to distribute and adapt ideas/technologies from overseas should be continued to be developed by Australian governments and the forestry industry. Ideas and technologies should be adapted for the domestic industry to improve its competitiveness.



1. Introduction

The forest products industry makes a significant contribution to Australia's economy and rural community. According to the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES), the industry contributed \$7.7 billion to GDP in 2013/14.³ Forest products exports were worth \$2.8 billion and imports \$5.1 billion. Over 70,500 people were employed by the sector in 2013-14. These jobs are key to diversifying and strengthening the twenty-eight regional communities that host forest industry hubs.

The forest products industry is unique in its reliance on a resource that takes decades to deliver commercial value. In many cases the forests harvested to meet today's domestic requirements were planted 25 to 35 years ago. Australia's forest industry relies on sound planning that anticipates changing needs. The existing softwood plantation estate reflects the foresight of earlier governments, both state and federal.

The *National Forest Policy Statement* in the early 1990s, and the *Plantations for Australia: The 2020 Vision* provide the most recent national reviews of the sector and its potential. *The 2020 Vision* plantation expansion target to reach 3 million hectares will not be met. Of the 1 million hectares of new plantations developed, few met the incremental log supply needs of existing domestic manufacturers. Most of the logs harvested from these new plantations are exported, mostly as woodchips. The sector no longer has access to capital generated by the managed investment schemes (MIS) that was used to develop the new plantations. With lower than expected yields and low product prices it is estimated that up to 40% of these plantations are unlikely to be replanted.⁴

The rise of the MIS companies caused a major distortion in the allocation of resources to the sector. The subsequent demise of these companies left significant areas of plantations that will not be replanted. The legacy of land cost increases due to MIS continues to adversely affect the returns from expanding softwood plantations. MIS's failure and the long-term nature of the industry's problems have also left successive governments with little appetite to tackle these issues. It has also tarnished the reputation of the sector as a safe investment.

In the aftermath of the MIS, investment into the commercial forestry has declined and due to the high profile and publicity also resulted in investor confidence in the industry to wane. Yet trade liberalisation and the need for many foreign companies to ensure supply of product to meet high growths in demand in their domestic markets (downstream integration) provides opportunities for Foreign Direct Investment (FDI).

The lack of an expanding log supply has constrained growth in the domestic manufacturing sector. Many processors now lack the economies of scale of our international competitors. This results in a vicious cycle where lack of scale and failure to invest in new technologies means that processors are unable to pay log prices needed to generate returns at levels needed to motivate new planting to expand the forest plantation area.

The pace of change within the Australian forest industry sector, and its markets is accelerating. The forces shaping the changes are becoming more global. Population growth and emergence of new middle classes in formerly developing countries are placing unprecedented demands on food and other resource supplies. This is changing patterns of trade and investment, and driving innovation.

In October 2014 the Commonwealth Government established the Forestry Industry Advisory Council (FIAC) to provide advice from a cross-section of industry participants on issues affecting Australia's forestry sector. An Issues Paper has been developed, however, no significant plans, policies or programs have yet been developed to grow and expand the sector.

³ ABARES (2015), *Australian forest and wood products statistics*, November 2015

⁴ New Forests (2015), *Timberland Investment Outlook 2015-2019*, page 13

To take advantage of this potential opportunity there is an urgent need to develop and communicate a national coordinated investment strategy. Such a strategy would address issues such as:

- ▶ An industry wide strategy to attract investment
- ▶ Identification of the key areas in which investment needs to be channelled, what products, what stage of the supply chain and what locations
- ▶ Identification of preferred investment models
- ▶ Policies on the types of FDI the industry aims to encourage
- ▶ Policy and position on ownership of assets
- ▶ Policy and position on FDI and access to intellectual property
- ▶ Policy and position on FDI and optimal agricultural land usages and forestry usage
- ▶ Policies on investment and environmental management and carbon management
- ▶ Risk management and mitigation strategies
- ▶ The role of the finance sector
- ▶ The role of Government.

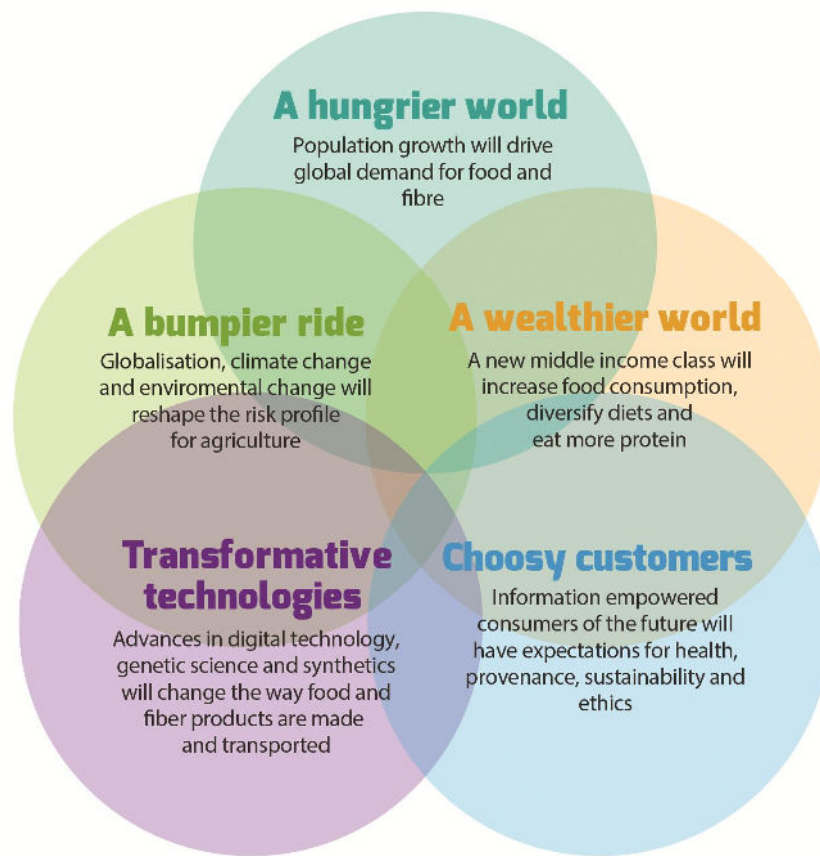
How prepared is the Australian forestry industry to respond to global megatrends?

This paper provides an initial overview of how five megatrends identified by RIRDC and CSIRO⁵ will impact on the Australian forest and wood product industry and looks at how the industry is prepared to react to the megatrends. It suggests how governments, industry and other stakeholders could develop a more in-depth process to yield insights into policies and programs needed to secure the sector's future. The megatrends are:

- ▶ A hungrier world —population growth driving global demand for food and fibre
- ▶ A wealthier world —emergence of a new middle class increasing food consumption
- ▶ Choosy customers —information empowered consumers demanding particular ethics, provenance, sustainability or health attributes
- ▶ Transformative technologies —advances in food and fibre production and transport
- ▶ A bumpier ride —changes resulting from globalisation and a changing climate

⁵ Hajkowicz SA & Eady S forthcoming, *Rural industry futures: megatrends impacting Australian agriculture over the coming twenty years*, a research report prepared by CSIRO for the Rural Industries Research and Development Corporation, RIRDC, Canberra.

Figure 2: RIRDC and CSIRO Megatrends



Source: RIRDC and CSIRO

This analytical framework provides a useful tool to develop scenarios exploring possible responses by the Australian forestry sector to these forces. For example:

- ▶ What are the possible challenges and opportunities facing the sector?
- ▶ How well placed is the Australian forest industry sector to grow to meet increased demand, to compete for resources such as land and capital?
- ▶ Can it adapt to accommodate changing technologies, consumer preferences and climate?

Case Study: The imperative of scale

As firms increase the size, output or scale of their operation they gain greater cost advantages – economies of scale. Economies of scale shows that as costs are fixed, increasing output decreases the unit cost per output.

Scale in sawmilling

A recent assessment of the relative competitiveness of global sawmilling found that the manufacturing costs (personnel, energy and other operating overheads) are in the following bands:

- ▶ Log input greater than 1,200,000m³/yr - AUD\$40-50/m³ (profitable across 100% of a typical market cycle)
- ▶ Log input between 1,000,000 - 1,200,000m³/yr - AUD\$55-70/m³ (profitable across 85+% of a typical market cycle)
- ▶ Log input between 700,000 - 1,000,000m³/yr - AUD\$85-100/m³ (profitable across 75+% of a typical market cycle)
- ▶ Log input between 500,000 - 700,000m³/yr - AUD\$120-150/m³ (profitable across 60+% of a typical market cycle)
- ▶ Log input less than 500,000m³/yr - AUD\$175+/m³ (profitable across 40+% of a typical market cycle)⁶

A sawmill with a log input of 600,000m³ has manufacturing costs of about AUD\$120-150/m³, and it is estimated that it will be profitable across 60+% over a typical market cycle of between five and seven years.

Australia's sawmills

An ABARES survey in 2012-13 showed that Australia had 200 hardwood and 61 softwood sawmills. EY analysis of sawmill data suggests just six of these mills are above a 500,000m³ input capacity. Of these six:

- ▶ None have a log input greater than 1,200,000m³/yr
- ▶ 1 has a log input of 1,000,000m³/yr
- ▶ 3 have a log input between 700,000 - 1,000,000m³/yr
- ▶ 2 have a log input between 500,000 - 700,000m³/yr

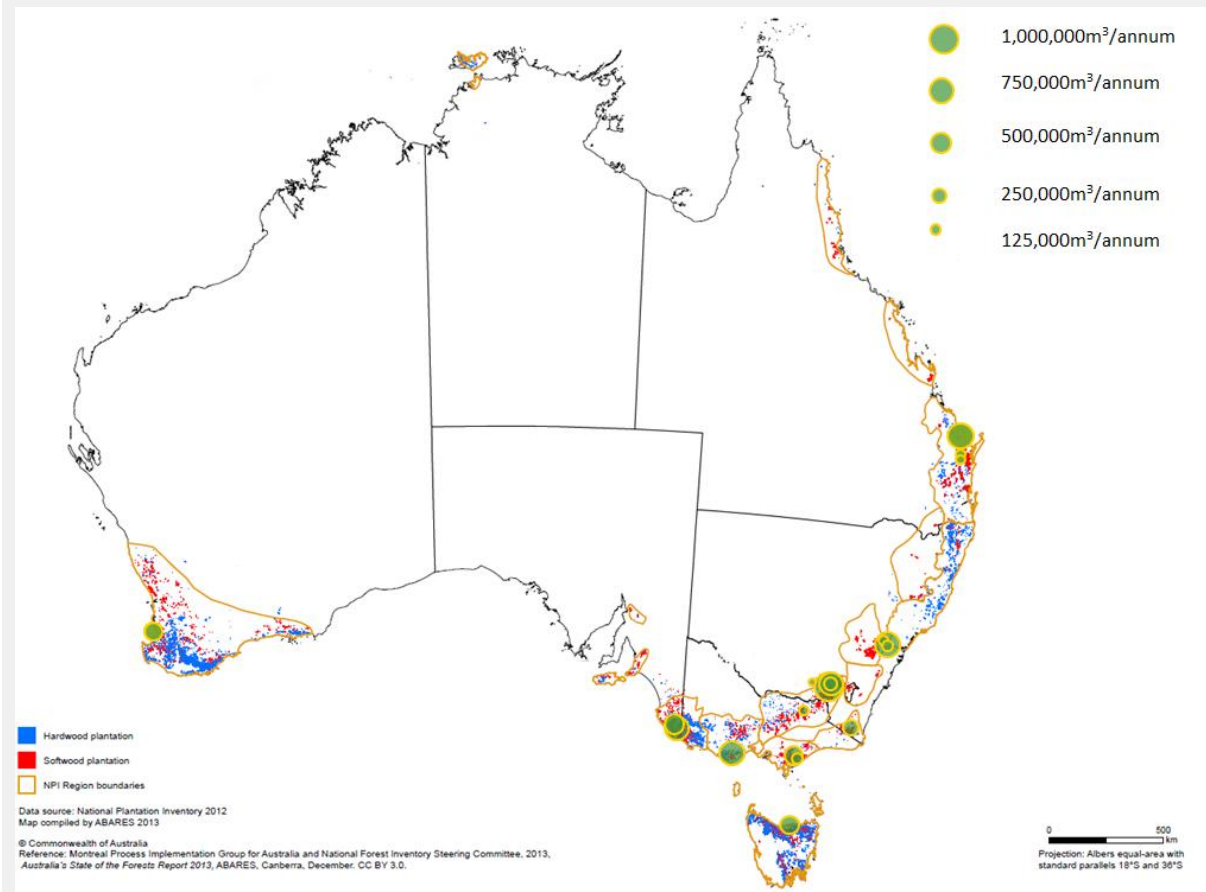
Source: Confidential industry source

⁶ A typical market cycle is between five and seven years, and the data does not include fibre costs.

Importance of proximity

The proximity of sawmills to their supply of logs is an important for increasing the scale of sawmill production. Most of the largest softwood sawmills in Australia are in close proximity to their input suppliers (Figure 3). Where multiple sawmills are in close proximity to one another operators suffer from a lack of scale in their production.

Figure 3: Location of plantation saw mill facilities (>100,000m³ log input / p.a.) relative to major plantation areas



Source: ABARES, EY analysis

Consolidation in sawmills to create increased economies of scale would drive greater profitability in the Australian industry.



2. Overview of Australian Forest Industry Sector

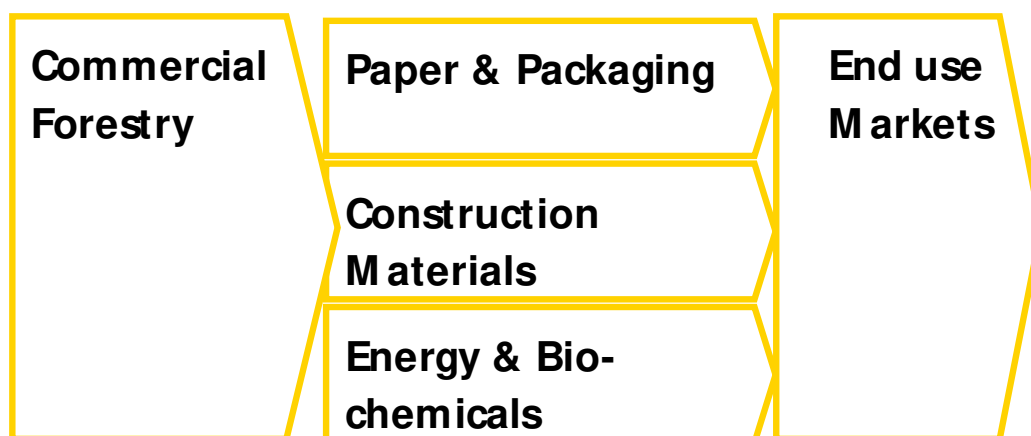
The Australian forest industry value chain is complex with many levels of interaction. The value chain starts with the commercial forestry segment. This segment grows and manages the forests that supply the log resources. These logs are processed into a wide array of products for domestic and export markets.

