

Socio-economic impacts of the forest industry

Green Triangle

November 2017



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Acknowledgments

This study was funded by Forest and Wood Products Australia. Many businesses in Victoria and South Australia contributed considerable time to this study, providing detailed information about their operations and about the industry in the region more generally. We thank all those who provided their time, effort and expertise to help inform the study. We also thank Dominic Peel, who contributed analysis of data from the Australian Bureau of Statistics *Census of Population and Housing* to this project.

Executive Summary

Introduction

The forest industry in Australia contributes to jobs and economic activity in many communities. During the last decade, there has been little information on how the industry is changing in different regions, in terms of the type and number of jobs generated, economic activity, or how residents of forest-industry dependent communities view the industry and its effects.

Forest and Wood Products Australia has invested in research to produce up-to-date information on the socio-economic impacts of the forest industry in Victoria, South Australia, Tasmania, Queensland, Western Australia and parts of New South Wales. This report presents findings for the forest industry in the Green Triangle, a region that includes the softwood and hardwood plantations in south-west Victoria and south-east South Australia. The forest industry in other parts of Victoria is examined in a separate report.

Methods

The data analysed for this report was drawn from (i) a survey of forest industry businesses conducted in 2016 to 2017, in which 62% of businesses completed the survey, with data on the remaining 38% obtained from industry experts, other businesses, and publicly available information; (ii) the 2006, 2011 and 2016 Australian Bureau of Statistics (ABS) *Census of Population and Housing*, (iii) economic modelling using EconSearch's RISE regional input-output model; and (iv) the 2016 Regional Wellbeing Survey, used to examine perceptions of the forest industry by residents living in communities in which the forest industry operates were measured.

The Green Triangle forest industry

The forest industry in the Green Triangle is based on production of wood and fibre from softwood plantations and hardwood plantations grown in south west Victoria and south east South Australia, as well as the processing of wood and fibre imported from other parts of Australia and other countries. Softwood plantation logs harvested in the Green Triangle region are processed at 11 sites located in the Green Triangle; some of these also processed small volumes of logs harvested outside the Green Triangle (in other parts of Victoria and South Australia). Hardwood plantations are predominantly harvested and processed into woodchips which are then exported. In addition to producing wood and fibre, plantations in the Green Triangle provide a base for other socio-economic activities including livestock grazing, bee keeping, and some recreational activities such as bushwalking. The economic value of these other activities has not been estimated as part of this report, which includes only the economic value of the fibre, wood and paper products produced from plantations and native forest.

Understanding the forest industry

The forest in the Green Triangle includes wood and fibre production from hardwood plantations and softwood plantations, as well as the processing of timber imported from other states and countries. It has a supply chain with three distinct parts. In the first two parts – primary production and primary processing - plantations are grown and harvested (primary production), and logs are processed into primary products such as sawntimber, woodchips, pulp and paper (primary processing). In primary

production and primary processing the jobs generated depend almost entirely on harvest of wood and fibre from the Green Triangle, with only small volumes of logs imported for processing from nearby locations in Victoria and South Australia. These 'primary' products are then either sold directly into a range of markets, including a range of end uses in industries such as construction, or sold for further processing into 'secondary' products by other processors. In the third part of the supply chain, the 'secondary processing' sector, primary wood and fibre products are further processed into a range of products (for example, cabinets, furniture, paper packaging products). While these jobs still rely on wood and fibre as a key input in processing, the wood or fibre used can be sourced either from wood and fibre grown in the Green Triangle, or from wood and fibre that has been grown and undergone primary processing in other parts of Australia or other countries.

Which parts of the forest industry are analysed in this report?

This report primarily examines the *primary production* and *primary processing* part of the forest industry. In addition, a limited amount of data on secondary processing is provided, drawing on employment data from the Australian Bureau of Statistics (ABS) *Census of Population and Housing.*

Economic value

In 2015-16, the direct value of output generated by the Green Triangle forest industry at the point of sale of primary processed products was \$1,170 million, increasing to \$1,909 million when flow-on effects generated in other industries as a result of spending by the forest industry are included. This \$1,909 million included \$532 million generated in the Victorian part of the Green Triangle, \$1,273 million in the South Australian part of the region, and \$104 million generated by 'cross-border' activity crossing both parts of the region. If examined based on economic contribution to the states of South Australia and Victoria – a much larger region that captures more of the total economic activity generated by the industry than the Green Triangle region - the total value of output of the industry in 2015-16 increases substantially, contributing \$3,238 million across the two states.

However, value of output is not always a good indicator of the industry's overall contribution to the local economy, as it does not identify the extent to which the economy of a given region benefited from the industry's activity in the form of returns to business owners, wages and salaries, and taxes. Measuring the industry's contribution to Gross Regional Product (GRP – the regional equivalent of Gross Domestic Product) helps address this. Measures of GRP quantify the value added by the industry to the local economy as a whole, meaning value contributed after subtracting non-wage expenditure from revenue. In 2015-16, the forest industry directly contributed \$382.9 million to GRP in the Green Triangle, and a total of \$729 million once flow-on effects through the entire economy were included. This total included \$318 million dependent on softwood plantation, \$206 million dependent on hardwood plantations, and \$205 million dependent on plantations and forests grown in other regions. The \$729 million included \$181 million in the Victorian part of the region, \$505 million in the South Australian part of the region, and a further \$43 million from activity only captured when the parts are modelled together. If examined based on economic contribution to the states of South Australia and Victoria – the industry's total contribution to GRP in these two states is substantially larger than it's contribution to the Green Triangle economy, rising to \$1,396 million, including \$534 million in Victoria and \$862 million in South Australia.

Employment

The forest industry in the Green Triangle generated a total of 2,344 direct jobs up to the point of sale of primary processed products in the first half of 2017. The estimated flow-on employment generated by this activity was an additional 2,903 jobs, meaning the industry contributed a total of 5,247 jobs to the Green Triangle up to and including primary processing once flow-on jobs are included. In addition, a further estimated 250 direct jobs were generated in secondary processing.

Of the 2,344 direct jobs generated up to the point of sale of primary processed products:

- The majority (53%) were generated in the processing of wood and paper products
- Almost one-third (31%) were generated by harvest and haulage
- Just over two-thirds (69%) were generated in the softwood plantation sector, including 1260 jobs generated as a result of softwood plantations grown in the region and a further 363 jobs that relied on softwood plantations grown in other regions
- 29% of direct jobs were generated by hardwood plantations, the majority of which depended on hardwood plantations grown within the Green Triangle (670 jobs compared to 15 dependent on hardwood plantations grown in other regions)
- 23% of the direct jobs up to primary processing generated by the Green Triangle forest industry were based in the Victorian part of the region, and 77% in the South Australian part.

When examining direct jobs generated by location, including primary and secondary processing, the forest industry directly generates 4% of all jobs in the Green Triangle, including 8% of employment in the South Australian part of the Green Triangle, and 1% of those in the Victorian part. The largest numbers of forest industry workers directly employed in the industry lived in the local government areas (LGAs) of Mount Gambier (1,035 jobs up to primary processing, 1,171 jobs when secondary processing is included), Wattle Range (495 jobs up to primary processing, 497 including secondary processing), Glenelg (324 jobs and 328 including secondary processing) and Grant (276 jobs, growing to 305 when secondary processing is included), while 172 jobs were located in the Southern Grampians (189 including secondary processing). When examined as a proportion of the workforce, these direct jobs (up to and including secondary processing, but not including flow-on jobs generated in other industries) made up 10% of the workforce in Mount Gambier and Wattle Range, 8% in Grant, 4% in Glenelg, 3% in South Grampians, and 1% or less of the workforce in other LGAs in the Green Triangle.

The survey data collected for this report differed in some respects to forest industry employment estimates from the Australian Bureau of Statistics 2016 *Census of Population and Housing* (ABS 2016 Census). The 2016 Census recorded substantially fewer forest industry workers in the Victorian parts of the Green Triangle than our survey. This is almost entirely because the Census data record a large number of harvest and haulage workers as being employed in the transport industry, rather than recording them as a part of the forest industry. On the South Australian side of the Green Triangle, our survey data recorded very similar numbers of workers to the 2016 Census.

The number of workers employed in the forest, wood and paper industries recorded in the Australian Bureau of Statistics *Census of Population and Housing* fell by 16% between 2006 and 2011, and by a further 5% between 2011 and 2016. The overall decline of 5% in jobs since 2011 is a consequence of two different types of change: between 2011 and 2016, employment grew

substantially in primary production, with growth of 73% in the number of jobs in the growing, harvest and haulage of plantations; at the same time, employment in wood and paper product manufacturing declined by 25% between 2011 and 2016.

Working conditions

Successfully recruiting and maintaining a strong workforce can be challenging for a regionally-based industry, with many rural and regional areas having a relatively small labour force compared to larger urban areas. The Green Triangle forest industry generates more full-time jobs than other industries, with 88% of those employed in the industry working full-time, compared to 67% of the broader workforce in the region. People employed in some parts of the industry work longer hours than is typical in most industries, particularly those employed in harvest and haulage contracting firms. Forest industry workers in the Green Triangle generally earn higher incomes than the average for the region: in 2011, only 17% of full-time forest industry workers earned less than \$600 per week, compared to 33% of full-time workers in the Green Triangle, and 37% earned \$1,250 or more per week, compared to only 27% of full-time workers in the broader workforce of the region.

Workforce diversity and sustainability

To be sustainable over time, every industry needs to successfully recruit and retain workers. In the Green Triangle, only 13% of forest industry workers were female in 2017 (compared to 46% of the broader employed labour force). The industry's workforce as of 2011 was slightly more likely to be middle aged than the workforce as a whole in the region, and was ageing at a slightly slower rate to the rest of the Green Triangle's workforce.

When asked how easy or difficult they found it to recruit different types of workers, 70% of forest industry businesses operating in the Green Triangle and Victoria reported finding it difficult to recruit managers and high level professional staff, followed by transport workers (69% finding it difficult to recruit staff), heavy machine operators (67%) and field staff (63%). Only 30% per cent found it challenging to source finance/book keeping staff, and most businesses (57%) found it easy to source administration staff. Two-thirds of plantation managers (67%) found it difficult recruiting harvest contractors. Factors that made recruitment challenging included a lack of available workers with appropriate skills (88% of businesses), lack of suitable workers based locally (65%), the time required to build the right skills (59%), workers not wishing to shift to local areas (50%) and negative perceptions of the industry (46%).

Industry skills and training needs

Forest industry businesses operating in the Green Triangle and Victoria were asked what types of skills were needed by their workforce, whether they required workers to have formal accreditation in these skills, and how they currently provided training. Businesses most commonly reported needing workers with skills in occupational health and safety training (100% of businesses), operation of heavy machinery (89%) and chainsaws (85%), compliance training (89%), business and financial management (80%) and fire-fighting (70%). There was variation in needs for skills and accreditation between businesses types, with some skills specialised to particular parts of the industry.

Businesses were also asked to identify whether they delivered skills training in different competency areas via in-house training by other staff, in-house training by an expert, or training via a registered training organisation (RTO). RTOs were most commonly used to provide training in forest ecology and silviculture, hand-held machinery operation, road transport and driver training and heavy machinery operation; in some cases this was supplemented by in-house training. RTOs were also the most common methods for training in occupational health and safety training, business and financial management, and fire-fighting, although less than 70% of businesses used RTOs and many businesses opted for in-house training by other staff. Compliance training was delivered through an RTO for just over half of all businesses, and in-house training by other staff or experts for most remaining businesses was almost half, suggesting opportunities for additional provision of training in this area through more formal mechanisms. In-house training was more common than use of a RTO for marketing/sales, IT/software training, and community relations/engagement.

As of 2016, forest industry workers in most parts of the industry were less likely to have completed high school than those working in other industries, were more likely to have a certificate qualification, and less likely to have a Bachelor degree or other university qualification than the average for the employed labour force.

Business and market outlook

Forest industry businesses were asked about the business and market conditions and challenges they were experiencing, and the extent to which they could cope with difficult business conditions. Fifty one per cent of businesses operating in the Green Triangle and Victoria described business condition in early 2017 as 'more challenging than usual', 33% as 'the same as usual' and 16% as 'easier than usual'. These questions help identify both areas of strength and areas of challenge being experienced by the industry. Businesses were also asked whether they felt that, over the next 12 months, demand for their services or products were likely to grow, remain about the same, or shrink. About half (51%) felt demand would remain the same, about one third (31%) felt that that demand would grow and few (18%) that demand would reduce.

Businesses were asked to rate the extent to which different factors had been a challenge or problems for their business in the last three years. The most common challenges in the last three years were government regulation (61% of businesses reporting this as a big challenge), increasing cost of labour (52%), difficulty obtaining labour (44%), rising input costs (41%) and lack of investment in the industry (39%). Softwood plantation dependent businesses were more likely than others to report that difficulty maintaining competitiveness with other similar businesses (29%), decreasing prices (41%), and lack of demand (24%) were problems. Hardwood plantation dependent businesses were more likely to report difficulty obtaining labour (75%) and lack of investment in the industry (50%) as key issues.

Community perceptions of the social, economic, service and infrastructure effects of the forest industry

To further evaluate the socio-economic effects of the forest industry in the communities in which it operates, residents living the Green Triangle were asked about (i) their overall views about quality of life and liveability of their community, and (ii) the extent to which they felt the different industries that operated in their region affected different social and economic aspects of their lives. Overall,

residents living in forest industry dependent communities in the Green Triangle reported a similar quality of life to those living in communities with less dependence on the industry.

Of those living in Green Triangle communities with higher dependence on the forest industry, most reported that the forest industry was important to their local community, including 91% of those living in the South Australian LGAs of Grant, Mount Gambier and Wattle Range, and 67% of those living in the Victorian LGAs of Glenelg and Southern Grampians.

When asked to assess the effects they felt the forest industry had on their community, the large majority of residents – 87% in the South Australian Green Triangle, 75% in the Victorian Green Triangle - felt the forest industry had positive impacts on local employment. However, when asked about contributions than employment, residents generally perceived the forest industry as having fewer positive effects than the farming and tourism industries, and more negative effects. When views about negative impacts were examined, the most common concerns reported about the forest industry were related to road impacts, bushfire risk and landscape aesthetics.

Conclusions

This report quantifies the employment and economic activity generated by the forest industry, and identifies the communities in which the industry generates a significant proportion of local jobs. The analysis shows that the industry is an important contributor to the economy in several LGAs in the Green Triangle, particularly in Mount Gambier, Wattle Range, and Grant. The majority of jobs generated by the industry are generated by the processing sector, as is the majority of the flow-on economic impact of the industry; however, these jobs have declined significantly over time, and this decline has only been partially offset by growth in harvest and haulage jobs as the first rotation of hardwood plantations has been harvested in the region. This highlights the importance of local processing of wood and fibre for generation of jobs from the industry; far fewer jobs are created if logs are harvested and exported with no or little processing. While relatively few businesses feel demand will decline for their products, half report business conditions as being more challenging than usual, and many find it difficult to recruit some types of workers. Increasing labour and input costs and lack of investment in the industry are concerns for many businesses. The industry is viewed by communities as contributing strongly to employment, but less to other aspects of quality of life. The results highlight both the importance of the industry to the region, and a likely continuing trend of loss of jobs in wood and paper manufacturing unless there is significant investment in additional plantation estate or processing capacity in the region.

Introduction

The forest industry in Australia contributes to jobs and economic activity in many communities. This contribution results from the growing, management and harvesting of plantations and native forests (primary production), and primary and secondary processing of logs into wood and fibre products such as sawn timber for use in construction, appearance products such as flooring and decking, woodchips for export, pulp and paper.

Like many other industries, Australia's forest, wood and paper industries are changing rapidly, with ongoing investment in new technology, skills and changing markets all contributing to evolving skills, training and technology needs. During the last decade, there has been little information on how the industry is changing in different regions, including change in the number of jobs generated, dependence of different communities on the economic activity generated by the industry, the type and quality of work generated in the industry, and how residents of forest-industry dependent communities view the industry and its effects.

Forest and Wood Products Australia has invested in research to produce up-to-date information on the socio-economic impacts of the forest industry in Victoria, South Australia, Tasmania, Queensland, Western Australia and parts of New South Wales. This report presents findings for the forest industry in the Green Triangle, a region that includes the softwood and hardwood plantations in south-west Victoria and south-east South Australia. The forest industry in other parts of Victoria is examined in a separate report. This report examines the following aspects of the Green Triangle's forest industry:

- Employment generated by the industry, including direct and flow-on jobs
- Economic value of the industry, including direct and flow-on economic activity
- Working conditions, workforce diversity, and workforce sustainability
- Skills and training needs for the forest industry
- Business and market outlook reported by businesses operating in the industry
- Community perceptions of the industry.

