

Socio-economic impacts of the softwood plantation industry in the South West Slopes and Bombala region, NSW

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More information

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Many businesses in the South West Slopes and Bombala region contributed considerable time to this study, providing detailed information about their operations and about the industry in the region more generally. We thank all those who provided their time, effort and expertise to help inform the study.

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Executive summary

Across Australia, more than 80% of the wood fibre and timber used by wood and paper processors is supplied from Australian softwood and hardwood plantations. However, this plantation-based industry is challenged by a lack of investment in new plantations, and to remain competitive requires ongoing investment in the plantation estate as well as in integrated hubs of processing facilities located near plantations.

The South West Slopes and Bombala region of New South Wales (NSW) is an example of this type of integrated processing hub. The region is the base for a large wood and paper processing industry that has developed in proximity to 165,000 hectares softwood plantations established in the region from the 1920s onwards. Despite the importance of the industry to this region, which includes the local government areas of Albury City, Shire of Bombala, Greater Hume Shire, Snowy Monaro Regional Council, Snowy Valleys Council and City of Wagga Wagga, there is little current data on the socio-economic contribution of the industry to the region, or the key areas in which investment is needed in skills and training to help maintain the industry into the future. This study addresses this gap, collecting data via a survey of the industry and analysis of data produced in past studies and by the Australian Bureau of Statistics. This enabled production of up-to-date information on the value of the industry, the jobs it generates, its contribution to the region, and the skills and training needs of the industry.

The softwood plantation industry in the South West Slopes and Bombala region (referred to from here as the 'South West Slopes' region) has grown substantially over time as more of the plantation estate reaches harvest age and the total volume of log production expanded in the region, with older plantations now in their third rotation. The regional industry based on these plantations provides a market for logs of different sizes. Sawlogs (generally straight logs with larger diameter and few knots) go to sawmills, with residues from the sawmilling process then being supplied to composite wood manufacturers and pulp/paper mills. Pulp logs go to pulp and paper mills in the region as well as to composite wood product manufacturers. This enables utilisation of all logs from plantations in the region. Fibre demand from the processors now established in the region exceeds the production ability of the local plantation estate, with additional resource brought in from other regions, particularly northern Victoria. A key constraint to any further expansion of the industry is sourcing fibre, with the local industry fully utilising all the fibre available within an economic transport distance of the region. Both existing processors, and new processors, such as the cross laminated timber (CLT) manufacturing plant being constructed in Wodonga by XLam, require security of supply of plantation fibre to be successful.

The gross value of final output from the industry was \$1,050 million in 2015-16, and \$2,130 million when flow-on effects to other industries are included. Contribution to Gross Regional Production (GRP) (or the 'value-added' to the economy excluding transfers between industries) in the region was \$1,014 million, including \$580 million from flow-on effects. The industry is thus a significant component of the regional economy. The direct net expenditure of the industry (the amount spent by the industry, rather than the sales value of its output), was \$734.8 million in 2015-16. Of this total expenditure, just over 80% was contributed by the wood and paper processing sector, with the balance fairly evenly split between forest growers and the contracting sector. The largest single component of expenditure for the industry overall was wages and salaries, with \$155 million injected directly into the regional economy via household incomes. Including flow-on effects, the total contribution of the industry to household income in the region was \$468 million in 2015-16.

The industry directly employed 1917 people in the region as of February 2017, with 66% of these (1260 jobs) generated by wood and paper processing. When flow-on effects of the industry on other industries are included – meaning the number of jobs generated as a result of the demand generated by the industry and its workers - the direct and flow-on employment generated by the South West Slopes softwood plantation industry provides jobs for a total of 5,375 people within the region, and for 6,026 people across NSW as a whole. This level of employment is particularly significant for two local government areas (LGAs), with 22% of jobs in Bombala Shire directly dependent on the industry, and 18% in the Snowy Valleys Council local government

area. When indirect employment is added, more than 50% of jobs in each of these LGAs is directly or indirectly dependent on the plantation industry of the South West Slopes.

Analysis of time series data suggests that the total amount of jobs directly dependent on the forest industry in the South West Slopes has declined by approximately 5%, or slightly less, in the last six years. This is not surprising for an industry in which a large proportion of jobs are reliant on manufacturing: investment in new technology in the manufacturing sector, a requirement for maintaining competitiveness over time, typically results in declining employment even as production volumes are increasing. A similar decline (5.2%) occurred in the total number of manufacturing jobs in Australia over the five years from 2006 to 2011.