Throughout the value chain there are many players responsible for primary and secondary processing as well as transport, distribution and marketing of wood products. For the purpose of this report five broad segments have been demarcated within the value chain:

- ▶ Commercial forestry
- ▶ Paper and packaging
- ▶ Construction materials
- ▶ Energy and bio-chemicals
- ▶ (Distribution) end use markets

These have been identified schematically below (Figure 4).

Figure 4: Forest Products Industry value chain sectors



Source: EY

The competitiveness of each link in a value chain influences the competitiveness of the whole chain. Value chains in this industry have strong geographic connections. They are based around the main log supply areas (as set out above in Figure 4).

Location of processors

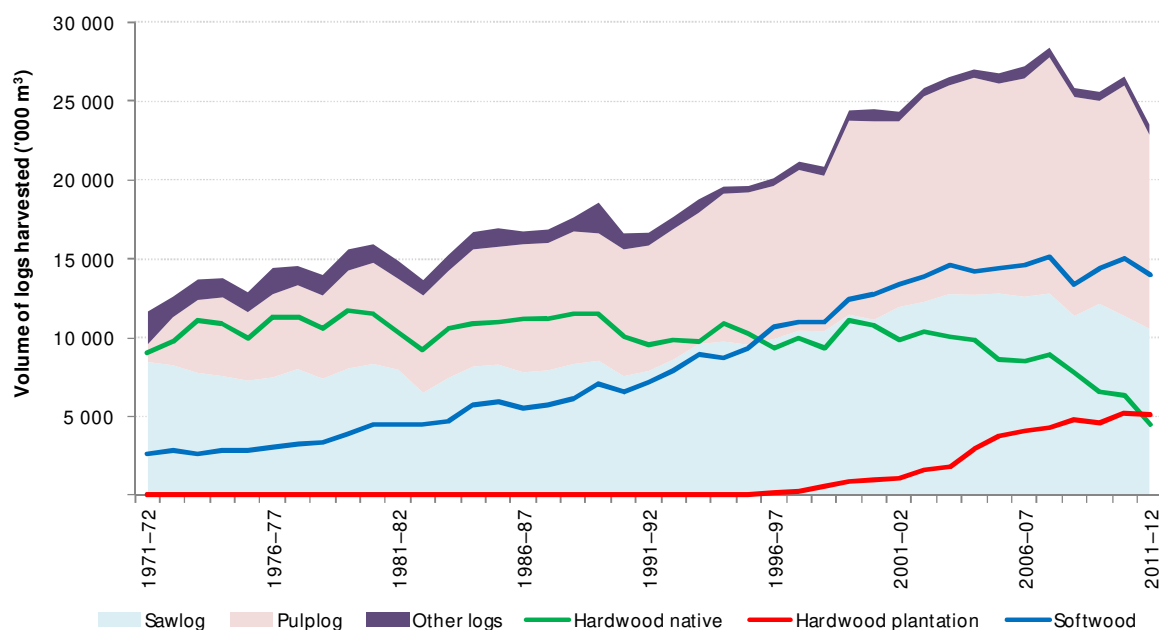
The primary and secondary processing industries should be located as close as possible to the sources of logs to reduce logistics costs associated with log transport. Secondary processors are typically located where they can access sufficient quantities of inputs from primary processors. In contrast, warehousing and distribution is often located closer to end use markets to facilitate efficient, timely deliveries of product. With vertically integrated companies the primary and secondary segments can be located on the same site.

This geographic dimension has important implications for the Australian forest industry. Inadequate log supply is a key limiting factor for many existing processors, and for any prospective greenfield processing investors. Some processors have taken steps to overcome this by transporting logs over long distances to achieve required scale. For others, the only option is to cannibalise log supplies from other plants as part of a wider rationalisation of the sector. The challenge is to have a value chain that is sufficiently flexible to allow consolidation.

Log availability

Figure 5 shows some clear trends in log availability over the past 40 years. Harvests of native logs have dropped by close to half. Hardwood plantation logs, mostly pulpwood, have increased significantly. Softwood logs increased through to the early 2000s and have since fluctuated with limited upside.

Figure 5: Historical logs harvested, by log type (1971/72 – 2011/12)



Source: ABARES

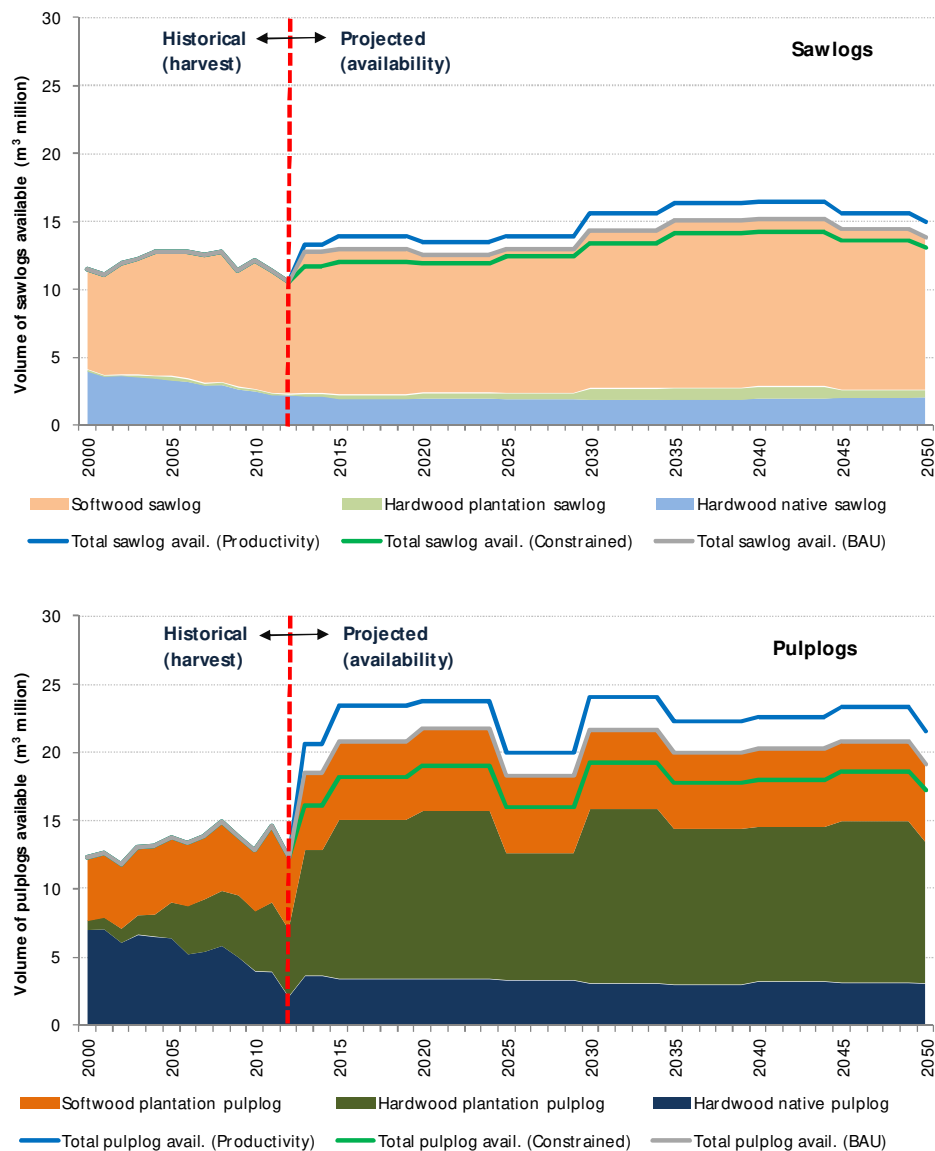
Historical and projected national sawlog and pulp log availability is set out under three scenarios — productivity, constrained and business as usual (“BAU”) (see Figure 6). The key trends show:

- ▶ Native hardwood sawlog supplies will continue to decline before levelling out later this decade.
- ▶ Relatively small volumes of plantation hardwood sawlogs will increase later in the decade and beyond.
- ▶ Softwood sawlog supplies have very limited upside. The aggregated picture masks the situation in specific regions (or “woodbaskets”). Some woodbaskets have almost no supply upside. This limits the ability of processors drawing from these woodbaskets to make the investments needed to maintain competitive scale and technology. In contrast, other woodbaskets may have increasing availability of small sawlogs that creates an opportunity for new small log processing lines.

For pulpwood, the projections show:

- ▶ Native pulpwood supplies declining before levelling out later in the decade.
- ▶ Plantation hardwood pulpwood supplies fluctuate.
- ▶ Softwood pulpwood supplies show a similar trend to softwood sawlogs and have a limited upside in aggregate.

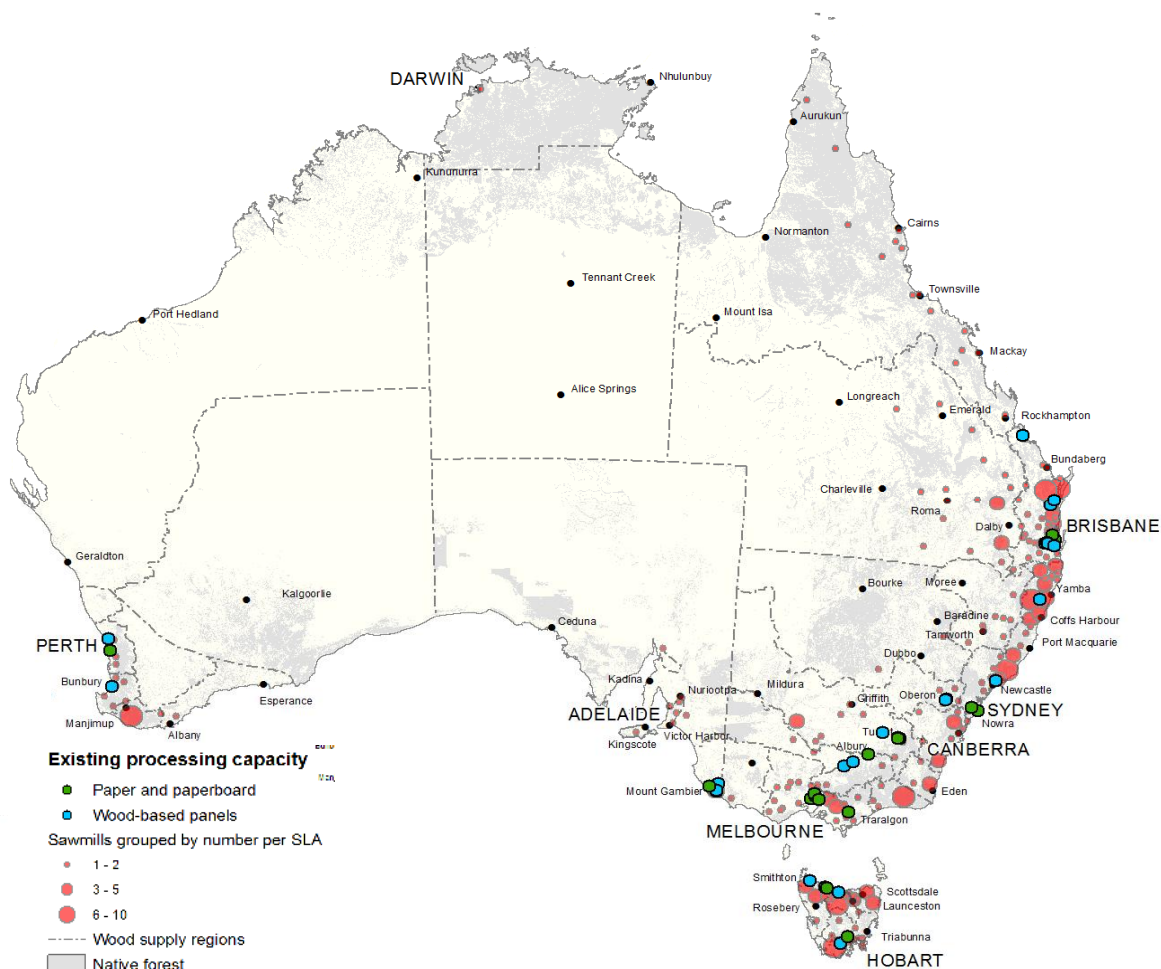
Figure 6: Historical and projected national log availability (2000 – 2050)



Source: ABARES

The geographic location of the processing capacity in comparison to wood supply is illustrated in Figure 7. The majority of processors are located along the eastern seaboard and in Tasmania. The wood supply region of south west Western Australia also has significant processing capacity.

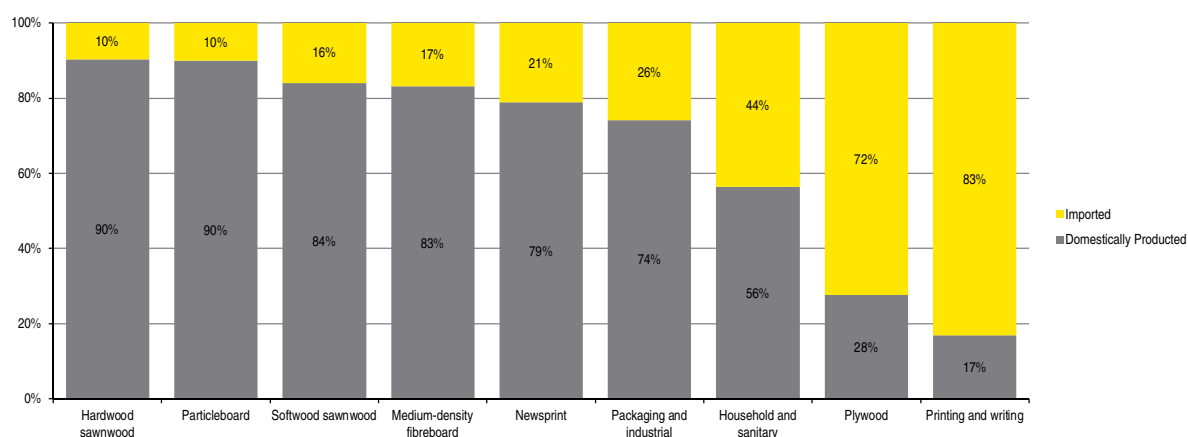
Figure 7: Approximate locations of total existing processing capacity in Australia



Source: ABARES

The diversity of products produced by the Australian forest products manufacturing sector is illustrated in Figure 8. Imports (predominantly of value added products) are an important part of meeting the country's needs for forest products. The domestic industry has a dominant role in meeting local demands in many sectors including softwood and hardwood sawnwood, industrial panels (MDF and particleboard), newsprint and packaging and industrial paper grades. We tend to import higher value add products such as printing and writing grade paper, tissue and sanitary products and plywood from countries with lower labour and manufacturing costs.