Methods

The data analysed for this report was drawn from the following sources:

- 2016-17 Industry Survey: A survey of forest industry businesses operating in both Victoria (examined in this report) and the Green Triangle (south west Victoria and south east South Australia, reported in a separate report), conducted between February 2017 and May 2017. As many businesses operate in both these regions, survey participation rates are reported for both regions together. Of 156 key businesses (including nurseries, plantation management businesses, silvicultural contractors, harvest and haulage contractors, and wood and paper processors), 62% completed the survey, while 38% (60 businesses) did not take part. A further 60 small contracting businesses were not asked to take part, with information instead obtained via data provided by forest managers who used their services. Of the 62% of the 156 surveyed businesses who completed the survey, 32 businesses completed every question, including most large businesses operating in the industry, and 64 completed a shorter version over the phone. Most non-participants managed smaller businesses, particularly contracting businesses. Information on businesses was identified based on (i) information provided by forest and plantation managers on their use of contracting services, (ii) information from past surveys, (iii) advice from industry experts familiar with the businesses, and (iv) publicly available data on non-responding businesses.
- 2006, 2011 and 2016 Census: Data from the 2006, 2011 and 2016 Australian Bureau of Statistics (ABS) *Census of Population and Housing* are drawn on to examine working conditions of the industry's workforce.
- Economic modelling: Economic modelling using EconSearch's RISE regional input-output model has been used to identify flow-on jobs and economic activity generated by the forest industry.
- 2016 Regional Wellbeing Survey: Perceptions of the forest industry by residents living in communities in which the forest industry operates were measured as part of the Regional Wellbeing Survey, a large survey of 13,000 Australians living in regional and rural areas.

A detailed description of these methods is provided in Schirmer et al. (2017), as well as discussion of key methodological considerations when examining social and economic effects of the industry.

Overview of the industry - Green Triangle

The Green Triangle's forest industry primarily includes wood and fibre production from softwood plantations and hardwood plantations grown within south west Victoria and south east South Australia, as well as processing of wood and fibre imported from other parts of Victoria and South Australia, other states and other countries. While a very small amount of native forest management occurs in the region of south west Victoria, this has been included in a separate report produced as part of this study, examining socio-economic impacts of the forest industry in Victoria (excluding the Green Triangle). The small number of workers who live in the Green Triangle and whose jobs depend on native forests in other regions are included in job estimates in this report. This section briefly describes the industry. First, the structure of the industry is examined, focusing on understanding the industry supply chain from the growing of plantations in the Green Triangle to processing of a range of products using both wood and fibre grown in the Green Triangle, and wood and fibre sourced imported from other regions. The second part then examines the softwood plantation and hardwood plantation sectors of the Green Triangle forest industry in more detail, focusing on the location of the plantations these two key industry sectors depend on, and the type of processors that utilise wood and fibre from each.

Industry structure

The forest industry in the Green Triangle, like most of Australia, has a supply chain with three distinct parts: primary production, primary processing and secondary processing. Primary production involves the establishing, growing and harvesting of logs ready for primary processing. Primary processing involves processing of roundwood (logs) into initial products such as sawn timber, woodchips and basic pulp and paper products, and usually uses logs grown within a relatively short distance of the processing plant (less than 200 kilometres in most cases). Secondary processing involves further processing of these initial products into a wide range of further processed products, and is less reliant on locally-grown timber, with secondary processors often importing their wood and paper inputs from other states or other countries as well as purchasing them from local primary processors. Each stage is described in more detail below.

1. Jobs generated in primary production of wood and fibre products. In this part of the industry, trees are grown and harvested to produce roundwood (logs), in softwood and hardwood plantations. The activities involved in primary production include management of plantations by forest management businesses and agencies, silvicultural contractors, and harvesting and haulage of logs to primary processors by harvest and haulage contractors.

2. Jobs generated up to and including primary processing of wood and fibre products. Primary processing means processing of logs into initial products. This part of the industry is based mostly on wood and fibre grown in the Green Triangle, with small volumes of logs and fibre products imported for processing from other regions. This means that the primary production of logs and primary processing combine to create a strongly inter-linked supply chain. This supply chain generates employment and economic activity based on the management and harvesting of mostly Green Triangle-grown logs for wood and fibre production from softwood plantations and hardwood plantations. Harvested logs from plantations are processed from logs into a range of primary products including sawn timber, composite wood products such as particleboard, and woodchips. The products from primary processing are then either sold directly into a range of markets, including

a range of end uses in industries such as construction, or sold for further processing into 'secondary' products by other processors.

3. Jobs generated in 'secondary' processing. These 'secondary' jobs involve further processing of primary processed wood and fibre (for example, rough sawn timber or paper) into a range of further products (for example, cabinets, furniture, paper packaging products). While these jobs still rely on wood and fibre as a key input in processing, the wood or fibre used is often combined with other products (for example, fabric covers on furniture, plastic components), and it can be sourced either from Green Triangle-grown wood and fibre or from wood and fibre that has been grown and undergone primary processing in other parts of Australia or other countries prior to being imported into the Green Triangle for secondary processing. In addition to primary processed products such as sawntimber and woodchips entering secondary processing, the residues produced in primary processing (for example, bark, sawdust and docking ends of logs) are also typically sold to businesses such as firewood sellers, agricultural businesses for use as animal bedding, and garden and landscape businesses. Figure 1 provides a stylised representation of this structure.

This report focuses primarily on understanding the employment and activity generated by the industry up to the 'primary processing' stage. The primary processing stage was defined for this report as including all processors who take roundwood (logs) harvested from plantations or native forests, and includes all products from those processors. In some cases, a single processor may process roundwood into multiple products on a single site, including engaging in some activities often considered part of the secondary processing sector. In these cases, all that processor's activities were included in the analysis.

In addition to examining the industry up to primary processing, basic data on secondary processing is provided in this report, using data from the Australian Bureau of Statistics (ABS) *Census of Population and Housing* to estimate the jobs generated in secondary processing of fibre and wood products in the Green Triangle. However, these data do not enable identification of what proportion of these jobs rely on wood or fibre from plantations grown in the Green Triangle versus in other states or other countries.



Figure 1 Stylised structure of the forest and wood products industry

Industry sectors

The softwood plantation and hardwood plantation industries in the Green Triangle are distinct sectors, each of which produces different types of products and services different markets. The softwood plantation and hardwood plantation industries are each described briefly below, followed by an overview of economic activities other than wood and fibre production that also occur in plantations grown in the Green Triangle.

Softwood plantation sector

Softwood plantations in the Green Triangle are clustered in the southern and central parts of the region, with the greater area located in South Australia, and in the western parts of the Victorian side of the region (Figure 2). Softwood plantations have a long history in the region, with the first softwood plantations in Australia being established by the South Australian government in the 1800s, although significant areas were not established until the first decades of the 1900s. Softwood plantations were predominantly established through government plantings, with ongoing expansion

on publicly owned land through to the 1950s. In the 1960s, recommendations from the Australian Forestry Council that an increased rate of expansion of softwood plantations was needed to meet future demand led to financial assistance being provided by the Australian government to various State governments, including the South Australian government. Large new areas of softwood plantations were established in the 1960s and 1970s, following which new establishment slowed (ABS 1973, Dargavel 1995). Areas of privately owned plantation were also established, although until 2012, around two-thirds of the total area of South Australia's softwood plantations was government-owned. In 2012, harvesting rights to state-owned plantations were sold by the South Australian government. Similar patterns occurred on the Victorian side of the Green Triangle, with most plantings established by the Victorian government, some establishment of privately owned plantations, and subsequent privatisation of the plantation resource: in the case of Victoria, privatisation occurred much earlier, with the sale of the State-owned Victorian Plantation Corporation (VPC) to Hancock Victorian Plantations (HVP) in 1998 (Schirmer and Kanowski 2005).



Figure 2 Distribution of softwood and hardwood plantations in Green Triangle

Softwood plantation logs harvested in the Green Triangle region are processed at 11 sites located in the Green Triangle; some of these also take small volumes of logs harvested in the Central Victoria region shown in Figure 2, and logs from small areas of plantation in other parts of South Australia.

Hardwood plantation sector

In 2017, the National Plantation Inventory estimated that there was a total of 157,300 hectares of hardwood plantations established in the Green Triangle. This area includes most of the 51,400 hectares of plantation established in South Australia, with the exception of some areas established on Kangaroo Island and small areas established west of the Green Triangle. The larger area of hardwood plantations is located in the Victorian side of the Green Triangle, with around 115,500 hectares located in the Victorian part of the region (Downham and Gavran 2017). Figure 2 shows the distribution of hardwood plantations in the region.

Hardwood plantations in the Green Triangle were predominantly established from the late 1990s to the mid-2000s by Managed Investment Scheme (MIS) companies. Following collapse of most of these MIS companies, institutional investors acquired many hardwood plantation areas, and the first rotation of hardwood plantations was being progressively harvested at the time this study was conducted. Not all these plantations are being re-established after harvest. The majority of plantation is re-grown for a further rotation, while other areas are re-established to agriculture postharvest. Where the plantation was established via leasing land from a farmer, some leases are relinquished to the landholder after harvest, with the landholder then making the decision on whether or not to re-grow the plantation, either from coppice growth from stumps or replanting new seedlings, or to revert the land use back to agriculture. Almost all hardwood plantation timber is either woodchipped as part of the harvest process (in-field chipping) and sent to export facilities, or sent to a woodchip mill for woodchipping and export.

Other activities

In addition to producing fibre to supply the wood and paper processing industry in the Green Triangle, plantations in the Green Triangle provide a base for other socio-economic activities. Plantation managers reported a range of activities occurring on the land they managed:

- Livestock grazing: This occurred on several thousand hectares of plantation land
- **Bee keeping:** Bee keeping occurred on many areas of plantation land, including in hardwood plantations and in areas of native vegetation on plantation land (for example, native vegetation occurring in riparian areas within a plantation)
- **Bushwalking, horse riding and camping areas:** These activities were available on some areas of plantation land
- Hunting: Recreational hunting occurred in some plantation areas.

The economic value of these other activities has not been estimated as part of this report, which focuses on the economic value of the fibre, wood and paper products produced by the forest industry in the Green Triangle.

Economic value

This section examines the economic value generated by the forest industry in the Green Triangle. . As economic value can be estimated using multiple approaches, we first describe the measures used in this report. This is followed by analysis of:

- the *direct* value of the industry the value of the activity generated by the forest industry, without including flow-on effects of this activity through the broader economy, and
- the *total economic value* of the industry, which includes both economic activity generated directly by forest industry businesses, and the flow-on effects of this activity through the broader economy.

Measuring economic impact

A number of economic indicators can be used to examine the value of an industry and estimate its impact on a specific regional economy. These range from simple measures of expenditure, to modelled estimates of the net contribution of an industry to the total value of economic activity in a given region (Gross Regional Production, or GRP). This section explains the measures used in this report, and why each is used.

Categories of economic impact

When using any measure of economic impact – whether it is value of output, expenditure by an industry, contribution of an industry to GRP, or generation of employment – it is possible to model this with a focus solely on the industry's direct activities, or with a broader focus on how these activities flow-on through the economy. In this report, we model economic impact based on (i) direct impacts of the industry, and (ii) total impacts which are the sum of direct impacts plus flow-on (indirect) impacts of the industry across the whole economy:

- *Direct impact* is generated directly by firms, businesses and organisations engaged in a particular industry, in this case the forest industry.
- *Flow-on or indirect* impacts are the economic activity generated in other industries as a result of the activity of the forest industry. Total flow-on or indirect impact is the sum of *production-induced* and *consumption-induced* impacts.
 - Production-induced impact is generated by businesses outside the forest industry that supply forest industry businesses. It also includes impacts generated by the suppliers of those suppliers and so on as successive waves of impact occur in the economy.
 - Consumption-induced impact is generated when workers involved in the forest industry, and in businesses that supply the forest industry, spend their wages on goods and services. The impact generated as a result of spending of wages on these goods and services is consumption-induced.
- *Total impact* is the sum of *direct* and *flow-on* (*or indirect*) impacts.

When calculating direct and total economic value in this report, the forest industry is treated as a vertically integrated industry (one part of the industry supplies goods and services to the next in a chain of supply), in which there are transfers between different parts of the industry at each point in

the supply chain. When calculating economic value of a vertically integrated industry, transfers between forest industry businesses are cancelled out so economic value can be quantified in terms of the interaction between the forest industry and the rest of the economy. Unless otherwise specified, all economic value estimates have excluded transfers occurring within the forest industry.

Direct and flow-on (indirect) impacts of the industry are estimated using four key measures of economic impact: value of output, value of industry expenditure, contribution to GRP, and employment.

Value of output

The total *value of output* of an industry is a relatively simple measure: it is the total revenue earned by forest industry businesses from sales of goods and services. This provides useful information about the total economic size of an industry and its output. When reporting value of output, it is important to estimate value at a specific 'end point of sale' – i.e. a particular point in the supply chain. In this report, the 'end point of sale' is the value of the sale of goods from primary processing. Note that this value excludes sales of products and services between industry businesses at earlier points in the forest industry supply chain to avoid double counting.

While this indicator provides a useful estimate of total value of an industry at a particular stage of production - in this case, at the point of sale of primary processed wood and paper products - it does not provide substantial information about how that industry has contributed to the local economy, for two key reasons. First, it doesn't consider the cost of producing the output. For example, an industry with a turnover (output) of two billion dollars and expenditure on goods and services of two billion dollars creates less value-add than one that has a turnover of two billion dollars and expenditure on goods and services of one billion dollars. Secondly, it matters where expenditures occur when considering flow-on impact. For example, an industry might generate two billion dollars of sales in a given region, but rely largely on imported goods and services to produce its output, generating very little local spending or employment as a result. Another industry, meanwhile, might also generate two billion dollars of sales, but do this through a locally-based supply chain, generating substantial jobs and expenditure in the local area as a result. To better understand this, economic modelling can be used to estimate how much additional value of output is generated in other industries in a given region as a result of the expenditure of the forest industry in that region. This can be done by modelling production-induced and consumption-induced effects, as defined earlier.

Given the importance of expenditure to understand how an industry contributes to an economy, it follows that the amount and location of expenditure should be considered when determining the economic value of an industry to a region.

Industry expenditure

Industry activity can also be measured by examining *value of expenditure*. This indicator measures how much is spent by the industry on goods and services as part of generating the final goods and services sold. When measured at regional level, this indicator provides an idea of the extent to which the industry contributes to the economy locally, as it will show how much the industry has spent within the region versus outside it.

Measures of expenditure differ to value of output, for a range of reasons. In particular, expenditure excludes business profits (which are captured in value of output), expenditure can sometimes be higher than value of sales over a given period depending on business investment and timing of production; and not all the expenditure used to produce a given amount of output will have occurred in the region in which expenditure is being estimated. For example, a business may generated \$1 million in sales in a given region, but only spend \$200,000 in that region as part of generating those sales, with the business purchasing most goods and services from other regions as part of the production process.

Value of expenditure can be measured in two ways, both of which are presented in this report:

- Gross expenditure total expenditure by all forest industry businesses, including spending within and outside the industry. This means some expenditure is 'double counted' as it involves 'within industry transfers'. For example, if expenditure by a wood processor purchasing logs from a plantation growing company is included as well as the expenditure incurred by that company in growing the plantations, this results in 'double counting': the gross expenditure includes the amount spent by the processor on the logs, and also includes the amount spent by growers to produce those logs. Because of this double counting, gross expenditure does not indicate the extent to which spending by the industry contributes to the broader economy.
- Net expenditure expenditure by the forest industry excluding transfers within the industry. This measure excludes payments made by businesses in one part of the industry to businesses in another part of the industry. It is a better indicator of the overall economic activity the industry provides to the local economy, as it identifies the net expenditure the industry as a whole contributes to the rest of the economy.

Industry expenditure is a useful indicator and provides more concrete data on the extent to which production of wood and paper products results in local economic activity compared to value of output measures. However, it is still subject to some problems of double counting: if the net expenditure of all industries in a region is added together, it will result in a value that is larger than the total value of production in that economy. This is due to the multiple transactions occurring between different industries in any given economy, some of which are double counted when expenditure of each individual industry is added together. This potential for double counting means it is also important to identify the *net* contribution of the industry to a regional economy, after taking into account the interactions between all sectors of the economy. This is done through identifying industry contribution to Gross Regional Production (GRP), described below.

Industry contribution to Gross Regional Product (GRP)

Gross Regional Product (GRP) is the total value of economic production in a region over a period of time. This can be defined as the sale value of all final goods and services produced in a region over a given period, less the expenditure on goods and services used to produce them (such as fuel, utilities, wood and fibre, accountants, office supplies, etc.). Operating a business requires more than just goods and services as inputs, it also requires capital (such as vehicles, machines and buildings), labour and land. These are known as 'primary factors of production' and GRP is the total amount paid to the owners of these primary factors. Workers 'own' labour and are paid a wage for it, business owners own land and/or capital and are paid a profit for them. Different types of

businesses use different amounts of each primary factor. For example, a forest plantation uses relatively more land and less capital than a sawmill.

GRP includes taxes because it concerns the whole economy, not just business. Even though business pays some profit to governments, that value is just a transfer within the economy of value that business produced. By the same logic, donations made by the business are also included in GRP. Annuities paid by growers are payments to the owner of the land used in production. While these are costs to businesses, they are income to owners of land so are included in GRP.

This report describes the direct and total contribution to GRP of the forest industry. The direct contribution to GRP is the GRP created by forest businesses themselves. Total contribution to GRP is the GRP created by forest businesses, plus the proportion of GRP created in the rest of the economy of Victoria due to the flow-on demand created by the forest industry (the production-induced and consumption induced flow-on effects described earlier). GRP is the preferred measure of economic contribution because it avoids the problem of double counting that can arise from using value of output or industry expenditure.