Examination of the demographic characteristics of the industry shows that the industry is offering full-time, long working hour jobs that have good pay and are particularly attractive to men, and is maintaining recruitment of men into the industry in most parts of the industry. The biggest socio-demographic challenge is to achieve recruitment of a greater diversity of workers, particularly women, into the industry. This may be achieved through actions such as offering jobs with more flexibility in terms of work hours, but will likely also require challenging and changing key aspects of the culture of the industry that continues to make it more appealing to male than female workers.

As the softwood industry evolves, there is growing demand for workers with specialised skills, including specialist engineers, scientists and mechanics. More generally there is increasing demand for skilled mobile and fixed plant operators. Demand for less skilled factory process operators is declining. A need to have a skilled haulage workforce and to have workers with high level financial, middle management and information and communication technology (ICT) skills remains strong, with ICT skills needs occurring across most occupations within the industry.

While many businesses use registered training organisations to provide skills training, the industry workforce continues to have lower than average formal educational qualifications. This presents a key challenge for the industry, with formal educational attainment providing not only specific competencies, but also providing the base skills (in literacy, numeracy and overall learning skills) needed by workers to continue to learn new skills and adapt to ongoing change in the industry associated with increasing efficiency and productivity. This suggests a strong need to continue to strengthen investment in providing formal accredited training opportunities for the workforce, which cover the diversity of competencies identified as important across the industry.

Recruiting skilled managers and professional staff, transport workers, finance managers and heavy machinery operators is difficult for many businesses in the region, suggesting a critical need to address the challenges that are causing a lack of skilled staff. These challenges include a lack of suitably skilled local workers, the high cost of in-house training of staff, and difficulty attracting skilled workers from elsewhere to live in the region.

Overall, the industry was cautiously optimistic in terms of the outlook for business conditions, although many operators felt business conditions were more challenging than usual. Most felt demand for their services or products would remain stable over the next 12 months, and few felt it would decline. Most reported being slightly to moderately profitable, and few reported difficulties with either servicing of debt or business cash flow. Most were planning to invest in their business, but this cautiously optimistic outlook will not bring employment growth.

A key challenge for the industry is ensuring access to a suitable supply of fibre for wood and paper processors. Given that a significant proportion of inputs are sourced from outside the region, this is a critical factor affecting the ability of processors to further invest. Maintaining competitiveness in a market place with increasing competition from imports was also identified as a key challenge. For contractors, lack of certainty about future contracts reduced their ability to invest in their business. Falling prices, rising input costs, difficulty obtaining labour and poor telecommunications were the four most commonly reported challenges experienced by businesses in the last three years.

For the future, the workforce is likely to remain at current levels, although there could be some slight decline as a result of improvements in labour efficiency and productivity. Skills required will include a large number of workers needing to have the skills to interface with often complex compliance/ accreditation systems, for large numbers of workers, an increasing need for a number of specialized professionals, and a strong requirement for generic skills such as business and financial management.

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1. Introduction

Study background

Across Australia, more than 80% of the wood fibre and timber used by wood and paper processors is supplied from Australian softwood and hardwood plantations (Commonwealth of Australia 2015). However, the industry that has developed based on these plantations is challenged by a lack of investment in new plantations, and in some regions a reduction in the area of plantations as some plantations are harvested and not replanted to trees (Commonwealth of Australia 2015, AFPA 2016). As wood and paper processing technologies evolve, remaining competitive requires ongoing investment, which in turn needs to be supported by availability of wood fibre and timber supply. This is most effective when undertaken in plantation 'hubs' in which a plantation estate supports an integrated processing industry that utilises all parts of the harvested tree (AFPA 2016).

The South West Slopes and Bombala region of New South Wales (NSW) has been identified as a region that already includes key plantation industry hubs in and around Tumut, Tumbarumba, Albury and Bombala (AFPA 2016). The region is the base for a large integrated softwood plantation industry, and includes the local government areas of Albury City, City of Wagga Wagga, Greater Hume Shire, Gundagai Shire Council, Snowy-Monaro Regional Council (the former Shires of Bombala, Cooma-Monaro and Snowy River), and the Snowy Valleys Council (formerly the Shires of Tumut and Tumbarumba). Processors include pulp and paper mills, sawmills, particleboard and plywood production, and most recently the announcement of the construction of Australia's first cross laminated timber (CLT) manufacturing plant by XLam in the region.

Within this region, a large estate of 165,161 hectares (ha) of softwood plantations supplies approximately 2.55 million tonnes of fibre annually to several wood and paper processors, supporting significant employment in several towns. As these wood and paper processors use a total of 3.26 million tonnes of fibre annually, the region also draws in softwood fibre from plantations grown outside the region, particularly from northern Victoria, and from the Oberon region in NSW.

