

Socio-economic impacts of the forest industry

Western Australia

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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, 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. This report presents findings for the forest industry in WA, focusing on the industry dependent on native forest, softwood plantations and hardwood plantations. Sandalwood plantations and firewood collection are not examined in this report.

The data analysed for this report was drawn from (i) a survey of forest industry businesses conducted in 2016 to 2017, in which 71% of businesses completed the survey, while data on the remaining 29% was 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. In addition, a survey of businesses who utilise outputs of primary processors was undertaken to better identify the extent of activity generated through the supply chain by wood and fibre grown in WA.

Understanding the forest industry

WA's forest industry includes wood and fibre production from native forest, hardwood plantations and softwood plantations grown within the State, 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 - native forest and 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 on harvest of wood and fibre from native forest and plantations grown in WA. These 'primary' products are then either sold directly into end-use markets, for example into industries such as construction; or are sold for further processing into 'secondary' products by other processors. In the third part of the supply chain, the 'secondary processing' sector, those primary wood and fibre products sold for further processing are further processed into a range of products (for example, cabinets, furniture, and paper packaging products). While secondary processing jobs still rely on wood and fibre as a key input in processing, the wood or fibre used can be sourced either from WA-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.

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

This report principally examines the primary production and primary processing parts of the WA forest industry. It also provides analysis of the activity generated beyond primary processing 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*, and a survey of businesses who further process primary processed products. This report focuses on the employment and economic activity generated as a result of harvesting of wood and fibre from native forest and plantations, and the production of wood and paper products. The plantations and native forest managed for timber production in WA also often provide a base for other socio-economic activities, such as bee keeping, livestock grazing, mountain biking, bushwalking, horse riding, and hunting. These activities are not examined in this report.

In this report, forest industry activities are analysed for four regions: the South-West, Great Southern and Esperance, Wheatbelt, and Perth.

Economic value

In 2015-16, the direct value of output generated by the WA forest industry at the point of sale of primary processed products was \$649 million, increasing to \$1,405 million when flow-on effects generated in other industries as a result of spending by the forest industry are included. This total included \$220 million dependent on native forests, \$617 million dependent on softwood plantation and \$568 million dependent on hardwood plantations. 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 around \$257 million to GRP in WA, and a total of \$643 million once flow-on effects through the entire economy were included. This total included \$104 million dependent on native forests, \$274 million dependent on softwood plantation and \$265 million dependent on hardwood plantations. The contributions to total GRP by region were \$162 million in the Great Southern and Esperance, \$327 million in the South West and \$26 million in the Wheatbelt, with the remainder in Perth or other parts of WA.

Employment

The forest industry in WA generated a total of 2,114 direct jobs up to the point of primary processing in the first half of 2017. The estimated flow-on employment generated was an additional 2,456 jobs, meaning the industry as a whole contributed around 4,570 jobs to the WA economy up to and including primary processing. In addition to this, a further 1,495 jobs were generated in secondary processing as of August 2016. The majority of direct jobs in the industry – two thirds – are generated in the processing of wood and paper products, while just over 30% are generated by the growing and harvest of plantations. This highlights the importance of establishment of local processing facilities to generating regional economic activity from the industry.

When broken down by region and sector:

- A total of 1,279 jobs were generated in the Great Southern and Esperance, including 537 direct jobs up to and including primary processing, 717 flow-on jobs from these direct jobs, and a further 24 jobs in secondary wood and paper processing
- A total of 2,763 jobs were generated in the South West region, including 1,304 direct jobs up to and including primary processing, 1,355 flow-on jobs from these direct jobs, and a further 93 jobs in secondary wood and paper processing
- A total of 738 jobs were generated in the Wheatbelt region including 101 direct jobs up to and including primary processing, 112 flow-on jobs from these direct jobs, and a further 524 jobs in secondary wood and paper processing.

Up to the point of primary processing, a total of 508 direct jobs were generated by the native forest industry, 863 by softwood plantations, and 743 by hardwood plantations grown in WA. A further 1,495 jobs were generated by secondary processing activities that use wood and fibre products both from the WA forest industry and imported from interstate or overseas. As of 2017, between 245 and 490 of these secondary processing jobs were dependent on timber grown in WA; and another 120 to 140 jobs were generated by the use of primary processing residues (principally sawdust and bark) by garden and landscape businesses.

Many of the jobs generated by the WA forest industry are located in just a few local government areas (LGAs). The LGAs with the largest proportion of workers employed directly in the industry (including secondary processing jobs) in the first half of were Nannup, with 13.2% of the workforce employed directly in the forest industry, followed by Manjimup (5.6%), Bridgetown-Greenbushes (3.8%), Plantagenet (3.2%), Bunbury (2.9%), Albany (2.6%), (2.0%) and Denmark (2.0%). In other LGAs less than 2% of jobs were generated directly by the forest industry. There has been some change since the time data were collected for this project: in the second half of 2017, there were announcements of job losses at Nannup Timber Processing, which mean it is likely that the number of jobs in the industry has declined in Nannup since the time data were collected for this project (ABC 2017).

There is little information available on how employment is changing in the forest industry over time. The only two sources of data on change over time are (i) the ABS Census of Population and Housing (Census), and (ii) surveys of the forest industry up to the point of primary processing. Data from both these sources show an overall decline in forest industry employment over time. Census data show that employment in wood and paper processing declined substantially between 2006 and 2016, with many jobs lost in the secondary processing sector in particular between 2011 and 2016. These job losses were offset to some extent between 2011 and 2016 by growth in employment in jobs in harvest, haulage and management of forests and plantations.

Jobs generated by activities beyond primary processing were examined by surveying businesses who purchase some of their inputs from primary processors and further process them. These included businesses engaged in garden and landscaping activities (using woodchips and sawdust from primary processors), and in manufacturing of flooring, joinery, trusses and frames, wooden furniture, pallets and containers. Overall, between 16% and 33% of the jobs generated in these activities rely on wood

and fibre grown in WA, while the remainder of jobs in these businesses utilises wood and fibre imported into WA.

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 WA forest industry generates more full-time jobs than other industries, with 84% of those employed in the industry working full-time in 2016, compared to 68% of the broader workforce. Workers in some parts of the industry work longer hours than is typical in most industries, particularly those employed in harvest and haulage contracting firms. In 2016, forest industry workers were less likely than those in other industries to earn lower incomes (less than \$649 per week), and more likely to earn higher incomes (above \$1,250 per week). This was largely due to the higher rates of full-time work in the industry.

Workforce diversity and sustainability

To be sustainable over time, every industry needs to successfully recruit and retain workers. In the WA forest industry, only 21% of workers were female in 2016 (compared to 47% of the broader employed labour force). The industry's workforce aged at a slightly faster rate between 2011 and 2016 than the rest of the workforce, and was slightly older than was typical for the workforce in 2016.

When asked how easy or difficult they found it to recruit different types of workers, two-thirds of forest industry businesses reported finding it difficult to recruit heavy machinery operators, managers and high level professional staff, while half found it difficult to recruit transportation (haulage) workers). When asked what factors made it difficult to recruit staff, a lack of available workers with appropriate skills was the top issue identified by 72% of businesses, followed by lack of certainty about the future of the industry (60%), lack of suitable local workers (59%), the large time and investment required to build worker skills (56%), other businesses being able to offer higher wages or better working conditions (53%), and negative perceptions of the industry (47%). Uncertainty about the future and negative perceptions of the industry were more commonly reported by businesses in the native forest sector.

Industry skills and training needs

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. Businesses most commonly reported needing workers with chainsaw and other hand-held machinery skills. This was followed by occupational health and safety training (94% of businesses) and compliance training (83%), while fire-fighting, heavy machinery operation, business and financial management, and marketing/sales skills were needed by more than 70% of businesses. There was variation in needs for skills and accreditation between businesses types, with some skills specialised to particular parts of the industry.

As of 2016, workers in most parts of the WA forest industry were less likely to have completed high school than those working in other industries in the same regions. However, forest industry workers were similarly likely to have completed a certificate qualification as those in other parts of the

workforce. Completion of a Bachelor degree or other university qualification was lower than the average for the employed labour force in most parts of the industry.

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. Businesses dependent on hardwood plantations predominantly reported that business conditions were the same as usual or easier than usual, with very few reporting they were harder than usual. Those operating native forest-dependent businesses predominantly reported business conditions as being more challenging than usual (71%), or the same as usual (18%), with very few reporting conditions were easier than usual (12%). In the softwood sector, most businesses (75%) reported business conditions were more challenging than usual. Most businesses (54%) felt demand would remain the same for their services and products in the next year, just over one third (36%) felt that demand would grow and few (11%) that demand would reduce. Hardwood plantation dependent businesses were more positive, with 55% believing demand was likely to grow for their products or services, while softwood plantation businesses were most likely to report demand would shrink (25%) and least likely to report it was likely to grow (25%). In the native forest sector, despite many reporting challenging business conditions, demand was forecast by most to stay the same or grow.

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 issues across the industry were lack of access to resource (in the form of harvestable timber from native forest or plantations), and market demand for timber products. Most businesses reported that challenges experienced in the last three years including a lack of investment in the industry, lack of demand for goods, and difficulty maintaining competitiveness with other similar businesses, with 50% to 65% of all businesses reporting these were big challenges for them. Poor telecommunications and government regulation were also challenges for a significant proportion (45%) of WA's 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 South West, Great Southern and Esperance, and Wheatbelt regions, 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. Overall, the results suggest that those living in regions with higher dependence on the forest industry are just as or likely to rate their community as highly liveable, friendly, safe and aesthetically pleasant as those living in nearby communities with less dependence on the forest industry.

Residents were also asked their views about how different local industries contribute to the liveability of their communities. Their views about the contributions of the forestry, agriculture and tourism industries were compared. In communities in the Great Southern and South West, residents generally perceived the forest industry as having fewer positive effects than the farming and tourism

industries, and more negative effects. While the large majority of residents – 76% in the Great Southern and Esperance region, and 71% in the South West region - felt the forest industry had positive impacts on local employment, fewer than 25% 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. The industry was viewed by a majority of residents as having negative impacts on roads and local landscape aesthetics.

Conclusions

This report examined the employment and economic activity generated by the WA forest industry, and identified the communities in which the industry generates a significant proportion of local jobs. The analysis shows that, overall, the number of jobs generated by the industry has declined significantly since 2006, although employment generated by hardwood plantations has grown. 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; 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. These challenges suggest that the current trend of ongoing decline in employment – particularly in processing of wood and fibre products - is likely to continue in the softwood plantation and native forest sectors unless there is significant new opportunity for investment in the industry.

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 parts of New South Wales, Victoria, South Australia, Tasmania, Queensland and Western Australia. This report presents findings for the forest industry in Western Australia (WA), including activity dependent on the harvest of timber for commercial sale from softwood plantation, hardwood plantation and native forests. It does not examine sandalwood production or firewood production. This report was also supported by funding provided by the Forest Products Commission and the Forest Industries Federation of Western Australia

This report examines the following aspects of the WA forest industry:

- Economic value of the industry up to the point of primary processing, including direct and flow-on economic activity
- Employment generated by the industry by the growing, harvesting and primary processing of wood and fibre from native forests and plantations in WA, including direct and flow-on jobs
- Activity generated beyond primary processing, including further processing and markets for residue products
- 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, and
- Community perceptions of the industry.

Methods

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

- 2016-17 industry survey: A survey of forest industry businesses operating the Western Australia study region, conducted between October 2016 and February 2017. Of 51 key businesses operating in the industry (including nurseries plantation management businesses, silvicultural contractors, harvest and haulage contractors, and wood and paper processors), 17 completed the full survey, 19 provided information by phone or completed part of the survey, and information on the remaining 15 was provided by industry experts (predominantly by businesses that contracted, supplied or otherwise engaged with these businesses). Additionally, information on a number of smaller silvicultural contracting and supply businesses was obtained through consultation with forest managers who used their services.
- 2017 supply chain survey: A survey of businesses that used primary-processed wood or fibre products as inputs in their business was conducted to further analyse the jobs generated by harvesting of wood and fibre from WA's native forests and plantations. Of 62 businesses contacted, 24 completed the full survey (39%), basic information was obtained for 29, and 9 did not participate in the survey.
- 2006, 2011 and 2016 Census: Data from the 2006 and 2011 Australian Bureau of Statistics (ABS) *Census of Population and Housing* were drawn on to examine working conditions and socio-demographic characteristics of the industry's workforce.
- Economic modelling: Economic modelling using EconSearch RISE (Regional Industry Structure and Employment) input-output models has been used to identify regional 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.

Overview of the Western Australian forest industry

The Western Australian (WA) forest industry is diverse and includes growing, harvesting, and processing of wood and fibre products. Processing depends both on wood and fibre grown in WA, and on wood and fibre grown elsewhere that is imported into WA. This section briefly describes the industry. First, the structure of the industry is described, focusing on the supply chain from plantation and native forest management and harvesting through to processing of a range of products based on both WA-grown wood and fibre and wood and fibre imported from other locations. The second part then describes the industry sectors that are dependent on native forest, softwood plantation and hardwood plantations in more detail.

Industry structure

The forest industry in WA, 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 (harvested logs) into initial products such as sawn timber, woodchips and basic pulp and paper products, and usually uses logs from plantation or native forest 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 native forests and plantations. The activities involved in primary production include management of native forest and plantation by forest management businesses and agencies, silvicultural contractors, and harvesting and haulage of logs to primary processors.

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 wood and paper processing sector is based almost entirely on wood and fibre grown in WA. This means that the primary production of logs and primary processing combine to create a strongly inter-linked supply chain within WA. This supply chain generates employment and economic activity based on the management and harvesting of mostly WA-grown logs for wood and fibre production from native forests, softwood plantations and hardwood plantations. Harvested logs from native forest and 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 end use markets such as the construction industry, or sold for further processing into 'secondary' products by other processors.

3. Jobs generated in 'secondary' processing. Secondary processing involves 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 and fibre inputs are often combined with other products (for example, fabric covers on furniture, plastic components), and may be sourced from WA-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. In addition to this, many of the residues produced in primary processing (for example, bark, sawdust and docking ends of logs) are sold to businesses such as firewood sellers, agricultural businesses for use as animal bedding, and garden and landscape businesses. A survey of secondary processors (including businesses utilising primary processing residues) was undertaken to better determine the proportion of their wood and fibre inputs that are sourced from WA versus from other locations.

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 and including the 'primary processing' stage. The primary processing stage was defined for this report as including all processors who take roundwood (logs) harvested from native forest or plantations, 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, 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 WA. However, these data do not enable identification of what proportion of these jobs rely on wood or fibre from native forest or plantation grown in WA versus in other states or other countries.

To assist in further understanding the extent to which the wood and fibre produced from native forest and plantations in WA then generates further jobs, a supply chain tracking analysis was undertaken. This was also used to identify the likely proportion of secondary processing activities that rely on wood and fibre grown in WA versus in other locations. To do this, wood and fibre products produced from WA plantations and native forest were traced through the supply chain beyond primary processors. Primary processors were asked to identify where their products were sold. The businesses they sold products to were then asked to complete a short phone survey identifying the jobs and economic activity generated by their use of these products.

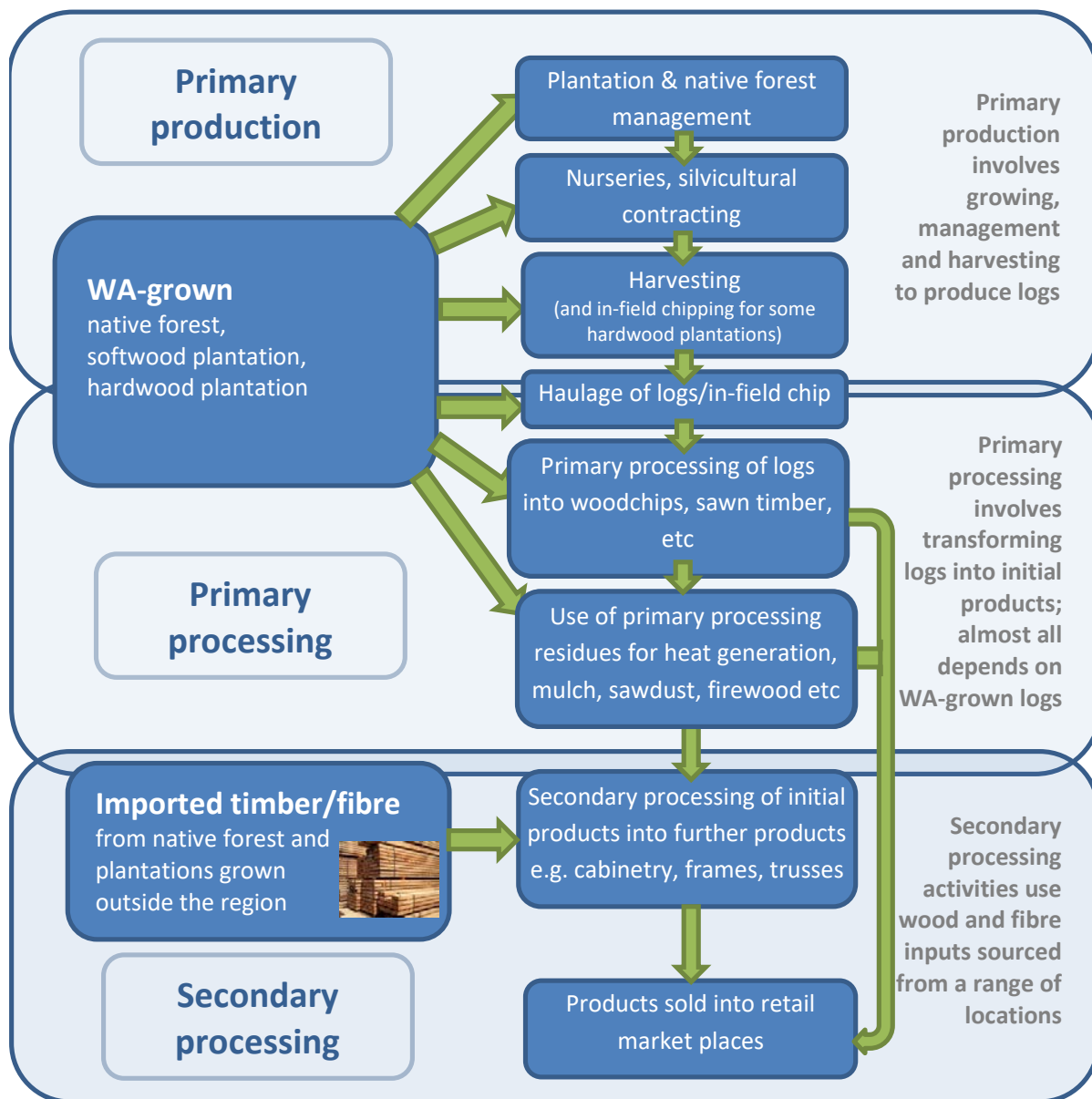


Figure 1 Stylised structure of the forest and wood products industry

Industry sectors

The native forest, softwood plantation, and hardwood plantation industries in Western Australia are distinct sectors, each of which products different types of products and often services different markets. These three industry sectors operate in distinct regions, which overlap in some parts:

- South West region: This region, extending from just south of Perth to Manjimup and Boyup Brook in the South, includes almost all native forest-based industry (including around 90% of the WA Regional Forest Agreement area), and also contains a large proportion of the softwood and hardwood plantation-based forest industry activity
- Great Southern and Esperance region: This region, extending from just west of Albany through to Esperance and extending inland to Plantagenet and Kojonup, is dominated by

hardwood plantations, with a smaller area of softwood plantations, and a very small area of native forest harvested in the western part of the region

- Wheatbelt plantation region: This region extends north and east of the South West, and the forest industry is predominantly based on softwood plantations, with major softwood processing facilities located in the region as well as significant areas of softwood plantation. The region also has a small amount of native forest harvesting.

The native forest, softwood plantation and hardwood plantation sectors are each described briefly below, followed by an overview of economic activities other than wood and fibre production that also occur in native forest and plantation areas.

Native forest sector

The native forest industry in WA is predominantly based on harvesting of multiple-use public forests in the south west of the state, shown in orange in Figure 2. These forests, all of which form part of the Western Australian Regional Forest Agreement region, extend from just north of Perth through to Albany, with most of the native forest managed for timber harvest located in the western parts of this region. In this report, the 'South West' region includes almost all of the native forest that is harvested for timber production, and almost all of the primary processors utilising this timber. The forest industry in the 'Wheatbelt plantation' and 'Great Southern and Esperance' regions, in contrast, is almost wholly dependent on plantations.

The native forest industry is based almost entirely on timber harvested from publicly owned native forests. The Forest Products Commission manages the harvesting and regrowing of native forests, while overall management of native forests is the responsibility of the Forest and Ecosystem Management Division of the Parks and Wildlife Service. The Parks and Wildlife Service is part of the Department of Biodiversity, Conservation and Attractions.

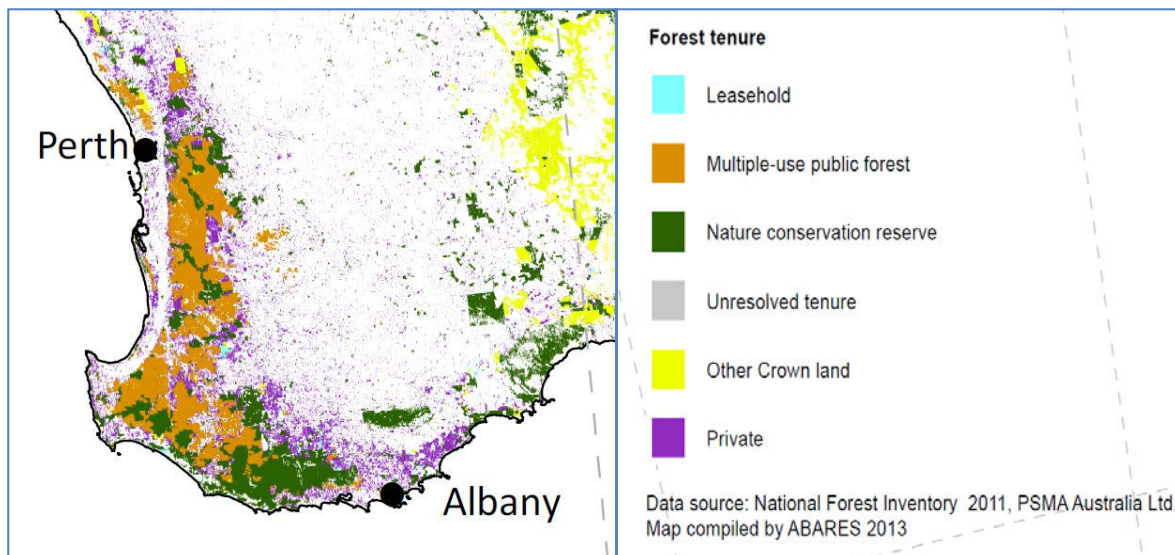


Figure 2 Western Australia's forest cover by tenure (Source: Reproduced from MPIGA & NFISC 2013)

Employment in the native forest industry is generated by the activities of forest management, harvesting and processing. Forest management jobs are generated in the Forest Products Commission and some contractor businesses; harvesting is then undertaken by harvest and haulage contracting businesses, and primary processing of logs is undertaken by a number of processors,

usually sawmills. These include 15 primary processors, most of which are small sawmills employing less than 20 people, with five larger sawmills employing more than 20 people. These processors are located in the South West, in a number of towns including Nannup, Busselton, Dwellingup, Yornup, Greenbushes and Albany. In addition, woodchips are processed from pulplogs in Bunbury, and some smaller logs unsuitable for other processing are used as part of silicon manufacturing by Simcoa in Bunbury.

Previous studies have found that employment in the native forest sector has declined over time (Dare and Schirmer 2012). Since the last comprehensive assessment of employment, there has been some change in the native forest sector. Most recently, in late 2016, timber processing at four AusWest processing sites located in Pemberton, Deanmill, Manjimup and Greenbushes was consolidated, with the Manjimup, Deanmill and Pemberton sites closed and production continuing at Greenbushes.