Figure 8: Australian consumption of selected forest products (2014)

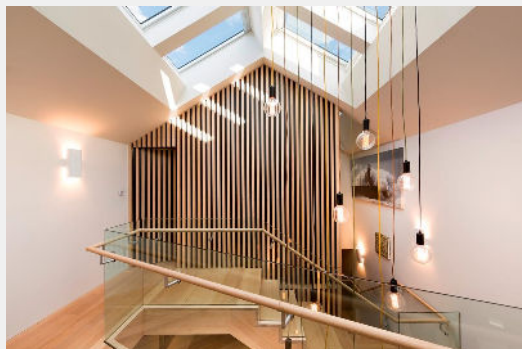


Source: ABARES, EY analysis

Australia's exports are largely in the form of relatively unprocessed logs and woodchips. A question for the sector and for governments is *how can the Australian forest sector improve its overall balance of trade through increased import substitution or additional exports?*

Recently there has been a resurgence of comprehensive trade agreements both at bilateral and multilateral levels. Trade agreements offer opportunities for both exporters and investors.

Development of a long-term industry strategy that addresses future mega trends should consider our competitive and comparative strengths in a globalised economy.



Source: ASH

Case Study: Domestically competitive: Australian Sustainable Hardwoods (“ASH”)

ASH is Australia’s largest hardwood mill, processing 155,000m³ per annum of hardwood sawlogs. ASH employs 220 direct workers.

How did ASH gain and maintain its competitive advantage?

ASH’s key to success is to understand its available forest resources and to listen to its customers. The

company actively grew through acquisition to secure a log supply profile with the scale and homogeneity to allow the company to invest in the processing technologies needed to meet the growing demand for its products. ASH has been able to gain and maintain its market through anticipating customers’ needs and responding to these needs. While the majority of ASH’s products are sold through distributors, ASH directly engages with the downstream users of their products such as staircase window, door and furniture manufacturers. They then take this a further step by engaging with the manufacturers and end use customers to get their take on the products and changes they would like to see. The company employs a staff member to constantly manage this key aspect of their business: “Listen to the market, understand the market, and provide solutions to the market.”⁷

ASH notes the importance of flexibility and responding to a changing market. It can change quickly from offering large volumes of standardised benchtops to one off architectural joinery house fit out, laminated window profiles to structural beams, or from open stairs to closed stairs.

ASH’s hardwood sawmill competitors typically only supply flooring, or structural grade timber, or stair treads. In contrast, ASH has the scale and the sophisticated value adding manufacturing processes to competitively manufacture a wide range of products. This together with the market orientation has allowed the company to develop new products and new markets delivering better margins. This provides a unique competitive advantage over its competitors who often supply to niche markets.

ASH sells both in to the domestic and export market. Its domestic market is largely import replacement (not competing against domestic producers). ASH strives to provide service, quality, availability and flexibility to Australian customers, and avoids price wars.

ASH has invested in new lines to suit the market needs.

ASH is also careful about the forest resources that it sources. Over time ASH has built up knowledge both in Australia and overseas to understand the market and to source and make decisions based on this market knowledge.

ASH is ideally located close to Australian Paper (“AP”) mills. This means that residue markets for green and dry chips are able to be sold easily to AP.

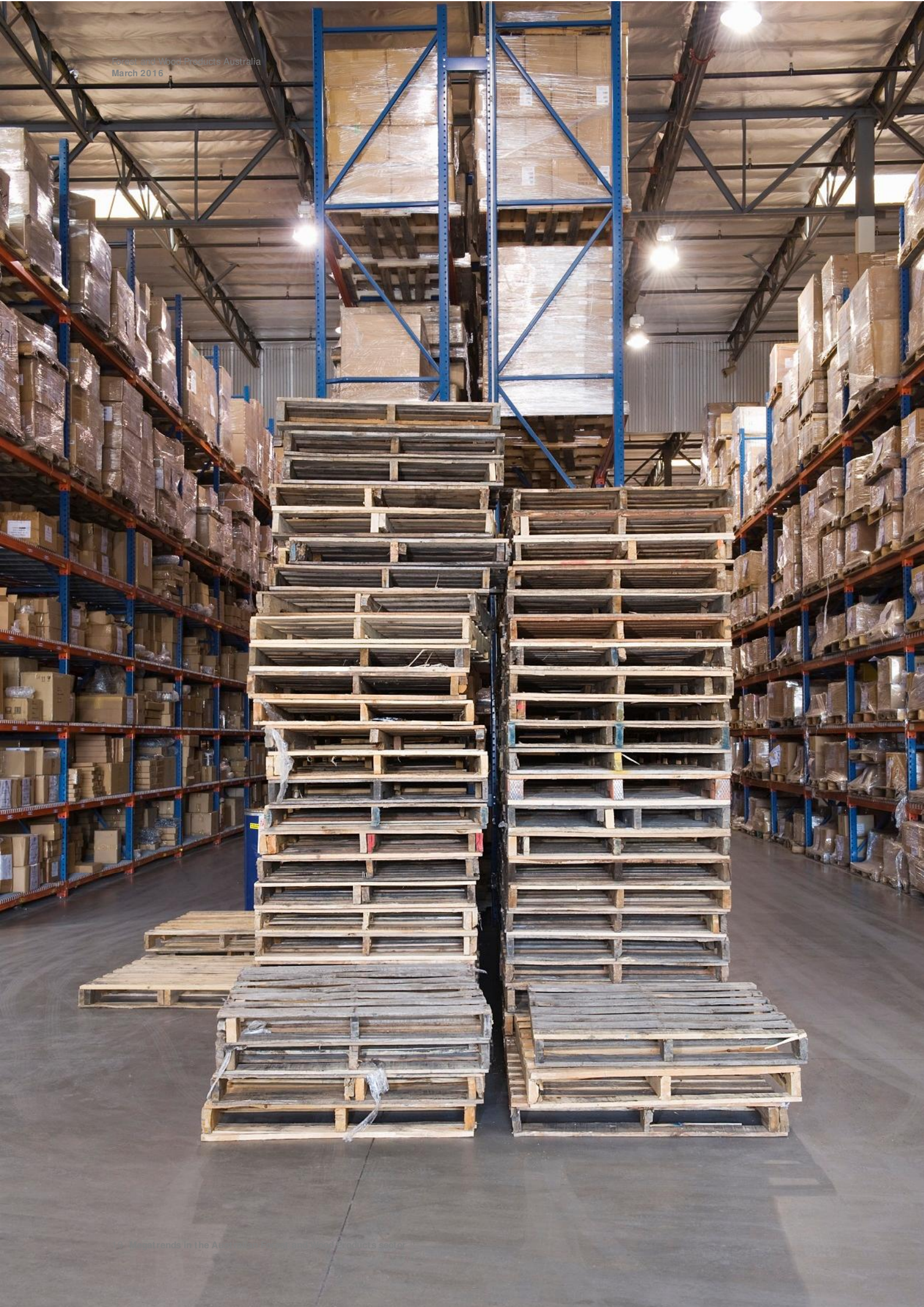
How will ASH continue its competitive advantage in to the future?

One of the key factors influencing the future competitiveness of ASH’s business is to continue to adapt to markets and respond to the resource available.

Overtime ASH has had to adjust its operations to suit the logs available. Log inputs have transitioned from predominantly trees older than 100 years, to 1940s regrowth, and more recently 1950/60s regrowth forests.

The company is exploring possible uses for plantation-grown shining gum hardwood logs, and ASH will continue to work with forest resource suppliers and customers to respond to market needs.

⁷ Vince Hurley (2015), *Pers. Comm.* 21 May 2015.



3. Megatrend 1: A hungrier world - population driving global demand from food and fibre

There is a consensus view, that there will be increasing demand for wood and wood products as global populations grow. Australia's population is projected to increase by 44% to 34 million by 2050.⁸ Populations in the Asian region including China, South East Asia and India are projected to increase to 4.9 billion over this same period.⁹

In the most basic economies wood and wood fibre is used for fuel and for housing. Increasingly sophisticated economies see fibre used to manufacture products such as paper for communication, packaging and personal hygiene, wood panels and structural lumber for construction, and biochemical products as feedstock into other manufacturing processes. Population growth can lead to localised shortages of wood fibre and growth of international trade.

Historically, there has been a very strong correlation between the consumption of forest products and wealth as measured by per capita gross domestic product. This relationship no longer exist in relation to communication papers, due to substitution to electronic-based communication. However, the correlation between economic growth and growth in consumption of other types of paper (e.g., packaging and hygiene) and construction materials remain strong due to the lack of viable substitutes.

3.1 Commercial forestry sector and a hungrier world

Australia's ability to respond to a hungrier world depends on its ability to provide a reliable supply of quality products at competitive prices. In order to do so current impediments to the industry's structure, loss of investment confidence extenuating from the Managed Investment Scheme (MIS) era, information asymmetry (both domestically and internationally) continuity of quality and supply and supply chain inefficiencies are all strategic priorities. The large areas of (mainly) hardwood pulpwood plantations developed under the MIS schemes are unlikely to remain as forests. New Forests recently estimated that as much as 40% of the approximately 1 million hectares planted under these schemes will be returned to agricultural uses. Australia's softwood plantation estate also has been stable since 1990.

This is combined with that the area of public native forest designated as production forest has continued to decline in key production areas. Currently, approximately 95% of native forest log supplies come from public native forests. While there are logs available from private native forests, relatively little is known about these forests and relatively limited areas are actively managed for log production.

An estimated USD \$100 to \$500 billion will be needed over the next 20 –30 years to plant the new areas needed to meet incremental global timber demand.¹⁰ However, lower returns and the longer time periods required to grow commercial-sized logs can make forestry a less attractive investment. In Australia, New Forests estimated real returns of between 4-7% for greenfield plantations requiring purchase of land and planting. These returns could be lifted by accepting lower returns on the land component.

Globally there has been an active market for established forest assets as an investment class. New Forests estimated the total value of the world's "investment quality" industrial forest and timberland at between USD 190 –200 billion. Of this total, timber investment and management organisations (TIMOs) currently have in excess of USD \$48 –\$57 billion in assets under management. A further

⁸ Australian Bureau of Statistics (ABS) (2012), *3222.0 – Population Projections, Australia, 2012 (base) to 2101*.

⁹ United Nations (UN) (2015) *Domestic Components of Future Population Growth: 2015 Revision*.

¹⁰ New Forests (2014) *Global Trends in the Forest Sector*, Presentation by David Brand, Chairman and CEO at MegaFloresta

USD 35 billion is held by timber real estate investment trusts (REITs) in North America. There remain further opportunities for investment in standing forest assets as more governments privatise public assets, companies monetise their timber holdings, private forests are aggregated, and new plantations developed.

Table 2: Commercial forestry sector and a hungrier world

Impact on the commercial forestry sector of a hungrier world	Structural impediments to responding to the impact of a hungrier world
<ul style="list-style-type: none"> ▶ New markets will open up for previously lower value logs. For example, increased demand for industrial panels and paper and paperboard products and energy will create markets for fibre that is currently underused by domestic processors. ▶ Forests that are accessible to ports will be exposed to export markets for relatively unprocessed product (e.g., logs and woodchips) to satisfy demands. This may have adverse consequences for domestic producers via new competition for available log supplies. ▶ Access to markets for softwood and hardwood residues and pulpwood grade logs will improve forest management. As demand grows there will likely be opportunities to increase prices with the potential to lift the overall returns per hectare. 	<ul style="list-style-type: none"> ▶ Low interest from institutional investors in establishing greenfield plantations. ▶ Adoption of research that increases the yield from existing and new forest estates.

3.2 Paper and packaging sector and a hungrier world

In the paper and packaging sector Australia's capacity has expanded as a consequence of investments in new lines in the past decade such as Amcor Botany and Visy Tumut #2 in containerboard (recycled and kraft respectively) and rebuilds of existing mills such as the Australian Paper Maryvale site (mainly printing and writing papers). The outputs from these capacity expansions have partly met incremental domestic demand but have also allowed increased exports. Visy has grown containerboard exports to US West Coast and to South East Asian markets.

The impact of a hungrier world on the paper and packaging sector will be different for different grades of products (see Table 3).

Table 3: Paper and packaging sector and a hungrier world

Impact on the paper and packaging sector of a hungrier world	Structural impediments to responding to the impact of a hungrier world
<p>An overall increase in demand for these products although the rate of change will vary across the grades:</p> <ul style="list-style-type: none"> ▶ Unbleached (brown) packaging grades (cardboard) will increase as more manufactured goods and agricultural products are traded and shipped. ▶ Bleached packaging will be used more widely as populations become more urbanised and reliant on processed and refrigerated food. ▶ Tissue and towelling demand will grow with increasing emphasis on sanitation, again due to increasing urbanisation. ▶ Communication papers such as newsprint and printing and writing papers that are most exposed to the transformative technologies (discussed later) will limit demand growth. 	<ul style="list-style-type: none"> ▶ New virgin fibre pulp capacity is unlikely to occur due to the lack of available fibre supplies in quantities and at locations that could host competitive scale pulping capacity. ▶ Additional paper machines needed to produce product from imported or recycled pulp. New tissue capacity is the most likely grade for such investments.

3.3 Construction materials sector and a hungrier world

In the domestic construction materials segment, sawmills and wood panel mills, continue to face challenges to maintain market share servicing the growing domestic and regional markets. The

sector's challenges include maintaining competitiveness versus imported products and substitute materials; and in producing products that continue to be demanded by an increasingly urbanised population.

A high proportion of sawn product yield from domestic softwood sawmills does not meet structural grade standards. European or North American competitors do not have this problem. The Australian industry is tackling this via focused R&D and is in the process of rolling out practical solutions to assess existing tree crops. This information is being used to direct logs to the most appropriate end uses. Timberlink is making use of its vertical integration with New Forests to actively explore how such information can be used to create value for forest owner and processor.

A recent study of the Green Triangle forest industry cluster identified clear opportunities to significantly improve grade recoveries and to reduce costs for sawmills through adoption of state of the art technologies and achieving scale throughputs (see transformative technologies).

There are also opportunities to produce more engineered wood products such as laminated veneer lumber (LVL). This can be produced from hardwood or softwood logs with better strength characteristics. In addition to better quality softwood logs, some regrowth native eucalypts and plantation eucalypts would be suitable for producing such products. Cross-laminated timber (CLT) is gaining acceptance as a building material suited for multi storey buildings, with Lend Lease developing several buildings in Australia using imported CLT components. These materials are being promoted as having excellent carbon and sustainability credentials.

Table 4: Construction materials sector and a hungrier world

Impact on the construction materials sector of a hungrier world	Structural impediments to responding to the impact of a hungrier world
<p>A hungrier world will increase demand for these products to house growing populations (including new residencies, community buildings and commercial infrastructure). The impacts will vary depending on the types of products:</p> <ul style="list-style-type: none"> ▶ Wood panels demand will grow due to demand for concrete formwork at the structural end of the spectrum and for increased furniture and fit out of apartment-based housing at the non-structural end. ▶ Increased demand for engineered wood products to provide superior performing products from smaller, younger logs. ▶ Increased demand for plantation-sourced timber to compensate for declining supply of natural forest-sourced log supplies. 	<ul style="list-style-type: none"> ▶ A relatively high proportion of the sawn product yielded from domestic softwood sawmills does not meet structural grade standards. This reflects differences in the inherent strength qualities of the wood in logs supplied from fast-grown plantations. The resulting products are sold at a significantly lower price, eroding average margins. ▶ The lack of the incremental log supplies needed to underpin the investments required to maintain competitiveness in the sawmilling sector. ▶ The lack of new plantation area limits the sawlog supply upside for existing producers, and limits new entrants unless they buy out an existing facility. This has meant limited investment in Australia's softwood sawmilling sector and has seen a decline in competitiveness. ▶ The hardwood sawmilling sector is facing constrained log supplies. ▶ Increased multistorey apartments and fewer "traditional" detached houses will require the sector to invest in new technologies to produce higher performing structural products.