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. While recognised as a key centre for the softwood plantation industry in Australia, there is a lack of up-to-date information on the employment and regional economic impact of the South West Slopes softwood plantation industry, and on skills and employment needs in the industry. This gap in knowledge is not limited to the South West Slopes, with few reports examining employment, economic values, skills and training needs of the forest, wood and paper industries in Australia during the last decade.

The study

Both the NSW Department of Industry, Skills and Regional Development (NSW Department of Industry) and Forest and Wood Products Australia (FWPA) have recognised this gap in knowledge, and sought to address it through funding this study of the South West Slopes

softwood plantation industry. The FWPA have also funded similar work in several other regions as part of a large program of work updating information on social and economic effects of the forest industries located in South-East Queensland, South Australia, Victoria, Tasmania, Western Australia and in the Central Tablelands of NSW.

This report provides robust data on employment, economic value, and key needs of the softwood plantation industry in the South West Slopes region of NSW. It has been undertaken by the University of Canberra (Dr Jacki Schirmer and Melinda Mylek) in partnership with Diana Gibbs and Partners (Diana Gibbs) and EconSearch (Dr Julian Morison and Anders Magnusson).

This study examined:

- The employment generated by the softwood plantations and wood and paper processing facilities located in the South West Slopes, including the direct and indirect employment generated by the growing, harvesting, haulage, processing, and distribution of finished products
- Socio-demographic characteristics of the current industry workforce
- Skills and training needs of the industry
- The economic value of the industry, including direct and flow-on economic activity generated by the industry
- Business and market outlook for the industry.

Data sources and methods

To produce robust and up-to-date data on employment, skills and training needs and economic value of the industry, all businesses involved in the growing, managing, harvesting, transporting or processing of commercial wood or paper products in the region were asked to take part in a survey. Of 59 businesses operating in the industry in the region (including nurseries, plantation management agencies/companies, silvicultural contractors, harvest and haulage contractors, and wood and paper processors), 63% completed the full survey, including all large businesses employing more than 50 people. Of the 22 who did not complete the full survey (predominantly small businesses employing fewer than 10 people), 12 provided information by phone, while information on the remaining 10 was estimated based on information provided by industry experts.

Appendix 1 provides more detailed information on the survey process and responses achieved. Data from the survey were analysed to identify the direct employment and economic activity generated by the industry, skills and training needs, and industry business and market outlook and challenges. They then informed economic input-output modelling using EconSearch's RISE model, which identified flow-on employment and economic activity generated by the industry in the South West Slopes region (see Appendix 1 for further information).

In addition to the analysis generated based on direct survey of industry members, and economic modelling, existing data from previous studies of the region (mostly conducted prior to 2005) and from the Australia Bureau of Statistics 2006 and 2011 *Census of Population and Housing* were analysed. These data are presented throughout the report as appropriate, and a detailed report of this analysis is provided in Appendix 2.

Report structure

The following chapters provide a detailed analysis of the socio-economic characteristics of the softwood plantation industry in the region, including:

- A brief overview of the South West Slopes softwood plantation industry (Chapter 2)
- Economic value and expenditure impacts of the industry (Chapter 3)
- Employment generated by the industry (Chapter 4)
- Workforce socio-demographic characteristics (Chapter 5)
- Industry skills and training needs (Chapter 6)
- Business and market outlook (Chapter 7)
- Future industry workforce needs (Chapter 8).

2. Overview of the South West Slopes softwood plantation industry

Brief history of the South West Slopes softwood plantation industry

The South West Slopes softwood plantation industry began in the 1920s, when the State government began establishing softwood plantations on large areas of government-owned land, including many areas cleared of native forest to establish the plantations. Between the 1920s and the 1980s a large area of softwood plantations was established in the region on this State-owned land, with plantings in the 1960s and 1970s supported by Commonwealth government loans made to State government to encourage establishment of softwood plantations.

In the 1980s and early 1990s, small private investors established additional areas of plantation, typically located close to the large areas of State-owned plantation. During this period state-owned plantations also expanded, with large new areas of plantations established by what is now the government-owned Forestry Corporation of NSW (FCNSW) in the Red Hill and Nanangroe districts.