Employment

Subsequent parts of this report describe the employment generated by the forest industry in detail. Employment is defined in this report as the total number of people employed in the industry. It is measured as both direct employment (generated by the forest industry) and flow-on/indirect employment generated in other industries as a result of forest industry activity.

Employment in this report is reported based on the total number of people employed, rather than full-time equivalents (FTE). This is done for two reasons: first, because a person whose job is in the industry is likely to rely on that income for their livelihood irrespective of whether the job is part-time or full-time; and second, because data from other sources such as the Australian Bureau of Statistics (ABS) measure jobs in terms of numbers of people, not FTE.

Direct economic value

This section examines the 'direct' value of the industry, meaning the value of the output produced by the industry, expenditure made by the industry, and the subsequent contribution of the industry to GRP. These direct estimates do not take into account the flow-on, or indirect, activity that is generated in other parts of the economy as a result of forest industry activity. This information provides context on the overall economic size of the industry and its activities. The next section then examines the total economic contribution of the industry after taking into account interactions between the forest industry and other parts of the economy.

Direct value of output of the Green Triangle forest industry

In 2015-16, the direct value of output from the Green Triangle forest industry at the point of sale of primary processed products was \$1,170 million. This excludes sales of products or services occurring at earlier points in the supply chain prior to primary processing, to avoid double counting. This included \$430 million of sales generated by the softwood plantation sector, \$334 million in sales of products produced from hardwood plantations grown in the region, and \$406 million in sales of products processed in the Green Triangle using logs from forests and plantations grown in other regions (for example, hardwood plantations in Central Victoria that are harvested and in-field woodchipped by contractors who live in the Green Triangle, and exported as woodchips through the

Portland export facility in the Victorian part of the Green Triangle). The figure of \$1,170 million does not include the value of the output generated by secondary processing which, as described earlier, generates additional value and draws on both wood and fibre produced in the Green Triangle, and on wood and fibre products imported from other states or from other countries.

Direct expenditure by the Green Triangle forest industry

Value of output does not always provide a picture of the extent to which an industry contributes directly to the region it is located in. Examining expenditure helps to answer questions such as whether industry expenditure largely occurs locally, or is mostly occurring some distance from the region in which the business is located.

In total, in 2015-16, the forest industry generated \$999.8 million in direct net expenditure in the Green Triangle as a whole, including \$293.5 million in the Victorian part of the Green Triangle and \$706.3 million in the South Australian part of the Green Triangle. Most of this expenditure was generated by the processing of wood and paper products, as shown in Tables 1 and 2. While substantial additional expenditure would be generated by the secondary processing sector, it was not possible to estimate the value of this or the extent to which expenditure in the secondary processing sector relies on Victorian-grown wood and fibre, versus wood and fibre imported from other parts of Australia or from other countries.

The types of expenditure generated by different industries vary. Of the direct expenditure by the forest industry, the largest single item was wages and salaries, as shown in Appendix 1, with around \$1 in every \$5.10 of expenditure on wages and salaries (the industry spent a total of \$196.9 million on wages and salaries of workers in the region in 2015-16). Comparing the sectors, the softwood plantation sector spennt relatively more on wages and salaries (\$1 in every \$3.50) than the hardwood sector (\$1 in every \$6.20). The softwood sector spent the most on wages directly (around \$102.5 million), while the hardwood plantation sector spent less on wages (\$45.1 million).

	Vict	orian Green	South Aust	South Australian Green		Green Triangle	
		Triangle		Triangle			
		Net		Net			
		expend-		expend-			
	Gross	iture exc.	Gross	iture exc.	Gross	Net expend-	
	expend-	transfers to	expend-	transfers to	expend-	iture exc.	
	iture in	other parts	iture in	other parts	iture in	transfers to	
	2015-16 of industry 2015-16 of industry		of industry	2015-16	other parts of		
Supply chain stage	(\$m)	(\$m)	(\$m)	(\$m)	(\$m)	industry (\$m)	
Establishing & growing	121.2		174.0	70.4	205.2	125.0	
native forest & plantations	121.2	50.4	174.0	79.4	295.2	135.8	
Harvest & haulage of logs to	F0 2	F0 2	121.0	121.0	101.0	101.0	
processors	59.2	59.2	121.9	121.9	181.0	181.0	
Primary wood and paper	120.6	177.0	620.8		1 070 4	682.0	
processing	439.6	177.9	630.8	505.0	1,070.4	682.9	
TOTAL	620.0	293.5	926.6	706.3	1,546.6	999.8	

Table 1 Direct expenditure generated by the Green Triangle forest industry in different region by growing, harvesting and primary processing, 2015-16, by supply chain stage

This table shows both 'gross' expenditure, and expenditure net of transfers within the industry. The net figure ensures there is no double counting by ensuring that payments made from one part of the industry to another (and then expended in that other part of the industry) are not included. The transfers excluded from net figures include payments made to harvest, haulage, roading, earthworks and silvicultural contractors by plantation managers, and payments made to plantation managers or to other processors for fibre inputs used by wood and paper processors.

······································								
	Softwood plantation industry		Hardwood p industry	lantation	Green Triangle			
Supply chain stage	Gross expend- iture in 2015-16 (\$m)	Net expend- iture exc. transfers to other parts of industry (\$m)	Gross expend- iture in 2015-16 (\$m)	Net expend- iture exc. transfers to other parts of industry (\$m)	Gross expend- iture in 2015-16 (\$m)	Net expend- iture exc. transfers to other parts of industry (\$m)		
Establishing & growing plantations	143.9	53.1	125.7	58.6	295.2	135.8		
Harvest & haulage of logs to processors	59.5	59.5	115.3	115.3	181.0	181.0		
Primary wood and paper processing	409.4	248.3	293.5	105.2	1,070.4	682.9		
TOTAL	612.7	360.9	534.5	279.1	1,546.6	999.8		

Table 2 Direct expenditure generated by different parts of the Green Triangle forest industry by growing, harvesting and primary processing, 2015-16, by supply chain stage

This table shows both 'gross' expenditure, and expenditure net of transfers within the industry. The net figure ensures there is no double counting by ensuring that payments made from one part of the industry to another (and then expended in that other part of the industry) are not included. The transfers excluded from net figures include payments made to harvest, haulage, roading, earthworks and silvicultural contractors by plantation managers, and payments made to plantation managers or to other processors for fibre inputs used by wood and paper processors.

Contribution of the forest industry to Gross Regional Production

Measures of the forest industry's contribution to GRP can be thought of as the value-added by the industry to the economy, or the value left once non-wage expenditure is subtracted from revenue. This means it represents the value contributed to the economy in the form of returns to business/resource owners (in the form of profits), workers (in the form of wages and salaries), and taxes to governments. In 2015-16, the direct contribution to GRP from the growing, harvesting and primary processing of wood and paper products in the Green Triangle was \$382.9 million. This included \$97.7 million in the Victorian Green Triangle and \$285.1 million in the South Australian part of the region. These figures do not include the GRP generated beyond this point by secondary processing. Figure 3 shows the derivation of direct contribution to GRP by the forest industry in the Green Triangle. The figure shows that GRP (blue) is what remains once non-wage net expenditure (red) is subtracted from value of output (green). The orange bars show that most of the direct contribution to GRP was wages, followed by gross operating surplus (GOS, before-tax business profit) and Other Value Added (OVA).



a - Net expenditure is as defined in Table 1 except that wages are excluded because they are a component of GRP.

b - Gross Regional Product (GRP).

c - Gross Operating Surplus (GOS) is before-tax business profit and Other Value-Added (OVA) is other kinds of GRP not already counted such as donations, lease payments, annuities, etc.

Figure 3 Calculation and decomposition of direct contribution to GRP, Green Triangle – all parts of the industry

Total economic value including both direct and flow-on effects

The direct expenditure of any industry generates further flow-on effects: expenditure by one industry generates economic activity in other sectors, and therefore generates further jobs and economic activity beyond that occurring directly within the first industry. This flow-on activity can be *production-induced*, meaning it is generated as a result of the purchase of goods and services by the industry (e.g. purchasing fuel, mechanical services, accounting or financial services, to name a few), or *consumption-induced*, meaning it is generated as a result of workers in the industry and service industries spending their wages/salaries. 'Total' economic value refers to the total value an industry contributes to the economy when both direct and flow-on effects are included.

When these flow-on effects are taken into account and examined by region (Table 3):

- The total gross value of output contributed by the industry in 2015-16 was \$1,909 million in the Green Triangle for the industry as a whole, including \$532 million in the Victorian part of the region and \$1,273 million in the South Australian part of the region (the remaining \$104 million is from business activity that crosses the border between the Victorian and South Australian parts of the region so is only fully captured when the entire region is modelled).
- The total contribution to the value of GRP was \$728.6 million in the Green Triangle for the industry as a whole, including \$181.4 million in the Victorian part of the region, \$504.6 million in the South Australian part, and a further \$43 million from activity only captured when the parts are modelled together.

• The total contribution to the household income component of GRP was \$390.5 million in the Green Triangle for the industry as a whole, including \$88.6 million in the Victorian part of the region, \$276.6 million in the South Australian part, and a further \$25 million from activity only captured when the whole region is modelled together.

	Victorian Green Triangle	South Australian Green Triangle	Green Triangle ^a
Output [♭] (\$m)	532.3	1,273.4	1,908.5
Direct (\$m)	345.8	824.5	1,170.3
Production-induced (\$m)	129.6	260.6	470.8
Consumption-induced (\$m)	56.9	188.3	267.4
GRP (\$m)	181.4	504.6	728.6
Direct (\$m)	97.7	285.1	382.9
Production-induced (\$m)	50.3	109.0	190.5
Consumption-induced (\$m)	33.4	110.4	155.2
Household Income (\$m)	88.6	276.6	390.5
Direct (\$m)	39.7	157.1	196.9
Production-induced (\$m)	33.1	66.9	120.0
Consumption-induced (\$m)	15.7	52.6	73.7
Employment (total)	1,253	3,767	5,247
Direct (total)	536	1,807	2,344
Production-induced (total)	453	960	1,632
Consumption-induced (total)	264	999	1,271

Table 3 Total economic value of the Green Triangle forest industry (including direct and flow-on effects), up to and including primary processing

n.p. - not published in order to preserve respondent confidentiality.

a - Direct and indirect impacts in the Green Triangle are each greater than the sum of the two regions as the Victorian region generated some activities in the South Australian part of the region and vice versa, which is counted in the Green Triangle regional estimate.
b - Total output for combined sectors may be lower than the sum of output for individual sectors as it excludes transfers between sectors to prevent double counting.

When examined by sector of the industry (see Appendix 1 for detailed data):

- The total gross value of output of \$1,909 million included \$714 million dependent on softwood plantation, \$551 million dependent on hardwood plantations, and a further \$644 million dependent on plantations and forests grown in other regions
- The net contribution to GRP of \$729 million included \$318 million dependent on softwood plantation and \$206 million dependent on hardwood plantations, and the remaining \$205 million dependent on plantations and forests grown in other regions
- The contribution to household income was \$391 million in the Green Triangle for the industry as a while, including \$177 million dependent on softwood plantation and \$103 million dependent on hardwood plantations, with the remaining \$111 million dependent on plantations and forests grown in other regions.

The Green Triangle forest industry makes a larger contribution to the economy if the larger economies of the states of Victoria and South Australia are examined: this is because some of the

spending generated by the industry occurs outside the Green Triangle, much in other places in these two states. However, the total contribution of the Green Triangle forest industry to the states of South Australia and Victoria (as opposed to its contribution just to the economy of the Green Triangle region) is difficult to define, as the region straddles the border between the two states. Adding the economic contribution of the South Australian part of the Green Triangle to South Australia with the economic contribution of the Victorian part to Victoria approximates (but slightly underestimates) the economic contribution of the Green Triangle to the combined states. When using this approach (see Appendix 1 for detailed data):

- The total gross value of output of the industry in 2015-16 was \$3,238 million across the two states, including \$1,267 million in Victoria and \$1,971 million in South Australia
- The net contribution to GRP was \$1,396 million across the two states, including \$534 million in Victoria and \$862 million in South Australia
- The contribution to household income \$782 million across the two states, including \$293 million in Victoria and \$489 million in South Australia.

Figure 4 shows the derivation of total contribution to GRP by the forest industry in Victoria, including flow-on effects. The figure shows that GRP (blue) is what remains once non-wage net expenditure (red) is subtracted from value of output (green) for all activity that occurred at Victorian businesses as a result of forest industry activity. The orange bars show that most of the direct contribution to GRP was wages, the rest was gross operating surplus (GOS, before-tax business profit) and Other Value Added (OVA).



a - Net expenditure is as defined in Table 1 except that wages are excluded because they are a component of GRP. b - Gross Regional Product (GRP).

c - Gross Operating Surplus (GOS) is before-tax business profit and Other Value-Added is other kinds of GRP not already counted. Since this chart includes flow-on effects, OVA includes a broader range of items such as donations, lease costs, annuities, etc.

Figure 4 Calculation and decomposition of total contribution to GRP, Green Triangle – all parts of the industry

Employment

The forest industry in the Green Triangle generates a total of 2,344 direct jobs up to the point of primary processing. The estimated flow-on employment generated by this activity is an additional 2,903 jobs, meaning the industry contributes a total of 5,247 jobs in the economy up to and including primary processing once flow-on jobs are included. In addition, a further estimated 250 direct jobs are generated in secondary processing¹.

Direct employment

As shown in Tables 4 and 5, the forest industry in the Green Triangle generated 2,344 direct jobs up to the point of primary processing in the first half of 2017^2 , and 2,594 when secondary processing jobs are included. 'Direct' jobs include jobs that depend on the presence of the industry, in nurseries, silvicultural contracting, harvest and haulage of logs to processors, and processing of logs and residues into wood and paper products. They do not include jobs generated in mechanical services, fuel supply, or supply of other goods and services to the industry, which are included in flow-on employment. The majority of jobs up to the point of primary processing – 53% – are generated in the processing of wood and paper products, while 31% are generated by harvest and haulage. This is different to other regions, with a relatively higher proportion of jobs generated by harvest and haulage compare to others. This reflects the increase in harvest and haulage jobs associated with harvest of the first rotation of hardwood plantations in the region; as these plantations are often woodchipped on site using in-field chipping, harvest and haulage employment includes employment generated by in-field chipping. As there is no employment generated in primary processing of hardwood plantations beyond woodchip production and export, the increase in harvest of these plantations has increased the proportion of harvest and haulage contractors without a substantial increase in primary processing employment.

When direct jobs up to the point of primary processing are compared, the majority (69%) are generated by softwood plantations, including 1260 jobs that depend on softwood plantations grown in the region and a further 363 jobs that rely on softwood plantations grown in other regions. A further 29% are generated by hardwood plantations, the majority of which depend on hardwood plantations grown within the Green Triangle (670 jobs compared to 15 dependent on hardwood plantations grown in other regions). A small amount of jobs (36) are generated by native forest and unidentified plantations (for example, a small amount of contracts living in the region work harvesting native forest in parts of Central Victoria). There is regional variation as well, with 23% of all jobs generated being based in the Victorian part of the region, and 77% in the South Australian part.

¹ See Appendix 2 for a detailed description of how jobs were classified into primary versus secondary processing.

² This figure includes some jobs in manufacturing of wood and paper products that depend on raw materials (logs, pulp) imported from other regions.

Industry sector	Jobs located in the Green Triangle that depend		Total direct	% forest industry	Additional jobs		
	on			forest industry	jobs based in Green	generated outside	
	SOFTWOOD	HARDWOOD	Plantations or	jobs located in	Triangle dependent	Green Triangle that	
	PLANTATION	PLANTATION	native forest	Green Triangle	on forest &	depend on plantations	
	grown in the	grown in the	grown OUTSIDE		plantation grown in	or native forest grown	
	region	region	GREEN TRIANGLE ²		the region	in Green Triangle	
Growers (forest management							
companies)	76	72	1	149	99%	17	
Nurseries, silvicultural &							
roading contracting businesses	88	65	0	153	100%	10	
Harvest & haulage contracting							
businesses (including in-field							
chipping)	232	461	26	719	96%	11	
Primary wood and paper							
processing ¹	832	41	381	1254	70%	286	
Other (including consultants,							
equipment sales, training)	32	31	6	69	91%	8	
Total – excluding secondary							
processing	1260	670	414 ²	2344	82%	331	
Secondary wood and paper	Unknown	Unknown	Unknown	250	Unknown	Unknown	
processing (2016 ABS data)							
Total – including secondary	Unknown	Unknown	Unknown	2594	Unknown	Unknown	
processing							

Table 4 Direct employment generated by the forest industry the Green Triangle, 2017, by sector (Data source: 2017 industry survey, unless otherwise noted)

¹The jobs generated in these sectors includes people involved in wholesaling of products produced by these processors.

²Of these 414 jobs, 363 depended on softwood plantations grown in regions other than the Green Triangle, 15 on hardwood plantations grown outside the Green Triangle, and the remaining 36 either on native forest grown in other regions or on unidentified forest or plantation types.