3.4 Energy and bio-chemicals sector and a hungrier world

In the biomass sector, the current global installed biomass capacity was recently estimated to exceed 87 GW. One-third located in Europe, 29% in the Asia-Pacific region, and almost 20% in North America. Continued government policies supporting a drive for low carbon development could see global bioenergy capacity reach 130 GW by 2025.

The growth in global biomass capacity, and the lack of alternative accessible environmentally sustainable wood supplies, mean Australian biomass suppliers should be well placed to service regional markets where government policies are aimed at fostering expansion in biomass use. This includes China, South Korea and Japan. Japan alone is projected to increase pellet consumption by

5 million tonnes within 5 years. Forest owners report active discussions with prospective pellet project developers seeking access to suitable fibre supplies. Altus Renewables have developed a pellet plant associated with the Hyne Tuan Queensland sawmill and currently produce approximately 125,000 tonnes of pellets annually with active plans to expand production.

The current growth in biofuels production in Australia reflects a growing expectation that markets will expand to take increasing volumes from sources that can be verified as sustainable. Demand for these product categories will be driven, at least initially, by government-mandated requirements. These include use of renewable fuels including wood pellets and biomass from forests for electricity generation. A second area now being commercialised is the production of chemicals and products from biomass that have been mainly produced from petroleum-based sources.

There is a potentially large volume of residues from native forest sawlog harvesting operations. These materials comprise log and branch materials, and trees culled for post-harvest silvicultural treatments. Recent changes in the Australian Renewable Energy Target (RET) legislation now allow native wood waste to be included as fuel for biomass electricity generation although some international jurisdictions also include heat generation within the scope of their renewal energy programs. There are potential supplies of complying wood waste from existing operations in all the East Coast states, Tasmania and WA. Decisions to make this material available for energy production now lies with the respective state governments.

Table 5: Energy and bio-chemicals sector and a hungrier world

Impact on the energy and bio-chemicals sector of a hungrier world	Structural impediments to responding to the impact of a hungrier world
<ul style="list-style-type: none"> ▶ Increased demand for wood fibre to supply new energy and bio-chemical products. 	<ul style="list-style-type: none"> ▶ Australia's current bio-energy and bio-chemicals sectors are very limited. There is not an established domestic market, and potential regional export markets have so far been supplied by other lower cost producers. ▶ Need to identify available biomass resources located sufficiently close to a port to permit efficient on-land transport of the manufactured product. ▶ State governments are yet to make a decision to make wood waste from existing operations available to the energy and bio-chemicals sector

Case Study: AKD Softwoods

AKD Softwoods is a vertically integrated company located in south-west Victoria. Its integration starts from managing a 8,000ha radiata pine estate through to two closely linked softwood sawmills sharing an efficient drying and drymill processing facility. The company also operates two post and preservation businesses as well as owning its own transport fleet.



How did AKD gain and maintain its competitive advantage?

AKD was established in 1955 and is privately owned by four family companies. The stable platform created by a consistent and committed ownership base with a long-term strategic view. It has also benefitted from having very stable management, with only three CEOs in the last 50 years.

The company has used this platform to build a competitive business. Company management has distilled the company's objective to be internationally competitive and continually improving. The company also strives to have a point of difference relative to competitors. In fulfilling this objective, AKD is investing in its forests, its manufacturing facilities, its logistics and in its people. AKD sees this as a primary reason for its success, being the stable business platform of strong balance sheet and stable ownership that has a long term, strategic view, being prepared to invest in the latest technologies and innovations.

In the last four years AKD has nearly doubled in size and is the fourth largest softwood sawmiller in Australia. This expansion has been funded through a prudent use of debt and cashflow and the growth has continued the development of AKD's vertically integrated business model. While only about 8-10% of AKD's log intake is currently supplied from company plantations, having access to company-sourced logs gives flexibility to better match external log intake needs and costs during periods of higher or lower demand. Likewise, AKD's trucking fleet means deliveries to customers are under the company's control. Vertical integration provides certainty of supply while managing costs and margins as efficiently as possible.

AKD's two large-scale mills give the company an advantage relative to competitors. Two mills give the company more flexibility and AKD produces a wider range of products, often with smaller production runs. The mills incorporate the latest technologies in key production areas. For example, AKD has installed Australia's first continuous drying kilns. The competitive advantages of the new technology include lower production costs for margin creation, and the ability to provide tailored products on time. This has allowed AKD to build its reputation as a price competitive, reliable supplier of a wide range of quality products.

How will AKD continue its competitive advantage in to the future?

For AKD, one of the biggest challenges is resource availability. Sawmillers are often put in the difficult position of having to secure long-term (multi-year) contracts for logs, when they sell products into shorter-term markets. Being able to draw on its own vertically integrated resource base allows AKD to operate with more flexibility than most of its competitors in the market.

One area outside of the company's control is finding good paying uses for the residues from sawmills and logs that are unsuited to AKD's needs. In the absence of a pulpmill such as Visy's Tumut mill this fibre is going to a range of end uses and to export markets. AKD is actively monitoring opportunities for alternative, better paying end uses.

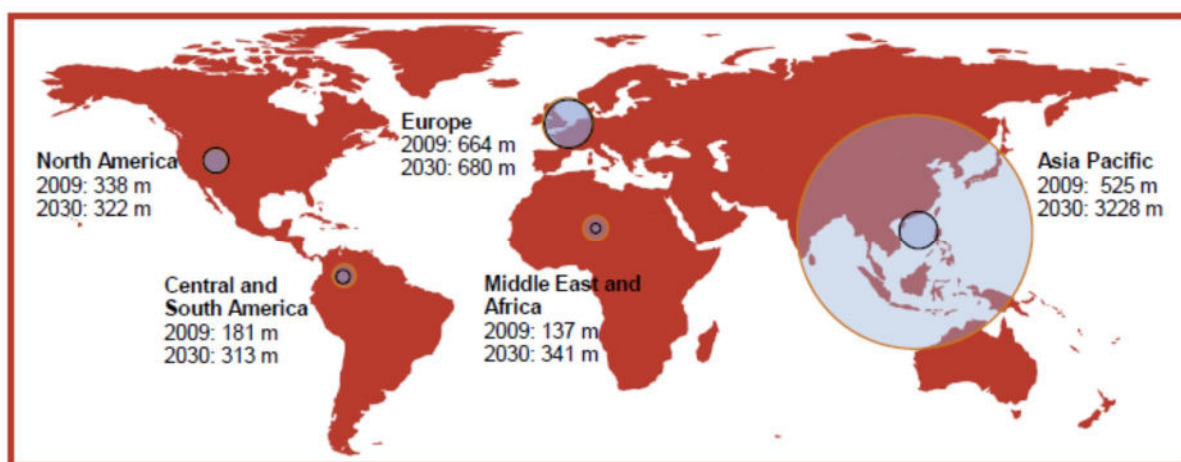
The company will maintain its focus on international competitiveness, continual improvement and points of differentiation versus competitors. In addition to leveraging its strong ownership platform, the company is investing in its staff as key part of the company's success. All employees are enrolled in active training programs at all times.



4. Megatrend 2: A wealthier world – emergence of a new middle class increasing consumption

The middle class in the Asia-Pacific region is projected to increase by over 500% to over 3.2 billion people by 2030. The growth in middle class households will lead to strong growth in demands for a whole range of products and services including housing, food, education, manufactured goods, energy, transportation and entertainment. These changes are on top of changes driven by growth in populations. Middle class households consume more resources than lower income families. The middle class family's additional consumption extends beyond the larger and better quality food, clothing, energy and housing required. Middle class families also require additional public infrastructure including roads, public transport, hospitals, education facilities, retail space, and entertainment facilities.

Figure 9: Middle Class Population Growth



Source: Kharas & Gertz, 2010

The increased consumption driven by growth in the region's middle class will show up in increased demand for products produced by the regional forest and wood products supply chains. Many of the impacts will be additional to the demand increases described under the Hungrier World megatrend. The responses needed to deal with the increased populations would be compounded by the increased numbers of middle class households.

Middle class consumers are projected to increase consumption of processed foods including frozen and refrigerated foods requiring paper and paperboard packaging. Australia's forest industry sector meets approximately 75% of the country's packaging and industrial papers demands. In addition, the sector supplies hardwood and softwood woodchip exports to produce these products in North Asian countries, China, Japan and South Korea. These products require additional hardwood and softwood kraft pulps and recycled fibre.

4.1 Commercial forestry sector and a wealthier world

The demand for forestry resources are increased from the wealthier world.

Table 6: Commercial forestry sector and a wealthier world

Impact on the commercial forestry sector of a wealthier world	Structural impediments to responding to the impact of a wealthier world
<ul style="list-style-type: none"> ▶ Commercial forestry operators will be under pressure to increase the supply of logs required to meet incremental demand. ▶ There is less than 15 years for forest product supply systems to ramp up to meet the incremental demand increases. ▶ There is potential to increase the area of fast-growing plantations to meet some of this incremental demand. 	<ul style="list-style-type: none"> ▶ New plantations require land to be taken out of other land uses and used to meet incremental demand. ▶ Wood fibre production from existing forests are insufficient to meet the required plantation establishment rates.

4.2 Paper and packaging sector and a wealthier world

The strong growth in pulp and paper manufacturing since the late 1990s in Asia and in other low-cost locations including South America has been in response to the growing demand for paper and paperboard in Asian markets. The growth in manufacturing has been accompanied by a commensurate increase in demand for fibre.

This has led to strong growth in Australia's exports of woodchips. Australia has also increased exports of recycled fibre to augment increased domestic (Chinese) sources. The growth in domestic consumer products sales under the wealthier world megatrend will benefit China's recycled paper collection numbers. With more products sold locally a higher proportion of packaging will be used and collected domestically.

Another sector facing additional competition is in the tissue and towelling grades. This is despite some protection from imports due to the relatively high transport costs associated with these products due to their low weight/high bulk. Relatively unprocessed (jumbo rolls) tissue is imported and then processed into consumer products closer to domestic end user markets. Given continued growth in Australian markets and strong growth in Asian markets there is the potential for price rises in these grades as more consumers compete for hygiene-related products. Australia's sector supplies just over half (53%) of the domestic demand for tissue and towelling products. Regional production is supported via exports of woodchips and recycled paper.

Relative to the Asian producers, Australia has an advantage with respect to softwood-based unbleached kraft papers and paperboards due to access to softwood pulpwood and residues (see Visy case study); and access to better quality recycled fibres. These products may see additional exports to satisfy the growing consumer products demands in Asia. However, growing domestic demand will consume an increasing proportion of available product.

In contrast, communications papers grades will be exposed to more competition. Per capita consumption in Australia is declining and companies are working hard to manage supply to sustain prices. Domestic producers of printing and writing grades will likely face increasing challenges as domestic fibre costs rise to reflect export parity pricing. Domestic producers meet 80% of newsprint and 17% of printing and writing papers demands. Australia imported close to AUD 1.2 billion of printing and writing papers in 2013/14, while exporting AUD 140 million.

Table 7: Paper and packaging sector and a wealthier world

Impact on the paper and packaging sector of a wealthier world	Structural impediments to responding to the impact of a wealthier world
<ul style="list-style-type: none"> ▶ Production of these paper and paperboard products will require additional volumes of hardwood, and some softwood, kraft pulps. ▶ Tissue and towelling products consumption grows with increased access to better domestic and community hygiene. ▶ Communication papers, including newsprint and printing and writing paper, are projected to increase but not at the same rates as for other grades. This reflects continuing inroads made by digital media that reduce the per-capita consumption of these products. These products require softwood and hardwood pulps and recycled fibre. 	<ul style="list-style-type: none"> ▶ There is a limited supply potential from domestic sources, especially for virgin (wood) fibre. ▶ Finding new sites to host pulp production is increasingly difficult. China's problems with existing industrial pollution of streams and rivers, and growing competition for available water supplies means new pulp mills will be increasingly difficult to site. ▶ In the absence of new fibre supplies coming on stream, incremental supply of virgin fibre softwood product from Australia will be marginal. ▶ Australia will face increasing competition with large scale paper production in Asia and South America ▶ Rising domestic fibre costs make Australia uncompetitive.

4.3 Construction materials sector and a wealthier world

Australian supply only meets around 25% of domestic demand for plywood. Regional production is supported via export of softwood and hardwood peeler logs and veneers.

Domestic producers meet over 90% of local demands for particleboard and over 80% of MDF. Regional production is supported via export of woodchips. And over 80% of domestic demand for softwood sawnwood, and over 90% of hardwood sawnwood demand is supplied domestically. Regional demand is partly met by relatively small exports of sawn product. Regional production is supported via export of softwood logs.

Engineered wood products are used in a growing range of construction applications including roofing and flooring systems. Australia's construction materials sectors can potentially benefit from the growth in housing required to service the incremental middle class households expected. Australia is a net importer of all the major categories of products.

A consortium of forest growers, the Association of Green Triangle Forest Growers (ATFG), was convened to identify possible domestic processors capable of using the over 4 million m³ of fibre exported from the Green Triangle region. This fibre is in the form of small softwood sawlogs, softwood pulpwood and chips, and plantation hardwood logs and chips. The ATFG has undertaken a study to identify options for processing this fibre. Options identified include a large-scale industrial panel plant, such as MDF, or a relatively small oriented strand board (OSB) mill. Both mills would require a combination of domestic and export markets to take the full output. A further option would be to develop a small log line sawmill to process the small softwood sawlogs.

Table 8: Construction materials sector and a wealthier world

Impact on the construction materials sector of a wealthier world	Structural impediments to responding to the impact of a wealthier world
<ul style="list-style-type: none"> ▶ Growth in middle class households will increase demand for higher quality housing. Higher quality housing units will typically be larger and will use higher standard materials in construction and fit-out. There will also be increased demand for better quality furniture and more furniture. ▶ Increased demand for structural wood panels, especially plywood used in concrete formwork and for some furniture and retail fit out. ▶ Increased demand for industrial wood panels including medium density fibreboard (MDF) and particleboard used in furniture, flooring, kitchen cabinets and retail fit out. ▶ Increased demand for solid structural timber used in framing and in formwork. ▶ Solid appearance-grade timbers used in furniture and internal fit out for domestic and retail outlets. ▶ There is potential for increased use of engineered wood products including CLT, laminated veneer lumber and other prefabricated building products as these products become more available and suitable applications better understood. 	<ul style="list-style-type: none"> ▶ Constrained supplies of sawlog and veneer log-based products, however, there may be opportunities to redirect logs and chips currently exported. ▶ Poor grade products do not meet required standards ▶ Lack of mills able to meet now domestic and international demand

4.4 Bioenergy and biomaterials sector and a wealthier world

Australia's biomass sector is expanding, and we can be positioned to increase exports of these products as demand grows.