In the late 1990s and early 2000s, new areas of softwood plantations were established in the Bombala region, and smaller areas around Tumbarumba, Tumut and Gundagai, through investment by Managed Investment Scheme (MIS) companies (Schirmer et al. 2005). The collapse of MIS companies in the late 2000s was followed by consolidation of the private softwood plantation estate, with most privately owned softwood plantations now owned by large institutional investors such as Global Forest Partners and New Forests. The rate of new plantation establishment in the region slowed substantially from 1991 onwards in all parts of the region except Bombala (Schirmer et al. 2005). Virtually no new plantation area has been established since 2008 in the region.

This long history of establishment means that many softwood plantations in the region have been harvested and replanted two to three times since they were first established. As more of the region's plantations have reached maturity, with a growing volume of plantation harvested annually, an increasing volume of wood and paper processing capacity has been established in the region to utilise this wood fibre resource.

Softwood sawmills began to be established in the region from the 1950s (Schirmer et al. 2005). The first large-scale softwood wood processor established in the region was CSR's particleboard plant at Tumut, established in 1967 (Schirmer et al. 2005). This was the first large scale industry to take early thinnings from the plantations around Tumut. A plywood mill was also established in Wagga Wagga in the 1960s, and a softwood sawmill in Tumbarumba in 1974.

The next major development in the industry based on a rapidly increasing supply of pulpwood was the ANM newsprint mill at Albury. It was commissioned in 1980 and initially consumed around 300,000 tonnes per year of pulpwood from NSW.

In 1982, Laminex commissioned a medium-density fibreboard (MDF) plant at Wagga Wagga, utilising around 120,000 tonnes per year. Following expansion in 1986, a further 50,000 tonnes per year of sawmill chips was sourced. Also in 1982, CSR added a second particleboard line to the Tumut plant, using mainly sawmill residues.

As increasing supplies of sawlogs became available from plantation harvest, a larger allocation of supply was given to softwood sawmillers in the region, enabling existing mills – particularly what was then Softwood Holdings in Tumut (now part of the Carter Holt Harvey group) and the Tumbarumba sawmill (then owned by Petersville Sleigh and now the site of the Hyne & Sons mill). However, despite gradually increasing availability of sawlogs in addition to pulplogs from thinning operations, relatively little investment was made in expanding the region's sawmilling operations until the late 1990s. In the late 1990's, CSR sold their Tumut sawmill to Weyerhaeuser International and that company significantly increased the capacity of the Tumut sawmill.

During the 1990s, FCNSW (at that time the Forestry Commission) negotiated with ANM to reduce its pulpwood allocation to accommodate an increased input of recycled fibre. With the volume of sawmill residues and pulpwood rapidly increasing during the 1990s, it became a high priority to facilitate the establishment of expanded pulp and paper processing in the region. Closure of the Laminex MDF plant in 2000 increased this need, as Laminex had been a user of sawmill residues and pulpwood. After several years of negotiations with ANM and other potential investors, Visy Industries invested in a kraft pulp and paper mill in Tumut. Stage 1 of the mill began operation in 2002.

In the early 2000s Hyne Timber purchased the Tumbarumba sawmill and constructed a new 1,000,000 tonnes per year capacity mill at the Tumbarumba site, utilising sawlogs sourced both from the South West Slopes and from areas of plantation in Victoria.

Visy opened its second stage in Tumut in 2009, with a second paper machine utilising all available pulp and residues in the region, and drawing additional raw material supplies from Bombala and Oberon.

During the whole of this developmental period (1980 to 2010) the plywood factory in Wagga Wagga continued in various ownerships, and is now owned by the Big River Group.

In Bombala, meanwhile, Dongwha opened a new sawmill in 2013, built on the site of the previous Bombala sawmill, providing demand for the softwood plantation estate established in the Bombala region by both FCNSW and private forest companies.

In 2016, XLam announced the construction of Australia's first cross-laminated timber (CLT) processing facility in Wodonga, positioned to access plantation resources from both the South West Slopes and key areas of Victorian plantations.

These recent investments illustrate the range of processing that can be established in a regional area based on a large plantation estate. More broadly, the history of development of both the plantation estate and associated processing facilities in the South West Slopes illustrates the importance of ongoing investment in modern processing facilities. Many of the current wood and paper processing mills in the region operate on the same site as facilities opened some decades ago. This continuity of operations is the result of ongoing investment in upgrading and refitting mills to utilise changing processing technologies and processes,

with the current mill operations often having little to no resemblance to those that would have been in place when milling first began at the site.

Softwood plantation estate in 2017

The current area of softwood plantation in the region is approximately 165,000 ha, of which approximately 37% is owned by a number of private growers, with the remaining 63% being in public ownership via Forestry Corp NSW.