Softwood plantation sector

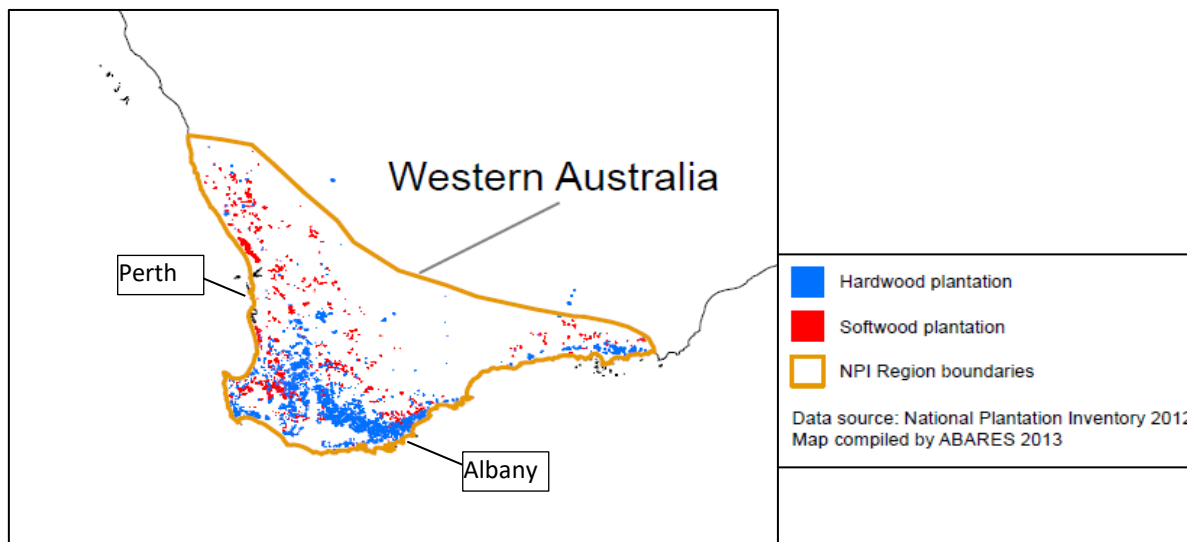
As of 2017, the National Plantation Inventory identified a total of 98,400 hectares of softwood plantation in Western Australia, comprised of 56,200 hectares of Radiata pine, and 41,400 hectares of Maritime Pine (Downham and Gavran 2017), shown in Figure 3. Radiata pine is typically established in higher rainfall areas, while Maritime Pine has been established in areas with lower rainfall (400-600mm annual rainfall) and lower nutrient soils, for the dual purpose of producing timber and reducing salinity effects. Softwood plantations are predominantly grown on 20-30 year rotations to produce sawntimber products and composite wood products such as laminated particleboard.

The softwood plantation estate is predominantly publicly owned, with almost all Radiata pine plantations managed by the Forest Products Commission (FPC), while most of the Maritime Pine estate was established in joint ventures between private landholders and FPC.

The softwood plantation industry generates employment in the management of plantations (predominantly at the Forest Products Commission), in silvicultural contracting, harvest and haulage contracting, and in processing. Major processors of softwood plantation timber in Western Australia include Wespine (Dardanup), Laminex (Dardanup) and Wesbeam (Wanneroo). In addition, some smaller processors process softwood logs into treated timber or other specialised products.

Hardwood plantation sector

Hardwood plantations, predominantly of *Eucalyptus globulus* (bluegum), have been established in Western Australia since the mid-1980s. These are typically grown on a short rotation (11-14 years). Currently, almost all logs are harvested to produce woodchips that are then exported to other countries for processing into pulp and paper products. Logs are processed into woodchips either using in-field chipping machinery at the time of harvest, or are transported for processing into woodchips at mills located in Albany and Bunbury.



From the mid-1980s to the mid-1990s, bluegum plantations were mostly established in the South West, via joint ventures and leasing arrangements between private companies (such as Bunbury Tree Farms, now WA Plantation Resources) and rural landholders. From the mid-1990s, the rate of expansion substantially increased, with much of the establishment from the mid-1990s to the mid-2000s undertaken by private companies via managed investment schemes (MIS) in which investors provided funds which companies used to establish plantations on private land that was either purchased outright or leased from landholders. From the mid-1990s, substantial hardwood plantation establishment occurred in the Great Southern and Esperance region in addition to the South West (Schirmer et al. 2008). In the 2000s, most companies using the MIS model collapsed, and new companies have taken over management of the plantation estate that was previously managed by MIS companies. In many cases, hardwood plantations are now managed by businesses who are contractors by large institutional investors who own the plantations. At the time of production of this report, hardwood plantations were predominantly managed (but not necessarily owned) by WA Plantation Resources (WAPRES), Bunbury Fibre Plantations, Australian Bluegum Plantations WA, Ents Forestry, PF Olsen and APFL (Albany Plantation Forest Company of Australia P/L).

Figure 3 Distribution of softwood and hardwood plantations in Western Australia (Source: Reproduced from MPIGA & NFISC 2013)

In addition, some areas of bluegum plantation are managed directly by rural landholders who at some point had leased their land to a plantation company. The plantation company typically established and managed a plantation on the leased land, with that lease then relinquished to the landholder after the first or second harvest rotation. Post cessation of the lease, landholders may either continue managing the area as a plantation, with plantations either grown from coppice (new shoots growing from stumps of the previous harvest, which are pruned to form a straight growing stem), or replanting of seedlings, or they may convert the land back to agricultural use.

There are varying estimates of the area of hardwood plantations in Western Australia. In 2017, the National Plantation Inventory estimated a total area of 276,400 hectares of hardwood plantations (Downham and Gavran 2017). However, in this study the major hardwood plantation managers in Western Australia reported managing a total net plantation area of 160,597 hectares, with these data verified with managers. The differences in estimates are likely to be due to the following factors:

- National Plantation Inventory data is likely to include some estimates based on gross land area rather than net plantation area, and thus indicates a larger area of plantation
- National Plantation Inventory data may not have captured all the area of plantation that has been harvested and subsequently converted back to agricultural land use, with this land still recorded as being used to grow plantations, and
- Areas of plantation managed by individual landholders were not captured in our study.

Based on consultation with plantation managers regarding the proportion of landholders who elect to continue managing land in plantation versus converting it to agricultural land use, we estimate that the net total area of hardwood plantation is around 190,000 to 220,000 hectares. A more precise estimate requires a detailed inventory of the end use of plantations that have been harvested and subsequently had leases relinquished over the land.

Other activities

In addition to producing wood and fibre to supply processors, the plantations and native forest managed for timber production in WA provide a base for other socio-economic activities. These include:

- **Bee keeping:** Almost all native forest and plantation managers reported that bee keeping occurs on part of their land. This included both hardwood plantation and native forest areas, with bee keeping an important economic use of forest.
- **Livestock grazing:** This occurs on around 55,000 hectares of land, including both plantation areas and native forest areas; not all this land is grazed at any given time
- **Mountain biking:** Mountain biking in native forest areas is growing rapidly in Western Australia, becoming an important economic activity in many of the multiple use forests that are also used for timber harvesting. No private plantation managers reported having mountain biking use of their plantation areas.
- **Bushwalking:** Bushwalking occurs both in native forest areas managed for multiple uses, and some plantation managers also have bushwalking trails on part of their plantation estate
- **Four wheel drive and dirt bike riding:** These activities occur in some areas managed by the Forest Products Commission and some private plantation managers
- **Horse riding:** Horse riding occurs on trails in forest and plantation areas managed by the Forest Products Commission
- **Hunting:** Hunting occurs in some of the forest and plantation areas managed by the Forest Products Commission
- **Conservation:** Several private plantation managers have areas of their land managed principally for conservation, particularly areas of native forest managed for conservation within a plantation area. Most of these are not formally declared conservation reserves.

The economic value of these other activities has not been estimated as part of this report, which includes only the economic value of the wood and fibre products produced from WA's native forest and plantations. However, these other activities generate important social and economic benefits for many residents living in WA.

Economic value

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

- (i) 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
- (ii) 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 exclude 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 generate \$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. GRP includes taxes because it concerns the whole economy, not just the business sector. Even though the business sector pays some profit to governments, that value is just a transfer within the economy of value that each business produced. By the same logic, donations made by businesses 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 WA 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 WA forest industry

In 2015-16, the direct value of output from the growing, harvesting and primary processing of wood and paper products in WA was \$649.2 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 \$100.6 million generated by the native forest industry, \$275.1 million by activities dependent on softwood plantations, and \$273.5 million dependent on hardwood plantations. These figures do not include the value of the output generated beyond this point by secondary processing which, as described earlier, generates additional value and draws on both wood and fibre produced in WA, and on wood and fibre products imported from other states or from other countries. It also

does not include additional value generated by use of residues from primary processing in other industries (for example, use of sawdust in chicken farms or off-cuts sold for firewood)¹.

Direct expenditure by the WA 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 \$548 million in direct net expenditure in WA as a whole up to and including the point of primary processing. This included \$150 million in the Great Southern and Esperance, \$336 million in the South West, and \$27 million in the Wheatbelt region. Expenditure was also generated in Perth, accounting for much of the \$36 million difference between total expenditure across WA and the expenditure in these three regions. In the native forest and softwood plantation industries, most of this expenditure is generated by the processing of wood and paper products, whereas in the hardwood plantation sector, processing generates a similar proportion of net expenditure as the activities of growing, harvest and haulage. This reflects the relatively smaller amount of processing activity in the hardwood plantation sector compared to the native forest and softwood sector.

To help understand where industry expenditure is generated, Tables 1 and 2 show both gross and net expenditure: while gross expenditure is not a true measure of economic contribution, as it double counts some expenditure that involves transfers within the industry, it helps show the relative size of different parts of the supply chain. Net expenditure is a measure of economic contribution and shows how much expenditure outside of the forest industry is added at different points in the supply chain.

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

Supply chain stage	Great Southern & Esperance		South West		Wheatbelt		Western Australia	
	Gross expenditure in 2015-16 (\$m)	Net expenditure exc. transfers to other parts of industry (\$m)	Gross expenditure in 2015-16 (\$m)	Net expenditure exc. transfers to other parts of industry (\$m)	Gross expenditure in 2015-16 (\$m)	Net expenditure exc. transfers to other parts of industry (\$m)	Gross expenditure in 2015-16 (\$m)	Net expenditure exc. transfers to other parts of industry (\$m)
Forest & plantation growing	134.1	64.2	111.5	43.6	1.2	1.2	277.2	121.1
Harvest & haulage of logs	71.9	71.9	66.2	66.2	0.0	0.0	140.3	140.3
Primary wood and paper processing	71.6	13.7	404.8	226.5	47.5	25.5	561.6	286.9
TOTAL	277.6	149.8	582.5	336.3	48.7	26.7	979.1	548.3

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 native forest and plantation managers, and payments made to plantation managers or to other processors for fibre inputs used by processors.

¹ Secondary processing is not included due to the complexities involved in estimating total value, especially identifying the proportion of value that is generated by native forest and plantations grown in WA versus in other regions. Subsequent sections discuss secondary processing in more detail.

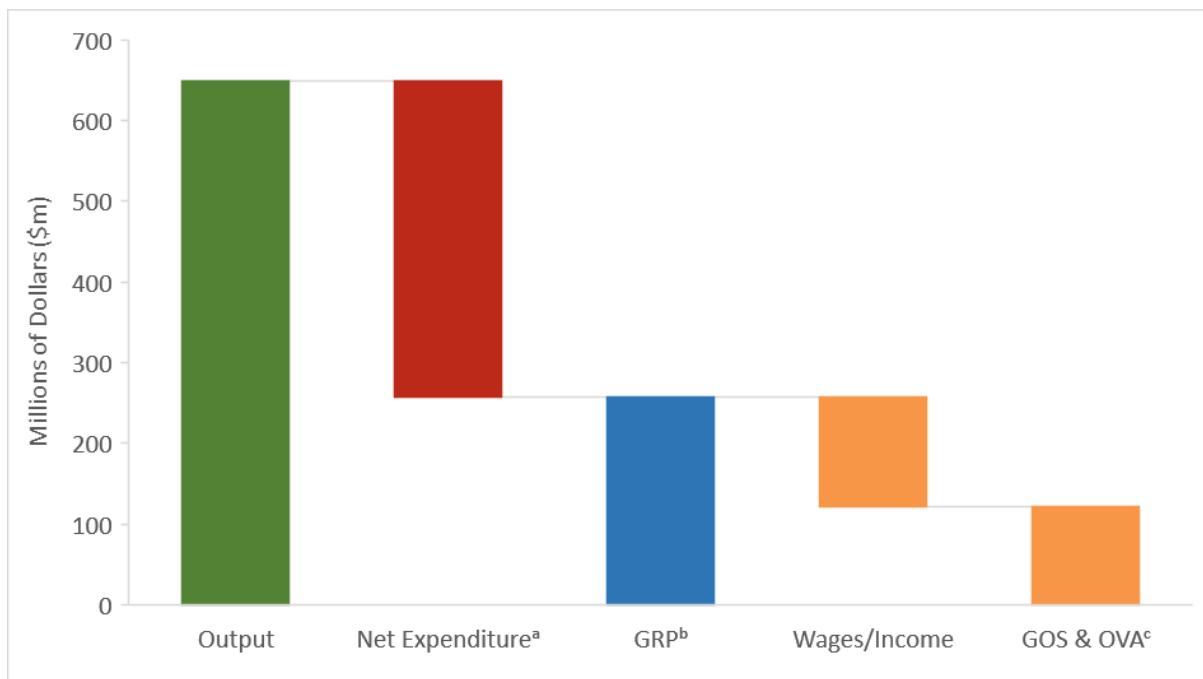
Table 2 Direct expenditure generated by different parts of the WA forest industry by growing, harvesting and primary processing, 2015-16, by supply chain stage

	Native forest dependent industry		Softwood plantation industry		Hardwood plantation industry		Western Australia	
Supply chain stage	Gross expenditure in 2015-16 (\$m)	Net expenditure exc. transfers to other parts of industry (\$m)	Gross expenditure in 2015-16 (\$m)	Net expenditure exc. transfers to other parts of industry (\$m)	Gross expenditure in 2015-16 (\$m)	Net expenditure exc. transfers to other parts of industry (\$m)	Gross expenditure in 2015-16 (\$m)	Net expenditure exc. transfers to other parts of industry (\$m)
Forest & plantation growing	52.5	20.8	59.9	26.2	164.9	74.1	277.2	121.1
Harvest & haulage of logs	17.3	17.3	30.8	30.8	92.2	92.2	140.3	140.3
Primary wood and paper processing	74.2	46.3	275.5	184.6	211.9	56.0	561.6	286.9
TOTAL up to point of sale of primary processed products	144.0	84.4	366.1	241.7	469.0	222.3	979.1	548.3
Est. gross expenditure-secondary processors & residue users ¹	\$8.6-\$34.2 million		\$29.1-\$61.8 million		Very little further expenditure identified		\$47.7-\$96.0 million	
<p>This table shows both 'gross' expenditure, and expenditure net of transfers within the industry. For secondary processing, only gross expenditure is shown as it was not possible to calculate net expenditure. The net expenditure 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 native forest and plantation managers, and payments made to plantation managers or to other processors for fibre inputs used by wood and paper processors.</p> <p>¹Gross expenditure by secondary processors and residue users reflects the amount of spending by businesses that was dependent on WA-grown wood and fibre. This includes only processors and does not include activities such as construction of housing. See the section of this report describing jobs and economic activity generated beyond primary processing for further detail.</p>								

The types of expenditure generated by different industries vary. Of the direct expenditure by the forest industry, the largest single item is wages and salaries, as shown in Appendix 1, with around \$1 in every \$4 of expenditure on wages and salaries (the industry spends a total of \$135.2 million on wages and salaries of workers in WA). The native forest sector spends relatively more on wages (\$1 in every \$3.40 of total expenditure) compared to the softwood plantation (\$1 in every \$3.80) and hardwood (\$1 in every \$4.80) sectors. The softwood sector has the highest total direct spending on wages (around \$64 million) followed by the hardwood (\$46 million) and native forest (\$25 million) sectors.

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 GRP 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 WA was \$256.9 million. This included \$41.9 million generated by the native forest industry, \$99 million by activities dependent on softwood plantations, \$116 million dependent on hardwood plantations. These figures do not include the GRP generated beyond this point by secondary processing. Figure 4 shows the derivation of direct contribution to GRP by the forest industry in WA. 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 a small amount of Other Value Added (OVA, in this case annuities and donations).



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.

d - Other Value-Added is other kinds of income not already counted. In this case it is annuities paid by growers and donations made by businesses anywhere along the forest industry supply chain up to primary processing.

Figure 4 Calculation and decomposition of direct contribution to GRP, WA – 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 parts of the economy, 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 (see Table 3 and Appendix 1 for detailed data) and examined by region:

- The total value of output contributed by the industry in 2015-16 was \$1,405 million in WA for the industry as a whole, including \$345 million in the Great Southern and Esperance, \$766 million in the South West and \$62 million in the Wheatbelt, with much of the remainder generated in Perth
- The total contribution to the value of GRP was \$643 million in WA for the industry as a whole, including \$162 million in the Great Southern and Esperance, \$327 million in the South West and \$26 million in the Wheatbelt
- The total contribution to the household income component of GRP was \$354 million in WA for the industry as a whole, including \$74 million in the Great Southern and Esperance, \$196 million in the South West and \$15 million in the Wheatbelt, with much of the remainder generated in Perth.

Table 3 Economic impacts of the WA forest industry, by region – all parts of the industry

	Great Southern & Esperance	South West	Wheatbelt	Western Australia ^a
Output^b (\$m)	344.7	766.1	62.4	1,405.4
Direct (\$m)	192.9	381.0	31.4	649.2
Production-induced (\$m)	107.5	252.9	20.9	424.1
Consumption-induced (\$m)	44.4	132.2	10.0	332.1
GRP (\$m)	161.6	326.6	26.2	643.0
Direct (\$m)	85.7	141.0	11.1	256.9
Production-induced (\$m)	48.8	108.7	9.3	194.4
Consumption-induced (\$m)	27.1	76.9	5.8	191.7
Household Income (\$m)	73.7	196.1	15.3	353.7
Direct (\$m)	29.1	89.7	6.4	135.2
Production-induced (\$m)	32.9	73.6	6.3	126.0
Consumption-induced (\$m)	11.7	32.8	2.6	92.6
Employment (total)	1,255	2,670	214	4,570
Direct (total to point of sale of primary processed products)	537	1,314	101	2,114
Production-induced (total)	510	864	73	1,237
Consumption-induced (total)	207	491	39	1,219

a - Direct and indirect impacts in WA are each greater than the sum of the three reported regions as some direct impacts occur outside of the three regions (primarily in Perth) and indirect impacts are smaller for the regions due to a higher proportion of imports from outside of these smaller regions by industries within them.

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.

The contribution of the industry to the economy of WA is larger than that to sum of the three regions of Great Southern and Esperance, South West and the Wheatbelt, because some of the direct and indirect expenditure by the industry occurs outside of these regions.

When examined by sector of the industry up to and including the point of primary processing (see also Appendix 1):

- The total value of output contributed by the industry in 2015-16 was \$1,405 million in WA for the industry as a whole, including \$220 million dependent on native forests, \$617 million dependent on softwood plantation and \$568 million dependent on hardwood plantations
- The total contribution to the value of GRP was \$643 million in WA for the industry as a whole, including \$104 million dependent on native forests, \$274 million dependent on softwood plantation and \$265 million dependent on hardwood plantations
- The total contribution to the household income component of GRP was \$354 million in WA for the industry as a whole, including \$59 million dependent on native forests, \$162 million dependent on softwood plantation and \$133 million dependent on hardwood plantations.

Figure 5 shows the derivation of total contribution to GRP by the forest industry in WA, 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 WA 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, such as lease costs, annuities and donations).



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 5 Calculation and decomposition of total contribution to GRP, WA – all parts of the industry

Employment

The forest industry in WA generated a total of 2,114 direct jobs up to the point of primary processing as of mid-2017. The estimated flow-on employment generated was an additional 2,456 jobs, meaning the industry as a whole contributed around 4,570 jobs to the WA economy up to and including primary processing. In addition to this, a further 1,495 jobs were generated in secondary processing as of August 2016. When broken down by region and sector:

- A total of 1,279 jobs were generated in the Great Southern and Esperance, including 537 direct jobs up to and including primary processing, 717 flow-on jobs from these direct jobs, and a further 24 jobs in secondary wood and paper processing
- A total of 2,763 jobs were generated in the South West region, including 1,304 direct jobs up to and including primary processing, 1,355 flow-on jobs from these direct jobs, and a further 93 jobs in secondary wood and paper processing
- A total of 738 jobs were generated in the Wheatbelt region including 101 direct jobs up to and including primary processing, 112 flow-on jobs from these direct jobs, and a further 524 jobs in secondary wood and paper processing.

Up to the point of primary processing, a total of 508 direct jobs were generated by the native forest industry, 863 by softwood plantations, and 743 by hardwood plantations grown in WA. A further 1,495 jobs were generated by secondary processing activities that use wood and fibre products both from the WA forest industry and imported from interstate or overseas. As of 2017, between 245 and 490 of these secondary processing jobs were dependent on timber grown in WA; and another 120 to 140 jobs were generated by the use of primary processing residues (principally sawdust and bark) by garden and landscape businesses.

Direct employment

As shown in Tables 4 and 5, the forest industry generated 2,114 direct jobs in the first half of 2017. 'Direct' jobs include jobs that depend on the presence of the industry, and include employment generated 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 direct jobs – two thirds – were generated in the processing of wood and paper products, while just over 30% were generated by the growing and harvest of plantations. This highlights the importance of establishment of local processing facilities to generating regional economic activity from the industry.

When direct jobs up to the point of primary processing are compared, 41% were generated by softwood plantations, followed by hardwood plantations (35%) and native forests (24%). There was regional variation as well, with 25% of all jobs generated being based in the Great Southern and Esperance, 62% in the South West, 5% in the Wheatbelt, 7% in Perth and a small amount in other parts of WA.

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

Industry sector	TOTAL direct employment, 2017			
	Native forest	Softwood plantation	Hardwood plantation	Forest industry (all)
Growers (forest management companies)	102	107	93	302
Nurseries, silvicultural & roading contracting businesses	20	86	97	203
Harvest & haulage contracting businesses (including in-field chipping)	84	147	435	666
Primary wood and paper processing ¹	301	520	115	936
Other (including consultants, equipment sales, training)	1	2	4	7
Total – excluding secondary processing	508	863	743	2114
Secondary wood and paper processing (2016 ABS data)	Unknown	Unknown	Unknown	1495
Total – including secondary processing	Unknown	Unknown	Unknown	3609

¹The jobs generated in this part of the industry includes people involved in wholesaling of products produced by these processors; it also includes secondary processing in the form of on-site value adding by some processors.

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

Industry sector	TOTAL direct employment, 2017				
	Great Southern and Esperance	South West	Wheatbelt	Perth	Forest industry (includes small number of jobs in other regions of WA)
Growers (forest management companies)	64	175	0	57	302
Nurseries, silvicultural & roading contracting businesses	85	95	18	0	203
Harvest & haulage contracting businesses	338	318	0	10	666
Primary wood and paper processing ¹	48	716	83	83	936
Other (including consultants, equipment sales, training)	2	0	0	5	7
Total – excluding secondary processing	537	1304	101	155	2114
Secondary wood and paper processing (2016 ABS data)	24	93	524	823	1495
TOTAL	561	1397	625	978	3609

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

Flow-on employment

When flow-on impacts generated up to the point of outputs being produced by primary processors were analysed, a further 2,456 indirect jobs were generated in WA by the forest industry (in addition to the 2,114 generated directly in the industry) as a result of (i) the demand created by the plantation industry for supplies and inputs such as fuel and mechanical servicing, and (ii) spending of salaries and wages by workers. Economic modelling using EconSearch RISE models identified that for every direct job generated by the industry in WA 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 sheep, finance and road transport sectors in Western Australia (2.2, 2.4 and 2.4 respectively). It is lower than the grains (4.1) and construction services (3.0) sectors, and higher than the personal and other services (1.8) and retail trade (1.7) sectors.

The employment multipliers varied depending on the forest type, with a total of 1.8 jobs created for every direct job in native forests, 2.3 for softwood plantations and 2.3 for hardwood plantations (see Table 6). The lower multiplier for native forests is primarily because the supply chain for this sector is more labour intensive than that for softwood and hardwood plantations, particularly at the processing stage. That is, the employment multiplier for native forests is low because the direct jobs are high relative to total expenditure in the sector, not because the indirect jobs are low. For each \$1 million of expended by the native forest sector, 6.0 workers are employed directly, compared to 3.6 for the softwood and 3.3 for the hardwood sectors. When examined by region, a total of 2.3 jobs are generated in the Great Southern and Esperance for every direct job in the region, a total of 2.0 in the South West, and 2.1 in the Wheatbelt (see Table 7). These differences are largely driven by the mix of forest types within each region. For example, the high multiplier in the Great Southern and Esperance region is largely because there are more hardwood plantations in this region compared to the other regions, so there is less direct employment relative to total expenditure (around 3.6 jobs per \$1 million expended compared to 3.8 in the Wheatbelt and 3.9 in the South West).