The following highlights the likely impacts on relevant segments of the forest and wood products supply chains in the region and beyond.

Table 9: Bioenergy and biomaterials sector and a wealthier world

Impact on the bioenergy and biomaterials sector of a wealthier world	Structural impediments to responding to the impact of a wealthier world
<ul style="list-style-type: none"> ▶ A wealthier world is expected to increase per-capita energy consumption. ▶ Government undertakings to reduce carbon emissions will drive increased demand for renewable energy sources regionally. ▶ There is a premium on renewable and recyclable products which could mean increased demand for biomass. ▶ Biomass, including wood pellets is projected to be a growing part of the region's energy mix. ▶ Bio-chemicals demand will grow as these products become more readily available. ▶ Increasing disposable income has seen strong demand growth for rayon as a fabric produced using dissolving pulps produced from softwood and hardwood fibres. 	<ul style="list-style-type: none"> ▶ Increased numbers of middle class households are likely to increase pressures on Asian countries to clean up more heavily polluting energy plants. ▶ Shortage of biomass resources located sufficiently close to a port to permit efficient on-land transport of the manufactured product.

Case Study: New Forests/ Timberlink

New Forests manages more than 620,000 hectares of land and forests in the Asia-Pacific region and the United States for institutional investors. Its Australian managed assets include 90,000 hectares of softwood plantations in the Green Triangle and northern Tasmania and a timber processing business Timberlink which operates sawmills in the same locations.



How did New Forests gain and maintain its competitive advantage?

Vertical integration has been key to maximising investor returns from New Forests managed softwood assets in Australia.

The sawmill and softwood plantations that supply the majority of logs processed by Timberlink sawmills operate as separate businesses but have entered into formal arrangements to share operational and commercial information. The objective of this arrangement is to optimise the performance of both assets. The companies have built on work undertaken as part of FWPA's e-Cambium model designed to develop a common way of measuring and understanding the impact wood quality can have on sawn timber yields. The companies are working to measure and quantify log attributes that contribute to structural performance (e.g., density and its correlation with stiffness) on an operational basis. This information is used to modify the harvesting schedule to ensure the average profile of log density and stiffness supplied to the sawmill matches market demand. For example, in Tasmania some of the forests produce a proportion of relatively low-density wood best suited for treated outdoor wood products. New Forests is now able to identify, schedule and process these lower density logs during winter in order to supply treated product during high demand spring and summer periods. Harmonising the harvesting schedule in this way reduces inventory costs and maximises sawn timber recovery.

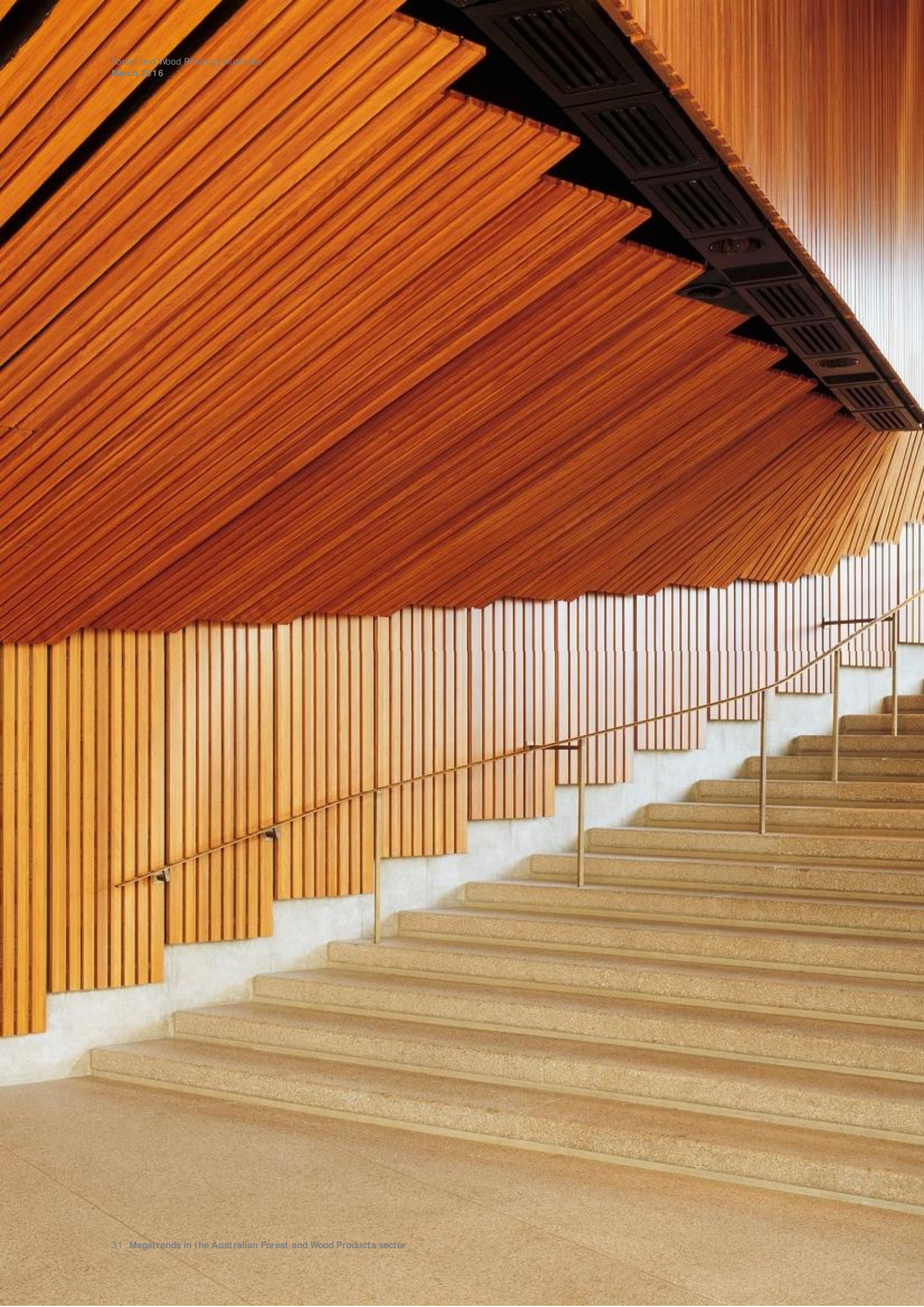
The companies are working on tools that will allow them to better predict likely wood quality attributes in standing trees. They are exploring how this could inform how these logs are sorted and batched so that different cutting patterns can be applied in the sawmill to optimise value recovery. The arrangement between the parties allows for negotiation of quantified commercial improvements. This changes the relationship between the forest resource owner and the mill owner and represents an important value creation initiative for both parties.

The next step in this process is to continue work with FWPA and others to better understand the changes to wood stiffness and density resulting from differences in tree growth variables. Examples of such variables include rainfall, soil types, site attributes, stand management, stand stocking, thinning and fertiliser use. The companies expect this work will allow New Forests to grow stronger, more valuable wood by modifying its silvicultural treatments. This in turn will help to improve the economics of replanted and new plantations. For the sawmills this knowledge will help in planning capital investments and marketing in the medium term.

How will New Forests continue its competitive advantage into the future?

New Forests is continuing to invest in research, development and technology to improve value recovery from its softwood operations. Every 1% improvement in recovery achieved in the sawmills is worth about \$1 million in EBITDA.

The development of export markets is part of New Forests' strategy to further diversify markets and provide opportunities to optimise the log mix processed in its Australian facilities. For example: the recent development of bioenergy demand in Japan provides a potential new byproduct market for low grade wood from the softwood plantations which has the prospect of providing an additional revenue stream and reducing land preparation costs.



5. Megatrend 3: Choosy customers – information empowered consumers demanding particular ethics, provenance, sustainability or health attributes

Increasing numbers of better educated and informed middle class customers are looking for ways to reduce their adverse impacts socially, environmentally and economically, and more broadly to reduce impacts at a local, regional, national and global level. These concerns have been translated into actions undertaken by individuals, environmental groups, companies and governments. These actions have included development of products and services intended to cause fewer adverse environmental impacts. Governments are also introducing legislation to ban imports of wood products deemed to have been produced from illegally-sourced logs.

This trend has both positive and negative implications for the forestry and forest industry sector. On the positive side, forest products have environmental benefits relative to competing products such as steel, plastics and concrete. These are well established, internationally accredited, systems for certifying that forests are sustainably and well managed. Tree planting as a practical means to offset greenhouse gas emissions, often in parallel with increased production of renewable biomass fuels are all well received by choosy customers. On the negative side, the rates of forest clearing, unsustainable harvesting and species loss are of concern to choosy customers.

The forest industry and government has responded in a variety of ways to meet the needs of increasingly choosy customers. These responses have affected all stages of the forest and wood products supply chain. Two schemes are in operation in Australia, the international forest stewardship council ("FSC"), and the Australian forestry standard ("AFS"). The latter scheme is affiliated with the internationally recognised Programme for the Endorsement of Forest Certification ("PEFC") scheme. By purchasing products with appropriate certification from either scheme, Australian consumers can be assured they have minimised adverse impacts caused by the management, harvesting and (possibly) processing of the wood used in the product. Native forest operations have been able to secure AFS certification.

The FSC certification process embodies a significant role for local Environmental Non-Government Organisations (ENGO) participation. In Australia such groups have historically taken strong positions against native forest harvesting. Therefore, they may find it difficult to reconcile that position with any action such as conferring FSC certification that might facilitate native forest operations.

According to research by FWPA, consumer awareness of both AFS and FSC certification is low but consumers claim that they are more likely to buy forest products if they were certified by credible authorities.

The draft Australian FSC forest management standard will go some way to treating well managed native forests in Australia on the same basis as native forests in other jurisdictions but this may not satisfy those individuals or organisations that do not support any timber harvesting from Australian native forests.

5.1 Commercial forestry sector and a choosier customer

Companies are now committing to ensuring that fibre inputs are from responsibly managed softwood plantations that comply with PEFC and FSC requirements. In conjunction with this, companies are avoiding controversial fibre sources such as from illegally harvested wood, wood sourced from areas where high conservation values are threatened, wood from significant conversion of forests to plantations or non-forest use, and wood from trees that have been genetically modified. For example, Australian Paper reports that "82% of all our fibre inputs are AFS/PEFC and/or FSC® chain of custody certified, and 97% of all our wood inputs are from forest management operations that are AFS/PEFC and/or FSC® certified."

Both FSC and AFS exclude wood from genetically modified sources, and while this is currently not an issue, it may restrict the adoption of these technologies and their associated benefits.

Table 10: Commercial forestry sector and a choosier customer

Impact on the commercial forestry sector of a choosier customer	Structural impediments to responding to the impact of a choosier world
<ul style="list-style-type: none"> ▶ Significant changes in forest management, especially in the area of planning and executing sustainable forestry operations. ▶ Introduction of independent certification schemes that audit companies' plans and execution of forestry operations. ▶ Schemes then track the movement of logs to assure customers they are buying products that minimise adverse impacts. ▶ Governments, including Australia, US and UK, have implemented legislation to control imports of illegally-sourced timbers. 	<ul style="list-style-type: none"> ▶ No Australian native forest operations have obtained full FSC certification.

5.2 Paper and packaging sector and a choosier customer

In the paper and packaging sector a choosier customer will require a conscious and concerted focus on building and expanding the social licence of the industry and individual companies. This will be especially important for products that are in close human contact (e.g., hygiene products) or in contact with food.

Table 11: Paper and packaging sector and a choosier customer

Impact on the paper and packaging sector of a choosier customer	Structural impediments to responding to the impact of a choosier world
<ul style="list-style-type: none"> ▶ More companies seeking FSC or PEFC certified sources of virgin fibre. ▶ Companies increasingly have been promoting use of recycled fibre in product manufacturing to broaden their sustainable credentials. 	<ul style="list-style-type: none"> ▶ Difficult to obtain a social license to harvest timber from native forests. ▶ Potential restriction to adopting genetic modification technologies and associated benefits. ▶ The industry needs to have the ability to anticipate and change and adapt to changing customer preferences.

5.3 Construction materials sector and a choosier customer

To date, adoption of certification in construction and furniture products has been driven by large retail chains and green building rating schemes and individual consumer pull through has been limited. As awareness of the schemes grow, there may be increased demand however this is unlikely to achieve a price premium due to availability of imported certified products.

Awareness of certification and the environmental benefits of wood products may increase wood usage at the expense of other materials. The choosier customer may become more appreciative of the provenance of products with a preference for Australian made products. Ultimately, the choosier customer's preferences move quickly and the industry will need to be alert to understand and respond to changing customer preferences.

Table 12: Construction materials sector and a choosier customer

Impact on the construction materials sector of a choosier customer	Structural impediments to responding to the impact of a choosier world
<ul style="list-style-type: none"> ▶ Sourcing of construction materials from legal and well managed forestry operations ▶ Average life of fitouts and furniture are likely to decrease as consumers become more fashion conscious. 	<ul style="list-style-type: none"> ▶ Inability to achieve a price premium for certified products.

5.4 Bioenergy and bio-chemicals sector and a choosier customer

Europe has led the growth in use of biomass. The industry has developed the Sustainable Biomass Partnership (SBP) to assure customers that the biomass used is economically, environmentally and socially sustainable. SBP has developed a certification framework to provide assurance that woody biomass is sourced from legal and sustainable sources. As nearly all of Australia's commercial forests are independently certified to one or both systems and thus well placed to be a supplier to domestic or international bioenergy or bio-chemical suppliers.

Some activists are seeking to undermine the environmental credentials of bio-energy as a means of reducing the commercial viability of native forest management. This may be partially addressed though the finalisation of Australian FSC forest management standard.

The adoption of bioenergy and biochemical is largely through government regulation, although consumer demand and corporate social responsibility may become an increasingly important driver.

Table 13: Bioenergy and bio-chemicals sector and a choosier customer

Impact on the bioenergy and bio-chemicals sector of a choosier customer	Structural impediments to responding to the impact of a choosier world
<p>► Increasingly choosier customers are moving away from energy sourced from fossil fuels and are moving towards renewable industrial feedstock.</p>	<p>► Australian FSC forest management standard is not finalised.</p>



6. Megatrend 4: Transformative technologies—advances in food and fibre production and transport

Forest products have experienced the impacts of transformative and disruptive technologies. For example, new technologies has driven strong growth in the production of high performance industrial panels, from hitherto low-value, small trees. There are a number of technologies available across the value chain (see Table 14).