Industry sector	TOTAL direct employment, 2017						
	Victorian Green Triangle	South Australian Green	Green Triangle -				
		Triangle	total				
Growers (forest management companies)	65	84	149				
Nurseries, silvicultural & roading contracting businesses	72	81	153				
Harvest & haulage contracting businesses	239	480	719				
Primary wood and paper processing ¹	109	1145	1254				
Other (including consultants, equipment sales, training)	52	17	69				
Total – excluding secondary processing	537	1807	2344				
Secondary wood and paper processing (2016 ABS data)	74	176	250				
TOTAL	611	1983	2594				
¹ The jobs generated in these sectors includes people involved ir	wholesaling of products produ	iced by these processors.					

Table 5 Direct employment generated by the Green Triangle forest industry, 2017, by region (Data source: 2017 industry survey, unless otherwise noted)

Flow-on employment

When flow-on impacts are included, a further 2,903 indirect jobs were generated in the Green Triangle by the forest industry up to and including primary processing, as a result of (i) the demand created by the forest industry for supplies and inputs such as fuel and mechanical servicing, and (ii) spending of salaries and wages by workers. Economic modelling using the EconSearch RISE model identified that for every direct job generated by the industry in the Green Triangle up to the point of primary processing, a total of 2.2 jobs were created in the region through a combination of production-induced and consumption-induced effects. EconSearch modelling suggests that this multiplier is similar to that of the metal product manufacturing and waste management services sectors (each 2.2), lower than the residential building construction sector (3.1), and higher than the communication services (1.8), beef cattle (1.6) and sheep (1.5) sectors.

The employment multipliers varied depending on the sector, with a total of 1.9 jobs created for every direct job dependent on softwood plantations and 2.3 for each direct job in hardwood plantations (see Table 6). Flow on jobs are generated through local expenditure by businesses in the region so the employment multiplier is higher if local expenditure is high or direct employment low. The softwood sector employs almost 11 workers for each \$1 million of local expenditure, compared to just over 6 for the hardwood sector. This explains the difference between the employment multipliers, the multiplier is lower for the softwood sector largely because direct employment is higher compared to the hardwood sector. When examined by region, a total of 2.3 jobs are generated in the Victorian part of the Green Triangle for every direct job in the region, and a total of 2.1 in the South Australian part of the region (see Table 7). The difference between the multipliers is largely driven by the different relative amount of activity within the softwood and hardwood sectors and amount of processing occurring in each region. For example, the South Australian part of the Green Triangle has around 20 per cent of its activity in the hardwood sector while the Victorian part has over 60 per cent. Likewise, the South Australian part has double the relative activity in processing compared to the Victorian part.

		Softwood plantation		Hardwood plantation		Green Triangle	
Type of		Multip-	Total	Multip-	Total	Multip-	Total
multiplier	Description	lier	jobs	lier	jobs	lier	jobs
None	Direct jobs only	1.0	1,260	1.0	670	1.0	2,344
Туре І	Direct jobs + production-induced jobs	1.4	1,826	1.8	1,186	1.7	3,975
Type II	Direct jobs + production-induced jobs + consumption-induced jobs	1.9	2,404	2.3	1,519	2.2	5,247

		Victorian Green		South Australian			
		Trian	gle	Green Ti	riangle	Green Ti	riangle
Type of		Multip-	Total	Multip-	Total	Multip-	Total
multiplier	Description	lier	jobs	lier	jobs	lier	jobs
None	Direct jobs only	1.0	536	1.0	1,807	1.0	2,344
Type I	Direct jobs	1.8	989	15	2 767	17	3 975
	+ production-induced jobs	1.0	505	1.5	2,707	1.7	5,575
Туре II	Direct jobs + production-induced jobs + consumption-induced	2.3	1,253	2.1	3,767	2.2	5,247
	jobs						

Table 7 Employment multipliers: indirect employment generated by the Green Triangle forest industry, by region

The flow-on effects vary in size in different parts of the industry (see Appendix 1), with the largest flow-on effects generated by the processing of wood and paper products, and silviculture and harvest and haulage activities having smaller flow-on effects to the rest of the economy.

Employment by local government area

Most of the jobs generated by the industry are located in just a few local government areas (LGAs). To understand how dependent an LGA is on the industry, it helps to examine both the total number of jobs generated, and also the overall proportion of jobs that depend on the industry. This provides an understanding of the extent to which a local area depends on the industry for employment of its workforce. To do this, we identified the proportion of the *employed workforce* in each LGA that worked directly in the forest industry (Table 8).

Within the Green Triangle, the largest numbers of forest industry jobs are located in Mount Gambier (1,035 jobs up to primary processing, ad 1,171 when secondary processing jobs are included), Wattle Range (495 jobs, 497 when secondary processing is included), Glenelg (324 jobs, 328 including secondary processing) and Grant (276 jobs, 305 including secondary processing), while 172 jobs (189 including secondary processing) were located in the Southern Grampians. When examined as a proportion of the workforce, the proportion of workers employed directly in the forest industry was:

- 10% of all workers in Mount Gambier
- 10% of workers in Wattle Range
- 8% of workers in Grant
- 4% of workers in Glenelg
- 3% of workers in Southern Grampians
- 1% or less of workers in all other LGAs in the Green Triangle.

The forest industry directly generates 4% of all jobs in the Green Triangle, including 8% of those in the South Australian part of the Green Triangle, and 1% of those in the Victorian part.

Region	Local government area name (2017)	Growing, harvest, haulage, primary processing (2017 industry	Secondary processing (2016 ABS Census) ^{1,2}	Total forest industry jobs	Size of employed labour force, all industries, 2011 ¹	% employed labour force employed in the forest	Employment secondary pr survey) Softwood plantations	by industry services ing jobs Hardwood plantations	ector (excludes ³ (2017 industry Other type of forest/plantation
		survey)				industry			
Victorian	Glenelg	324	4	328	8308	4%			
Green	Horsham	0	5	5	9109	0%			
Triangle	Moyne	0	13	13	7735	0%			
	Southern Grampians	172	17	189	7245	3%			
	Warrnambool	40	35	75	15605	0%			
	West Wimmera	1	0	1	1863	0%			
	TOTAL	537	74	611	49865	1%	164	350	22
South	Grant	276	29	305	3865	8%			
Australian	Mount Gambier	1035	136	1171	11617	10%			
Green	Tatiara	0	9	9	3428	0%			
Triangle	Wattle Range	495	2	497	5032	10%			
	TOTAL (also includes Kangaroo Island, Naracoorte & Lucindale, Tatiara)	1807	176	1983	23942	8%	1459	335	13
TOTAL	Green Triangle	2344	250	2594	73807	4%	1623	685	35

Table 8 Direct employment generated by the Green Triangle forest industry, 2017, by local government area

¹These figures will be updated based on 2016 labour force data when ABS Census data are released on employment by industry in late 2016.

²Note that the total for each region is different to the sum of individual LGAs. This is because the ABS randomise data for small areas, with job numbers changed slightly (by anywhere from one to five workers in most cases, although this can vary) to protect privacy. Totals for the region better reflect total employment than the sum of individual LGAs as they have less randomisation effects.

³These figures are based on type of plantation a job depended on, irrespective of whether the plantation was located in the Green Triangle or in another region.

Comparing employment estimates

There are relatively few sources of information available on employment in the forest industry. Other than specific surveys of businesses operating in the industry, the only regularly collected data on employment comes from two types of data produced by the Australian Bureau of Statistics (ABS): the *Census of Population and Housing* (Census), and the *Labour Force Survey* (LFS). In both cases, people who are employed are asked to describe the type of work they do. This information is then coded to identify each person's industry of employment, using the Australian and New Zealand Standard Industrial Classification (ANZSIC) (ABS/SNZ 2013).

The Census is conducted once every five years, and is a complete Census of the population, meaning it captures all Australians except the small proportion (<5%) who do not participate in this compulsory survey. Data produced from the Census has the highest reliability of any dataset on employment, because it is a comprehensive Census. However, it is only available every five years (data from the 2016 Census on industry of employment were released in November 2017). The LFS is based on data collected monthly from a sample of 26,000 Australian households representing around 0.32% of Australia's population (ABS 2017). In terms of the forest industry, this means that if the industry employed around 50,000 people nationally, the survey would include only a relatively small number of people from the industry (around 160). This means that any estimates of employment in the forest industry generated from the LFS are subject to high rates of sampling error, as a change of 5-10 people in the number sampled in the survey will be extrapolated to be a large change in total industry employment. Past reviews of the robustness of LFS survey for estimating employment in the forest, wood and paper industries have identified that the sampling error is too large to enable any accurate estimation of trends in industry employment, or of total employment levels, using LFS data (Schirmer et al. 2013). This means that the only robust source of data to which our survey data can be compared is data from the Census.

Both the Census and the LFS classify employment into several 'industry classifications' that form part of the forest industry, specifically in Forestry, Logging, Services to Forestry, Wood Product Manufacturing and Paper Product Manufacturing. However, some jobs directly dependent on the forest industry are classified into other industries. In particular, many log haulage workers are classified as being part of the transport industry. This means that Census data typically underestimate the total number of people employed in the industry, particularly in regions where there is substantial employment in harvest and haulage of logs. Additionally, Census data do not identify whether workers are based in softwood plantation or hardwood plantation jobs. ABS data do, however, capture employment in secondary processing, something difficult to do in direct surveys of the industry.

Table 9 compares estimates of employment generated up to the point of primary processing by our survey (data collected in late 2016 and the first half of 2017), and in the 2016 Census (data collected in August 2016). The ABS uses processes of data randomisation to protect privacy, which means that in any local government area, total numbers of workers may have been randomly changed by a small amount to protect privacy. This means that very small differences (of, for example, less than 10 workers) are unlikely to represent meaningful differences between the two datasets.

		2016 ABS Census			2017 Forest Industry Survey				
		Jobs in Forestry, Logging, Services to Forestry	Jobs in Wood and Paper Product Manuf- acturing – primary processing only	Total forest industry jobs generated up to point of sale of primary processed products	Jobs in Forestry, Logging, Services to Forestry	Jobs in Wood and Paper Product Manuf- acturing – primary processing only	Total forest industry jobs generated up to point of sale of primary processed products	Difference	
Region	Local government area	2016	2016	2016	2017	2017	2017	in estimates	Reasons for differences in estimates
	Glenelg	142	44	186	218	106	324	138	Some jobs in harvest and haulage were recorded as part of the transport industry in the Census. Some workers employed in woodchip manufacturing or working in mills in Grant and Mt Gambier were not classified as such in Census data.
Victorian Green Triangle	Horsham							100	Randomisation of Census data and small changes
	HOISHAIII	9	2	11	0	0	0	-11	in employment between Aug 2016 and 2017
	Moyne	16	9	25	0	0	0	-25	Randomisation of Census data and small changes in employment between Aug 2016 and 2017
	Southern Grampians	65	8	73	169	3	172	99	Most jobs in this region are in harvest and haulage of logs; this employment is recorded as part of the transport industry in the Census
	Warrnambool	7	13	20	40	0	40	20	Randomisation of Census data and small changes in employment between Aug 2016 and 2017
	TOTAL ¹	245	79	324	428	109	537	213	
SA Green Triangle	Grant	152	158	310	142	134	276	-34	Some businesses were unsure whether their
	Mount Gambier	383	629	1012	382	653	1035	23	workers lived in Mt Gambier vs Grant as the two LGAs are contiguous; as a result, in the Forest Industry Survey it is likely that a small number of Grant-based workers were recorded as living in Mt Gambier, leading to the small differences observed.
	Wattle Range	109	242	450	127	250	405	46	Some jobs in harvest and haulage were recorded
	τοται2	108 6E4	342	450	137	338	495	45	as part of the transport moustry in the Census
ΤΟΤΑΙ	Green Triangle	899	1152	2110	1090	1145	2344	21	
		000						20.	

Table 9 Comparison of forest industry employment generated up to point of sale of primary processed products: 2016 Census and 2017 Forest Industry Survey

¹ Also includes small numbers of workers in West Wimmera

² Also includes small numbers of workers in Narracoorte & Lucindale, Kangaroo Island, Tatiara
The 2016 Census recorded substantially fewer forest industry workers in key Victorian parts of the Green Triangle than our survey. This is predominantly because the Census data record a large number of harvest and haulage workers as being employed in the transport industry, rather than recording them as a part of the forest industry. In Victoria, there has been rapid growth in harvest and haulage employment related to harvesting of hardwood plantations in recent years, and while Census data captures some of this growth, it does not capture all of it due to the limitation of log haulage workers being classified as belonging to the transport industry, rather than to an industry category that is specific to the forest industry. On the South Australian side of the Green Triangle, our survey data recorded very similar numbers of workers to the 2016 Census, but there were again some differences related to employment in the log haulage industry.

Overall, all differences in estimates were a result of three factors:

- classification of some log haulage workers into the transport industry in the Census, who are recorded as part of the forest industry in the survey data, which in some LGAs led to large differences between Census data and Forest Industry Survey data
- (ii) randomisation of Census data, which led to small differences
- (iii) small changes in employment are likely to have occurred between the time of Census data collection (August 2016) and the time at which the Forest Industry Survey data were collected (late 2016 and the first part of 2017). This will also contribute to some of the differences observed.

Once these differences are accounted for, Census and Forest Industry Survey data are reasonably consistent. The one area of discrepancy was a number of workers based in Glenelg identified as working in wood product manufacturing. This may reflect differences in classification of workers employed in the processing and export of woodchips: it is possible that Census data classified these workers as being involved in wholesaling or export, rather than in manufacturing work.

Employment over time

There is little information on how employment is changing in the forest industry over time. The few studies that have estimated the employment generated by the industry in the Green Triangle have used a range of definitions of the forest industry, and drawn data from different sources, meanings that their figures are not always comparable. As a result, the only sources of data available that enable comparison of employment over time in the forest industry are (i) the ABS Census and (ii) surveys of the Victorian forest industry up to the point of primary processing undertaken in 2009 and 2012, which did not include the South Australian part of the Green Triangle (Forest Industry Survey).

Census data therefore provide the most robust insight into how employment in the industry is changing over time. As shown in Table 10, the number of workers employed in the forest, wood and paper industries recorded in the Australian Bureau of Statistics *Census of Population and Housing* fell by 16% between 2006 and 2011, and by a further 5% between 2011 and 2016. This overall trend masked very different types of change occurring in different parts of the industry. Between 2011 and 2016, employment grew substantially in primary production, with 73% growth in jobs in the growing, harvest and haulage of plantations; at the same time, employment in wood and paper product manufacturing declined by 25% between 2011 and 2016. While Forest Industry Surveys (FIS) were

undertaken in Victoria in 2009 and 2012, and captured detailed data on employment generated up to the point of primary processing, these covered only the Victorian part of the Green Triangle, and did not include the South Australian part. These surveys also showed a trend of falling employment between 2009 and 2012 consistent with Census data.

These findings are consistent with findings of the survey and other data sources: growth in primary production jobs has been driven by harvesting of the first rotation of hardwood plantations in the region, and re-establishment of most of these plantations to a second rotation. This harvest, haulage and re-establishment has resulted in a rapid increase in harvest and haulage jobs in particular. However, increased harvesting of hardwood plantations has not contributed substantially to employment in manufacturing, as most plantations are processed into woodchips for export, requiring relatively low levels of employment. The 25% decline in wood and paper product manufacturing employment was driven by closures of some processing plants, and downsizing of the labour force at others. In particular, the following contributed to the loss of 555 wood and paper product manufacturing jobs between 2011 and 2016:

- Pulp and paper industry: During 2011, just under 200 jobs were lost at the Millicent Tissue Mill, many of which would have occurred post collection of Census data in August 2011. In addition, in late 2011, the Tantanoola pulp mill was closed, with loss of around 65 jobs according to media reports at the time (ABC 2011)
- Closure of the Carter Holt Harvey Lakeside Sawmill and Pine Mouldings facilities in late 2012, with loss of around 100 jobs reported in the media (The Advertiser 2012)

In addition to these job losses, which cover around 350 of the recorded decline of 555 jobs, several mills described having downsized their labour force since 2011, accounting for the remaining decline in jobs.

There has therefore been significant decline in wood and paper manufacturing in the Green Triangle, which has been offset somewhat by growth in harvest and haulage of hardwood plantations since 2011, but still resulted in a substantial decline in employment in the forest industry over time. While the survey conducted for this study showed higher numbers of jobs in harvest and haulage than were identified in the Census, the findings were otherwise identical, highlighting that Census data provide an accurate picture of forest industry trends in all respect other than underestimating harvest and haulage employment.