Table 6 Employment multipliers: indirect employment generated by the WA forest industry, by sector

Type of multiplier	Description	Native forest		Softwood plantation		Hardwood plantation		Western Australia (all)	
		Multiplier	Total jobs	Multiplier	Total jobs	Multiplier	Total jobs	Multiplier	Total jobs
None	Direct jobs only	1.0	508	1.0	863	1.0	743	1.0	2,114
Type I	Direct jobs + production-induced jobs	1.4	694	1.6	1,394	1.7	1,259	1.6	3,346
Type II	Direct jobs + production-induced jobs + consumption-induced jobs	1.8	898	2.3	1,951	2.3	1,717	2.2	4,570

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

Type of multiplier	Description	Great Southern & Esperance		South West		Wheatbelt		Western Australia (all)	
		Multip- lier	Total jobs	Multip- lier	Total jobs	Multip- lier	Total jobs	Multip- lier	Total jobs
None	Direct jobs only	1.0	537	1.0	1,304	1.0	101	1.0	2,114
Type I	Direct jobs + production- induced jobs	1.9	1,048	1.7	2,178	1.7	174	1.6	3,346
Type II	Direct jobs + production- induced jobs + consumption- induced jobs	2.3	1,255	2.0	2,670	2.1	214	2.2	4,570

The flow-on effects of the industry on employment 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 WA forest 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, the proportion of the *employed workforce* in each LGA that was employed directly in the forest industry was identified (Table 8).

The LGA with the largest total number of direct jobs generated by the forest industry was Albany, with 405 jobs up to primary processing, followed by Bunbury with 375, and Manjimup with 235 jobs. The LGAs with the largest proportion of workers employed directly in the industry (including secondary processing jobs) were Nannup, with 13.2% of the workforce employed directly in the forest industry, followed by Manjimup (5.6%), and Bridgetown-Greenbushes (3.8%). In each of these LGAs, employment was highly dependent on the native forest sector with fewer jobs generated by plantations. There has been some change since the time data were collected for this project: in the second half of 2017, there were announcements of job losses at Nannup Timber Processing, which mean it is likely that the number of jobs in the industry has declined in Nannup since the time data were collected for this project (ABC 2017).

In Bunbury, 2.9% of jobs were generated directly by the forest industry, including a mix of native forest, hardwood plantation and softwood plantation jobs, while in Collie 2.0% of jobs depended directly on the industry. In the Great Southern the 1.9% of all jobs dependent on the forest industry were largely generated by hardwood plantations, and included 3.2% of jobs in Plantagenet, 2.6% of jobs in Albany and 2.0% of jobs in Denmark. In other LGAs less than 2% of jobs were generated by the forest industry.

Table 8 Direct employment generated by the WA industry, 2017, by local government area – up to and including primary processing

Region	Local government area name (2017)	Employment in growing, harvest, haulage, primary processing (2017 industry survey)	Employment in secondary processing (2016 ABS Census)	Total forest industry jobs	Size of employed labour force, all industries, 2016 ¹	% employed labour force employed directly in the forest industry	Employment by industry sector (excludes secondary processing jobs) (2017 industry survey)		
							Jobs dependent on native forest	Jobs dependent on softwood plantations	Jobs dependent on hardwood plantations
Great Southern and Esperance	Albany	405	16	421	15987	2.6%			
	Plantagenet	67	0	67	2121	3.2%			
	Denmark	47	0	47	2370	2.0%			
	Other LGAs	18	4	22	8430	0.3%			
	TOTAL	537	24	561	29910	1.9%	19	53	465
South West	Bridgetown-Greenbushes	73	0	73	1940	3.8%			
	Bunbury	375	18	393	13729	2.9%			
	Busselton	40	11	51	16077	0.3%			
	Capel	73	3	76	8021	0.9%			
	Collie	62	4	66	3282	2.0%			
	Dardanup	104	12	116	6425	1.8%			
	Donnybrook-Balingup	41	0	41	2513	1.6%			
	Harvey	164	8	172	11681	1.5%			
	Manjimup	235	0	235	4181	5.6%			
	Nannup	71	0	71	539	13.2%			
	Other LGAs	66	31	97	45100	0.2%			
	TOTAL	1304	93	1397	113490	1.2%	427	611	266
Wheatbelt	TOTAL¹	101	524	625	243158	0.3%	4	97	0
Perth	TOTAL²	155	823	978	649686	0.2%	55	92	8
TOTAL WA	Inc. jobs in other parts of WA	2114	1495	3609	1157735	0.3%	508	863	743

¹Wanneroo, Toodyay, Northam, Mundaring, Gingin, Armadale, Swan, Dandaragan, Kalamunda.

²All Perth LGAs other than those in Wheatbelt

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 based on the largest possible sample of people. 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 estimates of employment in the forest industry generated from the LFS have 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 accurate estimation of trends in industry employment, or of total employment levels (Schirmer et al. 2013). This means that the only robust source of data other than direct surveys of the industry is the Census.

Both the Census and the LFS classify employment into several 'industry classifications' that form part of the forest industry, specifically in the industry categories of Forestry, Logging, Services to Forestry, Wood Product Manufacturing and Paper Product Manufacturing. Wood Product Manufacturing, and Paper Product Manufacturing, are further disaggregated into multiple types of wood 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 jobs that depend on plantation or native forest. 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 early 2017), and in the 2016 Census (data collected in August 2016). The ABS uses a process called data randomisation to protect privacy, which means that in any local government area or industry group, total numbers of workers will be randomly changed by a small amount to protect privacy. This, combined with the likelihood that employment in many businesses changed between the time of the Census (August 2016) and when industry survey data were collected (first half of 2017), means that very small differences (of, for example, less than 10-15 workers) are unlikely to represent meaningful differences between the two datasets.

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

Region	Local government area name	2016 ABS Census			2017 Forest Industry Survey			Difference in estimates	Reasons for differences in estimates
		Forestry, Logging, Services to Forestry	Wood & Paper Product Manufacturing – primary processing	Total forest industry jobs (2016)	Forestry, Logging, Services to Forestry	Wood and Paper Product Manufacturing – primary processing	Total forest industry jobs (2017)		
		2016	2016	2016	2017	2017	2017		
Great Southern and Esperance	Albany	157	31	188	365	40	405	217	Many jobs in harvest and haulage were recorded as part of the transport industry in the Census. This is the principal reason for the higher employment estimates in this study compared to the Census. Randomisation of Census data and small changes in employment between 2016 and 2017 may also have contributed.
	Plantagenet	13	9	22	60	7	67	45	
	Denmark	13	0	13	46	1	47	34	
	Other LGAs	19	13	32	18	0	18	-14	
	TOTAL	202	53	255	489	48	537	282	
South West	Bridgetown-Greenbushes	21	42	63	0	73	73	10	In the South West, some businesses found it difficult to identify which local government areas their employees lived in; this means some workers were likely recorded as living in a neighbouring LGA instead of in the one they actually lived in. Many jobs in harvest and haulage were recorded as part of the transport industry in the Census, and this contributed to higher estimates of employment in the 2017 survey. The large differences in employment recorded in Manjimup are due to the closure of Auswest Timbers processing at sites located in this LGA in late 2016, which means workers were employed at the time of the 2016 Census, but many had lost their jobs by the time the industry survey was conducted in 2017. These job losses also affected some workers who lived in LGAs near Manjimup.
	Bunbury	49	124	173	177	198	375	202	
	Busselton	19	40	59	2	38	40	-19	
	Capel	37	57	94	30	53	73	-21	
	Collie	21	14	35	47	15	62	27	
	Dardanup	23	97	120	22	82	104	-16	
	Donnybrook-Balingup	40	27	67	28	13	41	-26	
	Harvey	38	79	117	53	111	164	47	
	Manjimup	119	149	268	185	50	235	-33	
	Nannup	9	29	38	19	52	71	33	
Other LGAs	45	13	58	25	31	66	8		
	TOTAL	421	671	1092	588	716	1304	212	
Wheatbelt	TOTAL	68	78	146	18	83	101	-45	In the Wheatbelt and Perth, the industry survey did not include some jobs in sandalwood growing, or people who worked in the forest industry in other
Perth	TOTAL	154	157	311	72	83	155	-156	

Region	Local government area name	2016 ABS Census			2017 Forest Industry Survey			Difference in estimates	Reasons for differences in estimates
		<i>Forestry, Logging, Services to Forestry</i>	<i>Wood & Paper Product Manufacturing – primary processing</i>	Total forest industry jobs (2016)	<i>Forestry, Logging, Services to Forestry</i>	<i>Wood and Paper Product Manufacturing – primary processing</i>	Total forest industry jobs (2017)		
TOTAL WA	TOTAL	839	957	1796	1167	930	2114	318	states/countries. In Perth, the Census records some workers in primary processing, however discussions with industry representatives suggested these workers may actually be employed in secondary processing.

The 2016 Census recorded fewer forest industry workers in many parts of WA compared to the survey of businesses conducted for this report. 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. 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. The other major difference between the two sources of data was that the Census was undertaken before closure of some Auswest Timbers processing sites, and hence recorded employment at these sites, whereas the industry survey occurred after these sites were closed, with reduced employment.

Once these differences are accounted for, in addition to the small differences expected as a result of randomisation of ABS Census data and changes in employment between the time of the Census and the industry survey, the Census and Forest Industry Survey data are reasonably consistent.

Employment over time

There is little information on how employment is changing in the forest industry over time. Few studies have estimated the employment generated by the industry in WA, and differences in definitions and methods used means the figures published in past studies are not always comparable. In WA, two sources of data are available that enable comparison of employment over time in the forest industry: (i) the ABS Census of Population and Housing (Census), which includes both primary and secondary processing employment generated by the industry, and (ii) surveys of the forest industry up to the point of primary processing undertaken in 2006, 2008, 2010 and in 2017 (Forest Industry Survey).

Census data (Table 10) show that between 2006 and 2011, the number of workers employed in the forest, wood and paper industries recorded in the Census fell in most regions for most parts of the industry: employment in forestry, logging and services to forestry (which includes growers, silvicultural contractors, and harvest contractors) fell by 7% in the Great Southern and Esperance, by 11% in the South West, and by 15% in the Wheatbelt and Perth. Employment in wood and paper processing (including both primary and secondary processing captured in the Census) grew in the Great Southern and Esperance, due to expansion of hardwood plantation woodchipping; fell by 30% in the South West, largely due to declines in native forest processing; and fell by a lesser amount in Perth and the Wheatbelt, largely due to changes in employment in various types of secondary processing activity. Between 2011 and 2016, there was growth in jobs in forestry, logging and services to forestry in almost all regions (with the exception of Plantagenet), reflecting both increases in harvesting of hardwood plantations, and in employment associated with managing these plantations as they are harvested and re-established. However, jobs in wood and paper product manufacturing fell substantially, by 51% in the Great Southern and Esperance, 28% in the South West, 34% in the Wheatbelt and 46% in Perth. This likely reflects in large part a large decline in jobs in secondary processing, triggered by reduced demand for products such as cabinetry, frames and trusses as new housing construction slowed considerably in Western Australia in 2015 and 2016 as the mining boom ended. When only secondary processing jobs are examined, the ABS Census recorded a decline of 47.6% in secondary processing jobs between 2011 and 2016, from 2,853 jobs to 1,495.

This is further supported by data from the Forest Industry Survey, which shows a smaller decline in primary processing employment, further supporting that much of the loss of jobs in the forest industry between 2011 and 2016 occurred in secondary processing businesses. The Forest Industry Surveys (FIS) undertaken in 2006, 2008, 2010 and now in 2017 captured detailed data on employment generated up to the point of primary processing, but the earlier surveys did not capture employment in secondary processing. Table 11 therefore shows trends over time in employment generated up to the point of finished products leaving the primary processing sector, and does not include secondary processing. This shows that while the number of jobs in forest management (growers) grew between 2006 and 2008, they subsequently fell dramatically as MIS companies collapsed in the late 2000s, and as plantation expansion effectively ceased, with a shift in focus to management of existing plantations. Employment in primary processing fell substantially between 2006 and 2011, largely due to changes in the native forest industry (Dare and Schirmer 2012), and fell further between 2011 and 2017, with some declines in native forest processing employment offset by some growth in hardwood plantation woodchip processing. Silvicultural contracting employment fell substantially, reflecting the cessation of expansion of plantations in the late 2000s.

Table 10 Forest industry employment recorded in the ABS Census of Population and Housing over time

Region	Local government area	Jobs in Forestry, Logging, Services to Forestry					Jobs in Wood and Paper Product Manufacturing – includes both primary and secondary processing					Total forest industry dependent jobs recorded in Census (includes wholesaling)				
		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
Great Southern and Esperance	Albany	158	126	184	-20%	46%	101	139	61	38%	-56%	259	279	264	8%	-5%
	Plantagenet	12	37	17	210%	-54%	11	13	9	18%	-31%	26	50	24	92%	-52%
	Denmark	7	5	4			15	5	3			22	10	11	-55%	10%
	Other LGAs	6	3	11			8	16	11			14	19	28	36%	47%
	TOTAL	183	171	222	-7%	30%	135	173	85	28%	-51%	321	358	328	12%	-8%
South West	Bridgetown-Greenbushes	22	15	20	-32%	33%	137	72	40	-47%	-44%	160	94	51	-41%	-46%
	Bunbury	29	26	45	-10%	73%	246	219	139	-11%	-37%	265	255	189	-4%	-26%
	Busselton	12	19	26	58%	37%	83	81	65	-2%	-20%	90	109	88	21%	-19%
	Capel	13	23	44	77%	91%	83	93	67	12%	-28%	93	127	106	37%	-17%
	Collie	24	13	15	54%	15%	90	13	14	-86%	8%	90	26	35	-71%	35%
	Dardanup	21	27	30	29%	11%	153	110	107	-28%	-3%	159	147	143	-8%	-3%
	Donnybrook-Balingup	57	34	41	-40%	21%	97	41	27	-58%	-34%	100	75	63	-25%	-16%
	Harvey	33	31	39	-6%	26%	163	121	90	-26%	-26%	177	167	136	-6%	-19%
	Manjimup	93	85	127	-9%	49%	355	181	150	-49%	-17%	355	266	208	-25%	-22%
	Nannup	14	6	10			65	47	27	-28%	-43%	68	53	38	-22%	-28%
	Other LGAs	21	32	35	52%	9%	91	109	72	20%	-34%	102	169	133	66%	-21%
	TOTAL	349	311	423	-11%	36%	1563	1087	787	-30%	-28%	2012	1488	1194	-26%	-20%
Wheatbelt	TOTAL²	54	46	66	-15%	43%	1005	1001	665	-1%	-34%	1362	1391	989	2%	-29%
Perth	TOTAL³	153	130	160	-15%	23%	2291	2082	1116	-9%	-46%	3351	3083	1923	-8%	-38%

¹Change has only been calculated where the total number of workers is >10, as randomisation of small numbers by the ABS means change below this threshold may not be meaningful

²Wanneroo, Toodyay, Northam, Mundaring, Gingin, Armadale, Swan, Dandaragan, Kalamunda

³All Perth LGAs other than those in Wheatbelt

Table 11 Forest industry employment recorded over time in Forest Industry Surveys

	Jobs – Estimated number of people employed up to point of primary processing				Change 2006-2008	Change 2008-2011	Change 2011-2017
	2006	2008	2011	2017			
Growers	406	508	358	302	25%	-30%	-16%
Primary processors	1932	1171	960	936	-39%	-18%	-3%
Silvicultural contractors, nurseries, seed suppliers	850	814	568	137	-4%	-30%	-76%
Harvest & haulage contractors	767	738	830	664	-4%	12%	-20%
Total (excludes jobs in other parts of the forest industry including consultants, secondary processing)	3955	3231	2716	2039	-18%	-16%	-25%

Jobs generated by activities beyond primary processing

As described earlier in this report, a substantial number of jobs are generated in what is called the 'secondary processing' part of the forest industry. This 'secondary processing' includes activities that draw on outputs from primary processing and transform them into further products, including:

- Flooring and decking installations
- Furniture that is wholly or partly constructed from wood
- Joinery, including cabinet making, doors, mouldings and others
- Packaging and storage such as crates, wooden boxes and pallets; this can also include construction of paper and cardboard packages from pulp
- Trusses and frames.

These secondary processing activities, as described in the previous section, generated an additional 1,495 jobs in WA in 2016, according to the ABS Census. However, not all of this processing relies on timber and fibre products that have been grown in WA, with a substantial amount of the wood and fibre inputs used in the secondary processing sector being imported from other locations. Based on a survey of secondary processors, described in detail in this section of the report, we estimate that between 245 and 490 secondary processing jobs in WA rely on timber grown in WA. This means that in total, between 16% to 33% of secondary processing jobs rely on timber grown in WA.

In addition to secondary processing, the residues produced as part of primary processing are used in many landscape, gardening and other businesses. For example, sawdust and chips produced as part of sawntimber production are sometimes sold for use as mulch, or to use in chicken farms or horse farms, while small ends of timber are often sold for use as firewood. Based on surveys of users of residues from primary processing, we conservatively estimate that between 120 and 140 jobs in the landscape and gardening sector rely on use of residues from primary processing such as sawdust and bark.

Methods used to estimate employment generated beyond primary processing

Previous studies have not tracked what happens to WA-grown native forest and plantation products beyond primary processing. To improve knowledge in this area, as part of this study all primary processors were asked:

- What types of end-products they produced. This enabled identification of the extent to which logs were 'value added' by processing them into multiple products at the primary processing sites. For example:
 - Drying sawntimber on site enables the processors to sell the dried product at a higher price that they would have achieved if the same sawntimber was sold 'green' (undried)
 - Treating sawntimber can add value
 - If dried sawntimber is dressed (machine finished to have smooth edges), it can be sold for a higher price than if it is sold as rough sawntimber
 - Moulding sawntimber ready for use in architraves, skirting, window and door framing (or for other uses) can add further value
 - Constructing frames and trusses from sawntimber can add value.
- Who they sold their products to, including:

- What proportion were sold for further processing
- What proportion were sold direct to wholesale or retail markets.

Following this, a database of secondary processors and businesses using residues from primary processing was developed, based on both survey responses from primary processors, and search of publicly available databases for businesses producing typical secondary processing products. A total of 62 businesses were identified. These 62 businesses were then contacted and asked to take part in a short survey that aimed to identify the extent to which they draw on WA-grown native forest or plantation products, and the employment generated from this use. A total of 24 (39%) completed the survey, and basic information was obtained for a further 29 businesses. This enabled some analysis of the typical amount of their work that depends on wood or fibre inputs from trees grown in WA, versus that dependent on wood or fibre imported from other locations.

The next sections examine:

- Value-adding undertaken by primary processors in WA
- Value-adding of WA-grown wood and fibre by secondary processing businesses
- Use of residue products from primary processing in WA

Value-adding by primary processors in WA

All primary processors were asked to describe the products they produced. This varied substantially between processors and sectors. The extent of value-adding of hardwood plantation, native forest and softwood plantation logs by primary processors is described below.

Hardwood plantation processors

The hardwood plantation sector has very little value adding: logs are chipped either in the field or at a woodchip mill in either Albany or Bunbury, and woodchips are then exported. There is no further processing of woodchips within WA. The woodchipping process at mills produces some waste residues (sawdust, small fines, bark, slithers), which are predominantly sold to garden and landscaping businesses in the local region, with some being exported for use in pulp mills elsewhere. These residues make up less than 1% of total production, based on the estimates provided. In in-field chipping operations, residues typically remain on site.

Native forest processors

Of the 17 native forest primary processors that provided information, one was a woodchip mill and the remaining 16 were all sawmills, often combined with other activities such as veneer processing, and producing a range of products such as flooring, laminate, furniture and others. Of the 16 sawmills:

- All but one were both 'green and dry' sawmills, meaning they both processed logs into undried (green) sawntimber and dried it on site
- Six principally described themselves as sawmills with no further processing beyond sawntimber; many of these sold their sawn product to other mills for further processing. Most described their product as focusing on 'appearance' products such as flooring, furniture and decking, with only two predominantly focusing on producing structural timber for internal use in construction

- Ten reported undertaking a range of further processing beyond producing rough sawntimber. These further processing activities included:
 - Veneer and laminate production (two mills)
 - Furniture production (four mills with some others producing feature timber subsequently sent to furniture makers)
 - Joinery and cabinetry (two mills)
 - Dressing, moulding, and/or producing specific decking and flooring products (seven mills).

Sawntimber, veneer, laminate and dressed/moulded/further processed timber products (such as joinery, flooring and decking products) were sold to a range of markets. Of rough and dressed sawntimber, around 40-50% was sold direct to other processors who then further processed it into a range of products, and the remaining 50%-60% was sold to retail or wholesale markets (for example into retail stores, sold direct by the mill, or sold to trade businesses such as those engaging in constructing flooring and decking). Further processed products such as flooring and decking products were typically sold into wholesale and retail markets.

Native forest processors reported sawntimber recovery rates of between 32% and 50% from sawlogs, with most ranging from 40% to 50%. This means that, in the case of a 50% recovery, half the volume of the log is turned into sawntimber, while the remainder is not useable for sawntimber (for example due to being too small for sawntimber, sawdust produced in the sawing process, or being an end of the log not shaped in a way that could produce sawntimber). The non-sawntimber part of the log, often referred to as residues, is used for a range of purposes. All processors were asked to report on the uses of their residues:

- Offcuts and some log ends were predominantly sold as firewood directly from the mill, or in some cases sold to Simcoa for use in silicon production. A small number of mills processed offcuts into woodchips sold for export. This made up around 30-50% of residues for most mills, although the proportion varied substantially depending on the types of production the mill was engaged in
- Sawdust and bark were sold to farms, garden centres, and landscaping businesses. This type of residue made up 50%-70% of residues at different mills.

Softwood plantation processors

Softwood plantation logs are processed by a relatively small number of processors in WA, with seven primary processors including:

- Wespine, producing structural sawntimber including untreated structural sawntimber for use in construction, treated structural timber, and packaging and landscaping timber such as sleepers and fencing; in-field chipping also produces woodchips
- Wesbeam, producing laminated veneer lumber in a range of forms for structural timber applications, including beams and joists
- Laminex, producing particleboard from softwood woodchips supplied both from woodchipped small logs and from woodchips produced from docking ends and small logs by other softwood processors

- Other production including woodchipping, sawmilling, pallet timber, sleepers, house stumps, fencing, poles and piles, produced at other mills.

Most of these mills are predominantly supplied by FPC plantations, supplemented with some softwood plantation logs from privately grown estate. Most sawntimber, particleboard and laminated veneer lumber (LVL) product is sold directly to market after production at these primary processors, with most processors undertaking a range of processing on site resulting in market ready products. Residues produced from sawmilling are typically supplied to other mills (for example woodchips are often supplied to Laminex for particleboard manufacture, and some blocks are supplied to Simcoa). Some use sawdust for producing heat as part of the production process. Most also supply bark and sawdust to landscaping, agriculture and related businesses such as horse stables.

Value-adding of WA-grown wood and fibre by secondary processors

How much of WA's secondary processing industry relies on WA-grown wood and fibre? This question is challenging to answer, as the main source of data on secondary processing – the ABS Census – does not identify what sources of wood and fibre are used by processors. It is also an important question, as a large number of jobs are generated in secondary processing. The estimated 1,495 jobs generated in secondary processing in WA in 2011 included:

- 420 jobs in the manufacture of corrugated paperboard containers, paper stationery and pulp-based sanitary products. None of these relied on timber grown in WA, with all importing their pulp or paper inputs from locations outside WA
- 755 jobs in wooden structural fitting and component manufacturing, which includes manufacture of doors, wooden door frames, window frames, wooden kitchen cabinet manufacturing and other joinery for use in buildings; jobs include construction of the wooden components but excludes their assemblage and installing (which forms part of the industry of 'carpentry services'. Some of this type of manufacturing is undertaken by primary processors, but the majority is undertaken by other businesses who further construction specific joinery products ready for construction from timber produced both by primary processors in WA and timber produced outside WA
- 265 jobs in other types of wood product manufacturing, which includes manufacturing of products such as ornamental woodwork, pallet manufacturing, picture frames, trellises, and includes some manufacturing based on wicker, cork, bamboo and cane as well as based on timber.