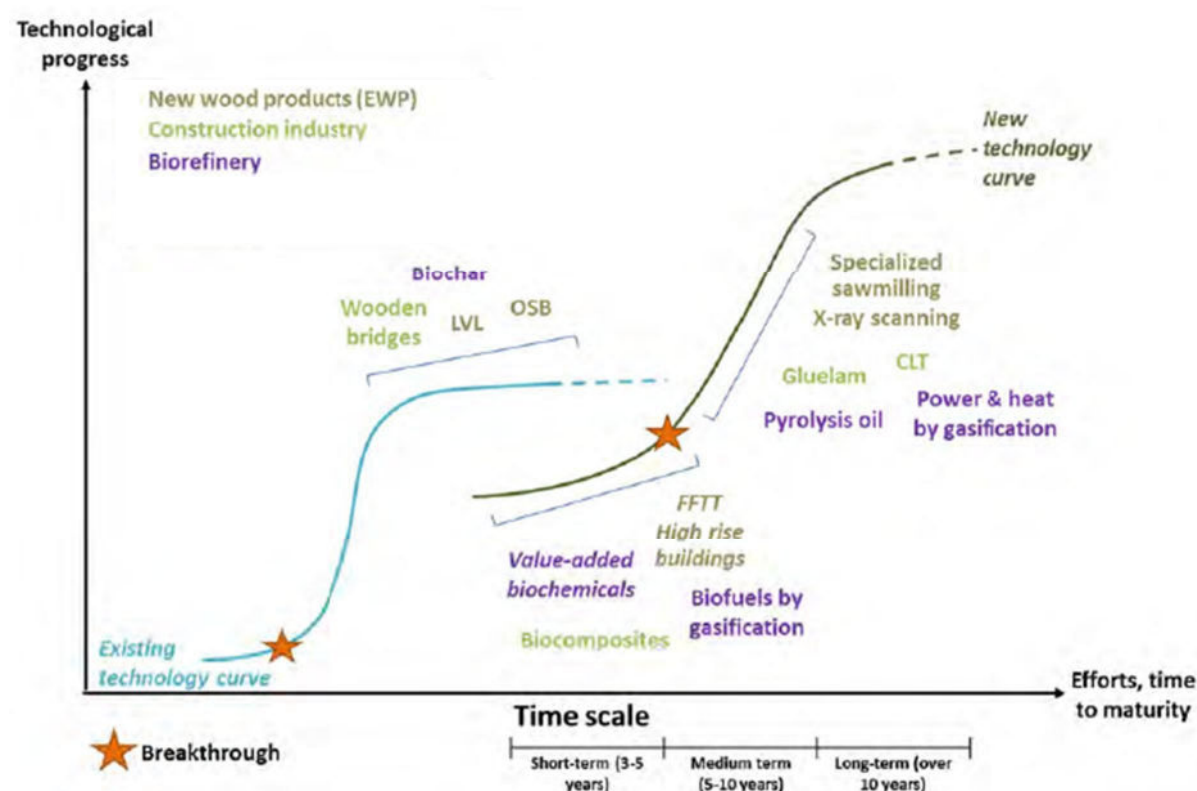
Table 14: Available technology to the forestry value chain

Opportunities	Examples
Sawmills	<ul style="list-style-type: none"> ▶ Process improvements ▶ X-ray and 3-D scanning technologies ▶ New planning systems for sawmills ▶ Information systems for sawmills ▶ CNC-based tools ▶ Robotics ▶ Engineered wood products ▶ Wood-plastic composites ▶ Nanocomposites
Biomaterials	<ul style="list-style-type: none"> ▶ Biomass-based precursors ▶ Biopolymers ▶ Nanofibres ▶ Converting technologies ▶ Packaging, building and vehicles/appliances
Biofuels	<ul style="list-style-type: none"> ▶ Bioethanol
Biochemicals	<ul style="list-style-type: none"> ▶ New chemicals from wood ▶ Platform chemicals
Construction Industry	<ul style="list-style-type: none"> ▶ Engineered wood products ▶ Construction materials ▶ Wood plastic composites
Textiles	<ul style="list-style-type: none"> ▶ New textile fibres ▶ Mixed textiles, e.g., with rayon

Source: T. Ahlqvist, J. Kettle, E. Hytönen, K. Niemelä, A. Kivimaa, N. Vanderhoek, M. Dufva, , and T. Mäkinen, E. Kurkela, V. Valovirta 2013, Table 1, Stage 2. Future options for the cellulosic fibre value chain in the Green Triangle, South Australia: strategic technology roadmaps, business cases and policy recommendations

While technology has displaced many wood products, technology can also broaden and strengthen the current forestry value chain by offering opportunities to change the production of wood products across each segment of the supply chain as well as linkages between them as illustrated in Figure 10.

Figure 10: Performance improvements in the pathways



Source: VTT, 2013

6.1 Commercial forestry sector and transformative technologies

Transformative technologies are already having a significant impact on the commercial forestry segment in terms of better growth rates, increased utilisation and improvements in process. Genome mapping and genetic improvements have helped to improve the growth rates of trees, and have also allowed the expansion of the forestry sector into other parts of Australia. Genetic improvement activities have been a part of plantation development since the late 1940s.¹¹

Bio-technology assists with increasing forest growth, facilitating pest management and also introducing more climate-adaptable species. This is through a range of bio-technology applications:

- ▶ Clonal propagation –allows the production of large numbers of genetically identical plants.
- ▶ Marker-aided selection and breeding –use of molecular genetics to match parents and progeny and find gene traits that are desirable –meaning that highest performing trees can be replicated on a large scale.
- ▶ Genetic engineering –inserting one or more genes into cells of superior genotypes and in vitro propagation of transformed plants. This allows for improvements such as in wood quality and resistance to pests.
- ▶ Geonomics –mapping of the genome sequence and use in studies to test stress against conditions such as drought and pollution can improve productivity and sustainability of trees.¹²

Precision forestry is increasingly used to improve the utilisation and therefore value and productivity of the forest resource. Technology such as GPS, automatic measuring devices, field

¹¹ Dieters, M.J. and Nikles, D.G. and Keys, M.G. (2007) Achievements in forest tree improvement in Australia and New Zealand 6: Genetic improvement and conservation of *Araucaria cunninghamii* in Queensland. *Australian Forestry*, 70 (2). pp. 75-85.

¹² Hetemaki L, and Mery, G (2009) Implications of Technological Development to Forestry, *Global Socio-Economic Changes*: 157: 181.

computers with wireless data transfer have been used for a number of years. More recently 3D methods including laser scanning and digital photogrammetric images are increasingly being used to improve connection between forest resource and future processing requirements.¹³

While technologies such as x-ray scanning have been shown to have short pay-back periods of 1-2 years this technology is not widely used in the commercial forestry / sawmilling industry.¹⁴ The benefit of precision forestry, including the use of scanners and 3D methods, is the monitoring and analysis of the inner structure of the timber to meet quality processes and improve utilisation. In order to generate these substantial benefits there needs to be sharing of information between commercial forestry and the further down the supply chain. Competitive tension can distort this process, and therefore efficiencies have been lost.

Genetic gains in commercial forestry have been made over a number of years, for example, radiata pine has been bred for three generations since the 1950s, with realised genetic gain up to 33% for volume from the first generation and more than 10% gain predicted from the second generation. For the third-generation breeding in has shifted to wood quality traits including integration of quantitative genetics, molecular genetics and wood science.¹⁵

There is current breeding and genetics, machine supply, data analysis and geoinformatics services within the commercial forestry sector, however, a lack of demand within the industry means that their potential is not fully realised.¹⁶

Table 15: Commercial forestry sector and transformative technologies

Impact on the commercial forestry sector of transformative technologies	Structural impediments to responding to the impact of transformative technologies
<ul style="list-style-type: none"> ▶ Better growth rates, increased utilisation and process improvements. ▶ Better pest management. ▶ Introduction of more climate adaptable species. ▶ Greater value add and productivity 	<ul style="list-style-type: none"> ▶ Lack of demand for potential value of transformative technologies. ▶ Insufficient sharing of information across the value chain. ▶ Competitive tension means that potential efficiencies are not realised.

6.2 Paper and packaging sector and transformative technologies

In the paper and packaging industry, transformative technologies are disrupting the sector. In 2010 19.9% of Australian's main source of news at breakfast was a newspaper, compared to 8.5% using the Internet. In 2014, newspaper use was 15.9% and internet use increased to 16.2%.¹⁷ However, as consumption of low income regions increases, it is projected that low-income regions will overtake high-income regions in consumption of paper.

¹³ Hetemaki L, and Mery, G (2009) Implications of Technological Development to Forestry, Global Socio-Economic Changes: 157: 181.

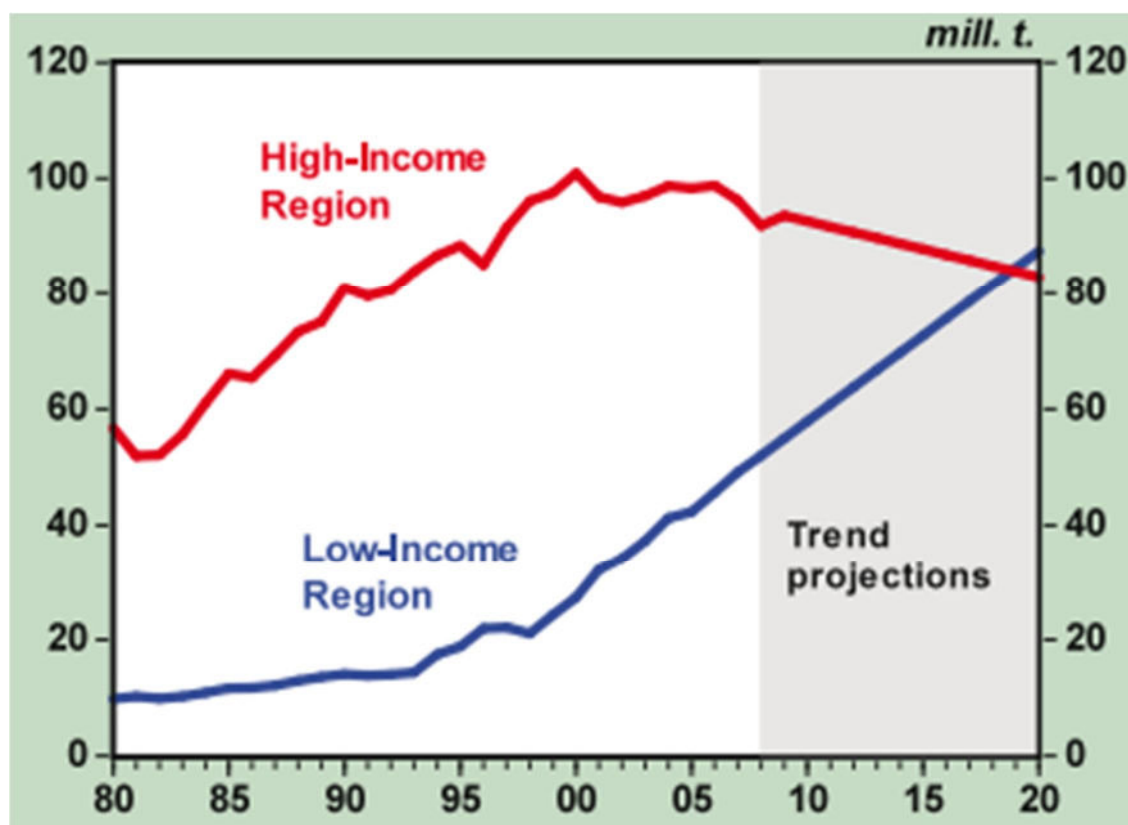
¹⁴ VTT (2013) Stage 2: Future options for the cellulosic fibre value chain in the Green Triangle, South Australia: strategic technology roadmaps, business cases and policy recommendations.

¹⁵ Wu, H., Eldridge, K., Matheson, C., Powell, M., McRae, T., Burcher, T., Johnson, I. (2007) *Achievements in Forest Tree Improvement in Australia and New Zealand, Successful Introduction and Breeding of Radiata Pine in Australia*, Australian Forestry, Vol. 70, Issue 4.

¹⁶ VTT (2013) Stage 2: Future options for the cellulosic fibre value chain in the Green Triangle, South Australia: strategic technology roadmaps, business cases and policy recommendations, page 69.

¹⁷ Roy Morgan Research (2015), Internet overtakes newspapers at breakfast, but radio still the most-used media in the morning, available at: <http://www.roymorgan.com/findings/6246-internet-overtakes-newspapers-at-breakfast-but-radio-still-top-australia-march-2015-201505250111>.

Figure 11: World graphics paper (newsprint, printing and writing paper) consumption, 1980-2008 and trend to 2020



Source: Hetemaki L, and Mery, G (2009) *Implications of Technological Development to Forestry, Global Socio-Economic Changes*: 157: 181

In order to remain competitive in a market where domestic consumption of paper and packaging is stabilised, investment in new technologies and export supply chains is required.

Companies have been able to secure log supply, and invest in technology to improve throughput and reduce waste, other participants in Australian pulp and paper segment face increasing competition and insecure supply. This makes decisions to invest in improvements in technology to keep up pace with imports difficult.

Investment in research and development in products will also help to reverse declines in the paper and packaging sector. For example, demand for Smart Packaging is expected to grow. Smart Packaging includes both active packaging and intelligent packaging. Active packaging can provide functional improvements such as moisture control, odour protection or heating/cooling. Intelligent packaging can convey information such as communicating when a product reaches its expiry date. Investments to improve hygiene products such as incorporating radio-frequency identification ("RFID") systems in to traditional cellulose-based diapers could improve quality of care and lower the stress of caregivers are also showing promise as cost for electronics continued to lower price.

Table 16: Paper and packaging sector and transformative technologies

Impact on the paper and packaging sector of transformative technologies	Structural impediments to responding to the impact of transformative technologies
<ul style="list-style-type: none"> Alternative forms of communication, moving away from paper based communication. While paper products are likely to be overtaken by digital formats (at least in the Western world) there is increasing demand for new intelligent packing products. 	<ul style="list-style-type: none"> investment in new technology to improve efficiency of plants is restricted by supply of forest resources in to the sector. Increasing competitive from imports Insecure wood supply. A change in the product mix is required.

6.3 Construction materials sector and transformative technologies

In construction materials, FastCo identified the use of wood products in our future skyscrapers as one of the five trends shaping the future of architecture. FastCo noted that C.F. Møller is currently working on one of the world's tallest timber skyscrapers. And that "...newfound availability of cross-laminated timber panels, engineered to be stronger and more fire-resistant than traditional wood, has allowed architects to build taller and taller with timber." It is expected that technological advances in wood/timber construction have made it possible to re-image building types and it is expected that other technologies will have a similar impact in the near future.¹⁸

Engineered wood products ("EWP") such as Cross Laminated Timber ("CLT"), laminated veneer lumber ("LVL") and glulam have gained acceptance in key European and North American markets. These products are spearheading increased interest in large-scale wooden buildings. EWP have advantages over conventional sawnwood. EWP can be produced to meet specific dimensions and strength requirements. These products can therefore be used more efficiently in structural applications.