		Jobs in Fe	orestry, La	ogging, Sei	rvices to Fo	restry	Jobs in V	Vood and I	Paper Proc	duct Manuf	acturing	Total for Census (est industi includes w	ry depend holesaling	ent jobs re g)	corded in
Region	Local government area name (2017)	2006	2011	2016	Change, 2006- 2011 ¹	Change, 2011- 2016 ¹	2006	2011	2016	Change, 2006- 2011 ¹	Change, 2011- 2016 ¹	2006	2011	2016	Change, 2006- 2011 ¹	Change, 2011- 2016 ¹
	Glenelg	85	38	142	-55%	274%	205	89	48	-57%	-46%	299	135	198	-55%	47%
	Horsham	0	0	9			39	27	7	-31%	-74%	49	31	17	-37%	-45%
	Moyne	5	11	16			25	14	22	-44%	57%	33	28	40	-15%	43%
Victorian Green Triangle	Southern Grampians	35	26	65	-26%	150%	57	43	25	-25%	-42%	92	72	100	-22%	39%
	Warrnambool	6	8	7			98	104	48	6%	-54%	115	126	61	10%	-52%
	West Wimmera	3	0	6			0	3	3			6	3	8		
	TOTAL	134	83	245	-38%	195%	424	280	153	-34%	-45%	594	395	424	-34%	7%
	Grant	106	103	152	-3%	48%	366	253	187	-31%	-26%	481	359	353	-25%	-2%
	Mount Gambier	273	247	383	-10%	55%	1218	977	765	-20%	-22%	1526	1239	1193	-19%	-4%
South	Kangaroo Island	8	0	5			8	12	3	50%	-75%	16	12	12	-25%	0%
Australian Green Triangle	Naracoorte and Lucindale	5	3	6			14	9	4			19	12	11	-37%	-8%
	Tatiara	0	0	0			16	24	6	50%	-75%	16	24	6	50%	-75%
	Wattle Range	104	83	108	-20%	30%	719	462	344	-36%	-26%	827	548	464	-34%	-15%
	TOTAL	496	436	654	-12%	50%	2341	1737	1309	-26%	-25%	2499	2194	2039	-12%	-7%
TOTAL	Green Triangle	630	519	899	-18%	73%	2765	2017	1462	-27%	-28%	3093	2589	2463	-16%	-5%
¹ Change has	s only been calcul	ated wher	e the total	number o	f workers is	s >10, as rai	ndomisatio	n of small	numbers t	by the ABS r	neans smal	ler change	s may not	be meanin	ngful	

Table 10 Green Triangle forest industry employment recorded in the ABS Census of Population and Housing over time

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Working conditions

Successfully recruiting and maintaining a strong workforce can be challenging for a regionally-based industry, with many rural and regional areas having a relatively small labour force compared to larger urban areas. This section examines whether the forest industry is providing positive working conditions relative to other industries in the Green Triangle. The working conditions in the industry will influence the ability of businesses in the industry to both recruit new workers and to retain their existing workforce. Many factors are important to creating a positive working environment (see for example Mylek and Schirmer 2014, 2015). Two can be examined readily based on data from businesses in the industry, and the ABS Census: working hours, and income.

Note that in the following pages, most data are presented for the whole forest industry in the Green Triangle, and are not typically broken into industry sectors (e.g. softwood plantation versus hardwood plantation) or different regions. This is due to limitations of available data, with Census data unable to be separated based on industry sector, and forest industry survey data often not able to be analysed by region as many businesses (particularly growers, harvest and haulage contractors, and silvicultural contractors) operated across both the Victorian and South Australian parts of the Green Triangle.

Working hours

All businesses were asked to report on the proportion of their workforce working full-time, part-time and in casual positions as part of the forest industry survey. The majority of jobs were full-time, comprising 70% of workers employed in forest and plantation management businesses (growers); 87% of harvest and haulage contractors; 93% of wood and paper processing workers, and 71% of silvicultural and nursery workers (Table). Overall, 88% of industry workers had full-time jobs³, 4% worked part-time and 7% were casual workers.

	Full-time	Part-time	Casual					
Growers	70%	9%	20%					
Harvest and haulage contractors	87%	6%	7%					
Processors	93%	2%	5%					
Silvicultural contracting and nurseries	71%	19%	10%					
Whole industry	88%	4%	7%					
Data source: 2017 Industry Survey. Data are reported for the Green Triangle combined with other parts of Victoria, as many businesses operated in both the Green Triangle and in areas of Victoria outside the Green Triangle, and there were also few differences by region or by industry sector								

Table 11 Full-time. part-time and casual	work in the softwood plantation in	ndustrv. 2017 – industrv survev result	ts

This is consistent with data from the ABS Census, which also shows a predominance of full-time workers in most parts of the industry. Table 12 shows that in 2016 11% of forest industry workers were employed part-time (identical to the proportion identified in the industry survey as the ABS

³ This includes a small number of workers who were subcontracted rather than directly employed: subcontractors typically worked full-time hours.

combines casual and part-time workers in their part-time category), compared to 38% of the broader workforce in the Green Triangle.

	% workers time	s employe	d full-	% workers employed part- time			
Industry sector (ABS classification)	2006	2011	2016	2006	2011	2016	
Forestry	87%	90%	91%	13%	10%	9%	
Logging	86%	94%	91%	14%	6%	9%	
Forestry Support Services	67%	78%	78%	33%	22%	22%	
Wood product manufacturing	91%	92%	91%	9%	8%	9%	
Pulp and paper manufacturing	91%	91%	93%	9%	9%	93%	
Forest industry workforce – Green	90		89%	10%	9%	11%	
Triangle	%	91%					
Employed labour force (all industries) - Green Triangle	67%	67%	62%	32%	33%	38%	

Table 12 Proportion of the Green Triangle workforce employed full-time and part-time, 2006-2016 – ABS Census of Population and Housing

Data source: ABS Census of Population and Housing, 2006, 2011. TableBuilderPro *Place of Usual Residence* database. Data are reported for all parts of the Green Triangle as results were almost identical for the Victorian and South Australian parts, and many workers work in both parts of the region. Workers who were away from work or did not report their working hours were excluded from the analysis.

Census data were also analysed to identify whether many workers were working high numbers of hours per week. Working long hours (often defined as more than 49 hours per week) has been shown to contribute to negative health and wellbeing outcomes for many workers. Under-employment – working fewer hours than desired – can also have negative impacts for workers, however it is not possible to identify from Census data whether a worker was satisfied with the number of hours they were working.

Across the entire workforce of the Green Triangle, 17% of workers reported working 49 or more hours a week in 2016 (Table 13). In the forest industry, 34% of workers reported working 49 hours or more per week, a substantial increase since 2011 when 20% reported this. This indicates that forest industry workers are much more likely to work very long hours compared to workers in other parts of the labour force of the region. Workers in some parts of the industry reported particularly long working hours: particularly those employed in logging and forestry, where 50% of more workers reported working more than 48 hours a week. These long hours can act as a disincentive to workers and reduce retention of workers in these parts of the industry.

	% work < 25 pric	% workers who worked < 25 hours in week prior to Census			% workers who worked > 48 hours in week prior to Census		
Industry sector (ABS classification)	2006	2011	2016	2006	2011	2016	
Forestry	5%	12%	11%	29%	32%	47%	
Logging	8%	10%	8%	66%	64%	67%	
Forestry Support Services	27%	12%	10%	19%	29%	23%	
Wood product manufacturing	6%	14%	8%	19%	14%	19%	
Pulp and paper manufacturing	5%	6%	11%	1%	15%	9%	
Forest industry workforce – Green Triangle	6%	9%	10%	19%	20%	29%	

Table 13 Working hours by industry sector, 2006-2016, Green Triangle – ABS Census of Population and Housing

Employed labour force (all industries) – Green	27%	28%	28%		18%	17%	
Triangle				20%			
Data source: ABS Census of Population and Housing, 2006, 2011, TableBuilderPro Place of Usual Residence database.							
Data are reported for all regions together as results were very similar across regions. Workers who were away from						m	
work or did not report their working hours were excluded from the analysis.							

Income

the analysis.

ABS Census data shows that forest industry workers in the Green Triangle generally earned higher incomes than the average for the region (Table 14): in 2016, only 10% of forest industry workers earned less than \$600 per week, compared to 33% of all workers in the Green Triangle, and 47% earned \$1,250 or more per week, compared to only 25% of the overall employed labour force. Much of this difference is due to the higher rates of full-time work in the forest industry, which result in overall higher income per worker on average. To identify whether the wages/salaries paid in the forest industry are higher than average after taking hours of work into account, the proportion of full-time workers earned low and high income was compared (Table 15). Forest industry workers were still less likely to earn low levels of income, although the differences were smaller (8% of full-time forestry workers earned less than \$600 per week in 2011, compared to 15% of full-time workers across the workforce in the Green Triangle). They were also much more likely to earn high income compared to other workers in the region (51% compared to 36%).

	% all workers earning% all workers earning > \$<\$600 per week\$1250 per week			1299 or						
Industry sector (ABS classification)	2006	2011	2016	2006 (\$1299/wk)	2011 (\$1250/wk)	2016				
Forestry	18%	7%	12%	13%	35%	46%				
Logging	9%	10%	9%	6%	25%	52%				
Forestry Support Services	34%	20%	11%	5%	31%	49%				
Wood product manufacturing	26%	13%	10%	11%	23%	35%				
Pulp and paper manufacturing	5%	4%	4%	58%	79%	85%				
Forest industry workforce – Green	21%	11%	10%	20%	36%	47%				
Triangle										
Employed labour force (all industries) –	55%	49%	33%	11%	10%	25%				
Green Triangle										
Data source: ABS Census of Population and Hou Data are reported for both regions together as r operated in both regions. Workers who were aw	Data source: ABS Census of Population and Housing, 2006, 2011, TableBuilderPro <i>Place of Usual Residence</i> database. Data are reported for both regions together as results were almost identical for both regions, and some businesses									

Table 14 Income earned by workers, 2006-2016, Green Triangle – ABS Census of Population and Housing

Table 15 Income earned by full-time workers, 2006-2016, Green Triangle – ABS Census of Population and Housing

	% full-tii earning	me worker <\$600 per	s week	% full-time \$1299 or \$1	ng >	
Industry sector (ABS classification)	2006	2011	2016	2006 (\$1299/wk)	2011 (\$1250/wk)	2016
Forestry	17%	6%	5%	15%	37%	53%
Logging	2%	5%	4%	7%	28%	55%
Forestry Support Services	21%	7%	4%	13%	37%	60%
Wood product manufacturing	21%	10%	5%	11%	24%	37%
Pulp and paper manufacturing	3%	3%	4%	57%	81%	87%

Forest industry workforce – Green	17%	8%	5%	20%	37%	51%			
Triangle									
Employed labour force (all industries) –	33%	19%	15%	13%	27%	36%			
Green Triangle									
Data source: ABS Census of Population and Housing, 2006, 2011, TableBuilderPro Place of Usual Residence database.									

Data are reported for both regions together as results were almost identical for both regions, and some businesses operated in both regions. Workers who were away from work or did not report their working hours were excluded from the analysis.

Workforce diversity and sustainability

To be sustainable over time, every industry needs to successfully recruit and retain workers. This section examines whether the forest industry is successfully recruiting workers from all parts of the labour force, and whether forest industry businesses in the Green Triangle find it easy or difficult to recruit workers.

Gender

The forest industry in Australia has traditionally predominantly employed men, with relatively few women working in the industry (ABARES 2015). In 2017, results of the industry survey showed employment of women was highest amongst forest management companies (growers), where 16% of workers were female. Only 7% of harvest and haulage contractors were female, and 12% of those employed in wood and paper processing (Table 16). This suggests that, similar to the industry in other regions, the forest industry in the Green Triangle and Victoria is not successfully accessing a large part of the female labour force.

Analysis of Census data suggests that there has not been substantial change in this gender composition of the workforce over time, with little growth in the proportion of the forest industry workforce in the Green Triangle who are female (Table 17). As of 2016, 47% of the total labour force in the Green Triangle was female, a small increase from 45% in 2006. In the forest industry workforce, female representation in the workforce fell slightly over the same period, from 17% in 2006 to 13% in 2016. The factors affecting female participation in the industry need to be better understood and addressed to enable the industry to more successfully recruit from the large proportion of the workforce that is female.

	Male	Female	Full-time	Full-time	Part-time/	Part-time/
	workers	workers	men	women	casual men	casual women
Growers	84%	16%	74%	61%	26%	39%
Harvest and haulage						
contractors	93%	7%	90%	50%	10%	50%
Processors	88%	12%	95%	78%	5%	22%
Silviculture/nurseries	92%	8%	74%	33%	26%	67%
Whole industry	87%	13%	91%	71%	9%	29%

Table 16 Workforce characteristics, Green Triangle and Victorian forest industry: gender (2017 Industry survey)

Table 17 Workforce by gender composition, 2006-2016, Green Triangle – ABS Census of Population and Housing

	% male			% female			
Industry sector (ABS classification)	2006	2011	2016	2006	2011	2016	
Forestry	74%	79%	83%	26%	21%	17%	
Logging	87%	92%	89%	13%	8%	11%	
Forestry Support Services	85%	87%	83%	15%	13%	17%	

Wood product manufacturing	83%	92%	91%	17%	8%	9%
Pulp and paper manufacturing	87%	89%	87%	13%	11%	13%
Forest industry workforce – Green	83%	89%	87%	17%	11%	13%
Triangle						
Employed labour force (all industries) –	55%	54%	53%	45%	46%	47%
Green Triangle						
Data any MDC Consult of Deputation and Line			م الم الم ال	Dimon of Linual	Desideres dete	

Data source: ABS Census of Population and Housing, 2006, 2011, TableBuilderPro *Place of Usual Residence* database. Workers who were away from work or did not report their working hours were excluded from the analysis.

Age

Australia's workforce is ageing, as is the population overall. In 2006, the forest industry workforce had a similar number of workers aged under 35 as the broader labour force (32% compared to 33%), but fewer workers aged 55 and older (13% compared to 18% in the broader labour force). By 2016, the forest industry workforce had slightly fewer younger workers (29% of the forest industry workforce was aged under 35, compared to 31% of the broader workforce in the region) and fewer workers aged 55 and older compared to the average for the workforce as a whole (20% in the forest industry compared to 26% in the Green Triangle workforce) (Table 18). Overall, our findings suggest that as of 2011 the forest industry workforce was more likely to be middled aged than was typical for the broader labour force working in the Green Triangle, and that the industry's workforce is ageing at a similar rate, or slightly less, than the broader workforce of the Green Triangle.

	% aged	< 35 years		% aged 5!	5 and older	
Industry sector (ABS classification)	2006	2011	2016	2006	2011	2016
Forestry	40%	33%	44%	11%	19%	14%
Logging	35%	26%	39%	17%	18%	16%
Forestry Support Services	42%	31%	29%	16%	4%	15%
Wood product manufacturing	34%	29%	24%	12%	17%	21%
Pulp and paper manufacturing	19%	16%	11%	16%	15%	22%
Forest industry workforce – Green	32%	26%	29%	13%	17%	20%
Triangle						
Employed labour force (all industries) –	33%	32%	31%	18%	22%	26%
Green Triangle						
Data source: ABS Census of Population and House	sing, 2006,	2011, Table	BuilderPro	Place of Usu	ial Residence d	latabase.

Table 18 Workforce by age, 2006-2016, Green Triangle – ABS Census of Population and Housing

Workers who did not complete this question on the Census were excluded from the analysis.

Aboriginal and Torres Strait Islanders

Employment of Aboriginal and Torres Strait Islander peoples was similar in the forest industry to the overall workforce in the Green Triangle, at 1% of the workforce (Table 19), and has not changed substantially over time.

Table 19 Aboriginal and Torres Strait Islander participation in workforce, 2006-2016, Green Triangle – ABS Census

	% workforce identifying as Aboriginal or Torres Strait Islander						
Industry sector (ABS classification)	2006	2011	2016				
Forestry	1%	0%	1%				
Logging	0%	0%	1%				
Forestry Support Services	0%	5%	0%				
Wood product manufacturing	1%	1%	1%				
Pulp and paper manufacturing	1%	1%	2%				
Forest industry workforce – Green	1%	1%	1%				
Triangle							
Employed labour force (all industries) –	1%	1%	1%				
Green Triangle							
Data source: ABS Census of Population and Hou	using, 2006, 2011.	TableBuilderPro Place of	Usual Residence database.				

Data are reported for both regions together as results were almost identical for both regions, and some businesses operated in both regions. Workers who did not complete this question on the Census were excluded from the analysis.

Recruiting workers and contractors

Forest industry businesses were asked how easy or difficult they found it to recruit workers and contractors. They were then asked what factors contributed to difficulty recruiting workers. Data in this section combine responses for Victoria and the Green Triangle: this is done because more than 30% of businesses who answered these questions operated across both regions.

The types of staff that were most challenging to recruit were managers and high level professional staff (Figure 5), with 70% of businesses reporting difficulty recruiting these types of workers. This was followed by transport workers (69% finding it difficult to recruit staff), heavy machine operators (67% finding it difficult to recruit staff) and field staff (63% finding it difficult to recruit staff). Only 30% per cent found it challenging to source finance/book keeping staff, and most businesses (57%) found it easy to source administration staff.



Figure 5 Level of difficulty involved in recruiting different types of workers, as rated by Victorian and Green Triangle forest industry businesses

When native forest⁴ and plantation managers were asked about accessing skilled contractors, most reported finding it easy to source nurseries to supply seedlings or seed (80%) and skilled contractors in the areas of roading and earthmoving (57%). More reported difficulty sourcing skilled contractors in the areas of harvesting (67%) and site preparation and planting (40%) (Figure).

⁴ Because these data include businesses operating in parts of Victoria outside the Green Triangle, it includes some businesses engaged in managing native forest.