In addition to the 1,495 jobs in secondary processing, a further 1,128 jobs in 2016 were generated in the manufacturing of 'wooden furniture and upholstered seats'. This manufacturing category, reported by the ABS, includes both wooden furniture manufacturing (defined as furniture made predominantly from wood), and all upholstered furniture, including furniture made with metal frames and upholstering. As a large proportion of the jobs in this category do not involve use of wood products, for example many metal framed sofa beds and upholstered metal chairs, these jobs have not been included as being part of secondary processing in the timber industry. Instead, the survey of further processors was used to better estimate employment generated in furniture manufacturing that relies on wood grown in WA.

Of the jobs identified in secondary processing, there was an identified need to better understand the extent to which the following types of secondary processing businesses relied on timber grown in WA versus sourced elsewhere: wooden structural fitting and component manufacturing, 'other' wood product manufacturing, and wooden furniture manufacturing.

To do this, two steps were used:

- First, primary processors were asked what proportion of their product was sold direct to other processors for further processing
- Second, a survey of secondary processors was used to identify the extent to which these processors rely on WA-grown wood and fibre inputs.

Primary processors sometimes sold all products direct to retail and wholesale markets, sometimes exported, and sometimes sold part of their product to other processors for further processing:

- Bluegum woodchip processors sold all product for export, with no sales for secondary processing in WA. All subsequent processing of hardwood plantation woodchips takes place in other countries
- Softwood primary processors sold product to a range of customers, with the majority of product sold either direct to retail or to wholesale buyers. Less than 10% of output was sold directly to secondary processors, typically to local pallet and wooden container manufacturers for processing into further products
- Native forest primary processors reported selling anywhere from 10% to 80% of their output to secondary processors. Smaller sawmillers reported selling more output to the secondary processing market, predominantly for furniture construction, flooring manufacture, and joinery. On average, around 20% of outputs were sold to secondary processors, although this varied substantially between mills.

In addition to direct sale of products from primary processors to secondary processors, many secondary processors purchase their wood inputs from other sources, for example from wholesalers and retailers. Therefore the proportion of WA timber entering secondary processing is likely to be higher than the 20% of native forest products and <10% of softwood plantation primary processed product sold directly to secondary processors.

To better understand this, secondary processors involved in wooden structural component manufacturing, furniture making, pallet and bin construction and flooring manufacture were contacted and surveyed to identify the extent to which they rely on timber grown in WA as inputs to their business. In total the following were identified:

- Flooring and decking (often combined with other joinery): Of eight key businesses identified (in addition to those primary processors who engaged in flooring and decking production), two completed the survey, and basic information was provided by a further four businesses
- Furniture: Of 13 wooden furniture manufacturers, three completed the survey, and a further five provided basic information
- Joinery: Of 10 joinery manufacturers, two of whom also constructed some furniture, four completed the survey and a further five provided basic information

- Pallet and container (packaging) manufacturing: Of 11 businesses, six completed the survey and a further four provided basic information
- Recycled timber: Of three businesses, one completed the survey
- Truss and frame: Of seven businesses who manufactured trusses and frames without also being engaged in primary processing, none completed the survey and basic information was identified for four businesses.

Each of these sectors is analysed below based on information from the survey.

Flooring and decking

Flooring and decking businesses reported using timber from a wide range of sources. Only two of the six who provided data relied solely on timber produced in WA, while the remainder mostly used timber from WA, timber produced in other locations in Australia, and timber sourced from other countries in their business. The timber sourced from WA was most commonly native forest timber, with very little use of softwood plantation timber.

Businesses who relied solely on native forest timber harvested in WA indicated that it would be very difficult to source alternative supplies if that source of timber was no longer available. These businesses typically completed the survey. Other businesses did not complete the full survey, but indicated in phone discussions that they had a lower reliance on WA grown timber, and a greater ability to source timber from a range of suppliers outside WA. Flooring and decking businesses employed anywhere from 6 to more than 100 employees, and often employed people who installed flooring and engaged in retail sales (activities generally considered to fall outside the 'manufacturing' category), as well as constructing flooring and decking products.

Conservatively, these businesses employ between 90-150 workers who are directly engaged in manufacturing of flooring and decking products, and it is likely that around 40-60% of these jobs currently rely on timber grown in WA while the remainder depend on timber grown elsewhere. It is not possible to be more precise as some businesses did not provide employment data, and others did not identify how many workers were involved in installation and retail sale versus in manufacturing. Overall, secondary processing of flooring and decking produced from WA-grown timber is likely to generate an additional 35 to 90 jobs beyond primary processing.

Wooden furniture manufacturing

Of 13 wooden furniture manufacturers identified in the supply chain survey, three completed the survey, and a further five provided basic information. Of these, four relied solely on timber from native forests, and four relied on a mix of timber including plantation timber, fibreboard, and recycled timber. Five relied solely on WA-grown timber and three on timber sourced from a mix of locations including WA, other parts of Australia, and other countries. Those who relied solely on WA-grown timber, who predominantly used native forest timbers, all reported they would find it difficult or very difficult to source timber from other suppliers or use alternatives to timber. Those who relied on a mix of timbers including timber sourced from outside WA did not feel it would be highly difficult to source timber from alternative suppliers. Key challenges in finding new suppliers for those who relied on WA native forest timber were finding supply of adequate quality, while price and availability were key concerns reported by those who sourced timber from both WA and other locations.

Most wooden furniture manufacturers had relatively small businesses, employing between one and six workers. In total, an estimated 40 people were employed in these businesses, of which around 30 jobs relied on timber grown in WA, predominantly native forest timber.

A large number of the jobs identified by the ABS in 'wooden furniture and upholstered seat manufacturing' were not captured in the supply chain survey. Most of these businesses are engaged in work such as re-upholstering sofas, but it is likely that some further jobs involving wooden furniture manufacturing were not captured in the supply chain survey. It is unlikely that many of these jobs rely substantially on WA-grown timber.

Joinery

Of 10 joinery manufacturers, two of whom also constructed some furniture, four completed the survey and a further five provided basic information. Of these nine businesses, two relied solely on timber grown in WA, two relied solely on timber from other countries, and the other four relied on timber grown in a number of locations, usually including WA, other parts of Australia, and other countries. Of four businesses who answered questions about how easy or difficult they would find it to source timber from different suppliers, three reported it would be relatively easy to change suppliers, and one reported that it would be slightly difficult. The key issues when sourcing supply were sourcing high quality timber in the right sizes at an affordable price.

Joinery businesses employed between two and 46 workers. In total, these businesses are estimated to employ between 100 to 200 workers, with the wide range reflecting difficulty identifying employment in some businesses. Of these workers, an estimated 70 to 90 rely on use of timber grown in WA, which included a mix of softwood plantation and native forest.

Pallet and container manufacturing

Of 11 businesses engaged in pallet and container manufacturing, six completed the survey and a further four provided basic information.

Seven of the ten who provided basic information relied solely on sourcing timber grown in WA, while the remaining three sourced between 60% and 90% of their inputs from WA. Those who sourced some inputs from other locations reporting using timber imported both from other parts of Australia and from other countries. The most common source of timber was WA-grown softwood plantation sawntimber, with six businesses using only softwood plantation inputs, and four using a mix of inputs from native forest and softwood plantations. Those using native forest inputs primarily used them as key components to increase strength of softwood packaging. Of the six who provided detailed commentary:

- Rising cost of wood inputs was a big challenge for three, and a moderate challenge for three
- Lack of local supply of wood was a big challenge for two, a moderate challenge for one, and not a problem for three
- Difficulty sourcing the right type of timber inputs needed for their businesses was a very big problem for three, a moderate problem for one, and not a problem for two businesses
- Sourcing wood inputs from different suppliers would be easy for two, very difficult for three, and neither easy or difficult for one

The biggest challenges experienced when trying to obtain supply were finding adequate volume within a transportable distance, available at the right time, of consistent quality and at the right price.

Each pallet and container manufacturer employed anywhere from two to 30 workers. In total, an estimated 100-150 workers were employed in total by these manufacturers, with more precise estimation not possible as some businesses did not provide employment data. Of these workers, an estimated 80-130 jobs rely on WA-grown timber, predominantly softwood plantations.

Recycled timber manufacturing

Of three recycled timber manufacturing businesses contacted, one completed the survey. To ensure privacy of this business and reduce potential for identification, only a very limited summary of their responses can be provided. This business reported sourcing timber from a range of sources, including timber from WA businesses such as those involved in demolition and renovation work, and from international sources. Sourcing timber was sometimes challenging and it could be difficult to find new supplies of recycled timber. By definition, recycled timber businesses do not rely on timber recently harvested in WA native forests and plantations.

Truss and frame manufacturing

Of seven businesses who manufactured trusses and frames without also being engaged in primary processing, none completed the survey and basic information was identified for four businesses. The data provided by these businesses indicated that:

- The majority of businesses relied on softwood timber grown in WA, using sawntimber and LVL beams produced in WA
- Some sourced timber from multiple sources including timber grown in WA and timber grown elsewhere.

Individual businesses were a range of sizes in terms of number of workers, and as few provided employment data, total employment may range anywhere from 50 to 200 workers in this sector, with anywhere from 30 to 150 relying on timber grown in WA.

Secondary processing employment dependent on WA-grown timber

The supply chain survey suggests that of the 1,495 jobs in secondary processing identified in WA in 2011, and the 1,128 jobs in wooden furniture and upholstered seat manufacturing, anywhere from 245 to 490 jobs rely on timber grown in WA, including:

- 35-90 jobs in flooring and decking
- 30 jobs in wooden furniture manufacturing
- 70-90 jobs in joinery
- 80-130 jobs in pallet and container manufacturing
- 30-150 jobs in truss and frame manufacturing.

More precise estimates are not possible, with many manufacturers unwilling to participate in the supply chain survey or to provide detailed data on their employment.

Use of residue products from primary processing

We estimate that, conservatively, 120-140 jobs of around 240-290 generated in the garden and landscaping sector in southern and western parts of WA depend on the presence of the forest industry. This was defined based on estimating how many jobs would be lost in this sector if businesses could no longer access their current supply of residues from WA's forest industry.

In total, an estimated 230,000 tonnes of residues in the form of bark and sawdust are sold to (i) landscaping and gardening businesses, predominantly for use as mulch, and (ii) agricultural businesses and other animal-based businesses for use as animal bedding and mulch. This includes an estimated 10,000 to 15,000 tonnes from hardwood plantations (residues produced in woodchip mills), 135,000 to 160,000 tonnes from softwood plantations (this includes all residues not otherwise exported as woodchip or used to provide heat for production processes), and an estimated 60,000 to 80,000 tonnes from native forests. The ranges are estimated as some businesses did not provide exact volumes of residue sale and residue volumes were estimated based on averages of those who did provide this information, together with information on the total volume of native forest logs entering primary processors. Some smaller primary processors indicated that they didn't record residue volumes as they were too small to be commercially viable after transport costs, instead they donated residues to users in the community or used them onsite for fuel and landscaping.

The total number of landscaping, garden and agricultural businesses who use this project is unknown. In the landscaping and garden sector, 10 larger businesses who use this type of product were identified from public databases. All ten were contacted, with basic data obtained for all ten businesses, and four completing all survey questions in the 'supply chain users' surveys. These four were reasonably representative of the 10 businesses, all of whom engaged in producing compost and mulch products for use in landscaping.

These businesses predominantly used sawdust and sometimes bark residues as part of their compost manufacturing; and bark and woodchips as part of mulch manufacturing. Some used native forest processing residues, some softwood plantation residues, and some used a mix. In total these businesses reported spending 12% of 50% of their total expenditure on the primary processing residues used in their business, with three spending more than 30% of business expenditure on these inputs and only one spending less than 30%. Of the four surveyed, all four obtained their wood residues from Western Australian sources. Most purchased from a number of different primary processors of logs, and some diverted local green waste by purchasing smaller amounts of sawdust and residues from local councils and businesses that undertake work such as tree trimming.

When asked the extent to which different issues were challenges for their business in the last three years:

- Three of the four rated 'rising cost of wood/fibre inputs' as a big challenge, and one as a moderate challenge
- Three of the four rated 'lack of local supply of wood/fibre inputs' as a big challenge, and one as a moderate challenge
- All four rated 'difficulty sourcing the right types of wood/fibre inputs' as a big challenge.

When asked how easy or difficult it would be for these businesses to source their wood or fibre inputs from different suppliers if they had to, two felt it would be very difficult, one that it would be somewhat difficult, and one (the smallest business) that it would be somewhat easy.

When asked how easy it would be to change their Western Australian suppliers of wood and fibre, three stated it would be very difficult to change suppliers, and one that it would be somewhat easy. The one who rated this as somewhat easy also stated they had not tested whether there were alternative suppliers available.

All four stated that it would be very difficult (three) or somewhat difficult (one) to use an alternative to the wood/fibre residues they currently use.

The main challenges faced if they had to find new suppliers were that there is a lack of available residues on the market, with one commenting that there are 'too many users of timber products' and it is difficult to obtain desired volumes of processing residues. Two others commented that finding local suppliers within economic transport distance is difficult, with logistics and cost of transport being key constraints to finding alternative supply, as they need to source supply from a short distance to be able to afford the cost of transporting the product. One also stated that finding product of consistent size and quality was a key challenge, with primary processing residues meeting this requirement better than supply from other potential sources. These comments, and those of smaller primary processors, suggest that there is both unmet demand and unutilised supply of forest industry residues in WA due to it being unviable to transport small amounts to market.

These survey responses suggest that many compost and mulch businesses require wood residues for their products, with the WA forest industry supplying a large part of their needs, and alternative sources such as tree trimmings from arborist work are not sufficient to meet demand.

In total, the 10 businesses identified employed an estimated 190 workers, and represented the largest producers of compost and mulch in southern and western WA. In addition to these 10, a number of smaller businesses also use sawdust and bark. Based on the typical employment of smaller businesses, it is estimated these employ another 50-60 workers.

How many of the total of 240 to 250 jobs identified depend on the WA forest industry is a challenging question to answer. Of the businesses surveyed, some would close if they could not access the residues produced in primary processing. Others – predominantly smaller businesses – would be able to continue business using alternative sources of inputs.

This suggests that approximately 120-140 workers in the garden and landscaping industry have jobs that are reliant on supply of residues from the forest industry, as the businesses they work in have a high likelihood of closing if their supply of residues from the forest industry was not available.

Estimating expenditure generated beyond primary processing by WA-grown wood and fibre

Only limited estimates of the expenditure generated beyond primary processing by WA-grown wood and fibre could be developed. This is because the majority of businesses engaged in utilising residues or secondary processing were not willing to provide information on their business expenditure. In total, 18 of those surveyed provided basic expenditure information, in the form of selecting the overall expenditure range of their business in 2015-16 (businesses could tick one of 12 options that ranged from "Below \$100,000" to "\$20 million or more"). These businesses included many of the largest employers, and this information provided a basis for generating estimates of expenditure. This was done by calculating the range within which total expenditure of businesses was likely to fall, based on the average expenditure per employee reported by businesses in each category. Using this approach, the expenditure estimates in Table 12 were generated.

Table 12 Estimated expenditure by secondary processors and businesses utilising residues from primary processors, 2015-15

Type of business	Estimated expenditure (\$ million) dependent on:			Total expenditure (irrespective of source of wood and fibre inputs)
	WA-grown native forest	WA grown softwood plantation	WA-grown wood and fibre (all types)	
Flooring and decking	\$3.4-11.0 million	\$1.0-2.5 million	\$4.4-13.5 million	\$11.3-22.5 million
Wooden furniture manufacturing	\$3.0-3.6 million	<i>No businesses reported using softwood inputs</i>	\$3.0-3.6 million	\$4.0-4.8 million
Joinery	\$3.5-5.4 million	\$3.5-5.4 million	\$7.0-10.8 million	\$10.0-24.0 million
Pallet and container manufacturing	\$1.2-2.3 million	10.8-21.1 million	12.0-23.4 million	\$15.0-27.0 million
Truss and frame manufacturing	\$0.3-1.9 million	\$3.0-17.6 million	\$3.3-19.5 million	\$5.5-26.0 million
Garden and landscaping businesses (& other users of processing residues)	\$7.2-10.0 million	\$10.8-15.2 million	\$18.0-25.2 million	\$36.0-52.2 million
TOTAL	\$18.6-34.2 million	\$29.1-61.8 million	\$47.7-\$96.0 million	\$81.8-\$156.5 million

Note: The expenditure data reported in this table represent gross business expenditure on all items, e.g. wages and salaries, inputs, etc. A range is provided due to the high level of uncertainty in estimates. The data are limited and should be used with caution given the wide range of the estimates.

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 WA. The working conditions in the industry will influence the ability of forest industry businesses 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 the industry survey, and from the ABS Census: working hours, and income.

Note that in the following pages, most data are presented for the whole forest industry in WA, and are not typically broken into industry sector 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 a single business often operated across multiple regions, and answered the survey for all its workers.

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 67% of workers employed in forest and plantation management businesses (growers); 87% of harvest and haulage contractors; 94% of wood and paper processing workers; and 60% of silvicultural and nursery workers (Table 13). Estimates for silvicultural contractors and nurseries are based on both interviews with these businesses conducted by phone, and data from similar businesses in other regions, due to the small number of these businesses who completed the full survey.

Overall, 85% of industry workers had full-time jobs², 5% worked part-time and 10% were casual workers. Casual work was more common than part-time work, and most casual work was generated in growing, nursery and silvicultural businesses, in which casual workers contribute to seasonal activities such as tree planting.

Table 13 Full-time, part-time and casual work in the WA forest industry, 2017 – industry survey results

	Full-time	Part-time	Casual
Growers	67%	7%	26%
Harvest and haulage contractors	87%	3%	11%
Processors	94%	4%	2%
Silvicultural contracting and nurseries (estimated based on phone discussions & similar businesses in other regions)	60%	10%	30%
Whole industry	85%	5%	10%

Data source: 2017 Industry Survey. Data are reported for all WA regions as many businesses operated across more than one WA region, and there were also few differences by region or by industry sector.

² This includes a small number of workers who were subcontracted rather than directly employed: subcontractors typically worked full-time hours.

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 14 shows that in 2016 only 18% of forest industry workers were employed part-time, compared to 36% of the broader workforce in WA's three key forest industry regions (the Great Southern and Esperance, South West, Wheatbelt).

Table 14 Proportion of WA workforce employed full-time and part-time, 2006-2016 – ABS Census of Population and Housing

Industry sector (ABS classification)	% workers employed full-time			% workers employed part-time		
	2006	2011	2016	2006	2011	2016
Forestry	80%	77%	83%	20%	23%	17%
Logging	91%	92%	91%	9%	8%	9%
Forestry Support Services	71%	69%	66%	29%	31%	34%
Wood product manufacturing	89%	86%	88%	11%	14%	12%
Pulp and paper manufacturing	86%	77%	74%	14%	23%	26%
Forest industry workforce	84%	81%	82%	16%	16%	18%
Employed labour force in Great Southern, Esperance, South West, Wheatbelt (all industries)	68%	63%	64%	32%	31%	36%

Data source: ABS Census of Population and Housing, 2006, 2011, 2016. 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.

Census data were also analysed to identify whether many forest industry 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 WA's forest industry regions, 16% of workers reported working 49 or more hours a week in 2011 (Table 15). In the forest industry, however, 24% of workers reported working 49 hours or more per week. This reflects both the relatively high proportion of people who work full-time in the industry, but also reflects long working hours being typical in some parts of the industry, particularly harvesting and haulage. These long hours can act as a disincentive to workers and reduce retention of the workforce.

Table 15 Working hours by industry sector, 2006-2016 – ABS Census of Population and Housing

Industry sector (ABS classification)	% workers who worked < 25 hours in week prior to Census			% workers who worked > 48 hours in week prior to Census		
	2006	2011	2016	2006	2011	2016
Forestry	13%	23%	14%	47%	36%	46%
Logging	8%	10%	10%	71%	64%	61%
Forestry Support Services	14%	34%	21%	30%	54%	28%
Wood product manufacturing	6%	15%	12%	23%	13%	16%
Pulp and paper manufacturing	6%	11%	20%	21%	20%	13%
Forest industry workforce	10%	10%	16%	22%	22%	24%
Employed labour force in Great Southern, Esperance, South West, Wheatbelt (all industries)	25%	26%	27%	19%	15%	16%

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 work or did not report their working hours were excluded from the analysis.

Income

ABS Census data shows that forest industry workers in WA generally earned slightly higher incomes than the average income earned by those employed in other industries in the same regions (Table 16): in 2016, only 16% of forest industry workers earned less than \$649 per week, compared to 49% of all workers in WA forest industry regions, and 42% earned \$1,250 or more per week, compared to 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 fewer workers earning low incomes. To identify whether the wages/salaries paid in the forest industry were higher than average after taking hours of work into account, the proportion of full-time workers who earned low and high income was compared (Table 17). Once this difference was accounted for, there was a different picture: in 2016, those working full-time in the forest industry were just as likely to earn less than \$649/week as those working full-time in other industries, with 7% earning this amount compared to 8% of full-time workers across the broader workforce in the three forest industry regions. They were slightly less likely to earn high income compared to full-time workers in other industries (49% compared to 53%). This indicates that forest industry workers are being paid wages that are often similar to the rest of the workforce when compared based on full-time work.

Table 16 Income earned by workers, 2006-2016 – ABS Census of Population and Housing

Industry sector (ABS classification)	% all workers earning <\$600 per week (\$649 in 2016)			% all workers earning > \$1299 or \$1250 per week		
	2006	2011	2016	2006 (\$1299/wk)	2011 (\$1250/wk)	2016 (\$1250/wk)
Forestry	25%	16%	13%	25%	43%	55%
Logging	15%	6%	9%	24%	59%	61%
Forestry Support Services	35%	20%	20%	18%	26%	49%
Wood product manufacturing	35%	18%	12%	10%	26%	39%
Pulp and paper manufacturing	37%	17%	20%	10%	27%	36%
Forest industry workforce	34%	20%	16%	12%	27%	42%
Employed labour force in Great Southern, Esperance, South West, Wheatbelt (all industries)	38%	50%	49%	19%	21%	25%

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.

Table 17 Income earned by full-time workers, 2006-2016 – ABS Census of Population and Housing

Industry sector (ABS classification)	% all workers earning <\$600 per week (\$649 in 2016)			% all workers earning > \$1299 or \$1250 per week		
	2006	2011	2006	2011	2006	2011
Forestry	17%	7%	7%	29%	54%	64%
Logging	12%	4%	5%	26%	65%	66%
Forestry Support Services	13%	11%	8%	24%	32%	65%
Wood product manufacturing	31%	11%	7%	11%	28%	42%
Pulp and paper manufacturing	26%	7%	6%	14%	33%	44%
Forest industry workforce	28%	10%	7%	14%	31%	49%
Employed labour force in Great Southern, Esperance, South West, Wheatbelt (all industries)	25%	11%	8%	20%	43%	53%

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 Western Australia 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 32% of workers were female, and in silvicultural contracting and nursery worker (an estimated 20%, although based on limited data). Only 8% of harvest and haulage contractors were female, and 12% of those employed in wood and fibre processing (Table 18). This suggests many parts of the industry are not successfully accessing the female labour force.

Analysis of Census data suggests that there has not been substantial change in the gender composition of the workforce over time, with little growth in the proportion of the forest industry workforce who are female in all parts of the industry except forestry support services (Table 19). As of 2016, 47% of the total labour force in Western Australia's forest industry regions was female, a 1% increase since 2011. In the forest industry workforce, female representation in the workforce fell by four per cent over the same period, from 25% to 21%, and remained substantially lower than was typical in other parts of the workforce. 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.