Wood fibre and plastic composites deliver enhanced durability and strength versus sawnwood. Natural Resources Canada suggests that the wood-plastic composite market for decking and railings is growing significantly.¹⁹

In addition to the development of new products, new construction techniques are improving the efficiency of the construction sector. Modular construction, the process by which a building is constructed off-site under controlled plant conditions, can halve construction time. "Wood is well-suited to prefabrication and modular construction because it is lightweight and easily transported, strong, straightforward to engineer, energy efficient, durable and cost effective."²⁰

Australia's construction materials segment appears to be adjusting to transformative technologies in the sector. Wood is gaining recognition for its utility in development of commercially viable pre-fabricated building systems, and its lightness (in comparison to concrete). Engineered wood products are also being used to create eco-efficient buildings.²¹

The industry would be ready to respond to increasing demand for engineered wood products and composite materials where regulation allows.

Wood is well suited to additive manufacturing (e.g., wood panels and 3-D printing) as well as digital-based precision manufacturing through CNC machines.

Table 17: Construction materials sector and transformative technologies

Impact on the construction materials sector of transformative technologies	Structural impediments to responding to the impact of transformative technologies
<ul style="list-style-type: none"> ▶ Re-imagining large scale wooden buildings ▶ Substantial growth in new bio-products such as wood plastic composites ▶ New construction techniques improving efficiency 	<ul style="list-style-type: none"> ▶ Regulation may restrict the adoption of new transformative technologies.

¹⁸ FastCo (2005), 5 Trends Shaping The Future Of Architecture: Architects from 2015's most innovative companies look into their crystal balls and divine the ways the built environment will evolve, available at: <http://www.fastcodesign.com/3042937/sector-forecasting/5-trends-shaping-the-future-of-architecture#6>.

¹⁹ Natural Resources Canada (2015), Transformative Technologies, available at: <http://www.nrcan.gc.ca/forests/industry/products-applications/13343>.

²⁰ WoodWorks (2014), Putting the Pieces Together: On the right projects, prefabrication and modular construction can increase speed and lower cost", available at: http://www.woodworks.org/wp-content/uploads/prefab-modular_case_study.pdf.

²¹ VTT, 2013 Stage 2: Future options for the cellulosic fibre value chain in the Green Triangle, South Australia: strategic technology roadmaps, business cases and policy recommendations.

6.4 Energy and bio-chemicals sector and transformative technologies

Emerging bio-products are anticipated to grow substantially over the coming decades offering exciting new opportunities for growth. The global market potential for new bio-products and biomass-based energy is predicted to grow from \$500 billion USD to \$1.3 trillion USD by 2030.²² This growth dwarfs the anticipated growth of traditional forestry products over the same period, of \$500 billion USD to \$550 billion USD. It is estimated that 80% of global research investments in biotechnology is in health related applications. Yet, 75% of the future economic contribution of biotechnology and large environmental benefits are likely to come from agricultural and industrial applications.²³

Technologies convert these materials into fuels for boilers and kilns within timber processing. These fuels can also be used for other energy intensive industries. Examples include:

- ▶ Technologies such as fast pyrolysis convert biomass (including forest residues) into liquid fuel.
- ▶ Biomass such as pulpwood, forest biomass and chips can be used to create bio-char by torrefaction. Bio-char can be used to co-fire coal-based furnaces.
- ▶ Wood and forest biomass has potential as a feedstock for gasification plants that produce syngas that can then be used in transport fuels and chemicals.

Demand for bio-composites is expected to expand globally at a rapid pace. Bio-composites consist of bioplastics, natural fibres and/or fillers and additives. The most common type of wood based bio-composite is wood plastic composite ("WPC") that contains up to 80% wood in its components. WPC can be generated as a wood fibre pellet ("WFP") that can be used as a feedstock in to the plastics industry. For WPC low quality biomass, such as bark, is sufficient, and depending on technical requirements kraft pulp may also be used.

There are already companies (such as Circa – a business involved in the research, development and commercialisation of non-food cellulose based bio-chemicals) who are considering pilot plants in Australia to produce a wide range of new products.

Overseas there are bio refineries that are used to produce bio mass precursor chemicals, in the medium term the industry will grow as advanced processes to refine bio-oil in to biochemical emerges.²⁴

There is also emerging technology in bio-mass precursor chemicals that can be used as for fuels, pharmaceuticals, oils or water purification. Some mills are already making use of bio-fuels in energy production in their plants (see VISY case study). In order to be commercially viable bioenergy plants require availability of feedstock, efficient collection and logistics and to be able to compete against existing energy costs. In a study of a number of energy biorefinery routes to market it was found that a number of viable plants could exist in current markets.²⁵

²² Forest Products Association of Canada (2011).

²³ OECD The Bioeconomy to 2030 Designing a Policy Agenda.

²⁴ VTT, 2013 Stage 2: Future options for the cellulosic fibre value chain in the Green Triangle, South Australia: strategic technology roadmaps, business cases and policy recommendations.

²⁵ VTT, 2013 Stage 2: Future options for the cellulosic fibre value chain in the Green Triangle, South Australia: strategic technology roadmaps, business cases and policy recommendations.

Table 18: Energy and bio-chemicals sector and transformative technologies

Impact on the energy and bio-chemicals sector of transformative technologies	Structural impediments to responding to the impact of transformative technologies
<ul style="list-style-type: none"> ▶ Greater use of relatively low cost forest residues, small logs and residues from processors. ▶ The development of new materials including bio-composites. ▶ Greater demand for WPC products. ▶ Development of bio-mass precursor chemicals. 	<ul style="list-style-type: none"> ▶ Lack necessary capabilities and competencies in material science/engineering, knowledge of plastics as a material and an understanding of how woody biomass needs to be refined or modified for mixing with plastics.²⁶

²⁶ VTT, 2013 Stage 2: Future options for the cellulosic fibre value chain in the Green Triangle, South Australia: strategic technology roadmaps, business cases and policy recommendations.

Case Study VISY – Pulp and Paper Mill – Tumut

VISY Pulp and Paper (“VPP”) operates a 35 hectare mill site employing 300 people including 232 direct employees and 68 contractors. The initial operation commenced in May 2001 with a second stage start up in September 2009. The total investment made by VISY in VPP was in excess of \$1.1 billion. Today paper output capacity is 680,000 ADt/an unbleached kraft liner board.



How did VPP gain and maintain its competitive advantage?

There are a number of factors that have helped VPP to gain and maintain its competitive advantage. The company carefully researched the location for the mill and anticipated the key issues needed to develop a competitive facility including access to sustainable sources of fibre, water, energy (gas) and a suitable workforce. An investment of this scale required development of clear lines of communication and joint understanding with all levels of government. Issues addressed include environmental compliance requirements, infrastructure needs and impact mitigation, water supply, natural gas supply and long-term fibre supply agreements. Key factors influencing VISY’s success include:

- ▶ Local, State and Commonwealth government support for the project.
- ▶ Active engagement with the community since the project was conceived and an excellent track record since has given the community confidence in their operations.
- ▶ A long-term base volume of fibre supply negotiated via an Act of the NSW Parliament.

Success factors of the second stage investment relied on securing fibre supplies from more distant suppliers. The company now secures roughly one-third of its intake volume from outside the region. Fibre costs are a key factor driving the mill’s competitiveness.

VISY is actively engaging with local softwood sawmillers, with the Forestry Corporation NSW and other log suppliers to review how logs are prepared, transported and sold to users in the region. The purpose of this exercise is to ensure that all logs end up in the highest and best use.

Customers also have a large impact on VPP’s competitiveness. VPP exports approximately 75% of product. The paper trading division is impacted by the spot price for paper, exchange rates and transport costs. In order to manage these variables VISY has vertically integrated its business where 80,000 tonnes, or about 12% of annual output is exported to its newly acquired Robert Mann Packaging sister company in California.

Competitiveness is maintained through best practice operating procedures. The mill has been designed to use 80% less water than any similar operation around the world, and produces 28MW of renewable energy generation (35% of mill energy).

How will VPP continue its competitive advantage in to the future?

Future competitiveness will depend on the intrinsic log quality of the forest resources. And it was suggested that there are a number of things that could be done to influence this:

- ▶ Adoption of new technologies to undertake testing of log quality at stump (e.g., acoustic wave technology) to ensure the logs suitable for producing structural grade lumber are directed to this purpose while other logs are directed to pulp and paper use.
- ▶ Increasing production of pulpwood logs within the region by motivating plantation owners to increase plantation stocking rates to 1,500–1,600 stems per hectare versus current practices of 1,000 stems per hectare.
- ▶ Carefully negotiating log supply agreements with forest owners to ensure that total delivered log costs remain competitive.



7. Megatrend 5: A bumpier ride – globalisation, climate change and environmental change will reshape the risk profile for the forest industry

The International Monetary Fund (IMF) warned G20 leaders at the 2015 meeting in Turkey they should brace for a “bumpy” ride as the world economy dealt with the normalisation of US monetary policy, the slowing of China’s economy and end of the decade-long commodities super cycle. “In an environment of declining commodity prices, reduced capital flows to emerging markets and higher financial market volatility, downside risks to the outlook remain elevated,” IMF’s report to G20 leaders said. Given these wider challenges to the global economy, the forest industry cluster faces additional threats likely to reinforce the bumpier ride.

With interest rates sitting at historic lows and high levels of volatility in global equity markets there has been a surge of interest in real assets as alternatives to traditional forms of investments. Benefits include portfolio diversification, good risk-adjusted returns, and inflation hedging. There is now in excess of USD 100 billion invested in forestry assets across the US, Oceania, Europe and South America. However, the majority of the funds invested have focused on securing forests with existing cashflows rather than creating new plantations.

Globalisation has seen the resurgence of comprehensive trade agreements. Currently, Australia has nine bilateral agreements in force, a tenth with China awaiting domestic implementation processes and a further two bilateral and five multilateral agreements in negotiation.

Whilst trade agreements promote trade and open up opportunities for both exporters and investors, they are particularly beneficial in removing barriers in protected markets and addressing supply chain impediment and integration. Competition is intensifying with more imports entering our domestic market and more countries competing for lucrative export markets.

In the wake of increasing trade liberalisation markets are constantly changing and changing at a far greater pace than ever before. The industry must constantly identify:

- ▶ changes in traditional markets
- ▶ emergence of new markets
- ▶ increasing competition and threats both domestically and internationally
- ▶ opportunities for high value management skills and know how.

An ongoing analysis of the international markets in particular the positioning of Australia against competitors to take advantages of increasing demand and a vigilant focus on niche products and niche markets is vital to ensure a sustainable forestry industry in Australia.

Global companies and financial entities own key forest industry assets in Australia. New Zealand’s Rank Group owns the Carter Holt Harvey sawmills and panel mills. Nippon Paper owns Australian Paper. Australian forestry assets compete for investment funds with other candidate regions and industries.

7.1 Commercial forestry sector and a bumpier ride

Increasing globalisation presents both challenges and opportunities for the commercial forestry segment. While there is increased competition for investment, savvy investors will look to diversify their portfolios through investments in different climate zones. For example, investors in forestry in South America may seek investments in Australia in a different climate zone. This may also help to spread currency risk associated with globalisation.

Australia is seen as an attractive timberland investment market “with high-quality assets, low technical risk, stable governments, and exposure to the Asian growth markets.”²⁷ However, despite the strong interest in Australia’s existing forests there remains a hurdle to securing the investments needed to expand the plantation estate, especially for softwoods. The TIMO ownership model is also not suited to making investments in plantations that require decades to generate returns. Consequently, opportunities to expand existing estates by exploiting potential synergies and using marginal costings appear limited unless it occurs in conjunction with existing land owners.

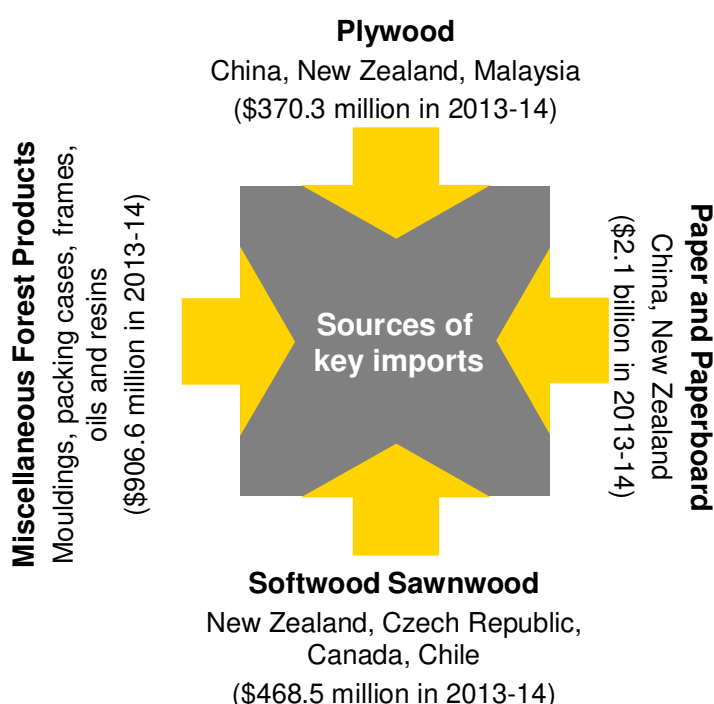
Table 19: Commercial forestry sector and a bumpier ride

Impact on the commercial forestry sector of a bumpier ride	Structural impediments to responding to the impact of a bumpier ride
<ul style="list-style-type: none"> ▶ Greater value attributed to forests and wood products as carbon sinks. ▶ Global companies are responding to climate change through diversifying forestry assets in to different climate zones. ▶ Shift to trees capable of growing in drier conditions. 	<ul style="list-style-type: none"> ▶ Lack of tree stock capable to respond to changing climate conditions.

7.2 Paper and packaging sector and a bumpier ride

Globalisation also affects the increasingly competitive paper and packaging sector as increasing competition for imported products tests the sustainability of the sector. In 2012-13, 83% of printing and writing paper was imported, the majority from New Zealand and China.

Figure 12: Sources of imported wood products



Source: ABS, EY analysis

Australia’s investment attractiveness in this sector has been significantly impacted by Gunns failed bid to develop a pulp mill. Korda Mentha, Gunns Receivers, have not been able to sell the proposed mill site and permits despite a prolonged domestic and international marketing campaign. Since the

²⁷ NewForests (2015) Timberland Investment Outlook 2015-2019, page 42.

project was conceived, designed and approved the scale of hardwood Kraft pulpmills has grown. The scale of new mills announced in Indonesia and Brazil now exceed 1.5 million air dried tonnes of market pulp annually. Tasmania doesn't have the available plantation wood supply to furnish a mill of that scale. More broadly, the Gunns project has left global industry players with the perception that Australia has lengthy approval processes, and that Australian construction costs are high relative to competing regions.