Figure 6 Level of difficulty involved in recruiting different types of contractors, as rated by Victorian and Green Triangle forest industry businesses involved in engaging contractors

When asked what factors made it difficult to recruit staff, a lack of available workers with appropriate skills was the top issue identified by businesses, with 88% reporting that this was a big issue for them (Figure). For 65%, the lack of suitable workers available in their local community was a big issue, and for 59% the investment and time required to build workforce skills was a big issue.

Fifty per cent of businesses reported that a key challenge was workers not wishing to shift to the community in which they were located. Related to this, 38% reported that a lack of employment opportunities for partners/spouses of workers in the local region affected their ability to recruit workers.

A large proportion of businesses (46%) reported that negative perceptions of the industry was a big problem, and only 12% of businesses felt that negative perceptions wasn't an issue, or a low issue, and 46% of businesses felt that a lack of certainty about the future of the industry was a bit issue.

In many cases (44% of businesses), skills obtained in other industries were not easily transferable to the forest industry, with only 7% indicating that this was not an issue or a low issue. A total of 44% of businesses also reported that other businesses being able to offer higher wages was an issue that substantially affected their ability to recruit workers. Less than 34% of businesses reported that competition from other industries in the area of working conditions, or lack of affordable accommodation, were issues for recruitment.



Figure 7 Key issues preventing recruitment of skilled workers into forest industry in Victoria and the Green Triangle

Industry skills and training needs

This section examines the skills and training needs of the forest industry in the Victorian and Green Triangle regions⁵. The forest industry needs workers with a diverse range of skills, which are evolving over time as the technologies used in the industry evolve.

Forest industry businesses were asked what types of skills were needed by their workforce, whether they required workers to have formal accreditation in these skills, and how they currently provided training. forest ecology and silviculture compared to growers and processors. A total of 75% of growers required skills in marketing/sales, however none indicated a need for formal accreditation in this area, while 78% of processors required skills in marketing/sales and 50% reported needing accreditation.

Businesses were also asked to identify whether they delivered skills training in different competency areas via in-house training by other staff, in-house training by an expert, or training via a registered training organisation (RTO). They were able to select more than one of these (Table 21):

- RTOs were most commonly used to provide training in forest ecology and silviculture, hand-held machinery operation, road transport and driver training and heavy machinery operation; in some cases this was supplemented by in-house training
- RTOs were also the most common methods for training in occupational health and safety training, business and financial management, and fire-fighting, although less than 70% of businesses used RTOs and many businesses opted for in-house training by other staff
- Compliance training was delivered through an RTO for just over half of all businesses, and inhouse training by other staff or experts for most remaining businesses was almost half, suggesting opportunities for additional provision of training in this area through more formal mechanisms
- In-house training was more common than use of a RTO for marketing/sales, IT/software training, and community relations/engagement.

⁵ Both regions are combined due to the large proportion of businesses who operated across both regions and did not differentiate skills and training needs by region.

Table20 shows the proportion of businesses reporting that some or all of their workers required skills in each of twelve competency areas, and the proportion of businesses who required formal accreditation of their workers in each. Businesses most commonly reported needing workers with skills in occupational health and safety training, with 100% of businesses reporting a need for this skill. Other common business requirements included skills that are used across forest types and business types, including operation of heavy machinery (89%) and chainsaws (85%), compliance training (89%), business and financial management (80%) and fire-fighting (70%).

Businesses operating in different forest types (softwood plantations, hardwood plantations) reported similar skill requirements in many competency areas. There was more variation in needs for skills and accreditation between businesses types, with some skills specialised to particular parts of the industry. For example, processors less commonly require forest operations planning and management, forest ecology and silviculture and road/transport driving skills, while these were important competency areas for growers. Harvest and haulage contractors reported less need for skills in marketing/sales, community relations/engagement and forest ecology and silviculture compared to growers and processors. A total of 75% of growers required skills in marketing/sales, however none indicated a need for formal accreditation in this area, while 78% of processors required skills in marketing/sales and 50% reported needing accreditation.

Businesses were also asked to identify whether they delivered skills training in different competency areas via in-house training by other staff, in-house training by an expert, or training via a registered training organisation (RTO). They were able to select more than one of these (Table 21):

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- Compliance training was delivered through an RTO for just over half of all businesses, and inhouse training by other staff or experts for most remaining businesses was almost half, suggesting opportunities for additional provision of training in this area through more formal mechanisms
- In-house training was more common than use of a RTO for marketing/sales, IT/software training, and community relations/engagement.

Table 20 Skills and accreditation needs reported by businesses in Victoria and the Green Triangle

	All busi	nesses	Softwood		Hardwo	ood			Harvost	and		
	(includes silvicultu	ral	busines	ses	businesses				haulage			
	contracto	ors)					Growe	rs	contract	ors	Processors	
	Need skills	Require accred- itation	Need skills	Require accred- itation	Need skills	Require accred- itation	Need skills	Require accred- itation	Need skills	Require accred- itation	Need skills	Require accred- itation
Occupational health and safety training	100%	81%	100%	82%	100%	75%	100%	75%	100%	83%	100%	78%
Heavy machinery operation	89%	85%	94%	88%	75%	75%	50%	50%	100%	100%	100%	90%
Compliance training	89%	79%	88%	77%	75%	71%	75%	67%	92%	83%	100%	88%
Chainsaw and other hand-held machinery	85%	78%	82%	77%	88%	75%	100%	100%	75%	67%	90%	80%
Business and financial management	80%	64%	75%	56%	71%	57%	100%	100%	73%	36%	90%	90%
Fire fighting	70%	60%	71%	53%	63%	50%	100%	100%	58%	33%	70%	75%
IT/ software training specialised to the industry	69%	28%	65%	18%	38%	25%	100%	25%	50%	8%	78%	50%
Road transport/driver training for haulage drivers	54%	52%	65%	59%	63%	50%	50%	50%	75%	67%	33%	33%
Forest operations planning and management	48%	30%	44%	19%	50%	38%	100%	75%	46%	9%	33%	33%
Marketing/sales	42%	17%	35%	19%	13%	0%	75%	0%	8%	0%	78%	50%
Forest ecology and silviculture	32%	32%	25%	25%	50%	38%	100%	75%	9%	9%	22%	22%
Community relations/ engagement	31%	13%	29%	19%	25%	0%	75%	25%	8%	0%	44%	29%

	Registered training organisation	In-house training by expert	In-house training by other staff
Forest ecology and silviculture including			
plant identification	83%	17%	67%
Chainsaw and other hand-held machinery			
(eg brushcutter, pruning)	77%	23%	23%
Road transport/driver training for haulage			
drivers	77%	23%	23%
Heavy machinery operation	74%	13%	44%
Business and financial management	68%	21%	37%
Fire fighting	65%	35%	20%
Occupational health and safety training.	64%	48%	32%
Compliance training e.g. training in compliance needed for regulatory or			
certification bodies	52%	44%	44%
Forest operations planning and			
management	46%	18%	46%
Marketing/sales	40%	30%	80%
IT/ software training specialised to the			
industry e.g. for plant operation, in-field			
survey	12%	41%	65%
Community relations/community			
engagement	11%	33%	89%

Table 21 Types of training used by forest industry businesses in Victoria and the Green Triangle

Formal skills attainment

Formal qualifications do not always reflect the skills of a given workforce, particularly in cases where skills have been learned on the job – for example, through in-house business training such as that identified in the previous section. Having a formal qualification does, however, provide an idea of the extent to which workers have skills that are formally recognised and thus able to be better transferred between workplaces and even industries. Engaging in formal educational attainment is also beneficial beyond enabling workers to attain specific competencies: the process of formal learning builds foundational learning, literacy and numeracy skills that enable workers to have the ability to more rapidly adapt to changing industry requirements, and which have been identified as critical to increasing the productivity of Australia's labour force into the future (Skills Australia 2010).

As of 2011, forest industry workers in most parts of the industry were less likely to have completed high school than those working in other industries (Table 22), were similarly likely to have a certificate qualification, and less likely to have a Bachelor degree or other university qualification than the average for the employed labour force. Between 2011 and 2016, high school completion grew amongst the forest industry workforce, but at a slower rate than in the rest of the workforce: in 2016, 37% of forest industry workers had completed Year 12 or equivalent compared to 49% of the total workforce of the Green Triangle. Forest industry workers were just as likely as other members of the workforce to have a certificate or diploma qualification (41%), but low rates of other post-school qualifications such as Bachelor degrees meant they were overall less likely to have a post-school qualification than people working in other industries in the Green Triangle.

	% complet 12 or equi	ted high sch valent)	igh school (Year % with no post-school it) qualification		I	% with Certificate or Diploma qualification			% with Graduate Diploma, Bachelor or postgraduate degree			
Industry sector (ABS classification)	2006	2011	2016	2006	2011	2016	2006	2011	2016	2006	2011	2016
Forestry	41%	35%	38%	57%	48%	46%	25%	37%	42%	18%	15%	11%
Logging	17%	16%	28%	62%	71%	57%	31%	29%	40%	0%	0%	2%
Forestry Support Services	34%	33%	55%	70%	54%	35%	21%	31%	41%	10%	15%	27%
Wood product manufacturing	29%	45%	34%	64%	59%	53%	32%	37%	43%	4%	4%	4%
Pulp & paper manufacturing	35%	31%	46%	56%	51%	49%	35%	37%	38%	10%	12%	13%
Forest industry workforce – Green Triangle	31%	34%	37%	62%	57%	51%	32%	36%	41%	7%	7%	8%
Employed labour force (all industries) – Green Triangle	39%	44%	49%	54%	48%	42%	33%	37%	41%	13%	15%	17%

Table 22 Formal educational attainment: rates of attainment of high school and post-school qualifications in the Green Triangle forest industry, 2006 to 2016

Data source: ABS Census of Population and Housing, 2006, 2011, TableBuilderPro *Place of Usual Residence* database. Data are reported for the Victorian and South Australian parts of the Green Triangle together as results were almost identical for both regions. Workers who did not complete this question on the Census were excluded from the analysis.

Business and market outlook

Businesses were asked about the business and market conditions and challenges they were experiencing, and the extent to which they could cope with difficult business conditions. These questions help identify both areas of strength and areas of challenge being experienced by the industry.

Overall business conditions

Businesses were asked 'how would you describe business conditions for your business at the moment?' About half of the Green Triangle and Victorian businesses operating in softwood plantations (49%) felt that business conditions were 'more challenging than usual' and only 18% indicated business conditions were 'easier than usual'. Results were similar for businesses working in hardwood plantations, with 50% indicating business conditions were 'more challenging than usual' and 20% indicating business conditions were 'easier than usual'.

Future business expectations

Businesses were asked how likely or unlikely it was that in the next year they would invest in new business systems or new capital equipment, reduce or increase their workforce, grow their business revenue, or increase business profitability. As shown in Figure 8:

- All hardwood businesses and 65% of softwood businesses intended to invest in new capital equipment in the next 12 months
- Around half of all businesses (44% of those in the hardwood plantation and 57% in the softwood plantation sector) planned to invest in new business systems, although 31% of softwood plantation dependent businesses reported this was unlikely
- 42% of all businesses expected business profitability to grow, and a similar proportion that business revenue would grow; less than 20% felt revenue or profitability would decline
- Relatively few planned to either increase or reduce the size of their workforce, with most expecting stability: in the softwood sector, around one in five businesses felt growth was likely but a similar amount that a reduction in workforce size was likely; in the hardwood sector one-third of businesses expected growth and only 14% decline in the size of their workforce.

Businesses were also asked whether they felt that, over the next 12 months, demand for their services or products were likely to grow, remain about the same, or shrink. About half (51%) felt demand would remain the same, about one third (31%) felt that that demand would grow, and few (18%) that demand would reduce. No growers indicated that demand was likely to grow, with 80% of growers feeling like demand is likely to remain about the same. No processors felt that demand was likely to shrink, with 67% indicating demand was likely to remain about the same and 33% that they believed it would grow. Businesses were asked what factors would enable them to invest more in their business. This question was either completed in the survey, or answered on the phone, with a total of 20 businesses providing their perspectives:

• Growers most commonly reported that having more land, or more affordable land, available for expansion of plantations was a key factor that would enable investment.

- Harvest, haulage and silvicultural contractors most commonly identified having more or longer term contracts, as well as a more secure industry with greater available wood volumes as the factors that have the greatest impact on their ability to invest.
- Processors reported a need for greater resource security, growth in market demand, increase in prices for products, and development of export markets.



Figure 8 Expectations for business revenue, profitability, workforce size and investment over the next 12 months

Business challenges

Businesses were asked 'what factors would trigger you to downsize or close your business?' A total of 23 businesses provided answers to this question. Answers were very consistent and not surprisingly mostly related to demand for products or services, loss of contracts and resource security. Growers reported loss of demand for timber products and contractors non-renewal of contracts as the factors that would trigger downsizing or closure. Processors most commonly reported lack of wood/fibre supply as a factor likely to trigger downsizing. Businesses were then asked to rate the extent to which different factors had been a challenge or problems for their business in the last three years (Figure 9). Of the businesses that completed these questions, the most common challenges for softwood plantation-dependent businesses were difficulty obtaining labour (53%), government regulation (53%), rising costs of labour (53%), falling prices for the goods

they produced (41%) and rising input costs (35%). For hardwood plantation-dependent businesses, the most common challenges were difficulty obtaining labour (75%), rising costs of labour (50%), lack of investment in the industry as a whole (50%), government regulation (38%), and rising input costs (38%).

		No/low	/ problem		Modera	ate proble	m	🗖 Big p	problem	1
ment ation	Softwood businesses	18%		29%				53%		
Goverr regula	Hardwood businesses	38	3%		25	5%			38%	
osts of our	Softwood businesses	18%		29%				53%		
Rising c labo	Hardwood businesses 0%	5	50%					50%		
ulty ning our	Softwood businesses	18%		29%				53%		
Diffic obtail labc	Hardwood businesses 0%	5 25%					75%			
input ts	Softwood businesses	18%		4	47%				35%	
Rising	Hardwood businesses	25%			38%				38%	
: of lent in stry as ole	Softwood businesses		41%			29%			29%	
Lack investrr the indu a wh	Hardwood businesses	25%		25%	5			50%		
prices goods	Softwood businesses	29%			29%			41	<mark>.%</mark>	
Falling for the you pro	Hardwood businesses	38	3%				50%			13%
or munica ns	Softwood businesses		53%				3	5%		12%
Po telecom tio	Hardwood businesses	38	3%			38%			25%	5
aining itivenes other ilar esses	Softwood businesses	359	%			35%			29%	
maint: compet s with sim busin	Hardwood businesses		50%				389	%		13%
lemand goods oduce	Softwood businesses		53%				24%		249	%
.ack of c for the you pr	Hardwood businesses		(53%				25%		
ulty I g some æts-	Softwood businesses		41%				5:	9%		
Diffic accessin mark	Hardwood businesses	25%				63%				13%
ulty ning ation	Softwood businesses			71%					29%	C
Diffic obtaii certific	Hardwood businesses		50%					50%		C
				71%					24%	6%
ulty ning e to n the ess	Softwood businesses			/1/0						

Figure 9 Challenges experienced by Green Triangle forest industry businesses

Community perceptions of the social, economic, service and infrastructure effects of the forest industry

To further evaluate the socio-economic effects of the forest industry in the communities in which it operates, residents living in communities across Australia, including the Green Triangle regions of Victoria and South Australia, were asked about (i) their overall views about quality of life and liveability of their community, and (ii) the extent to which they felt the different industries that operated in their region affected different social and economic aspects of their lives.

These questions were asked as part of the 2016 Regional Wellbeing Survey, a large-scale survey of 13,000 people living in rural and regional areas of Australia. Schirmer et al. (2017) provide a detailed description of the survey methods and data collection process.

Quality of life and liveability

Quality of life and liveability of local regions was examined by analysing responses to survey questions which asked residents of these regions how they viewed the overall liveability, economy, roads, friendliness, safety, landscape and environmental health of their local community. To identify whether the forest industry may be contributing to differences in these experiences, the following groups were compared:

- Rural and regional South Australia: a total of around 1,480 people from rural and regional South Australia participated in the survey, including a small number of Adelaide residents of whom most lived on the urban fringe of Adelaide⁶
- Rural and regional Victoria: a total of around 3,630 people from rural and regional Victoria participated in the survey, including Melbourne residents living on the urban fringe of the city (for example, in parts of the Yarra Ranges local government area and Mornington Peninsula that are on the fringe of the suburban area)³
- High forest industry dependence: people living in local government areas (LGAs) in which more than 3% of employment was directly dependent on the forest industry, or in which there were large areas of plantations or harvesting of native forests. This was examined by region within the Green Triangle:
 - South Australian Green Triangle: residents of the three LGAs of Grant, Mount
 Gambier and Wattle Range had high forest industry dependence. A total of around
 153 residents from these LGAs participated in the survey.
 - Victorian Green Triangle: residents of the LGAs of Glenelg and Southern Grampians had high forest industry dependence. A total of around 188 residents from these two LGAs participated in the survey.
- Low forest industry dependence: people living in LGAs with less than 3% of jobs directly dependent on the forest industry, or with relatively smaller amounts of plantation of forest harvesting:
 - South Australian Green Triangle: residents of Kangaroo Island, Naracoorte and Lucindale and Tatiara, with a total of around 77 survey respondents.
 - Victorian Green Triangle: residents of Horsham, Moyne, Warnambool and West Wimmera, with a total of around 210 survey respondents.