Table 18 Workforce characteristics: gender (2017 Industry survey)

	Male workers	Female workers	Full-time men	Full-time women	Part-time/casual men	Part-time/casual women
Growers	68%	32%	71%	57%	29%	43%
Harvest and haulage contractors	93%	8%	89%	20%	11%	80%
Processors	88%	12%	97%	75%	3%	25%
Silvicultural contractors and nurseries (estimated based on phone discussions & similar businesses in other regions)	80%	20%	90%	60%	10%	40%
Whole industry	82%	18%	88%	62%	12%	38%

Data source: 2017 survey of South West Slopes and Central Tablelands softwood plantation businesses

Table 19 Workforce by gender composition, 2006-2016 – ABS Census of Population and Housing

Industry sector (ABS classification)	% male			% female		
	2006	2011	2016	2006	2011	2016
Forestry	78%	79%	88%	22%	21%	12%
Logging	83%	90%	89%	17%	10%	11%
Forestry Support Services	71%	54%	72%	29%	46%	28%
Wood product manufacturing	84%	84%	86%	16%	16%	14%
Pulp and paper manufacturing	69%	66%	70%	31%	34%	30%
Forest industry workforce	76%	75%	79%	24%	25%	21%
Employed labour force in Great Southern, Esperance, South West, Wheatbelt (all industries)	55%	54%	53%	45%	46%	47%

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.

Age

Australia's workforce is ageing, as is the population overall. In 2006 and 2011, the forest industry workforce had a slightly older age distribution compared to the rest of the workforce in WA's forest industry regions, with 31% of workers aged under 35 (compared to 36% in the workforce as a whole), and 23% aged 55 or older (compared to 20% in the broader workforce) (Table 20). Overall, these findings suggest that as of 2016 the forest industry workforce had a similar age distribution to the broader labour force working in the regions of WA in which most of the industry's employment is generated. However, the forest industry workforce aged more rapidly between 2011 and 2016 than the rest of the workforce.

Table 20 Workforce by age, 2006-2016 – ABS Census of Population and Housing

Industry sector (ABS classification)	% aged < 35 years			% aged 55 and older		
	2006	2011	2016	2006	2011	2016
Forestry	40%	33%	31%	9%	18%	26%
Logging	29%	40%	32%	12%	12%	25%
Forestry Support Services	40%	31%	33%	12%	15%	29%
Wood product manufacturing	38%	37%	30%	13%	17%	22%
Pulp and paper manufacturing	29%	39%	30%	15%	19%	22%
Forest industry workforce	37%	38%	31%	13%	16%	23%
Employed labour force in Great Southern, Esperance, South West, Wheatbelt (all industries)	36%	38%	36%	16%	18%	20%

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 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 Western Australia's forest industry regions (Table 21), and stayed stable between 2006 and 2016.

Table 21 Aboriginal and Torres Strait Islander participation in workforce, 2006-2016 – ABS Census

Industry sector (ABS classification)	% workforce identifying as Aboriginal or Torres Strait Islander		
	2006	2011	2016
Forestry	2%	0%	2%
Logging	3%	0%	1%
Forestry Support Services	0%	0%	0%
Wood product manufacturing	1%	1%	1%
Pulp and paper manufacturing	0%	0%	0%
Forest industry workforce	1%	1%	1%
Employed labour force in Great Southern, Esperance, South West, Wheatbelt (all industries)	1%	1%	1%

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 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. Only 18 businesses in Western Australia elected to answer these questions, which were an optional part of the industry survey. However, these included many of the largest businesses operating in the industry: the 18 respondents included six growers (managing almost all native forest and plantation in Western Australia), ten processors (including all but one of the largest processors). Only two harvest and haulage contractors answered these questions.

The types of staff that were most challenging to recruit were heavy machinery operators, and managers and high level professional staff (Figure 6), with 64-67% of businesses reporting difficulty recruiting these types of workers. Difficulty recruiting managers and professional staff was most commonly reported by growers and less often by processors, while difficulty recruiting heavy

machinery operators was more commonly reported by processors and harvest contractors. This was followed by transport workers, with 50% of those businesses who needed this type of employee finding it difficult to recruit staff. Fewer reported difficulties recruiting administrative staff (29%), or finance managers and book keepers (23%), and none reported finding it difficult to recruit field staff.

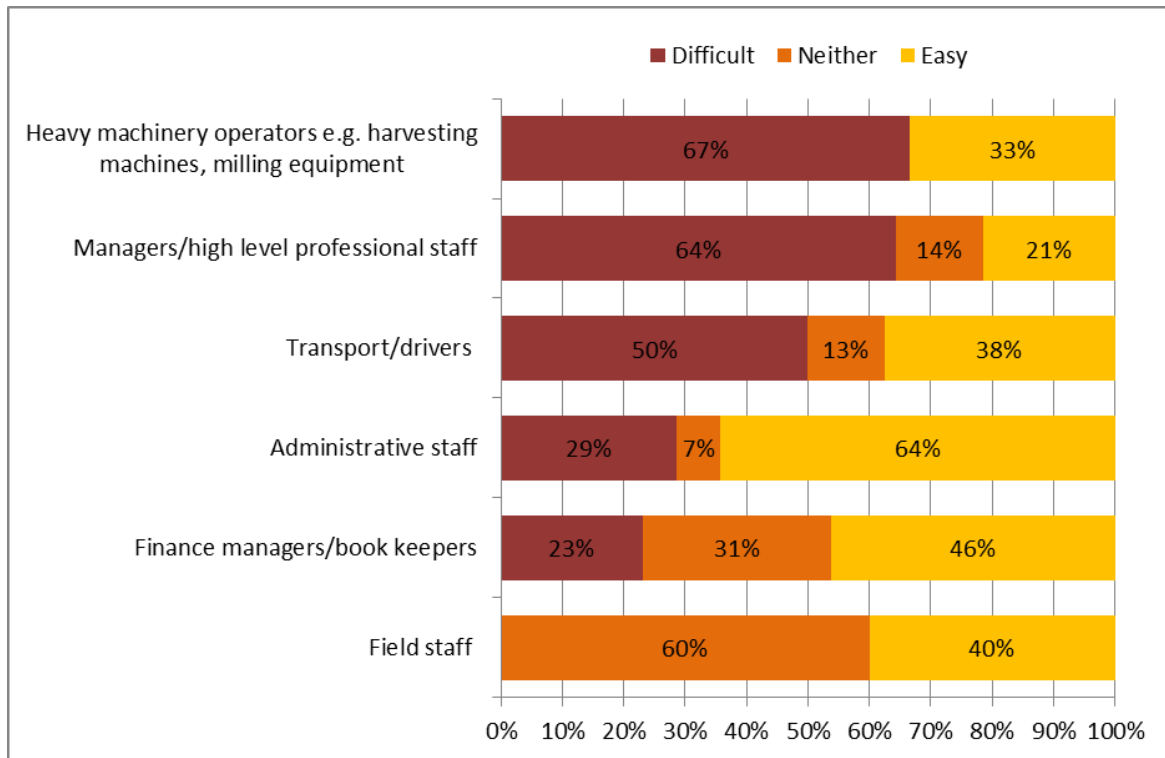


Figure 6 Level of difficulty involved in recruiting different types of workers, as rated by WA forest industry businesses

When native forest and plantation managers were asked about accessing skilled contractors, most reported finding it easy to source skilled contractors in the areas of harvest, haulage, roading and earthmoving, and nurseries. Silvicultural contractors who undertake coppicing, pruning, spraying and fertilising were slightly more difficult to source, with 29% of native forest and plantation managers finding it difficult to source these (Figure 7).

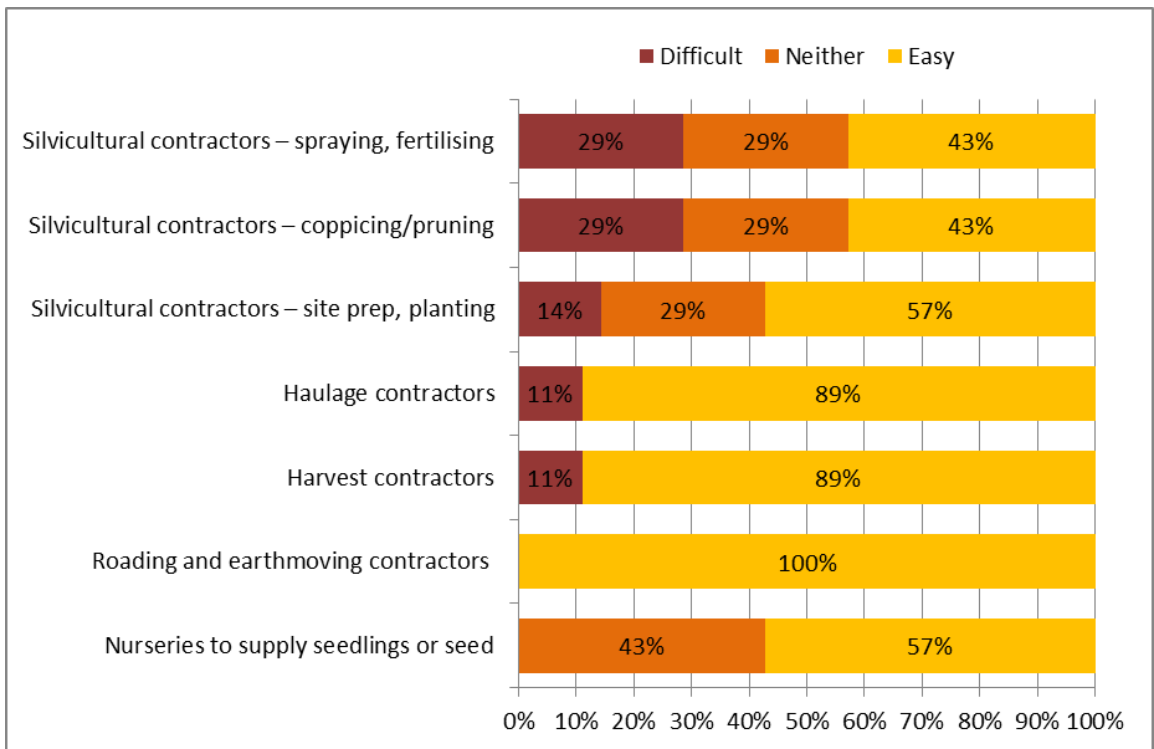


Figure 7 Level of difficulty involved in recruiting different types of contractors, as rated by WA forest industry businesses involved in engaging contractors

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 72% reporting that this was a big issue for their business (Figure 8). For 60%, lack of certainty about the future of the industry was a big issue, particularly for those operating in the native forest sector, while 59% reported that lack of suitable local workers was a big issue, and 56% had challenges related to the time and investment required to build worker skills. Just over half (53%) reported that other businesses being able to offer higher wages or better working conditions was a big issue. For 47%, negative perceptions of the industry were an issue, with this most commonly reported by those in the native forest sector. Less than one quarter reported that lack of affordable house, lack of willingness of workers to shift to their community, or lack of jobs for partners/spouses were big issues.

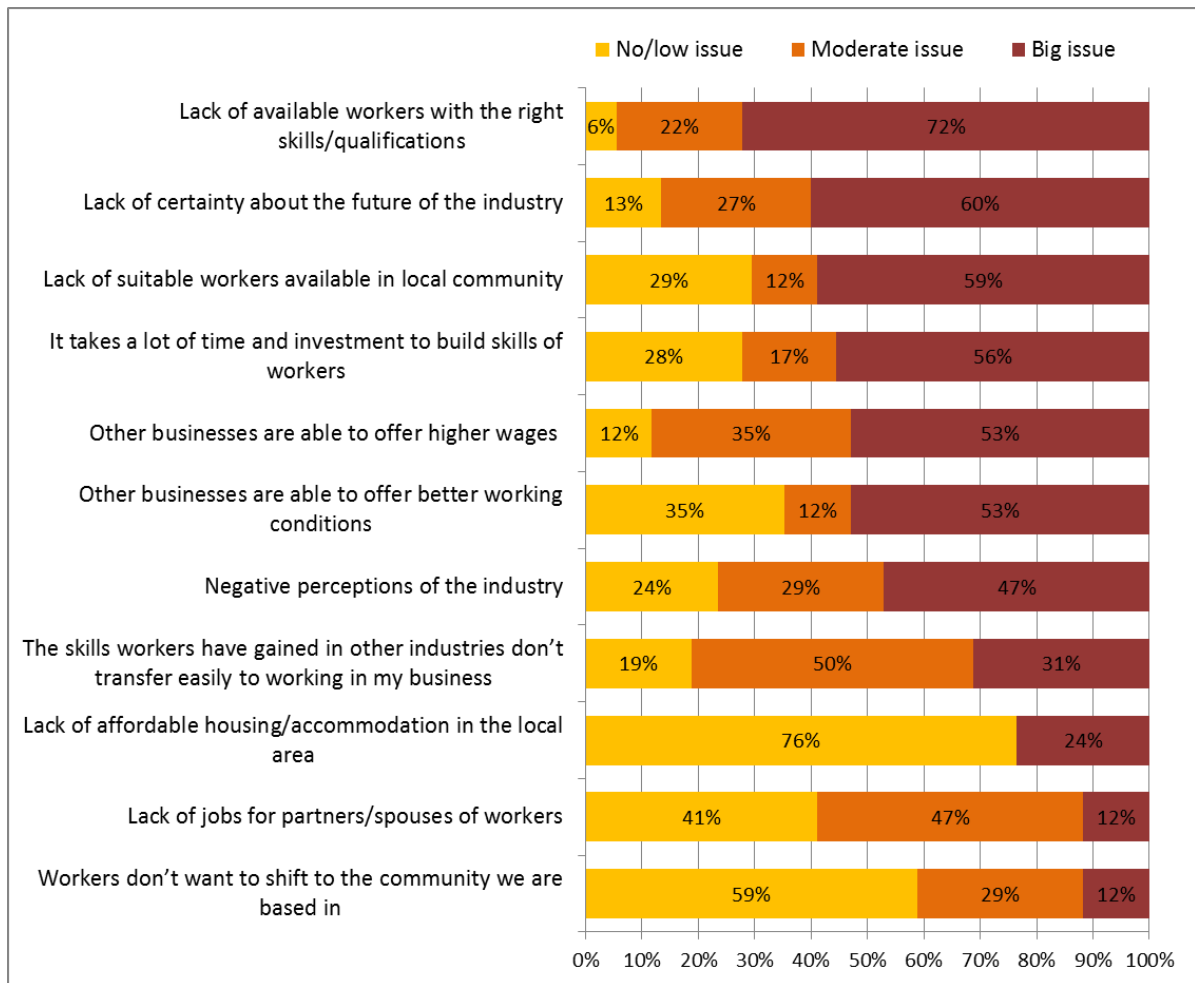


Figure 8 Key issues preventing recruitment of skilled workers into the South West Slopes and Central Tablelands softwood plantation industry

Recruiting heavy machinery operators, managers/high level professional staff, and transport drivers was difficult for many businesses in the Western Australian forest industry, suggesting a need to address the challenges that are causing challenges recruiting staff with these skills. These challenges include a lack of suitably skilled local workers and challenges of training workers, lack of certainty about the future of the industry, and the competitiveness of the industry compared to other industries in terms of the wages and conditions being offered.

Industry skills and training needs

This section examines the skills and training needs of the forest industry in WA. The industry needs workers with a diverse range of skills, ranging from nursery growers to skilled machinery operators and finance and administration professionals. The specialised skills required in the workforce are evolving over time as the technologies used in the industry evolve in areas as diverse as plantation management, harvest, haulage, and wood and fibre processing.

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. Table 22 shows the proportion of businesses reporting that some or all of their workers required skills in each of twelve competency areas asked about, and the proportion who required workers to have formal accreditation in each skill area. Businesses most commonly reported needing workers with chainsaw and other hand-held machinery skills, with this a common need across all types of business. This was followed by occupational health and safety training, needed by 94% of businesses, with 76% of all businesses requiring formal accreditation in this area. Compliance training – defined as training in ensuring compliance with government and/or voluntary regulation – was needed by 83% of businesses, with 44% requiring formal accreditation of some kind in this area. Fire-fighting, heavy machinery operation, business and financial management, and marketing/sales skills were needed by more than 70% of businesses. Forest operations planning and management was important to growers and to many processors. Community relations and community engagement were skills needed by 63% of businesses, particularly growers; the small number of contractors who completed these questions did not identify this as a skills need for their workers. Training in ICT products specialised to the industry was needed by 61% of businesses; however, few businesses required workers to have formal accreditation in these skills, with the exception of growers.

Other skills were needed by a smaller proportion of businesses, with some being specialised to particular parts of the industry. For example, processors did not typically require forest ecology and silviculture skills, while these were important skills for growers. Road transport and driver training was described as important by fewer businesses.

Table 22 Skills and accreditation needs reported by forest industry businesses in Western Australia

	All businesses (includes silvicultural contractors)		Growers		Processors		Harvest and haulage contractors	
	Need skills	Require accreditation	Need skills	Require accreditation	Need skills	Require accreditation	Need skills	Require accreditation
Chainsaw and other hand-held machinery	94%	78%	100%	100%	90%	60%	100%	100%
Occupational health and safety training	94%	76%	100%	83%	100%	78%	50%	50%
Compliance training	83%	44%	100%	50%	80%	40%	50%	50%
Fire fighting	83%	61%	100%	83%	80%	50%	50%	50%
Heavy machinery operation	78%	67%	50%	50%	90%	70%	100%	100%
Business and financial management	72%	61%	100%	67%	60%	60%	50%	50%
Marketing/sales	72%	28%	83%	17%	70%	30%	50%	50%
Forest operations planning and management	67%	39%	100%	67%	50%	20%	50%	50%
Community relations/engagement	63%	13%	83%	17%	56%	11%	0%	0%
IT/ software training specialised to the industry	61%	39%	83%	67%	50%	20%	50%	50%
Forest ecology and silviculture	47%	35%	83%	67%	30%	20%	0%	0%
Road transport/driver training for haulage drivers	33%	33%	33%	33%	30%	30%	50%	50%

Businesses were also asked to identify whether they delivered skills training in different competency areas via in-house training by their own staff, in-house training by an expert, or training via a registered training organisation. They were able to select more than one of these if training was delivered using more than one method (Table 23):

- Registered training organisations were most commonly used to provide road transport/driver training, occupational health and safety training, forest ecology and silviculture, heavy machinery operation, chainsaw and other hand-held machinery operation, and business/financial management; in some cases this was supplemented by in-house training, particularly for occupational health and safety, and for forest ecology and silviculture
- In-house training by an expert was the most common methods for staff receiving compliance training and fire-fighting training
- In-house training by other staff was the most common method used for IT/software training, marketing and sales, and community engagement/relations training.

Table 23 Types of training used to build staff skills

	Registered training organisation	In-house training by other staff	In-house training by expert
Road transport/driver training for haulage drivers	86%	14%	29%
Occupational health and safety training.	75%	38%	38%
Forest ecology and silviculture including plant identification	75%	38%	50%
Heavy machinery operation	71%	29%	14%
Chainsaw and other hand-held machinery (eg brushcutter, pruning)	65%	24%	18%
Business and financial management	62%	31%	15%
Forest operations planning and management	55%	45%	27%
Compliance training e.g. training in compliance needed for regulatory or certification bodies	36%	36%	50%
Fire fighting	33%	27%	47%
IT/ software training specialised to the industry e.g. for plant operation, in-field survey	33%	42%	33%
Marketing/sales	30%	80%	20%
Community relations/community engagement	11%	67%	33%

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 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 more readily transferable between workplaces. Engaging in formal educational attainment is beneficial beyond enabling workers to attain specific competencies: the process of formal learning builds fundamental learning, literacy and numeracy skills that enable workers to better 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 2016, workers in most parts of the WA forest industry were less likely to have completed high school than those working in other industries in the same regions (Table 24). However, forest industry workers were similarly likely to have completed a certificate qualification as those in other parts of the workforce. Completion of a Bachelor degree or other university qualification was higher than the average for those employed in forestry support services, but lower than the workforce average in all other parts of the industry.

Table 24 Formal education attainment: rates of attainment of high school and post-school qualifications, 2006 to 2016

Industry sector (ABS classification)	% completed high school (Year 12 or equivalent)			% with no post-school qualification			% with Certificate or diploma qualification			% with Bachelor or postgraduate degree		
	2006	2011	2016	2006	2011	2016	2006	2011	2016	2006	2011	2016
Forestry	49%	39%	47%	53%	53%	40%	28%	35%	45%	19%	12%	13%
Logging	30%	30%	29%	65%	62%	52%	29%	32%	46%	6%	6%	2%
Forestry Support Services	62%	46%	66%	42%	36%	36%	39%	38%	38%	20%	26%	27%
Wood product manufacturing	35%	45%	41%	56%	47%	50%	39%	47%	43%	5%	6%	6%
Pulp & paper manufacturing	42%	35%	52%	57%	53%	50%	39%	36%	39%	10%	11%	9%
Forest industry workforce	41%	39%	46%	58%	51%	50%	34%	40%	42%	8%	9%	9%
Employed labour force in Great Southern, Esperance, South West, Wheatbelt (all industries)	45%	51%	57%	51%	46%	39%	36%	39%	42%	13%	15%	19%

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 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. In total, 32 businesses answered these questions, including almost all of the largest businesses involved in the forest industry in WA.

Overall business conditions

Businesses were asked 'how would you describe business conditions for your business at the moment?' Answers varied substantially depending on the type of business answering, as shown in Figure 9. Those businesses dependent on hardwood plantations predominantly reported that business conditions were the same as usual or easier than usual, with very few reporting they were harder than usual. Those operating native forest-dependent businesses predominantly reported business conditions as being more challenging than usual (71%), or the same as usual (18%), with very few reporting conditions were easier than usual (12%). Those who reported conditions were easier than usual were mostly businesses who operated in both the native forest and plantation sector. In the softwood sector, most businesses (75%) reported business conditions were more challenging than usual.

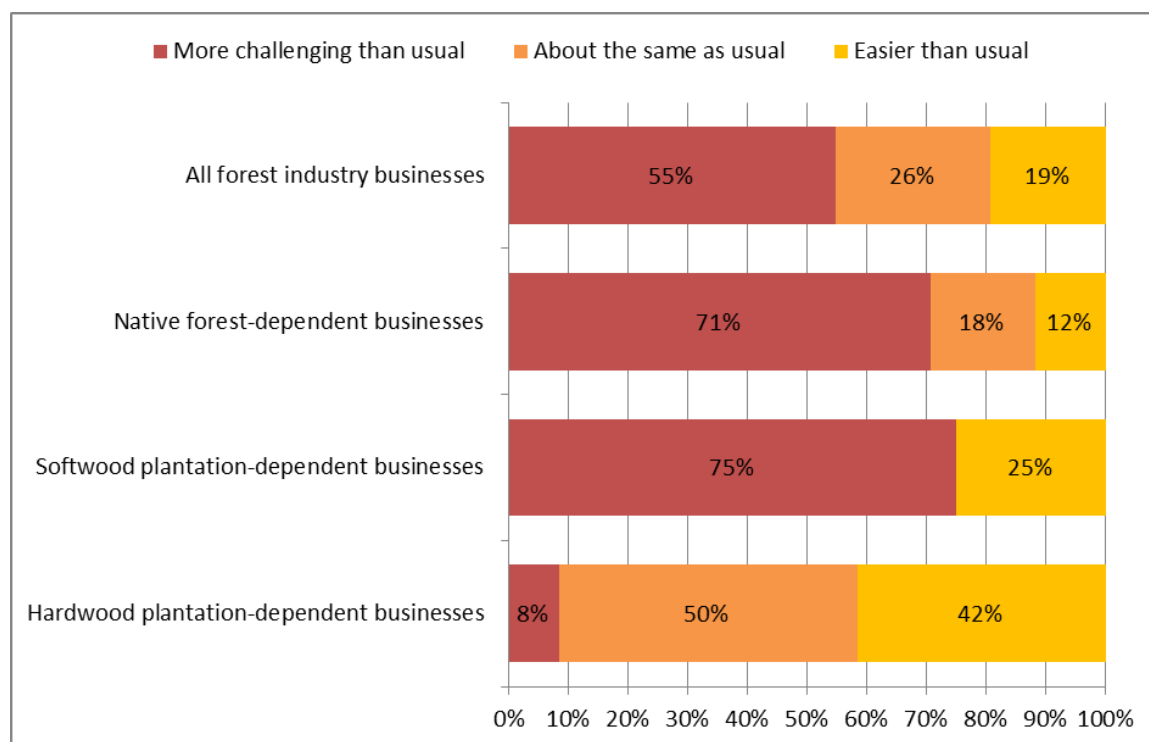


Figure 9 Overall business conditions reported by WA forest industry businesses, 2017

The answers given by businesses also depended on the type of activity they were engaged in: only 25% of growers reported conditions were more challenging than usual, compared to 50% of harvest and haulage firms and 72% of processors.