Table 20: Paper and packaging sector and a bumpy ride

Impact on the paper and packaging sector of a bumpy ride	Structural impediments to responding to the impact of a bumpy ride
<ul style="list-style-type: none"> ▶ Less long term certainty ▶ Greater volatility in resource availability 	<ul style="list-style-type: none"> ▶ Australia seen as an uncompetitive investment destination

7.3 Construction materials sector and a bumpy ride

Increasing exposure to globalised markets due to higher proportions of imported products brings the risk of greater volatility in pricing of these products. Post GFC, when global lumber markets were depressed and the Australian dollar/US dollar exchange rate was strong, imported lumber prices were relatively low. This prompted anti-dumping action by some domestic producers. The lower cost imports limited prices domestic producers could charge. This capped the upside in the normal market cycle and limited producers' ability to generate earnings.

Despite globalisation of softwood lumber markets, the domestic softwood processing sector will be limited in its ability to respond to increased regional demand for these products. Australia's net imports of softwood lumber will likely increase, with rising domestic demand and static domestic production. There may be opportunities for the sector to invest in new technologies and to expand into products such as CLT that deliver lower carbon building options likely to be attractive in a carbon constrained world. There have been examples of international expansion by major softwood producers. The major Canadian sawmilling firms, Canfor, West Fraser and Interfor have been acquiring existing sawmill assets in US South. Klausner, a major Central European producer has built the first of three very large scale sawmills also in US South. In contrast, larger international players in the softwood lumber business appear unwilling to invest in existing Australian assets. Rank Group has reportedly offered CHH, in whole or in parts, to potential buyers with no success. There may be opportunities to expand manufacturing of industrial panels (such as MDF and particleboard) by diverting some of the fibre currently exported as logs and/or chips.

Increasing competition for low cost suppliers of construction products, such as pre-fabricated kitchens and flooring will continue.

Table 21: Construction materials sector and a bumpy ride

Impact on the construction materials sector of a bumpy ride	Structural impediments to responding to the impact of a bumpy ride
<ul style="list-style-type: none"> ▶ Greater volatility in pricing ▶ Greater risk of dumping 	<ul style="list-style-type: none"> ▶ Uncompetitive investment destination

7.4 Energy and bio-chemicals sector and a bumpy ride

Climate change is certain to affect global forests. Rising temperatures, changing precipitation patterns, increased CO₂ concentrations will combine to change tree growth rates, species ranges, pest and disease damage levels, and destructive risk factors including bush fires. Warmer temperatures in Australia are forecast to increase the frequency of very high and extreme fire danger days. Days with very high and extreme fire risk are likely to increase by between 4-25% by

2020 and 15-70% by 2050 in mainland forest areas.²⁸ This represents an increased risk to the industry due to the long period required to replace burnt trees.

At the 2015 Paris Climate Conference (COP21) 195 countries agreed on a global action plan with the aim of keeping global warming below 2°C. Global initiatives to limit climate change by reducing greenhouse gas emissions are in place. These include initiatives to close down and clean up high emitting facilities as well as create new renewable sources of energy. The increase in biomass-based electricity generation requires significant new sources of (mainly) wood-based fuels. This has created new industry sectors that barely existed ten years ago. The Clean Energy Finance Commission argues that Australia has the potential to double its bioenergy output over the next five years.²⁹

Other initiatives are designed to increase the area of forests planted to sequester carbon. Forests play a significant role as carbon sinks. EU authorities suggest that existing forests absorb 10% of our carbon emissions.³⁰ CSIRO research shows that Australia could expand the area of carbon forests without significant impact on agricultural production. In fact, the report suggests that “stronger global action to reduce greenhouse gas emissions could shift the economic foundations of some rural communities, as forestry and ecosystem services become more profitable than production of food and fibre in some locations.”³¹ CSIRO research has showed that at a \$40 CO₂e price investment in carbon forestry becomes an attractive option and will not interfere with agricultural land for food and other fibre production.

Other schemes have been developed to reduce emissions by preventing deforestation. Finally, efforts to “decarbonise” the global economy have led to the promotion of building materials that contain less embodied carbon. Wood fibre-based products have been well placed to capture growth in this arena.

Climate change is predicted to reduce rainfall in key plantation areas. As a consequence, tree breeding efforts will also have to select for trees capable of growing under drier conditions as well as for productivity gains. Availability of trees with these traits will be key to maintaining the existing plantation estate.

The impact of climate change on the forest resource sector is likely to flow through to the paper and packaging sector in Australia as many operators in the sector continues to operate in an environment with low resource availability and long term certainty.

The forest industry will face a bumpier ride resulting from changes to forest growth rates and consequently to fibre supply. The unknown magnitude of the direct impacts of climate change on forests increases the risk profile the industry faces. These supply risks are exacerbated by the introduction of new competitors for fibre. Bioenergy uses, biofuels and other uses will reinforce the existing competition from export markets for Australian fibre. China in particular has been a major source of volatility in Asia Pacific fibre trade flows.

It is estimated that OECD countries source 2.4% of their electricity output from bioenergy, whereas Australia is estimated at 0.9%. The Clean Energy Finance Corporation identified potential of up to

²⁸ Hennessy, KJ, Lucas, C, Nicholls, N, Bathols, J, Suppiah, R & Ricketts, J 2005, ‘Climate change impacts on fire- weather in southeast Australia’, CSIRO Atmospheric Research, Consultancy report jointly funded by the Commonwealth of Australia and the governments of New South Wales, Victoria, Tasmania, and the Australian Capital Territory, p. 91.

²⁹ Australian Energy Finance Commission, 2015, *The Australian bioenergy and energy from waste market*, November 2015.

³⁰ Brannen, P. (2015), ‘Man's Best Friend Is Not the Dog - It's the Tree’, Huffington Post, available at: http://www.huffingtonpost.co.uk/paul-brannen/climate-change-environment_b_6602372.html.

³¹ CSIRO (2015), *Australian National Outlook 2015: Economic activity, resource use, environmental performance and living standards, 1970 –2050*, October 2015, page 18.

800MW of new generation from bioenergy, valued at up to \$5 billion. This would avoid more than 9 million tonnes of carbon emissions each year.³²

Increased research into alternative fuels to reduce carbon emissions is helping to develop a viable industry. Australia has most of the elements in place to benefit from the projected growth in biomass demand for the North Asian markets. Australian suppliers will be well placed to supply certified product. The key for these markets is efficient logistics. There are locations in Australia where existing port infrastructure and forestry value chains could be leveraged to supply cost competitive product into Asia. However, agreement is needed to allow access to potentially available native forest logs and residues currently surplus to existing uses.

While technology that uses heat from bioenergy to generate energy is cost competitive, technologies are not widely deployed in Australia.³³

Table 22: Energy and bio-chemicals sector and a bumpier ride

Impact on the energy and bio-chemicals sector of a bumpier ride	Structural impediments to responding to the impact of a bumpier ride
<ul style="list-style-type: none"> ▶ As more people seek alternative, cleaner, energy sources the demand for bio-fuels increases. 	<ul style="list-style-type: none"> ▶ Lack of access to suitable sources of input supply ▶ Technologies are not widely deployed

³² Australian Energy Finance Commission, 2015, *The Australian bioenergy and energy from waste market*, November 2015.

³³ Australian Energy Finance Commission, 2015, *The Australian bioenergy and energy from waste market*, November 2015.

Case Study: Planet Ark

In April 2015 Planet Ark released a report which analysed the health and wellbeing benefits of wooden interiors in homes, businesses, places of learning and places for healing. The report examined current literature and empirical

studies as well as conducting a survey of over 1,000 Australians regarding their current opinions and attitudes toward, and exposure to, wood.



Multiple physiological, psychological and environmental benefits

The Planet Ark report found that there are multiple physiological, psychological and environmental benefits from wooden interiors. These included the benefits of wood:

- ▶ On the body —Japanese, Canadian and New Zealand studies showed improvements to a person's emotional state and level of self-expression.
- ▶ On the body —Japanese and Austrian studies found reduced blood pressure, heart rate and stress levels.
- ▶ On the air —Studies showed improved air quality through humidity moderation.
- ▶ On environmental outcomes and climate change —through the process of photosynthesis trees remove carbon from the atmosphere and store it as biomass, mostly wood. Wood has a role in long-term storage of carbon, helping to mitigate the impact of climate change.

Australian's attitudes to wood

The study found that Australians are innately drawn to wood:

- ▶ 66%of survey participants preferred an image of a room furnished with items made from wood compared to the same items made from plastic.
- ▶ 96%of survey participants agreed that wood is 'visually appealing' and 'has a natural look and feel'.
- ▶ 80%of survey participants thought that wood is versatile, recyclable, renewable and long lasting.



8. Key Observations

Australia's forest industry sector faces both opportunities and challenges. Under the hungrier world and wealthier world megatrends, projected growth in domestic and regional populations, especially people with middle class incomes, will drive increased demand for all resources. Demand for wood fibre products will increase strongly. However, at the same time wood fibre production will be competing for land and resources.

Wood and products sourced from wood are well placed to benefit from the growing awareness of its environmental credentials. This will see increased use of wood products such as structural and decorative timbers, paper and wood panels. New products including biomaterials, bioenergy uses, and new structural buildings systems based on wood provide a platform for further demand growth in a carbon emissions-constrained world.

Australia's certified wood supplies and value chains will be well positioned to satisfy increasingly choosier customers. Australia has a reputation for environmental management of its certified plantations and native forests. These sources, and the resulting value chains via chain of custody certification give downstream processors, retailers and consumers the assurance of known-sourced fibre with independently verified good environmental practices. Australia's native forests have been certified by AFS and work is underway to finalise the FSC listing protocols.

Certification gives Australian products access to key domestic and international markets. It also helps to make Australian-sourced products more attractive to the choosier customers found in these markets. However, certification doesn't generate price premiums. Domestic and international producers are also keen to emphasise wood's other benefits to choosier customers. Wood's excellent environmental and carbon credentials relative to other building products is being better promoted and accepted in the marketplace.

Transformative technologies offer the prospect of improving forest management and wood fibre processing. Some companies are using technologies to create and share data on key wood attributes as a way to extract maximum value from the wood resources available to the value chain. Examples include new structural products that extend the reach of wood products into uses currently dominated by steel and concrete. New technologies will also create new uses for wood fibre and hence new markets. These new markets can then create new value for forest owners.

Globalisation and the bumpier ride megatrends expose Australian consumers and industries to increasingly volatile international markets. While Australia is a net exporter of wood fibre (by volume), it remains a net importer (in value terms) of manufactured wood fibre products. The challenge for the domestic forest industry sector will be to respond to the resulting increased demand and changing product mix. Australian consumers will face increased competition (and prices) for imported wood fibre products. Consumers and domestic producers will also be affected by increased competition for domestic fibre. Many of the precursor requirements for key industry participants to be able to respond are not in place. Some of these, such as increasing softwood log supply, will take decades to have an impact.

While there will be strong demand for wood fibre, the key question is how much of this will be processed domestically? Key points set out above include:

- ▶ Asia will experience a growing fibre deficit as the region's middle class population exceeds 3.2 billion people within 15 years.
- ▶ Asia has very limited opportunities to expand fibre supplies from domestic sources.
- ▶ Available, accessible land will be increasingly directed to food production.

Growth in Australia's population will itself create incremental demand for wood fibre-based products. However, imported wood products will continue to capture significant shares of this growing market.

- ▶ Expansion of existing domestic manufacturing capacity is often constrained by a lack of incremental fibre supplies, making it difficult for investments to achieve competitive scale and technology and limiting companies' ability to pay for fibre.
- ▶ Australia's domestic processors have been unable to capture opportunities to add value to export-oriented fibre supplies that are now shipped in relatively unprocessed forms (chips and logs).
- ▶ There are areas with incremental fibre supplies and forest owners are seeking to identify possible manufacturing partners to invest in new processing capacity. Owners in the Green Triangle Region have combined resources to create a competitive ongoing quantity of fibre. There is sufficient supply available to potentially service scale manufacturing plants for a variety of products including panels, sawn wood and bioenergy (pellets). However, other uncommitted fibre supplies, such as in Tasmania, are mainly hardwood pulpwood that does not fit well with the product/scale processing opportunities to service the domestic market.

Australia has not been able to create needed investment to expand plantations in key wood supply areas to maintain industry competitiveness.

The strong growth in domestic and regional fibre demand has not led to a commensurate growth in fibre sources within Australia. The area of public native forests designated for wood supply has continued to be reduced by respective state governments. The rate of plantation forest establishment has also declined over the last decade. The rate of new softwood plantation expansion has been low for several decades. The rate of new hardwood plantation expansion has turned negative with up to an estimated 40% of the ex-MIS hardwood plantation estate returned to other land uses over the next decade. Despite this conversion, New Forests estimated the Australian industrial plantation estate could again reach 2 million ha by 2030 if circumstances combine to make greenfield plantation projects more attractive.

Achieving this outcome would require planting of up to 400,000 ha of new plantations to replace the areas progressively lost from the ex-MIS estate. This equates to an annual planting of 26,000 ha for the next 15 years. However, there are currently no large scale planting programs in place, and no government (Commonwealth, State or Territory) frameworks to foster such programs.

The TIMO model as currently practised, with mainly closed-end 10-15 year investments, is unsuited to taking on the longer rotations required for softwood plantations. However, the TIMO model may already be adapting to the lack of new candidate timberland acquisitions, and these changes may extend investment horizons. This raises questions such as:

- ▶ How can Australia attract the capital or long term investments that at best yield between 4-7% over the life of the rotation?
- ▶ How can returns be improved to make the investment more attractive?
 - ▶ Reduce land value return expectations (via farm forestry?)
 - ▶ Increase plantation productivity, especially of more valuable stronger, parts of the log yield profile.
 - ▶ Improve utilisation, capture all the fibre produced and direct logs to highest and best uses to maximise the returns per unit area.
 - ▶ Concentrate new plantings in areas accessible to existing processing hubs, especially those constrained by fibre shortages.

- ▶ Diversify the sources of income from (especially plantation) forests to include carbon sequestration, wildlife habitat and other environmental services that hitherto have not been paid for.

Responding to the opportunities and challenges from the megatrends will require changes in operating models for key value chains.

Australia's forest industry value chains would benefit from strengthening lines of communication among stages of the chain and with customers. The decisions as to where to plant, what to plant and how to manage the resulting stands of trees all have a significant bearing one, two, or more decades later on the types, qualities, and quantities of logs yielded. These factors drive the options for products, scale of processing plant, and ultimately the economics of downstream processing. The most successful chains share an understanding of key value drivers, and of the opportunities to manage them. Flexibility to adapt, and a commitment to innovation are also key attributes.

- ▶ How can the forest sector, especially growers and processors, be positioned to develop a culture of cooperation to maximise value created by each participant in the value chains?
- ▶ How can growers and processors build on research to develop operational ways to measure key wood properties such as strength attributes in standing trees and translate this to a common understanding of relative log values and the log sorting protocols?
- ▶ How can manufacturers be motivated to invest in the technologies and scale manufacturing facilities needed to improve their capacity to pay for logs in addition to earning a return on their investments?
- ▶ What new products such as CLT and other disruptive technologies can be adopted to add further value to the available fibre supplies via the solid wood products sector?

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