⁶ Not all answered every question, and as such the 'n' changes slightly for different results presented below.

The experiences of those living in Victoria as a whole, South Australia as a whole, and in communities with high versus low forest industry dependence in the Victorian and South Australian parts of the Green Triangle, were compared. This gives a useful indication of whether residents of forest industry dependent communities report substantially different levels of quality of life and liveability in their communities compared to those living in other communities. However, where there are differences they may be driven by a range of factors, only one of which is the presence of the forest industry. Figure 10 shows overall views of residents about the liveability of their community. The error bars show 95% confidence intervals; where error bars do not overlap, this indicates there is a significant difference between regions at the '5%' significance level.

People living in South Australian parts of the Green Triangle with high dependence on the forest industry were just as or more likely to rate their community as a good place to live when compared to those living in regions with lower forestry dependence. Those living in Victorian parts of the Green Triangle with high forest industry dependence were less likely to rate their community as a good place to live overall, or to feel their community is a great place to live, compared to those living in communities with low forestry dependence. Respondents living in the 'high forest industry dependence' LGAs of Mount Gambier, Grant and Wattle Range in South Australia were also significantly more likely to indicate having good quality roads in their local region, compared to all other parts of the Green Triangle.

Overall people living in the Green Triangle felt welcome and part of their community (Figure 11), although those living in areas with high dependence on the forest industry were less likely to feel part of their community (62% in South Australia and 66% in Victoria) compared to those in areas with a low forestry dependence (75% in South Australia and 78% in Victoria). People living in (i) areas with high dependence on the forest industry within the South Australian Green Triangle, and (ii) areas with low dependence on the forest industry in the Victorian Green Triangle, were significantly more likely to report high crime in their community. When perceptions of local landscape aesthetics and environmental health were asked about (Figure 12), responses were positive overall. Similar proportions of residents reported liking the environment and surrounds they live in, and feeling their area has attractive natural landscapes, in all parts of the Green Triangle. Those living in forestry dependent communities in their community (87%) compared to those living in communities with less dependence on the industry (64%). Only 17% of those living in high forestry dependent communities in the South Australia part of the Green Triangle reported environmental degradation as a problem in their local region compared to 28% of South Australia as a whole.

The differences identified above are in many cases likely to be caused by factors other than the presence of the forest industry: for example, high concern about crime occurred in some forest industry dependent communities and not others, and also occurred in some communities with low dependence on the industry. Overall, the results suggests residents living in forest industry dependent communities have a similar quality of life to those living in communities with less dependence on the industry, while some community characteristics such as crime rates and road quality vary across communities in ways that do not appear associated with the presence of the forest industry. It is possible that higher road quality in forest industry communities in the South Australian Green Triangle has been influenced in part by forest industry efforts to improve funding for roads in the region.



Figure 10 Perceptions of overall liveability and economy of local region – Regional Wellbeing Survey 2016



Figure 11 Perceptions of friendliness, safety and crime



Figure 12 Perceptions of landscape aesthetics and environmental health

Perceptions of regional industries

After asking their overall perceptions of the liveability of their communities, residents were asked their views about how different local industries contribute to that liveability. In total, 1275 residents living in South Australia and 2849 residents living in Victoria answered questions about the socioeconomic effects of different industries. This included 214 living in the South Australian part of the Green Triangle and 344 living in the Victorian part. Of the Green Triangle respondents, a total of 314 lived in local government areas or towns with high dependence on the forest industry for employment.

Survey participants were asked to identify whether a number of industries were important to their community, including (i) forestry (defined in the survey as logging of native forests or plantations) and (ii) wood or paper product manufacturing. As shown in Figure 13, those who lived in LGAs with high forest industry dependence were much more likely to identify the forest industry as an important industry in their local community than those who lived in LGAs with little employment in the industry:

- South Australian Green Triangle: 91% of those who lived in Grant, Mount Gambier and Wattle Range (with higher forest industry dependence) felt the forest industry was important to their local community, compared to only 18% of those living in other parts of the South Australian Green Triangle. Fewer felt that wood and paper processing were important (61% in Grant, Mount Gambier and Wattle Range and 3% in other parts of the region)
- Victorian Green Triangle: 67% of those living in the LGAs of Glenelg and Southern Grampians (with higher forest industry dependence) felt that the forest industry was important to their community, compared to 13% of those living in other parts of the Green Triangle region of Victoria. Wood product manufacturing was considered an important industry by 17% in high forest industry dependent communities, and only 3% in other parts of the region.

Those who identified that each industry was important were then asked to rate whether they felt the industry had a negative impact, positive impact, or no impact, on the following in their local community: local employment; cost of living (food, rent); friendliness of the local community; health of local residents; traffic on local roads; quality of local roads; attractiveness of the local landscape; local water quality; health of local environment; bushfire risk; and land prices.

When asked to assess this for the forest industry, survey participants were asked to assess forestry, wood and paper manufacturing together. This section compares the views of Green Triangle residents about the forest industry with their perceptions of the two other industries most commonly identified as important in the region: agriculture and tourism.



Figure 13 Proportion of residents who viewed the different industries as important contributors to their local community

Residents of the Green Triangle generally perceived the forest industry as contributing strongly to job creation in the region. However, they were less likely to view it as having other types of positive impacts for local communities, and more likely to report concerns about negative effects, compared to the agriculture and tourism industries (Figures 14 to 17). Responses were similar for those who lived in communities with greater dependence on the forest industry, and for those living in communities in which fewer jobs depended on the industry (see Appendix 1).

The large majority of residents – 87% in the South Australian Green Triangle, 75% in the Victorian Green Triangle - felt the forest industry had positive impacts on local employment. Fewer than 40% felt the industry had positive impacts on other aspects of community liveability including cost of living, friendliness of the local community, health of local residents, safety and quality of roads, bushfire risk, landscape attractiveness, water quality, land prices or health of the local environment. When views about negative impacts were examined, the most common concerns reported about the forest industry were related to road impacts, bushfire risk and landscape aesthetics, with:

- 74% in the South Australian Green Triangle and 58% in the Victorian Green Triangle believing the industry had a negative impact on the quality of local roads
- 60% in the South Australian Green Triangle and 84% in the Victorian Green Triangle feeling the industry had a negative impact on the traffic on local roads
- 56% in the South Australian Green Triangle and 56% in the Victorian part feeling the industry had a negative impact on bushfire risk, and
- 39% in the South Australian part and 57% in the Victorian part reporting that they felt the forest industry had a negative impact on the attractiveness of the local landscape.

The results suggest that the forest industry is not viewed as either being as important an industry as agriculture and tourism, or as having positive outcomes for many aspects of community life other than employment. These perceptions will not always reflect objective measures of outcomes such as bushfire risk or environmental health; however, perceptions reflect how residents experience and view an industry.

In particular, the results suggest a lack of connection by many residents with the industry, with fewer feeling the industry contributes to friendliness of the local community compared to the agriculture and tourism industries. Working to address concerns about traffic, road quality, bushfire risk and landscape aesthetics, as well as to increase positive experiences of friendliness, can help address the relatively less positive perceptions reported of the forest industry compared to agriculture and tourism in the region.



Figure 14 Proportion of SA Green Triangle residents who felt the forestry, farming and tourism industries had a positive impact on different aspects of their local community



Figure 15 Proportion of Victorian Green Triangle residents who felt the forestry, farming and tourism industries had a positive impact on different aspects of their local community



Figure 16 Proportion of SA Green Triangle residents who felt the forestry, farming and tourism industries had a negative impact on different aspects of their local community



Figure 17 Proportion of Victorian Green Triangle residents who felt the forestry, farming and tourism industries had a negative impact on different aspects of their local community

Conclusions

This report quantified the employment and economic activity generated by the forest industry in the Green Triangle in 2016-2017, and identified the communities in which the industry generates a significant proportion of local jobs and economic activity. There are several LGAs which have a high economic dependence on the presence of the forest industry, in particular the LGAs of Mount Gambier, Wattle Range, Grant, Glenelg and Southern Grampians. In these LGAs the presence of the industry provides a significant proportion of economic activity, and acts to diversify the local economy, which can help maintain local economic activity during periods of lower activity in other key local industries such as agriculture and tourism. The majority of jobs generated by the industry are generated by the processing sector, as is the majority of the flow-on economic impact of the industry. This highlights the importance of local processing of wood and fibre for generation of jobs from the industry; far fewer jobs are created if logs are harvested and exported with no or little processing. Large declines have occurred in wood and paper manufacturing jobs in the region in the last decade, and these declines have only been partially offset by growth in jobs generated by harvest and haulage of hardwood plantations for woodchip export.

People living in regions with higher dependence on the forest industry for employment generally view their communities as being just as liveable, friendly, safe and pleasant to live in as those who live in other nearby communities with less forest industry activity. They do not, however, view the forest industry as positively as other industries operating in their local community: while recognising the employment contribution made by the industry, few perceive the industry as having positive impacts on other aspects of community life, and a significant proportion report concerns about effects of the industry on roads, bushfire risk and local landscapes.

While relatively few businesses feel demand will decline for their products, half report business conditions as being more challenging than usual, and many find it difficult to recruit some types of workers. Increasing labour and input costs and lack of investment in the industry are concerns for many businesses. These challenges suggest that there is a high likelihood of further decline in jobs in the industry over time – particularly in processing of wood and fibre products – unless there is significant new opportunity for investment in the industry.

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Appendix 1 Data tables

Table A1.1 Expenditure by the forest industry, 2015-16, by region

	Victorian Green Triangle South Au			Green Triangle	Green Triangle		
Type of expenditure	Value (\$m)	Proportion of total (%)	Value (\$m)	Proportion of total (%)	Value (\$m)	Proportion of total (%)	
Wages/Salaries	39.7	14%	157.1	22%	196.9	20%	
Other Services	22.7	8%	52.7	7%	91.4	9%	
Manufacturing	18.7	6%	42.5	6%	69.9	7%	
Retail and Wholesale Trade	10.8	4%	20.8	3%	33.3	3%	
Transport, Postal and Warehousing	8.0	3%	19.3	3%	29.9	3%	
Professional, Scientific and Technical Services	9.0	3%	17.5	2%	28.3	3%	
Annuities and donations	6.1	2%	8.0	1%	15.7	2%	
Mining	5.7	2%	9.7	1%	15.5	2%	
Electricity, Gas, Water and Waste Services	3.4	1%	8.3	1%	12.7	1%	
Agriculture	3.5	1%	5.5	1%	10.0	1%	
Construction	1.3	0%	2.8	0%	7.1	1%	
Communication	1.7	1%	3.9	1%	6.3	1%	
Other	1.1	0%	2.8	0%	4.4	0%	
Accommodation and Food Services	0.6	0%	1.1	0%	1.9	0%	
Education and Training	0.0	0%	0.0	0%	0.0	0%	
Sub-total	132.4	45%	352.1	50%	523.2	52%	
Expenditure outside the respective region	161.1	55%	354.2	50%	476.6	48%	
Total	293.5	100%	706.3	100%	999.8	100%	

Table A1.2 Expenditure by the forest industry, 2015-16, by industry sector

	Softwo	Softwood plantation		plantation	Green Triangle		
	Value	Proportion of		Proportion		Proportion	
Type of expenditure	(\$m)	total (%)	Value (\$m)	of total (%)	Value (\$m)	of total (%)	
Wages/Salaries	102.5	28%	45.1	16%	196.9	20%	
Other Services	32.2	9%	25.5	9%	91.4	9%	
Manufacturing	23.6	7%	19.0	7%	69.9	7%	
Retail and Wholesale Trade	13.1	4%	12.0	4%	33.3	3%	
Transport, Postal and Warehousing	9.4	3%	7.9	3%	29.9	3%	
Professional, Scientific and Technical Services	10.6	3%	9.8	4%	28.3	3%	
Annuities and donations	4.1	1%	9.4	3%	15.7	2%	
Mining	9.3	3%	6.1	2%	15.5	2%	
Electricity, Gas, Water and Waste Services	4.1	1%	3.2	1%	12.7	1%	
Agriculture	2.9	1%	4.3	2%	10.0	1%	
Construction	2.7	1%	2.1	1%	7.1	1%	
Communication	2.0	1%	2.1	1%	6.3	1%	
Other	1.4	0%	1.0	0%	4.4	0%	
Accommodation and Food Services	0.6	0%	0.7	0%	1.9	0%	
Education and Training	0.0	0%	0.0	0%	0.0	0%	
Sub-total	218.6	61%	148.3	53%	523.2	52%	
Expenditure outside the Green Triangle	142.2	39%	130.7	47%	476.6	48%	
Total	360.9	100%	279.1	100%	999.8	100%	

	Growers (forest management companies)	Wood and paper processing	Harvest & haulage contracting businesses	Other (including consultants, equipment sales, training)	Nurseries, silvicultural & roading contracting businesses	Whole industry (excludes transfers)
Output ^a (\$m)	176.3	558.6	101.3	10.0	12.7	532.3
Direct (\$m)	148.0	448.0	62.1	6.3	8.0	345.8
Production-induced (\$m)	20.4	83.0	21.6	2.2	2.5	129.6
Consumption-induced (\$m)	7.9	27.6	17.6	1.4	2.3	56.9
GRP (\$m)	61.6	71.7	38.4	4.3	5.4	181.4
Direct (\$m)	49.1	23.4	19.7	2.6	3.0	97.7
Production-induced (\$m)	7.9	32.1	8.4	0.9	1.1	50.3
Consumption-induced (\$m)	4.6	16.2	10.3	0.8	1.4	33.4
Household Income (\$m)	12.3	43.0	27.4	2.3	3.6	88.6
Direct (\$m)	4.6	14.9	16.8	1.3	2.2	39.7
Production-induced (\$m)	5.5	20.5	5.8	0.6	0.7	33.1
Consumption-induced (\$m)	2.2	7.6	4.9	0.4	0.6	15.7
Employment (total)	174	516	403	67	93	1,253
Direct (total)	65	108	239	52	72	536
Production-induced (total)	73	280	82	8	10	453
Consumption-induced (total)	37	128	82	7	11	264

Table A1.3 Economic impacts of the Green Triangle forest industry, by sector, on the Victorian part of the Green Triangle

a - Total output for combined sectors may be lower than the sum of output for individual sectors as it excludes transfers between sectors to prevent double counting.
	Growers (forest management companies)	Wood and paper processing	Harvest & haulage contracting businesses	Other (including consultants, equipment sales, training)	Nurseries, silvicultural & roading contracting businesses	Whole industry (excludes transfers)
Output ^a (\$m)	171.7	1,035.3	207.9	64.5	14.2	1,273.4
Direct (\$m)	151.6	718.2	127.4	38.6	9.0	824.5
Production-induced (\$m)	8.8	192.7	41.6	15.0	2.5	260.6
Consumption-induced (\$m)	11.4	124.4	38.9	10.9	2.7	188.3
GRP (\$m)	51.4	340.3	81.2	25.5	6.1	504.6
Direct (\$m)	41.0	187.3	40.8	12.6	3.4	285.1
Production-induced (\$m)	3.7	80.0	17.6	6.5	1.1	109.0
Consumption-induced (\$m)	6.7	72.9	22.8	6.4	1.6	110.4
Household Income (\$m)	16.7	182.7	57.2	16.0	4.0	276.6
Direct (\$m)	11.1	99.7	35.0	8.8	2.5	157.1
Production-induced (\$m)	2.4	48.3	11.3	4.2	0.7	66.9
Consumption-induced (\$m)	3.2	34.7	10.9	3.0	0.8	52.6
Employment (total)	178	2,503	845	134	106	3,767
Direct (total)	84	1,145	480	17	81	1,807
Production-induced (total)	33	698	158	59	11	960
Consumption-induced (total)	60	660	207	58	15	999

Table A1.4 Economic impacts of the Green Triangle forest industry, by sector, on the South Australian part of the Green Triangle

Table A1.5 Economic impacts of the Green Triangle hardwood plantation industry on the Green Triangle region

	Growers (forest management companies)	Wood and paper processing	Harvest & haulage contracting businesses	Other (including consultants, equipment sales, training)	Nurseries, silvicultural & roading contracting businesses	Whole industry (excludes transfers)
Output ^a (\$m)	197.8	379.1	211.9	4.9	12.4	550.7
Direct (\$m)	160.3	297.5	121.4	3.0	7.2	334.0
Production-induced (\$m)	27.3	63.6	51.6	1.1	2.9	146.5
Consumption-induced (\$m)	10.2	18.0	38.8	0.8	2.4	70.2
GRP (\$m)	71.0	45.6	82.1	2.2	5.4	206.2
Direct (\$m)	54.2	9.3	38.7	1.3	2.7	106.2
Production-induced (\$m)	10.9	25.8	20.8	0.5	1.3	59.3
Consumption-induced (\$m)	5.9	10.4	22.5	0.5	1.4	40.7
Household Income (\$m)	14.9	26.3	56.7	1.1	3.5	102.5
Direct (\$m)	4.8	5.3	32.4	0.6	2.0	45.1
Production-induced (\$m)	7.3	16.0	13.6	0.3	0.8	38.0
Consumption-induced (\$m)	2.8	5.0	10.7	0.2	0.7	19.3
Employment (total)	216	346	832	39	88	1,519
Direct (total)	72	41	461	31	65	670
Production-induced (total)	95	219	186	4	11	515
Consumption-induced (total)	49	86	184	4	11	334

n.p. - not published in order to preserve respondent confidentiality.