Businesses were also asked what was going well in their business, and to describe the main challenges facing their businesses. Key themes in answers included:

- Hardwood plantation businesses: The lower exchange rate for the Australian dollar was identified as improving demand for woodchips by several businesses, while key challenges were encouraging new plantation establishment, and coping with poor road infrastructure
- Softwood plantation businesses: Key challenges included softening of the housing market reducing demand for structural timber, and reduced demand for poles, combined with increased competition from imported timber
- Native forest businesses: Reduced demand for sawnwood products (particularly structural sawn timber), high levels of regulation, and for some processors difficulty accessing desired volume of resource or desired quality of logs from FPC were key challenges.

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 10:

- Only 30% of businesses felt they were likely to grow their profitability, and 40% that revenue would grow, with 40% and 25% respectively feeling their business was unlikely to achieve these two things in the next 12 months
- Most businesses felt their workforce would remain stable over the next 12 months, although there may be a slight reduction in the overall workforce as only 15% of businesses expected to increasing workforce size while 30% expected to reduce the size of their workforce
- Many planned to invest in their business: 50% were planning to invest in new capital equipment and 40% in new business systems.

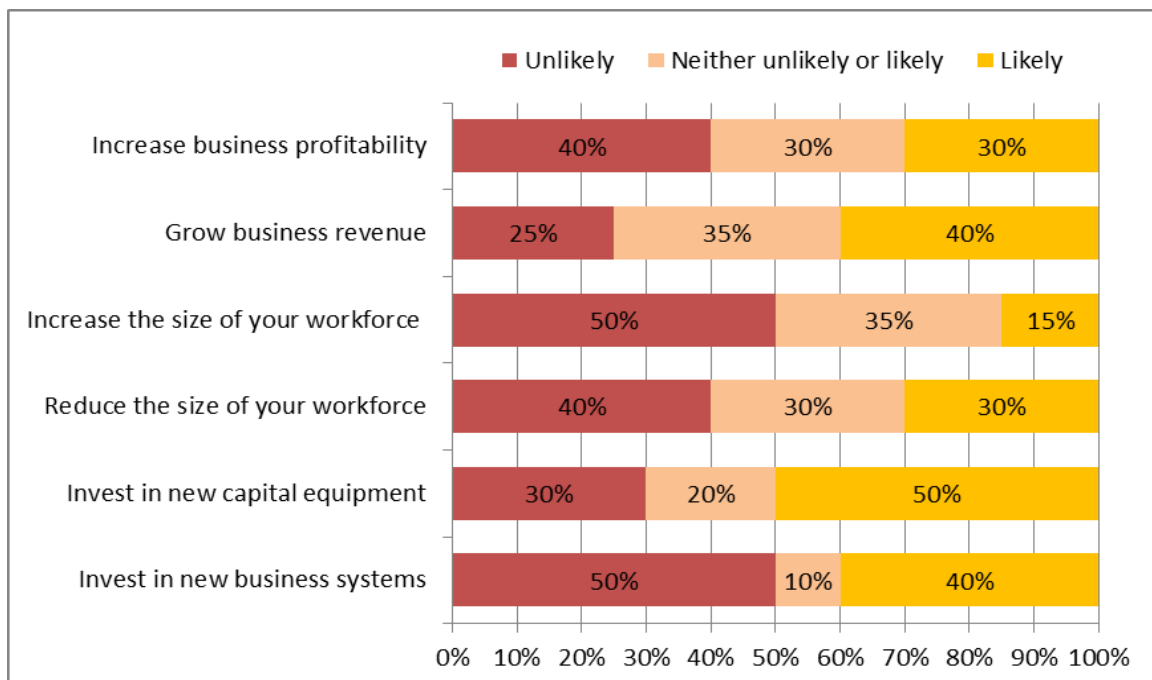


Figure 10 Expectations for business revenue, profitability, workforce size and investment over the next 12 months

Expectations were somewhat different for businesses dependent on native forest, softwood plantations and hardwood plantations (Figure 11). Hardwood plantation businesses were much more likely than others to be expecting to grow revenue, but one third also thought it was likely the size of their workforce would reduce in the next 12 months. Softwood plantation dependent businesses were less likely than those operating in the native forest or hardwood plantation sectors to report that business profitability or revenue would grow in the next 12 months.

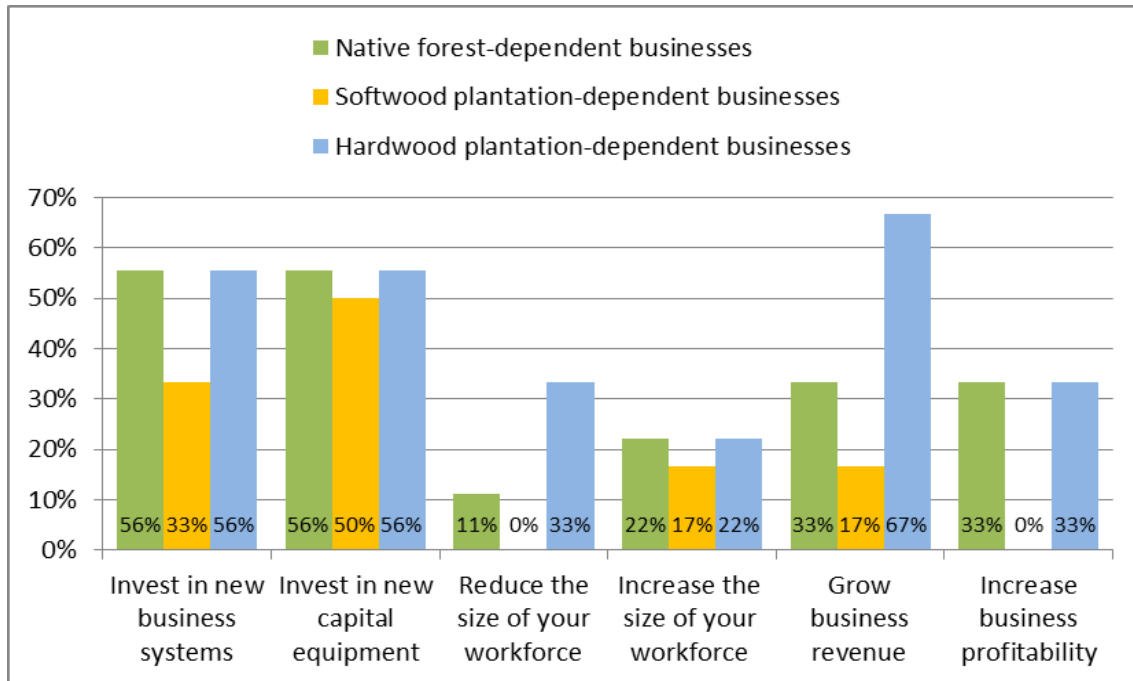


Figure 11 Business expectations over the next 12 months – native forest and plantation businesses

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 (Figure 12). Most (54%) felt demand would remain the same, just over one third (36%) that demand would grow and few (11%) that demand would reduce. Hardwood plantation dependent businesses were more positive, with 55% believing demand was likely to grow for their products or services, while softwood plantation businesses were most likely to report demand would shrink (25%) and least likely to report it was likely to grow (25%). In the native forest sector, despite many reporting challenging business conditions, demand was forecast by most to stay the same or grow.

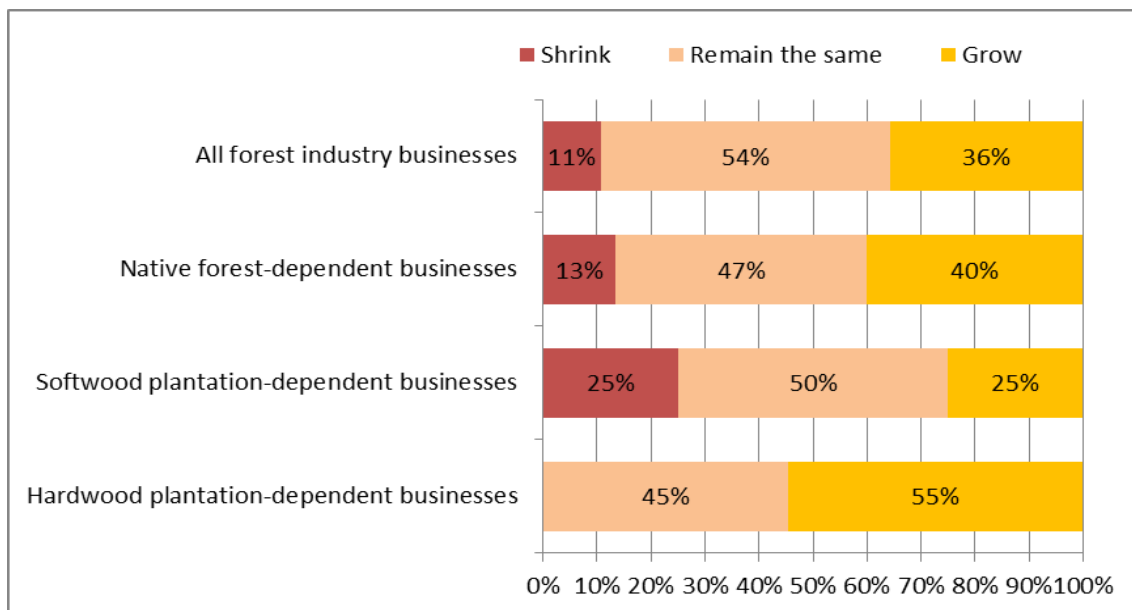


Figure 12 Expectations for business demand over the next 12 months

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 increased demand for logs, better availability of land for expansion of plantations, and further lowering of the value of the Australian dollar on currency exchange markets, would enable them to invest more; one also felt that more consistent regulation giving better certainty would enable them to invest more
- Harvest, haulage and silvicultural contractors most commonly identified having resource security and increased profitability as factors affecting their ability to invest
- Processors reported a range of factors that would enable them to increase investment in their business, including:
 - All processors – increase in demand for their products and having secure access to resource were important for most; some also identified that having renewable energy credits applicable to heat generators as well as electricity would assist some processors
 - Hardwood plantation processors – These processors identified continued favourable exchange rate conditions, ensuring free trade market conditions, and increased resource availability as factors affecting ability to invest
 - Softwood plantation processors – Stronger demand was the key topic discussed
 - Native forest processors – Increased sales and increased confidence in future security of resource were commonly mentioned.

Business challenges

Businesses were asked 'what factors would trigger you to downsize or close your business?' Answers to this question were very consistent and not surprisingly mostly related to demand for products or services:

- Growers most commonly reported lack of access to resource and lack of demand for products as factors triggering downsizing
- Contractors reported resource insecurity and demand for their services as key factors
- Processors most commonly reported lack of resource supply and lack of demand for products, with several native forest processors identifying concerns that lack of confidence in the future regarding supply of native forest resource was a key issue.

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. Of the businesses who completed these questions, including the majority of large employers in the forest industry, the most common challenges in the last three years were lack of investment in the industry, lack of demand for goods, and difficulty maintaining competitiveness with other similar businesses, with 50% to 65% of all businesses reporting these were big challenges for them (Figure 13). Poor telecommunications and government regulation were also challenges for a significant proportion (45%) of WA's forest industry businesses.

Difficulty accessing markets, obtaining finance, obtaining certification or accessing labour were not significant issues for most businesses, although access to markets and labour were moderate problems for many. The types of challenges experienced varied by sector (Figure 14):

- Hardwood plantation businesses: These businesses were most likely to report that lack of investment in the industry, poor telecommunications and difficulty maintaining competitiveness with other similar businesses were key challenges for them
- Softwood plantation businesses: These businesses were more likely than others in the industry to report that lack of demand and falling prices for goods, difficulty maintaining competitiveness, and rising input costs were big challenges
- Native forest businesses: These businesses were more likely than others to report that lack of investment in the industry and government regulation were big problems, with lack of demand for products also reported by several.

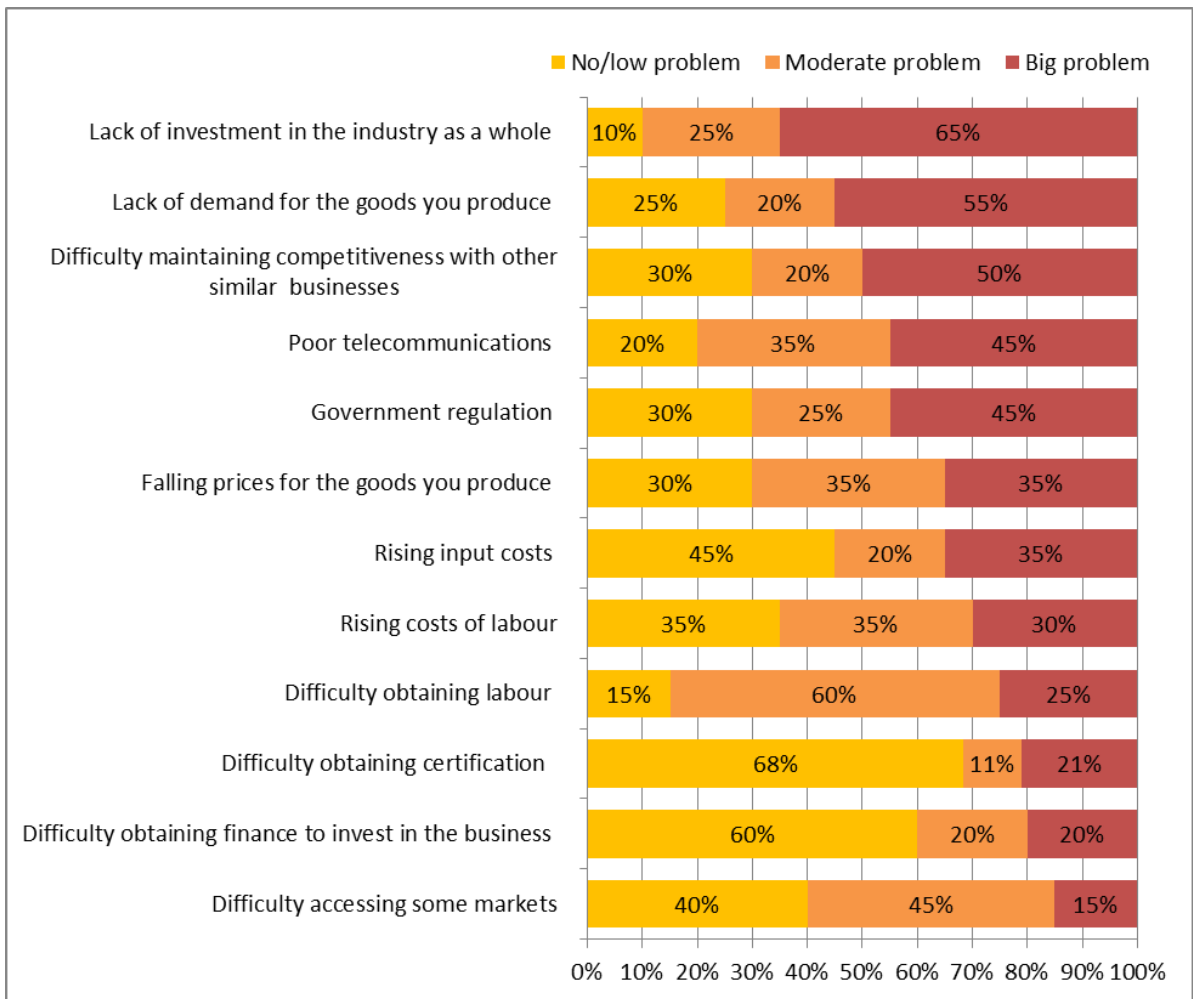


Figure 13 Challenges experienced by forest industry businesses in Western Australia

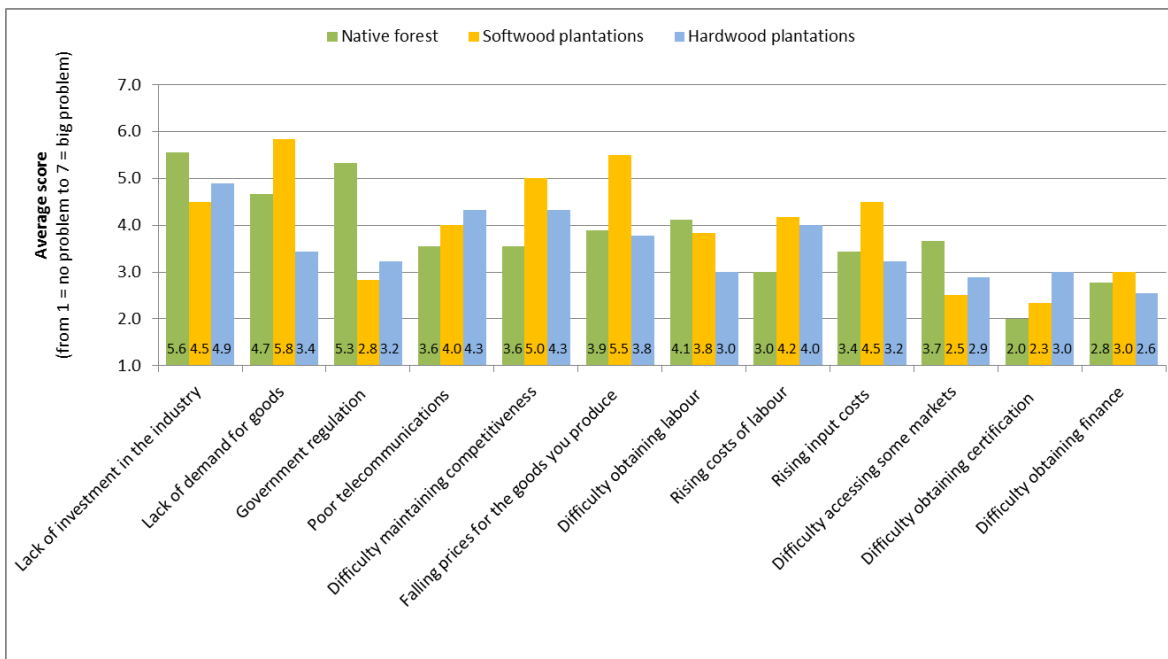


Figure 14 Challenges experienced by forest industry businesses in Western Australia, by industry sector

Liveability of communities with high dependence on 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 South West, Great Southern and Esperance, and Wheatbelt regions, 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.

The analysis in this section provides two perspectives, each of which provide different insight into quality of life in communities in which the forest industry operates:

- The first perspective examined the overall ratings residents give their communities for different aspects of liveability, and compares whether residents living in regions with high dependence on the forest industry rate their community as having better or worse quality of life compared to those in other nearby communities. This perspective does not involve residents specifically assessing the contribution of the forest industry, but rather examines the outcomes of the multiple factors that contribute to the liveability of a community, with the presence of the forest industry being only one of these many factors
- The second perspective asks residents to specifically rate their views about how different industries affect various aspects of their local economy and quality of life. This perspective uncovers common perceptions residents have of the forest industry compared to other industries, although their ratings of its contribution to quality of life may not always be consistent with their rating of overall liveability of their community.

Quality of life and liveability

Quality of life and liveability of local regions was examined by asking residents how they viewed the overall liveability, economy, roads, friendliness, safety, landscape and environmental health of the local community they lived in. To help examine whether the forest industry may be contributing to differences in these experiences, the following groups were compared:

- Rural and regional WA: a total of around 1,000 people³ from rural and regional WA participated in the survey, including a small number (<20) of Perth residents, of whom most lived on the urban fringe of Perth
- High forest industry dependence: people living in local government areas (LGAs) in which more than 2% 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:
 - Great Southern and Esperance: Two LGAs, Albany and Plantagenet, had high forest industry dependence. A total of around 150 residents from these two LGAs participated in the survey.

³ Not all survey participants answered every question, and as such the 'n' changes slightly for different results presented below

- South West: The LGAs of Bridgetown-Greenbushes, Dardanup, Manjimup and Nannup had high forest industry dependence. A total of around 130 residents from these LGAs participated in the survey.
- Wheatbelt: There were no LGAs with high forest industry dependence in the Wheatbelt region.
- Low forest industry dependence: people living in LGAs with 2% or less of jobs directly dependent on the forest industry, or with relatively smaller amounts of plantation of forest harvesting
 - Great Southern and Esperance: residents of Cranbrook, Denmark, Esperance, Jerramungup and Kojonup, with a total of around 130 survey respondents
 - South West: residents of Augusta-Margaret River, Boyup Brook, Bunbury, Busselton, Capel, Collie, Donnybrook-Balingup, Harvey, Mandurah and Murray, with a total of around 150 survey respondents
 - Wheatbelt: residents of Dandaragan, Gingin, Kalamunda, Mundaring, Northam, Swan, Toodyay and Wanneroo, with only 56 survey respondents. Data from this region have limited reliability due to the low sample size.

The analysis below compares experiences of those living in rural and regional WA as a whole, and those living in communities with high versus low forest industry dependence in the Great Southern and Esperance, South West, and Wheatbelt regions. This gives a useful indication of whether residents of forest industry dependent communities report substantially different local quality of life and liveability compared to those 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. For example, in the Great Southern the LGAs with higher forest industry dependence also have the largest populations of most LGAs in the region, and some of the differences between these communities and those with lower dependence on the forest industry are therefore likely to be due more to their differences in overall population size than to the presence of the forest industry.

Figure 15 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. Overall, people living in regions with higher dependence on the forest industry were slightly (but usually not significantly) more likely to rate their community as a good place to live with affordable living costs and plenty of jobs. In the South West, those living in LGAs with high forest industry dependence were significantly more likely to report their community was a great place to live and that they would recommend to others, compared to those in nearby LGAs with low forest industry dependence, or those in WA as a whole. They were significantly less likely to report having good quality local roads, however. Overall, the results suggest that those living in regions with higher dependence on the forest industry are just as (or, in the South West, slightly more) likely to rate their community as highly liveable as those living in nearby communities with less dependence on the forest industry.

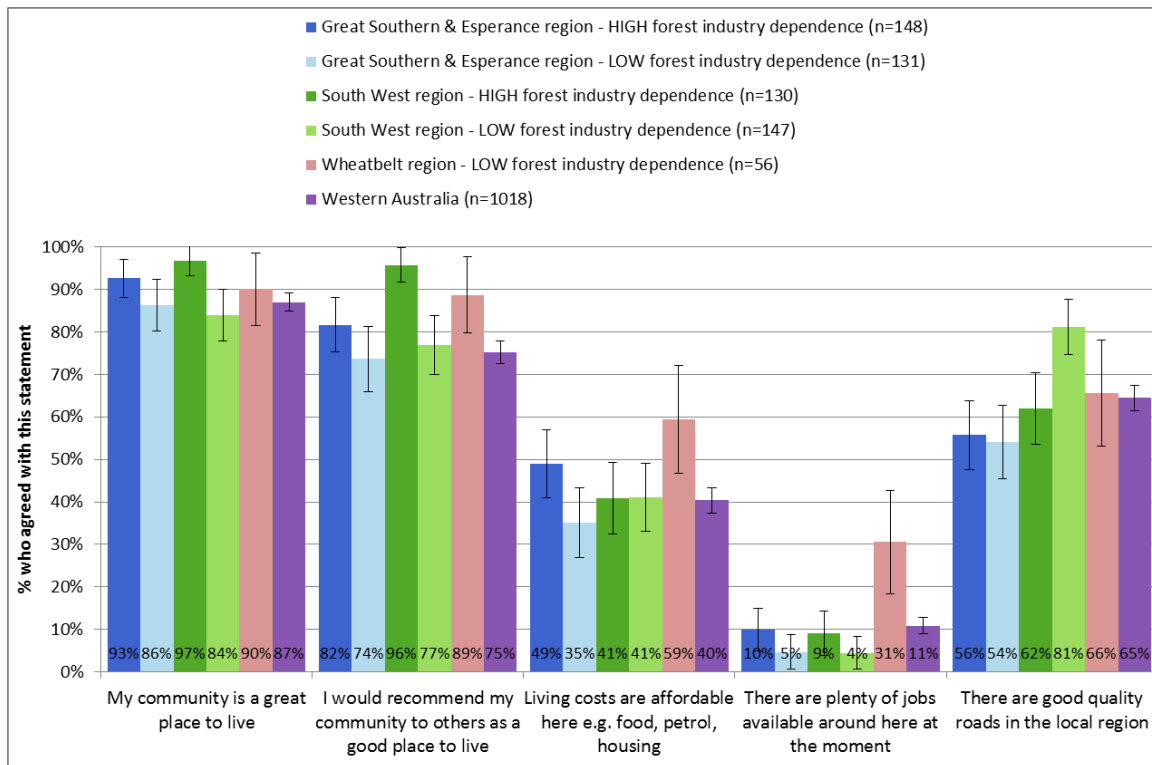


Figure 15 Perceptions of overall liveability and economy of local region – Regional Wellbeing Survey 2016

There were similar findings when resident’s perceptions of the overall friendliness and safety of their community were examined (Figure 16). The large majority of people living in rural and regional areas of WA, and in the Great Southern and Esperance, South West, and Wheatbelt regions, feel welcome in and part of their communities, and feel their community is a safe place to live. Only 36% of Great Southern and Esperance residents felt there was a high crime rate in their community, and only 11% of those in South West LGAs with high dependence on the forest industry, compared to 49% of those in other parts of the South West and in rural WA as a whole. In the South West, a large part of the difference is likely to reflect that communities with higher forest industry dependence tend to have smaller population size, whereas those living in regional cities such as Harvey (with lower forest industry dependence) are more likely to report concerns about high rates of crime.

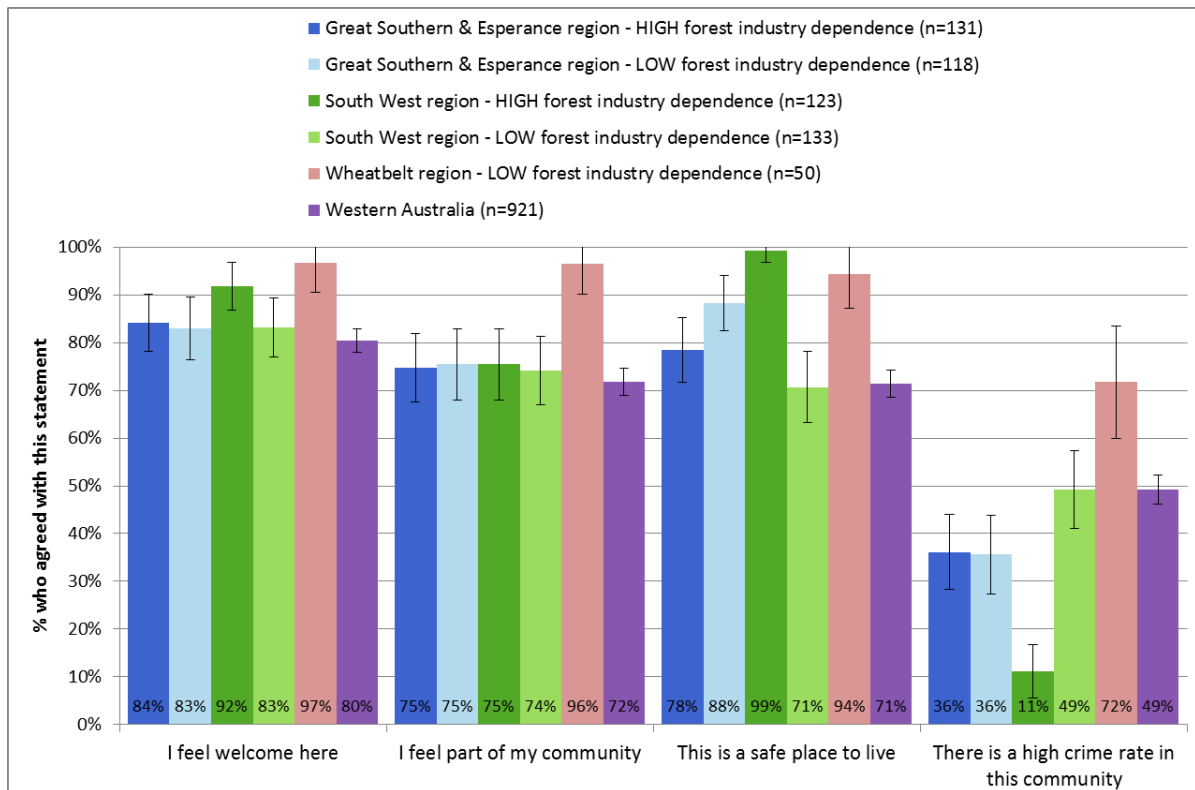


Figure 16 Perceptions of friendliness, safety and crime

When perceptions of local landscape aesthetics and environmental health were asked about (Figure 17), those living in more and less forest industry-dependent communities had similar highly positive perceptions of their local landscape, with more than 85% stating that they liked the environment and surrounds they lived in, 85% or more that there were attractive natural places in their community, and 70% or more that there were attracting buildings and homes in their communities. Less than 50% felt environmental degradation was a big problem in their local region, with this concern highest in low forest industry dependence parts of the Great Southern which often also have significant salinity problems in their agricultural landscapes. Those living in communities with high dependence on the forest industry were less likely to report concerns about water quality compared to those living in other regions, although differences were not generally large enough to be statistically significant.

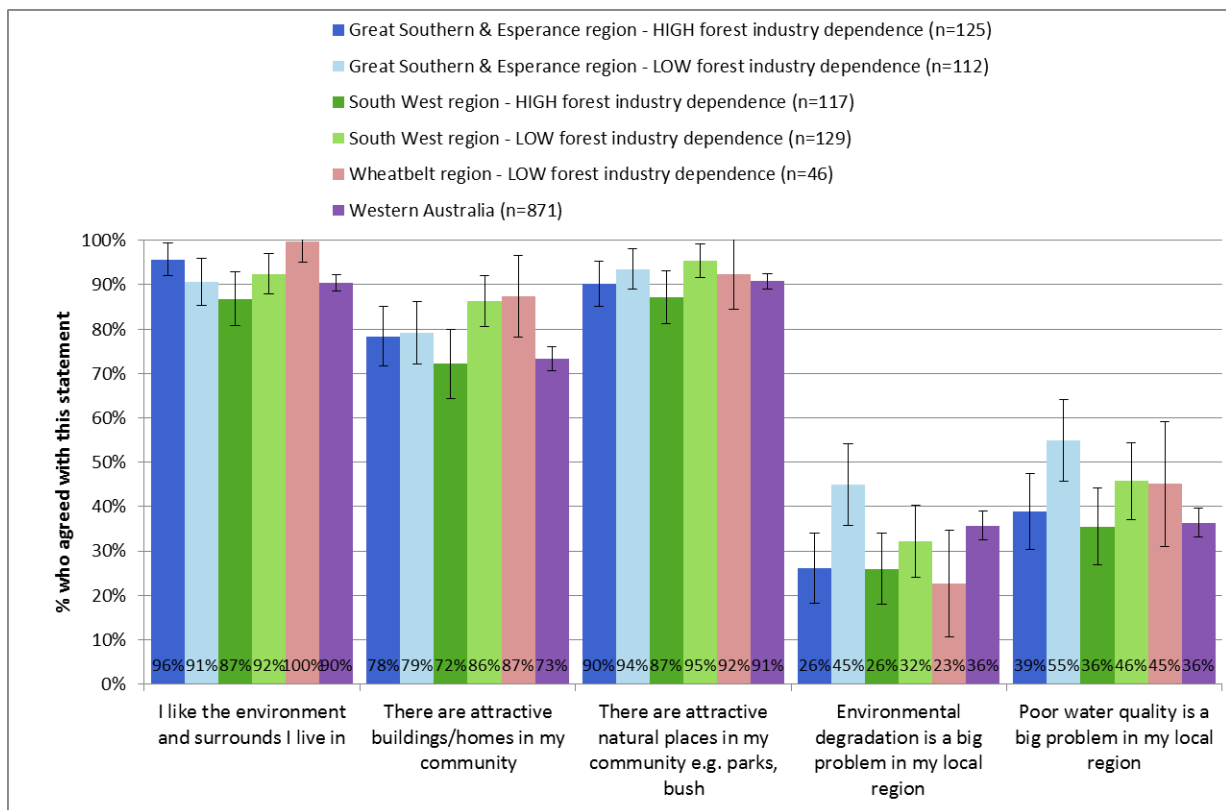


Figure 17 Perceptions of landscape aesthetics and environmental health

Overall, these results suggest that the overall perceptions residents have of the liveability of their communities are mostly positive, and similar for communities that have higher and lower dependence on the forest industry.

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, 923 residents living in Western Australia answered questions about the socio-economic effects of different industries. This included 251 living in the Great Southern and Esperance region, 259 living in the South West region and 47 living in the Wheatbelt region. Of these, a total of 257 lived in local government areas or towns with high dependence on the forest industry for employment.

These survey participants were asked to identify whether a number of industries were important to their community, with two of those asked about being defined as (i) forestry (logging of native forests or plantations) and (ii) wood or paper product manufacturing. As shown in Figure 18, 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 where a smaller proportion of employment relies on the industry:

- Great Southern and Esperance: 66% of those who lived in Albany and Plantagenet (with higher forest industry dependence) felt the forest industry was important to their local community, compared to 37% of those living in other parts of the region. Fewer felt that wood and paper processing were important (31% in Albany and Plantagenet and 10% in other parts of the region).

- South West: 73% of those living in ‘high forest industry dependent’ LGAs (Bridgetown-Greenbushes, Dardanup, Manjimup and Nannup) indicated that the forest industry was important to their community, compared to 45% of those living in other parts of the South West. Wood product manufacturing was considered an important industry by only 15% in high forest industry dependent communities, and 11% in other parts of the South West.
- Wheatbelt region: only 6% felt forest was an important industry, and 2% that wood product manufacturing was important.

In all these communities, agriculture and tourism were also identified as important industries, as was fishing in Albany.

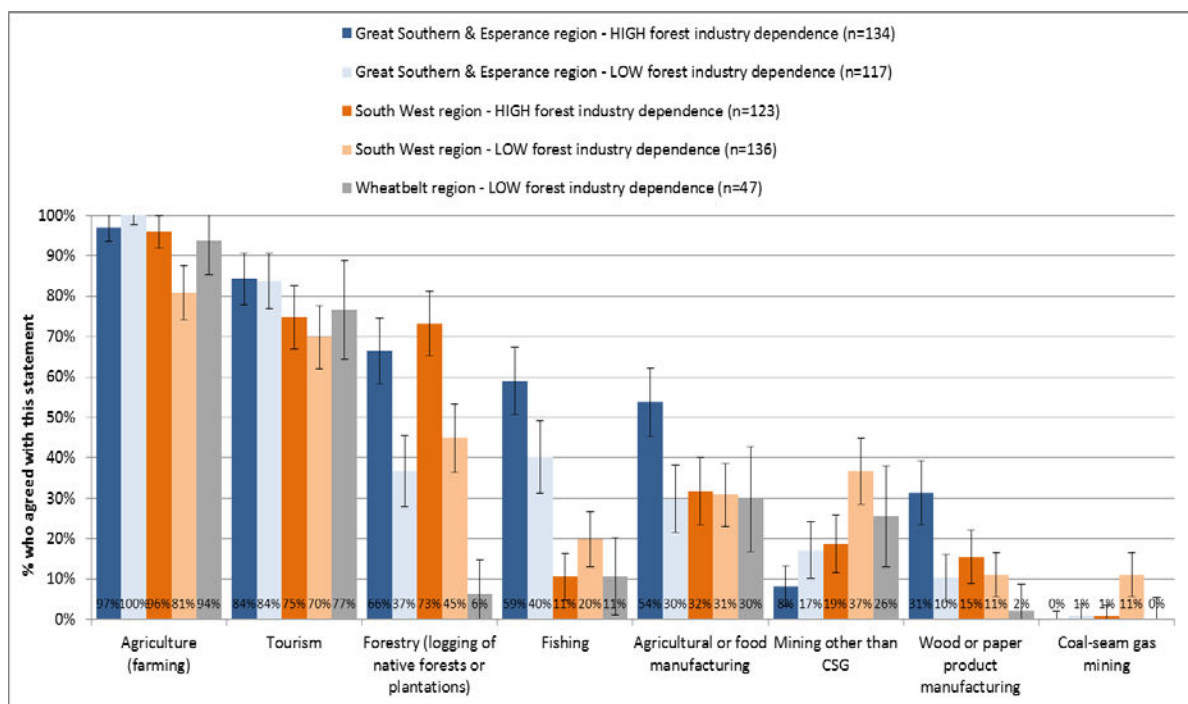


Figure 18 Proportion of residents who views the forest industry as an ‘important industry’ in their local community

Survey participants were then asked to rate whether they felt each of the industries they considered to be important to their local region had a negative impact, positive impact, or no impact, on the following social and economic characteristics of 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
- 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 examines the views of those living in the (i) Great Southern and Esperance and (ii) South West regions. The views of these residents about the forestry industry are compared to their views about the two other industries most commonly considered important by local residents: agriculture and tourism. Too few residents of the Wheatbelt region answered questions about the forest industry to be able to report their views on its effects for their community.

In the Great Southern and Esperance and South West regions, residents generally perceived the forest industry as having fewer positive effects than the farming and tourism industries, and more negative effects (Figures 19 to 22). This was particularly the case for those who lived in communities with greater dependence on the forest industry, and less so for those living in communities in which fewer jobs depended on the industry (see Appendix 1).

The large majority of residents – 76% in the Great Southern and Esperance region, and 71% in the South West region - felt the forest industry had positive impacts on local employment. Fewer than 25% 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 and landscape aesthetics, with 67% in the Great Southern and Esperance and 71% in the South West believing the industry had a negative impact on the traffic on local roads; 59% in the Great Southern and Esperance and 67% in the South West feeling the industry had a negative impact on the quality of local roads; and 54% in Great Southern and Esperance and 53% in South West 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 as many positive outcomes as these other two industries 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. They do, however, reflect how residents experience an industry and view it. Despite rating their communities as being just as, or more, liveable than nearby communities with less dependence on forestry – indicating that there is no overall difference in liveability of ‘forestry’ communities compared to others – residents do not perceive the forest industry as contributing strongly to this high overall liveability, even though they recognise its contribution to employment.

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

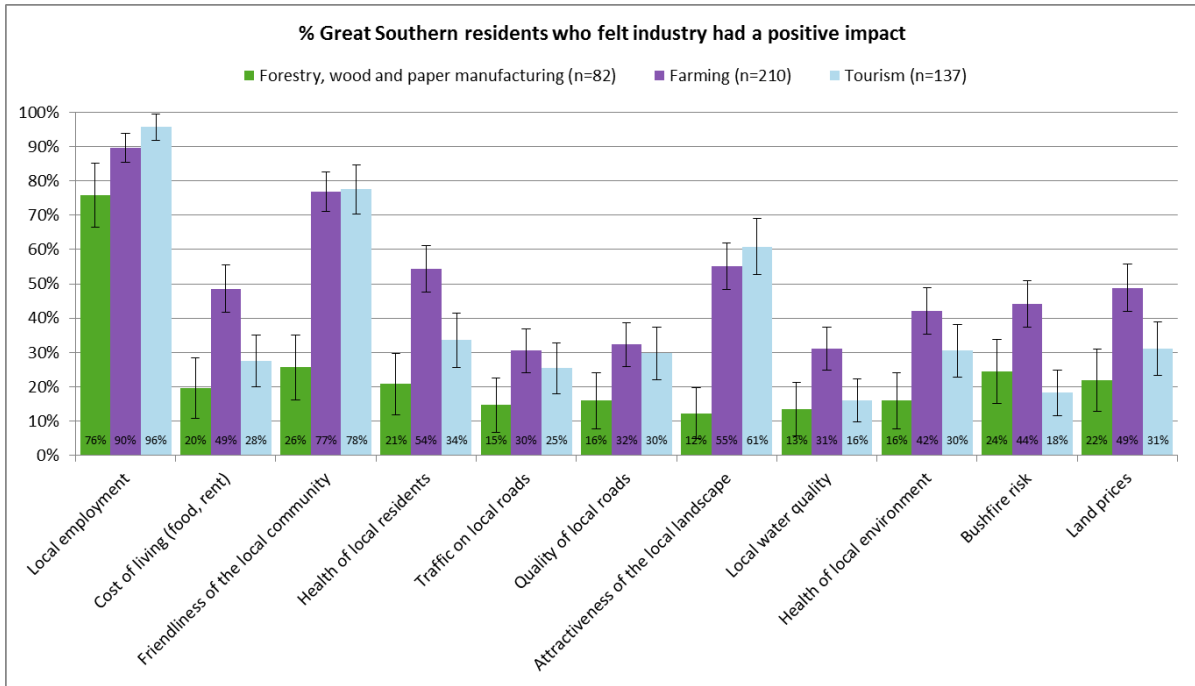


Figure 19 Proportion of Great Southern and Esperance residents who felt the forestry, farming and tourism industries had a positive impact on different aspects of their local community

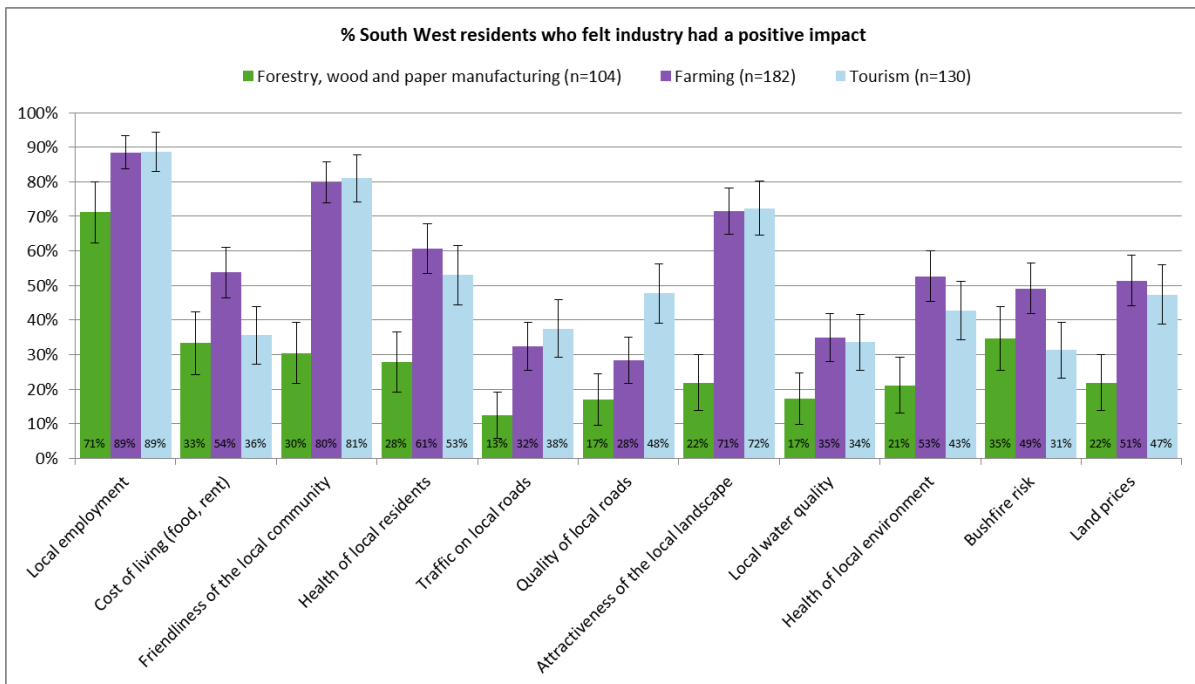


Figure 20 Proportion of South West residents who felt the forestry, farming and tourism industries had a positive impact on different aspects of their local community

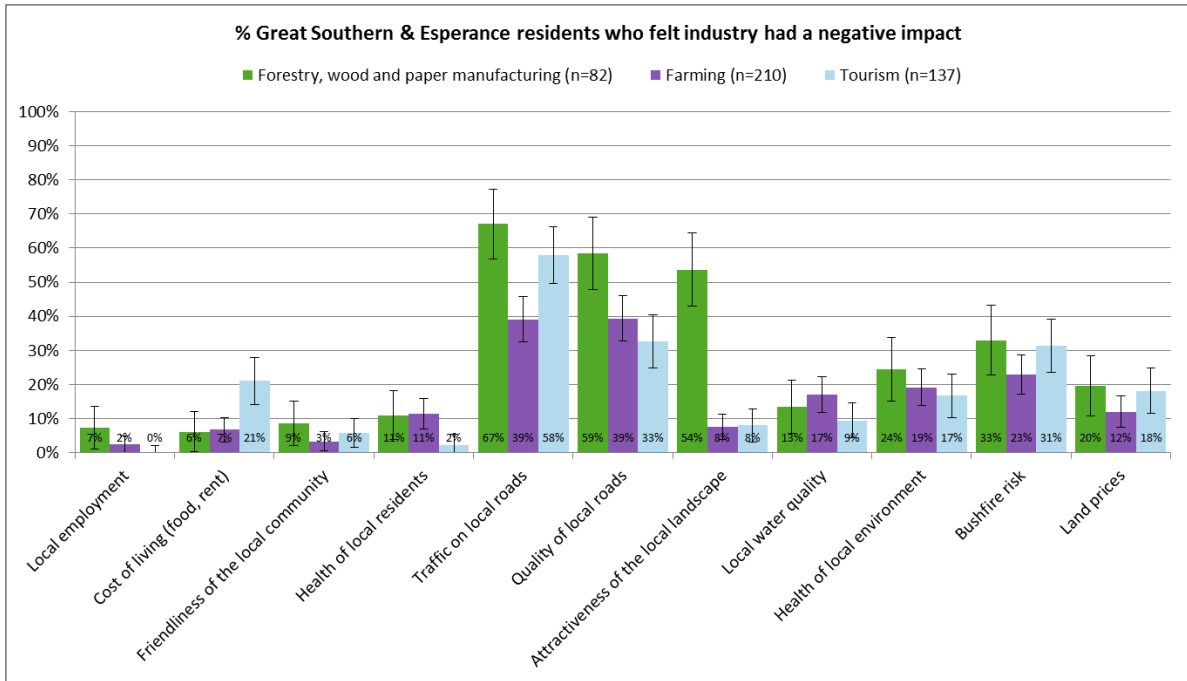


Figure 21 Proportion of Great Southern and Esperance residents who felt the forestry, farming and tourism industries had a negative impact on different aspects of their local community

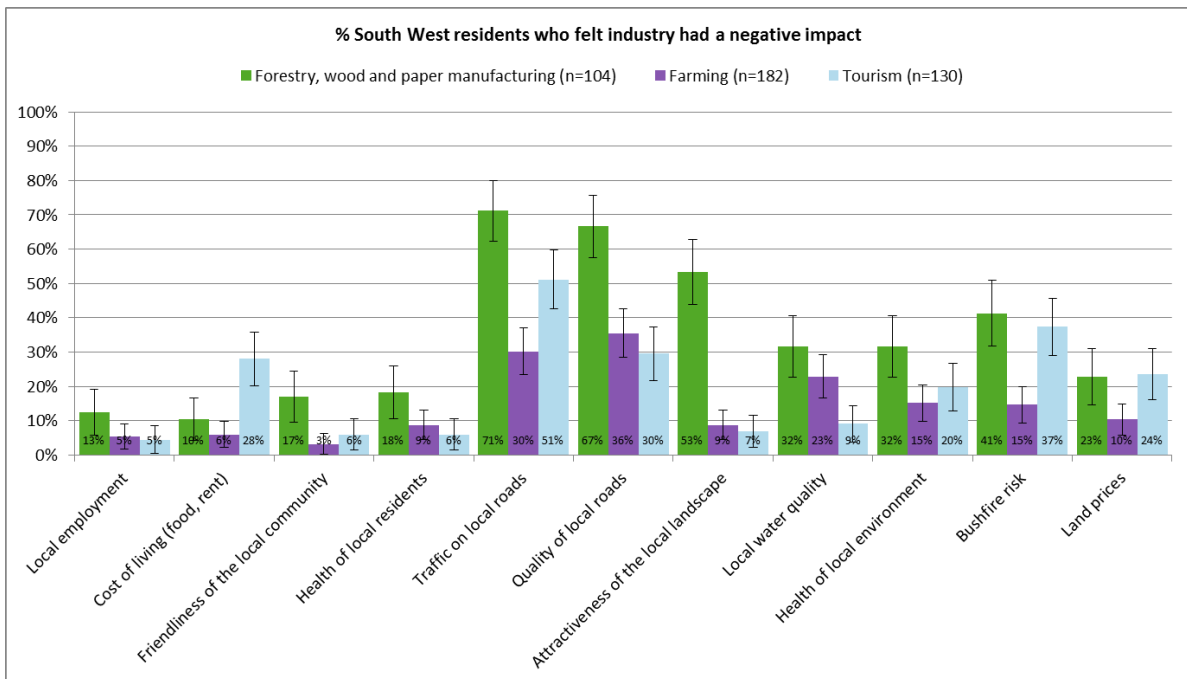


Figure 22 Proportion of South West residents who felt the forestry, farming and tourism industries had a negative impact on different aspects of their local community

Conclusions

The forest industry in WA supports jobs and economic activity in multiple regional communities. In 2015-16, the direct value of output from the growing, harvesting and primary processing of wood and paper products in WA was \$649.2 million; when flow-on effects of these activities were included, the contribution to the value of gross regional production was \$643 million in WA for the industry as a whole, including \$104 million dependent on native forests, \$274 million dependent on softwood plantation and \$265 million dependent on hardwood plantations. The industry generates a total of 2,114 direct jobs up to the point of primary processing, and these 2,114 direct jobs generate an additional 2,456 flow-on jobs, meaning that the industry contributes around 4,570 jobs to the WA economy up to and including primary processing. In addition to this, a further 1,495 jobs were generated in secondary processing in 2016. As of 2017, between 245 and 490 of these secondary processing jobs were dependent on timber grown in WA; and another 120 to 140 jobs were generated by the use of primary processing residues (principally sawdust and bark) by garden and landscape businesses.