Table A1.6 Economic impacts of the Green Triangle softwood plantation industry on the Green Triangle region

	Growers (forest management companies)	Wood and paper processing	Harvest & haulage contracting businesses	Other (including consultants, equipment sales, training)	Nurseries, silvicultural & roading contracting businesses	Whole industry (excludes transfers)
Output ^a (\$m)	156.5	658.0	107.9	26.4	16.8	713.6
Direct (\$m)	138.1	457.4	61.5	15.3	9.7	430.1
Production-induced (\$m)	7.5	118.1	25.9	6.7	3.8	162.0
Consumption-induced (\$m)	10.9	82.5	20.5	4.4	3.2	121.5
GRP (\$m)	45.8	212.1	42.0	10.5	7.2	317.6
Direct (\$m)	36.3	116.4	19.6	5.2	3.7	181.1
Production-induced (\$m)	3.2	47.9	10.5	2.8	1.7	66.0
Consumption-induced (\$m)	6.3	47.9	11.9	2.6	1.9	70.5
Household Income (\$m)	15.9	120.4	30.0	6.5	4.7	177.4
Direct (\$m)	10.9	68.1	17.5	3.4	2.7	102.5
Production-induced (\$m)	2.0	29.6	6.8	1.9	1.1	41.4
Consumption-induced (\$m)	3.0	22.7	5.7	1.2	0.9	33.5
Employment (total)	155	1,630	423	78	118	2,404
Direct (total)	76	832	232	33	88	1,260
Production-induced (total)	27	406	94	24	15	566
Consumption-induced (total)	52	392	98	21	15	578

n.p. - not published in order to preserve respondent confidentiality.

	Growers (forest management companies)	Wood and paper processing	Harvest & haulage contracting businesses	Other (including consultants, equipment sales, training)	Nurseries, silvicultural & roading contracting businesses	Whole industry (excludes transfers)
Output ^a (\$m)	355.6	1,661.4	331.3	77.9	29.2	1,908.5
Direct (\$m)	299.6	1,166.3	189.5	44.9	16.9	1,170.3
Production-induced (\$m)	34.8	329.1	80.2	19.9	6.7	470.8
Consumption-induced (\$m)	21.2	166.0	61.5	13.1	5.6	267.4
GRP (\$m)	116.5	439.9	128.6	30.9	12.6	728.6
Direct (\$m)	90.1	210.7	60.5	15.2	6.4	382.9
Production-induced (\$m)	14.1	132.8	32.4	8.1	3.0	190.5
Consumption-induced (\$m)	12.3	96.3	35.7	7.6	3.2	155.2
Household Income (\$m)	31.0	242.4	89.9	19.1	8.2	390.5
Direct (\$m)	15.8	114.5	51.8	10.0	4.7	196.9
Production-induced (\$m)	9.3	82.2	21.1	5.5	1.9	120.0
Consumption-induced (\$m)	5.8	45.7	16.9	3.6	1.5	73.7
Employment (total)	372	3,164	1,301	202	206	5,247
Direct (total)	149	1,253	719	69	153	2,344
Production-induced (total)	122	1,122	289	71	26	1,632
Consumption-induced (total)	101	789	293	62	27	1,271

Table A1.7 Economic impacts of the Green Triangle forest industry – whole industry – on the Green Triangle region

	Growers (forest management companies)	Wood and paper processing	Harvest & haulage contracting businesses	Other (including consultants, equipment sales, training)	Nurseries, silvicultural & roading contracting businesses	Whole industry (excludes transfers)
Output ^a (\$m)	280.7	1,097.1	216.6	23.2	29.1	1,267.0
Direct (\$m)	160.4	556.2	64.7	7.2	8.8	417.7
Production-induced (\$m)	62.5	288.0	68.8	7.3	8.8	435.4
Consumption-induced (\$m)	57.8	252.8	83.1	8.7	11.5	413.9
GRP (\$m)	110.6	307.5	91.9	10.7	13.1	533.8
Direct (\$m)	53.5	56.1	20.5	3.0	3.3	136.4
Production-induced (\$m)	27.3	120.5	28.4	3.2	3.8	183.2
Consumption-induced (\$m)	29.9	130.8	43.0	4.5	6.0	214.2
Household Income (\$m)	41.0	179.3	58.9	6.2	8.2	293.5
Direct (\$m)	6.7	33.7	17.4	1.6	2.5	62.0
Production-induced (\$m)	18.3	75.6	18.5	2.1	2.5	117.0
Consumption-induced (\$m)	16.0	70.0	23.0	2.4	3.2	114.5
Employment (total)	484	2,117	755	113	151	3,620
Direct (total)	82	394	249	60	82	867
Production-induced (total)	193	811	207	22	28	1,261
Consumption-induced (total)	209	912	300	31	41	1,493

Table A1.8 Economic impacts on Victoria of the Victorian part of the Green Triangle forest industry and forest industry in the rest of Victoria dependent on the Green Triangle

Table A1.9 Economic impacts on South Australia	of the South Australian part of	of the Green Triangle forest industry
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	Growers (forest management companies)	Wood and paper processing	Harvest & haulage contracting businesses	Other (including consultants, equipment sales, training)	Nurseries, silvicultural & roading contracting businesses	Whole industry (excludes transfers)
Output ^a (\$m)	196.8	1,551.0	322.9	97.9	22.3	1,970.6
Direct (\$m)	151.6	718.2	127.4	38.6	9.0	824.5
Production-induced (\$m)	20.1	488.2	99.9	32.0	6.6	646.8
Consumption-induced (\$m)	25.0	344.6	95.6	27.2	6.7	499.2
GRP (\$m)	64.6	604.0	140.1	43.1	10.3	862.1
Direct (\$m)	41.0	187.3	40.8	12.6	3.4	285.1
Production-induced (\$m)	9.4	221.7	45.2	15.1	3.1	294.6
Consumption-induced (\$m)	14.2	195.0	54.1	15.4	3.8	282.4
Household Income (\$m)	24.5	337.3	93.6	26.6	6.6	488.6
Direct (\$m)	11.1	99.7	35.0	8.8	2.5	157.1
Production-induced (\$m)	6.2	139.0	31.2	10.1	2.1	188.6
Consumption-induced (\$m)	7.2	98.6	27.4	7.8	1.9	142.8
Employment (total)	261	4,331	1,258	250	135	6,236
Direct (total)	84	1,145	480	17	81	1,807
Production-induced (total)	77	1,809	396	124	28	2,434
Consumption-induced (total)	100	1,377	382	109	27	1,995

			LGAs/towns					LGAs/towns	LGAs/towns
		LGAs/towns	with LOW		LGAs/towns	LGAs/towns		with HIGH	with LOW
		with HIGH	forest	All	with HIGH	with LOW	All	forest	forest
		forest industry	industry	resident	forest industry	forest industry	resident	industry	industry
	All residents	dependence	dependence	S	dependence	dependence	S	dependence	dependence
	Forestry,								
	wood &	Forestry, wood	Forestry,						
	paper	& paper	wood & paper						
	manufacturin	manufacturing	manufacturin	Farming	Farming		Tourism	Tourism	Tourism
	g (n=106)	(n=98)	g (n=8)	(n=170)	(n=110)	Farming (n=63)	(n=101)	(n=78)	(n=23)
Local employment	6%	3%		2%	3%	2%	2%	3%	0%
Cost of living	8%	8%		5%	1%	6%	10%	10%	8%
(food, rent)	870	870	_	578	470	078	1078	1078	870
Friendliness of the	7%	5%		2%	20/	7%	2%	1%	0%
local community	770	578		270	570	270	370	470	078
Health of local	24%	25%		5%	4%	5%	1%	1%	0%
residents	2470	23/6	_	570	470	5/0	170	1/0	0/0
Traffic on local	60%	60%		32%	33%	30%	42%	46%	29%
roads	00/0	00/0	Not reported	32/0	00/0	5070	1270	10/0	23/0
Quality of local	74%	75%	due to low	44%	46%	40%	33%	32%	39%
roads	, 1,0	, 3, 6	sample size	11/0	10/0	10/10	00/0	52/6	33/0
Attractiveness of			00						
the local	39%	37%		5%	7%	2%	5%	4%	8%
landscape									
Local water	27%	26%		27%	30%	22%	5%	5%	5%
quality	2770	20/6		2770	50/0	2270	3/0	3/0	570
Health of local	30%	29%		14%	19%	5%	10%	10%	8%
environment	5570	2370		1 -170	10/10	570	10/0	10/0	870
Bushfire risk	56%	55%	<u>.</u>	27%	33%	17%	20%	19%	22%
Land prices	19%	19%		14%	20%	5%	11%	12%	9%

Table A1.10 Proportion of South Australian Green Triangle residents who reported the forest, farming and tourism industries had a NEGATIVE impact on different aspects of community life

	All residents	LGAs/towns with HIGH forest industry	LGAs/towns with LOW forest industry	All resident	LGAs/towns with HIGH forest industry	LGAs/towns with LOW forest industry	All resident	LGAs/towns with HIGH forest industry	LGAs/towns with LOW forest industry
	Airresidents	dependence	dependence	3	dependence	dependence	3	dependence	dependence
	Forestry,								
	wood &	Forestry, wood	Forestry,						
	paper	& paper	wood & paper						
	manufacturin	manufacturing	manufacturin	Farming	Farming	Farming	Tourism	Tourism	Tourism
	g (n=105)	(n=88)	g (n=17)	(n=296)	(n=137)	(n=159)	(n=165)	(n=72)	(n=92)
Local employment	16%	16%		3%	3%	2%	2%	3%	2%
Cost of living (food, rent)	8%	8%		6%	6%	5%	18%	5%	28%
Friendliness of the local community	15%	17%		4%	4%	4%	4%	1%	5%
Health of local residents	12%	14%		15%	14%	16%	4%	1%	5%
Traffic on local roads	84%	88%		44%	45%	43%	50%	40%	57%
Quality of local roads	85%	89%	due to low	62%	62%	62%	54%	47%	59%
Attractiveness of			sumple size						
the local	57%	62%		11%	9%	14%	2%	0%	4%
landscape									
Local water quality	32%	33%		18%	17%	19%	7%	5%	9%
Health of local environment	35%	35%		21%	14%	26%	13%	7%	17%
Bushfire risk	56%	61%	-	19%	23%	16%	15%	14%	16%
Land prices	30%	30%	-	11%	7%	14%	19%	5%	30%

Table A1.11 Proportion of Victorian Green Triangle residents who reported the forest, farming and tourism industries had a NEGATIVE impact on different aspects of community life

	All residents	LGAs/towns with HIGH forest industry dependence	LGAs/towns with LOW forest industry dependence	All resident s	LGAs/towns with HIGH forest industry dependence	LGAs/towns with LOW forest industry dependence	All resident s	LGAs/towns with HIGH forest industry dependence	LGAs/towns with LOW forest industry dependence
	Forestry, wood &	Forestry,	-		-	-		-	-
	paper	wood & paper							
	manufacturing	manufacturin		Farming	Farming	Farming	Tourism	Tourism	Tourism
	(n=106)	g (n=98)		(n=170)	(n=110)	(n=63)	(n=101)	(n=78)	(n=23)
Local employment	87%	91%		93%	91%	97%	94%	95%	92%
Cost of living (food, rent)	38%	41%		59%	57%	62%	41%	39%	50%
Friendliness of the local community	37%	39%	Not reported	82%	78%	89%	79%	78%	83%
Health of local residents	35%	36%	due to low	63%	61%	67%	39%	39%	39%
Traffic on local roads	21%	21%	sample size	31%	23%	44%	28%	25%	38%
Quality of local roads	15%	15%		24%	16%	37%	20%	22%	13%
Attractiveness of the local landscape	32%	35%		66%	62%	73%	72%	69%	83%
Local water quality	22%	23%		33%	28%	43%	28%	29%	23%
Health of local environment	33%	34%		51%	45%	60%	39%	37%	46%
Bushfire risk	24%	24%		41%	28%	63%	22%	16%	39%
Land prices	18%	18%		59%	45%	83%	31%	29%	35%

Table A1.12 Proportion of South Australian Green Triangle residents who reported the forest, farming and tourism industries had a POSITIVE impact on different aspects of community life

Table A1.13 Proportion of Victorian Green Triangle residents who reported the forest, farming and tourism industries had a POSITIVE impact on different aspects of community life

		LGAs/towns with HIGH	LGAs/towns		LGAs/towns	LGAs/towns with LOW		LGAs/towns	LGAs/towns with LOW
		forest	forest	All	forest	forest	All	forest	forest
		industry	industry	resident	industry	industry	resident	industry	industry
	All residents	dependence	dependence	S	dependence	dependence	S	dependence	dependence
		Forestry,							
	Forestry, wood &	wood &	Forestry,						
	paper	paper	wood & paper						
	manufacturing	manufacturi	manufacturin	Farming	Farming	Farming	Tourism	Tourism	Tourism
	(n=105)	ng (n=88)	g (n=17)	(n=296)	(n=137)	(n=159)	(n=165)	(n=72)	(n=92)
Local employment	75%	75%		92%	93%	91%	86%	82%	88%
Cost of living (food, rent)	32%	34%		46%	42%	50%	31%	27%	33%
Friendliness of the local community	25%	26%		70%	71%	70%	72%	70%	74%
Health of local residents	26%	26%		52%	45%	57%	36%	28%	43%
Traffic on local roads	13%	11%	Not reported	28%	28%	28%	23%	26%	21%
Quality of local roads	12%	10%	due to low	18%	17%	18%	13%	7%	17%
Attractiveness of the local	25%	20%	sample size	50%	60%	5.8%	5.8%	10%	65%
landscape	2370	2078		55/0	00%	36/6	36%	4970	05/0
Local water quality	11%	9%		34%	32%	35%	17%	11%	21%
Health of local environment	22%	18%		45%	48%	43%	33%	23%	40%
Bushfire risk	18%	14%		42%	43%	40%	17%	16%	17%
Land prices	29%	29%		59%	64%	53%	29%	23%	33%

Appendix 2 Using ABS Census data to identify employment in secondary processing

Data from the ABS Census were used to estimate the number of jobs generated in 'secondary processing', defined as processing in which already processed wood and paper products are further processed. As described in the main body of this report, primary processing was defined as the jobs generated at processing plants which take in roundwood products and transform roundwood into initial wood and paper products. In some cases, sites that take in roundwood further process initial wood and fibre products into secondary processed products. For simplicity, all the employment at these sites was counted as 'primary processing'.

Our definition of primary processing employment is therefore that it is the employment generated at sites that process wood and fibre products from roundwood. Secondary processing occurs at sites that take in already processed wood and fibre products and further process these.

When using ABS Census data, a two-step process was used to identify employment in primary processing versus secondary processing. First, jobs were classified into 'primary' and 'secondary' processing based on the industry categories defined in ANZ-SNZ (2016), as follows:

- Primary processing: The following four digit ANZSIC categories were considered to be predominantly composed of primary processing activities:
 - Log Sawmilling and Timber Dressing, not further defined
 - Log Sawmilling
 - Wood Chipping
 - Timber Resawing and Dressing
 - o Other Wood Product Manufacturing, not further defined
 - Reconstituted Wood Product Manufacturing
 - Veneer and Plywood Manufacturing
 - Pulp, Paper and Converted Paper Product Manufacturing, not further defined
 - Pulp, Paper and Paperboard Manufacturing.
- Secondary processing: The following four digit ANZSIC categories were considered to be predominantly composed of secondary processing activities:
 - Wood Product Manufacturing, not further defined.
 - Prefabricated Wooden Building Manufacturing
 - o Wood Structural Fitting and Component Manufacturing
 - Other Wood Product Manufacturing not elsewhere classified
 - o Converted Paper Product Manufacturing, not further defined
 - o Corrugated Paperboard and Paperboard Container Manufacturing
 - Paper Bag Manufacturing
 - Paper Stationery Manufacturing
 - Sanitary Paper Product Manufacturing
 - Other Converted Paper Product Manufacturing.

However, there are cases in which either (i) Census data are mis-classified, with workers at a given facility classified into an incorrect industry category, or in which (ii) while correctly classified

according to the industry definitions used by the ABS, a wood or paper processing facility classified as primary processing does not utilise roundwood as an input and is in fact a secondary processor.

Therefore, the second step in analysis was to compare known data from our industry survey to ABS data, and identify areas in which data did not match. Where there was a mismatch, the businesses involved were then identified and contacted to confirm whether or not they were a primary processor or secondary processor. The only adjustment made as part of this process was a classification of some paper product manufacturing workers as 'primary processing' workers, due to a historical reliance on pulp produced in the Green Triangle that only changed in recent years.

ABS Census data used in this report have been randomised. This means that numbers have been randomly adjusted by small amounts when produced by the ABS TableBuilderPro product. Because of this randomisation, the ABS Census data we present will vary by small amounts (usually less than 20-30 workers in any given region) from other analyses.