The results highlight the importance of having local processing to generation of jobs and economic activity. The majority of both jobs and economic value generated by the industry occurred in the processing sector. However, many processors identified that challenges accessing resource and lack of investment in the industry represent a challenge to maintaining business viability, together with market downturn in the softwood sector. The current jobs generated by the industry rely on having local processing facilities, and ideally on having inter-dependent processing facilities that produce products from all parts of the logs, including the parts suitable for sawntimber and those suitable for composite wood manufacturing from smaller off cuts and smaller logs. Overall, the findings suggest that the current trend of ongoing decline in employment – particularly in processing of wood and fibre products - is likely to continue in the softwood plantation and native forest sectors unless there is significant new opportunity for investment in the industry.

The industry generates jobs in a large number of communities, with 62% of jobs up to primary processing located in the South West, 25% in the Great Southern and Esperance, and the remainder mostly in Perth and nearby areas of the Wheatbelt. Because jobs are spread across many communities, no one community has a very large proportion of its jobs directly dependent on the industry, and even when indirect jobs are taken into account there are very few communities with more than 5% of jobs dependent on the industry, with Nannup the only local government area in which up to more than 10% of jobs directly depend on the industry. This means that the industry is not the sole or largest provider of jobs in any community, but rather contributes to economic diversity in many communities. Diverse economies have a range of benefits: in particular, they tend to be more robust to changes in any one industry, as other industries continue providing economic opportunities when one is experiencing challenges. The presence of the forest industry provides alternative sources of economic activity when other major industries operating in the same communities – agriculture, tourism, and in some cases fishing – are experiencing difficult times.

The forest industry provides many more full-time jobs than is typical for other industries in WA, and slightly higher incomes: this means that the jobs provided are often having a significant impact on local economies. High working hours in some parts of the industry, and low employment of women, are ongoing concerns, especially as many forest industry businesses report difficulty recruiting some types of skilled workers.

While those living in communities in which the industry operates rate their communities as being just as, or slightly more, liveable than those living in communities with little forest industry activity, and view the industry as contributing positively to employment, they do not generally view the industry as making substantial contributions to their community beyond employment.

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Appendix 1 Data tables

Table A1.1 Expenditure by the WA forest industry up to and including primary processing, 2015-16, by region

Type of expenditure	Great Southern & Esperance		South West		Wheatbelt		Western Australia	
	Value (\$m)	Proportion of total (%)	Value (\$m)	Proportion of total (%)	Value (\$m)	Proportion of total (%)	Value (\$m)	Proportion of total (%)
Wages/Salaries	29.1	19%	89.7	27%	6.4	24%	135.3	25%
Other Services	17.4	12%	34.0	10%	2.7	10%	57.7	11%
Manufacturing	10.7	7%	30.6	9%	2.8	11%	47.2	9%
Retail and Wholesale Trade	9.9	7%	28.3	8%	2.6	10%	43.5	8%
Transport, Postal and Warehousing	4.8	3%	15.1	4%	1.4	5%	22.9	4%
Professional, Scientific and Technical Services	10.1	7%	9.4	3%	0.5	2%	21.6	4%
Annuities and donations	13.4	9%	6.6	2%	0.0	0%	20.5	4%
Mining	1.8	1%	12.4	4%	1.3	5%	16.8	3%
Electricity, Gas, Water and Waste Services	2.8	2%	10.1	3%	1.0	4%	14.9	3%
Agriculture	7.5	5%	5.4	2%	0.1	0%	13.7	3%
Construction	2.6	2%	5.6	2%	0.4	2%	9.0	2%
Communication	2.4	2%	4.7	1%	0.2	1%	8.1	1%
Other	1.1	1%	4.7	1%	0.5	2%	6.9	1%
Accommodation and Food Services	1.4	1%	2.1	1%	0.2	1%	3.9	1%
Education and Training	0.5	0%	0.7	0%	0.1	0%	1.3	0%
Sub-total	115.5	77%	259.4	77%	20.3	76%	423.3	77%
Expenditure outside the respective region	34.3	23%	76.9	23%	6.3	24%	125.1	23%
Total	149.8	100%	336.3	100%	26.7	100%	548.3	100%

Table A1.2 Expenditure by the WA forest industry up to and including primary processing, 2015-16, by industry sector

Type of expenditure	Native forest		Softwood plantation		Hardwood plantation		Western Australia	
	Value (\$m)	Proportion of total (%)	Value (\$m)	Proportion of total (%)	Value (\$m)	Proportion of total (%)	Value (\$m)	Proportion of total (%)
Wages/Salaries	24.8	29%	64.2	27%	46.3	21%	135.3	25%
Other Services	8.6	10%	24.3	10%	24.8	11%	57.7	11%
Manufacturing	7.0	8%	23.1	10%	17.0	8%	47.2	9%
Retail and Wholesale Trade	6.5	8%	21.3	9%	15.7	7%	43.5	8%
Transport, Postal and Warehousing	3.5	4%	11.6	5%	7.8	4%	22.9	4%
Professional, Scientific and Technical Services	3.2	4%	6.6	3%	11.8	5%	21.6	4%
Annuities and donations	0.9	1%	1.2	0%	18.5	8%	20.5	4%
Mining	2.7	3%	9.7	4%	4.4	2%	16.8	3%
Electricity, Gas, Water and Waste Services	2.2	3%	7.9	3%	4.7	2%	14.9	3%
Agriculture	1.9	2%	3.1	1%	8.7	4%	13.7	3%
Construction	1.3	2%	3.9	2%	3.9	2%	9.0	2%
Communication	1.6	2%	2.6	1%	3.9	2%	8.1	1%
Other	1.2	1%	3.6	2%	2.1	1%	6.9	1%
Accommodation and Food Services	0.6	1%	1.5	1%	1.8	1%	3.9	1%
Education and Training	0.2	0%	0.5	0%	0.6	0%	1.3	0%
Sub-total	66.1	78%	185.3	77%	171.9	77%	423.3	77%
Expenditure outside Western Australia	18.3	22%	56.4	23%	50.4	23%	125.1	23%
Total	84.4	100%	241.7	100%	222.3	100%	548.3	100%

Table A1.3 Economic impacts of the WA forest industry up to and including primary processing, by sector, on the Great Southern and Esperance 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)	204.7	96.4	150.0	11.1	10.3	344.7
Direct (\$m)	155.0	81.1	74.0	5.2	5.6	192.9
Production-induced (\$m)	37.1	11.0	52.0	4.4	2.9	107.5
Consumption-induced (\$m)	12.6	4.3	24.1	1.6	1.8	44.4
GRP (\$m)	74.7	20.2	58.0	4.2	4.5	161.6
Direct (\$m)	50.0	12.5	20.1	1.0	2.0	85.7
Production-induced (\$m)	17.0	5.0	23.2	2.2	1.4	48.8
Consumption-induced (\$m)	7.7	2.6	14.7	1.0	1.1	27.1
Household Income (\$m)	20.9	7.2	40.0	2.6	3.0	73.7
Direct (\$m)	6.0	3.0	18.0	0.6	1.6	29.1
Production-induced (\$m)	11.6	3.0	15.6	1.6	1.0	32.9
Consumption-induced (\$m)	3.3	1.1	6.4	0.4	0.5	11.7
Employment (total)	305	103	695	43	108	1,255
Direct (total)	64	39	338	11	85	537
Production-induced (total)	182	44	245	25	15	510
Consumption-induced (total)	59	20	112	7	9	207

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.

Table A1.4 Economic impacts of the WA forest industry up to and including primary processing, by sector, on the South West 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)	145.7	711.6	142.5	0.0	12.4	766.1
Direct (\$m)	111.2	441.5	68.1	0.0	6.4	381.0
Production-induced (\$m)	18.5	182.5	48.4	0.0	3.5	252.9
Consumption-induced (\$m)	16.1	87.7	26.0	0.0	2.4	132.2
GRP (\$m)	43.7	222.7	54.9	0.0	5.3	326.6
Direct (\$m)	25.8	93.8	19.1	0.0	2.3	141.0
Production-induced (\$m)	8.5	77.9	20.7	0.0	1.6	108.7
Consumption-induced (\$m)	9.4	51.0	15.1	0.0	1.4	76.9
Household Income (\$m)	23.9	130.1	38.6	0.0	3.6	196.1
Direct (\$m)	13.9	56.9	17.1	0.0	1.8	89.7
Production-induced (\$m)	6.0	51.4	15.0	0.0	1.2	73.6
Consumption-induced (\$m)	4.0	21.8	6.5	0.0	0.6	32.8
Employment (total)	311	1,640	600	0	118	2,670
Direct (total)	179	722	318	0	95	1,314
Production-induced (total)	73	592	186	0	14	864
Consumption-induced (total)	60	326	97	0	9	491

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.

Table A1.5 Economic impacts of the WA native forest industry up to and including primary processing, by sector

	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)	86.0	149.4	41.3	n.p.	n.p.	220.3
Direct (\$m)	59.0	81.9	17.8	n.p.	n.p.	100.6
Production-induced (\$m)	12.1	39.0	12.1	n.p.	n.p.	64.1
Consumption-induced (\$m)	14.9	28.4	11.4	n.p.	n.p.	55.6
GRP (\$m)	30.9	53.5	17.7	n.p.	n.p.	103.5
Direct (\$m)	16.6	19.0	5.7	n.p.	n.p.	41.9
Production-induced (\$m)	5.6	18.1	5.4	n.p.	n.p.	29.5
Consumption-induced (\$m)	8.6	16.4	6.6	n.p.	n.p.	32.1
Household Income (\$m)	15.9	30.3	12.2	n.p.	n.p.	59.2
Direct (\$m)	7.8	11.3	5.2	n.p.	n.p.	24.8
Production-induced (\$m)	3.9	11.0	3.8	n.p.	n.p.	19.0
Consumption-induced (\$m)	4.2	7.9	3.2	n.p.	n.p.	15.5
Employment (total)	195	511	165	n.p.	n.p.	898
Direct (total)	102	301	84	n.p.	n.p.	508
Production-induced (total)	39	105	39	n.p.	n.p.	186
Consumption-induced (total)	55	104	42	n.p.	n.p.	204

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

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.

Table A1.6 Economic impacts of the WA softwood plantation industry up to and including primary processing, by sector

	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)	91.1	563.2	74.9	n.p.	12.1	617.4
Direct (\$m)	62.5	299.5	31.7	n.p.	5.6	275.1
Production-induced (\$m)	12.8	150.4	24.0	n.p.	3.2	190.7
Consumption-induced (\$m)	15.8	113.2	19.2	n.p.	3.3	151.6
GRP (\$m)	32.6	205.7	30.3	n.p.	5.4	274.2
Direct (\$m)	17.5	71.0	8.5	n.p.	2.0	99.0
Production-induced (\$m)	6.0	69.3	10.7	n.p.	1.5	87.7
Consumption-induced (\$m)	9.1	65.4	11.1	n.p.	1.9	87.5
Household Income (\$m)	16.8	120.6	20.4	n.p.	3.6	161.5
Direct (\$m)	8.3	46.7	7.6	n.p.	1.6	64.2
Production-induced (\$m)	4.1	42.3	7.5	n.p.	1.0	55.1
Consumption-induced (\$m)	4.4	31.6	5.3	n.p.	0.9	42.3
Employment (total)	206	1,342	294	n.p.	105	1,954
Direct (total)	107	520	147	n.p.	83	863
Production-induced (total)	41	406	76	n.p.	10	535
Consumption-induced (total)	58	416	70	n.p.	12	557

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

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.

Table A1.7 Economic impacts of the WA hardwood plantation industry up to and including primary processing, by sector

	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)	246.7	316.8	223.9	13.3	13.6	567.6
Direct (\$m)	178.8	234.9	94.8	5.3	6.3	273.5
Production-induced (\$m)	40.7	48.3	71.8	4.9	3.6	169.3
Consumption-induced (\$m)	27.2	33.5	57.4	3.0	3.8	124.8
GRP (\$m)	85.8	77.5	90.6	5.3	6.1	265.3
Direct (\$m)	51.4	35.8	25.5	1.0	2.3	116.0
Production-induced (\$m)	18.7	22.4	32.0	2.5	1.7	77.2
Consumption-induced (\$m)	15.7	19.3	33.1	1.7	2.2	72.1
Household Income (\$m)	29.0	35.7	61.1	3.2	4.0	133.0
Direct (\$m)	8.3	12.8	22.8	0.6	1.8	46.2
Production-induced (\$m)	13.1	13.6	22.3	1.8	1.2	51.9
Consumption-induced (\$m)	7.6	9.3	16.0	0.8	1.0	34.8
Employment (total)	323	359	874	41	120	1,719
Direct (total)	93	106	435	13	95	743
Production-induced (total)	131	130	229	17	11	517
Consumption-induced (total)	100	123	211	11	14	458

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.

Table A1.8 Economic impacts of the WA forest industry up to and including primary processing, by sector – all of Western Australia, all parts of the industry

	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)	423.8	1,029.3	340.1	14.3	28.7	1,405.4
Direct (\$m)	300.3	616.4	144.3	5.7	13.2	649.2
Production-induced (\$m)	65.6	237.8	107.8	5.3	7.6	424.1
Consumption-induced (\$m)	57.9	175.1	87.9	3.2	7.9	332.1
GRP (\$m)	149.2	336.6	138.7	5.6	12.9	643.0
Direct (\$m)	85.5	125.8	39.8	1.1	4.8	256.9
Production-induced (\$m)	30.3	109.8	48.1	2.7	3.5	194.4
Consumption-induced (\$m)	33.4	101.1	50.8	1.9	4.6	191.7
Household Income (\$m)	61.7	186.5	93.7	3.4	8.4	353.7
Direct (\$m)	24.4	70.8	35.6	0.6	3.8	135.2
Production-induced (\$m)	21.2	66.9	33.5	2.0	2.4	126.0
Consumption-induced (\$m)	16.1	48.8	24.5	0.9	2.2	92.6
Employment (total)	725	2,211	1,332	46	251	4,570
Direct (total)	302	927	666	16	198	2,114
Production-induced (total)	210	641	344	19	24	1,237
Consumption-induced (total)	213	643	323	12	29	1,219

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.

Table A1.9 Economic impacts of the WA forest industry up to and including primary processing, by region – all parts of the industry

	Great Southern and Esperance	South West	Wheatbelt	Western Australia ^a
Output^b (\$m)	344.7	766.1	62.4	1,405.4
Direct (\$m)	192.9	381.0	31.4	649.2
Production-induced (\$m)	107.5	252.9	20.9	424.1
Consumption-induced (\$m)	44.4	132.2	10.0	332.1
GRP (\$m)	161.6	326.6	26.2	643.0
Direct (\$m)	85.7	141.0	11.1	256.9
Production-induced (\$m)	48.8	108.7	9.3	194.4
Consumption-induced (\$m)	27.1	76.9	5.8	191.7
Household Income (\$m)	73.7	196.1	15.3	353.7
Direct (\$m)	29.1	89.7	6.4	135.2
Production-induced (\$m)	32.9	73.6	6.3	126.0
Consumption-induced (\$m)	11.7	32.8	2.6	92.6
Employment (total)	1,255	2,670	214	4,570
Direct (total)	537	1,304	101	2,114
Production-induced (total)	510	864	73	1,237
Consumption-induced (total)	207	491	39	1,219

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

a - Direct and indirect impacts in Western Australia are each greater than the sum of the three reported regions as some direct impacts occur outside of the three regions (primarily in Perth) and indirect impacts are smaller for the regions due to a higher proportion of imports from outside of these smaller regions by industries within them.

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.

Table A1.10 Proportion of **Great Southern** residents who reported the forest, farming and tourism industries had a **NEGATIVE** impact on different aspects of community life

Great Southern									
	All residents	LGAs/towns with HIGH forest industry dependence	LGAs/towns with LOW forest industry dependence	All residents	LGAs/towns with HIGH forest industry dependence	LGAs/towns with LOW forest industry dependence	All residents	LGAs/towns with HIGH forest industry dependence	LGAs/towns with LOW forest industry dependence
	Forestry, wood & paper manufacturing (n=82)	Forestry, wood & paper manufacturing (n=62)	Forestry, wood & paper manufacturing (n=20)	Farming (n=210)	Farming (n=110)	Farming (n=101)	Tourism (n=137)	Tourism (n=76)	Tourism (n=60)
Local employment	7%	5%	15%	2%	1%	4%	0%	0%	0%
Cost of living (food, rent)	6%	7%	5%	7%	7%	6%	21%	17%	27%
Friendliness of the local community	9%	10%	5%	3%	3%	4%	6%	5%	7%
Health of local residents	11%	13%	5%	11%	6%	18%	2%	1%	3%
Traffic on local roads	67%	68%	65%	39%	38%	40%	58%	53%	64%
Quality of local roads	59%	60%	55%	39%	40%	39%	33%	33%	33%
Attractiveness of the local landscape	54%	55%	50%	8%	5%	10%	8%	8%	8%
Local water quality	13%	11%	20%	17%	17%	17%	9%	3%	18%
Health of local environment	24%	24%	25%	19%	19%	20%	17%	7%	30%
Bushfire risk	33%	37%	20%	23%	23%	23%	31%	28%	36%
Land prices	20%	19%	20%	12%	11%	13%	18%	13%	25%

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

South West									
	All residents	LGAs/towns with HIGH forest industry dependence	LGAs/towns with LOW forest industry dependence	All residents	LGAs/towns with HIGH forest industry dependence	LGAs/towns with LOW forest industry dependence	All residents	LGAs/towns with HIGH forest industry dependence	LGAs/towns with LOW forest industry dependence
	Forestry, wood & paper manufacturing (n=104)	Forestry, wood & paper manufacturing (n=62)	Forestry, wood & paper manufacturing (n=41)	Farming (n=182)	Farming (n=92)	Farming (n=88)	Tourism (n=130)	Tourism (n=59)	Tourism (n=70)
Local employment	13%	11%	14%	6%	3%	8%	5%	2%	7%
Cost of living (food, rent)	11%	10%	12%	6%	4%	8%	28%	21%	34%
Friendliness of the local community	17%	22%	10%	3%	4%	2%	6%	2%	10%
Health of local residents	18%	21%	14%	9%	11%	7%	6%	2%	10%
Traffic on local roads	71%	77%	62%	30%	29%	31%	51%	55%	48%
Quality of local roads	67%	70%	62%	36%	40%	31%	30%	30%	30%
Attractiveness of the local landscape	53%	57%	48%	9%	10%	8%	7%	3%	10%
Local water quality	32%	32%	31%	23%	28%	18%	9%	5%	13%
Health of local environment	32%	32%	32%	15%	18%	12%	20%	13%	25%
Bushfire risk	41%	39%	45%	15%	16%	13%	37%	40%	35%
Land prices	23%	25%	19%	10%	13%	8%	24%	15%	31%

Table A1.12 Proportion of **Wheatbelt** residents who reported the forest, farming and tourism industries had a **NEGATIVE** impact on different aspects of community life

	All residents	All residents	All residents
	Forestry, wood & paper manufacturing (n=0)	Farming (n=38)	Tourism (n=24)
Local employment	NA	5%	0%
Cost of living (food, rent)	NA	10%	8%
Friendliness of the local community	NA	5%	0%
Health of local residents	NA	8%	17%
Traffic on local roads	NA	39%	30%
Quality of local roads	NA	41%	25%
Attractiveness of the local landscape	NA	10%	4%
Local water quality	NA	18%	8%
Health of local environment	NA	18%	13%
Bushfire risk	NA	24%	21%
Land prices	NA	21%	13%

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

Great Southern									
	LGAs/towns with HIGH forest industry dependence	LGAs/towns with LOW forest industry dependence	All residents	LGAs/towns with HIGH forest industry dependence	LGAs/towns with LOW forest industry dependence	All residents	LGAs/towns with HIGH forest industry dependence	LGAs/towns with LOW forest industry dependence	
	Forestry, wood & paper manufacturing (n=82)	Forestry, wood & paper manufacturing (n=62)	Farming (n=210)	Farming (n=110)	Farming (n=101)	Tourism (n=137)	Tourism (n=76)	Tourism (n=60)	
Local employment	76%	78%	90%	89%	90%	96%	96%	95%	
Cost of living (food, rent)	20%	19%	49%	47%	50%	28%	29%	25%	
Friendliness of the local community	26%	23%	77%	76%	77%	78%	86%	67%	
Health of local residents	21%	19%	54%	59%	49%	34%	32%	35%	
Traffic on local roads	15%	15%	30%	30%	31%	25%	27%	23%	
Quality of local roads	16%	16%	32%	29%	36%	30%	32%	26%	
Attractiveness of the local landscape	12%	13%	55%	57%	53%	61%	69%	51%	
Local water quality	13%	15%	31%	30%	32%	16%	18%	13%	
Health of local environment	16%	15%	42%	42%	43%	30%	34%	26%	
Bushfire risk	24%	23%	44%	41%	48%	18%	16%	21%	
Land prices	22%	24%	49%	43%	55%	31%	26%	38%	

Table A1.14 Proportion of **South West** residents who reported the forest, farming and tourism industries had a **POSITIVE** impact on different aspects of community life

South West									
	All residents	LGAs/towns with HIGH forest industry dependence	LGAs/towns with LOW forest industry dependence	All residents	LGAs/towns with HIGH forest industry dependence	LGAs/towns with LOW forest industry dependence	All residents	LGAs/towns with HIGH forest industry dependence	LGAs/towns with LOW forest industry dependence
	Forestry, wood & paper manufacturing (n=104)	Forestry, wood & paper manufacturing (n=62)	Forestry, wood & paper manufacturing (n=41)	Farming (n=182)	Farming (n=92)	Farming (n=88)	Tourism (n=130)	Tourism (n=59)	Tourism (n=70)
Local employment	71%	76%	64%	89%	91%	86%	89%	93%	85%
Cost of living (food, rent)	33%	40%	24%	54%	55%	52%	36%	31%	39%
Friendliness of the local community	30%	29%	33%	80%	84%	76%	81%	89%	74%
Health of local residents	28%	26%	31%	61%	65%	57%	53%	49%	56%
Traffic on local roads	13%	10%	17%	32%	33%	32%	38%	32%	42%
Quality of local roads	17%	16%	19%	28%	23%	34%	48%	43%	52%
Attractiveness of the local landscape	22%	25%	17%	71%	71%	72%	72%	71%	73%
Local water quality	17%	15%	21%	35%	37%	33%	34%	27%	39%
Health of local environment	21%	21%	22%	53%	51%	54%	43%	37%	48%
Bushfire risk	35%	39%	29%	49%	51%	48%	31%	28%	34%
Land prices	22%	21%	24%	51%	48%	54%	47%	55%	41%

Table A1.15 Proportion of **Wheatbelt** residents who reported the forest, farming and tourism industries had a POSITIVE impact on different aspects of community life

	All residents	All residents	All residents
	Forestry, wood & paper manufacturing (n=0)	Farming (n=38)	Tourism (n=24)
Local employment	NA	95%	100%
Cost of living (food, rent)	NA	33%	46%
Friendliness of the local community	NA	61%	79%
Health of local residents	NA	46%	38%
Traffic on local roads	NA	38%	52%
Quality of local roads	NA	33%	42%
Attractiveness of the local landscape	NA	64%	67%
Local water quality	NA	26%	33%
Health of local environment	NA	38%	46%
Bushfire risk	NA	45%	38%
Land prices	NA	49%	42%