The plantation estate of the south-west slopes of New South Wales has some unique features. The plantations zone is bordered by national park to the east, the Murray River to the south and the Hume Highway to the west and covers an area approximately 200 km long by 100 km wide, representing about 3% of the total land mass between Hume and Burrinjuck Dams. The rainfall varies from 700 mm in the west to 1200 mm in the east.

Although production of fibre from the region's plantations has increased over the past 20 years, supply will not continue to increase substantially in the future, as there has been little to no expansion of the plantation estate since the early 2000s, and the large majority of already established plantations in the region have reached maturity and are contributing to the annual supply of fibre (with the exception of some plantation area around Bombala which is yet to reach harvest age). Unless there is active investment in expanding the plantation estate, the most likely future scenario is that the supply of fibre plateaus or declines. With areas of plantation in the region lost in bushfires in recent years, and the potential for some privately owned plantations to be converted to agriculture after harvest, a decline in supply is a likely scenario.

Wood and paper processing in 2017

The majority of timber grown in the South West Slopes (approximately 86% of total harvested volume) is processed at facilities within the region. Much of the 14% not processed locally is fibre harvested around the Bombala region that is transported to locations including the Australian Capital Territory for processing.

The current processing industry in the South West Slopes consists of:

- Visy Industries, located in Tumut NSW. The key products from Visy in Tumut include kraft paper and cardboard/ packaging products
- Norske Skog, located in Albury NSW. The key product at Norske Skog is newsprint paper.
- Carter Holt Harvey (CHH) Sawmill, located in Tumut NSW. The key products at CHH sawmill include kiln-dried structural sawn wood and treated pine sleepers.
- Carter Holt Harvey (CHH) Woodproducts panel manufacturing facility, located in Tumut NSW. The key products at CHH Woodproducts include rawboard (particleboard [PBD]) and laminated particleboard.
- Hyne Timber, located in Tumbarumba NSW. Key products at Hyne Timber include kiln-dried structural sawn wood and treated timber.
- Big River Group, located in Wagga Wagga NSW. The key product produced is plywood.
- Dongwha Timbers, located in Bombala NSW. Key products at Dongwha Timbers include treated structural sawn wood, decking, sleepers, fencing and landscaping timbers and decorative interior boards.

In addition, AusWest Timbers has a mill in the ACT producing roof tiling battens, which draws resource from the South West Slopes region. While not located physically within the region, this mill forms part of the group of processing facilities generating employment as a result of plantations grown in the region.

The majority of total raw fibre requirements for these processing facilities (approximately 78%) is sourced from sawlogs and pulplogs harvested in plantations within the South West Slopes region. The remainder comes mainly from Victoria, a smaller volume from the regions around Oberon in NSW, and some from bordering regions such as the ACT, Junee, Yass, and Palerang. The need to source fibre outside the region to meet current supply needs for the region's mills presents some challenges for the industry, with processors reporting that they cannot source additional fibre inputs within an economic transport distance of their mills, curtailing potential expansion and creating a risk to current production if any of the fibre inputs currently imported from other regions become unavailable.

Residues such as woodchips and shavings produced as by-products at some of the region's processing facilities (e.g. Hyne Timber and CHH sawmill) are used in the manufacture of products such as paper, cardboard and particleboard at other processing facilities in the region, such as Visy Industries and the CHH Woodproducts panel manufacturing facility. Other residues are typically used as fuel for onsite energy needs, or in some cases sold to local landscapers or other industries requiring wood shavings and bark. This results in the utilisation of the full log through more than one stage of production, thus maximising fibre recovery and minimising potential waste.

Conclusions

The South West Slopes region is home to a large, world scale industry that has developed in proximity to the softwood plantations established in the region from the 1920s. The volume of production in the region has grown over time as a larger proportion of the plantations reach harvest age and contribute to the annual supply, with older plantations now in their third rotation. The large industry that has developed enables utilisation of the fibre harvested from these plantations, providing a market for logs of different sizes. Sawlogs (generally straight logs with larger diameter and few knots) go to sawmills, with residues from the sawmilling process then being supplied from sawmill to composite wood manufacturers and pulp/paper mills. Pulp-quality logs go to pulp and paper mills in the region as well as to composite wood product manufacturers. This enables utilisation of all logs from plantations in the region. The large size of the plantation estate has attracted establishment of processors that utilise not only the plantation estate in the region, but also process fibre from adjacent regions in Victoria. The key constraint to any further expansion is sourcing fibre, with the local industry fully utilising all the fibre available within an economic transport distance of the region.

3. Economic value of the industry

The softwood plantation industry in the South West Slopes of New South Wales (NSW) represents a significant part of Australia's total softwood plantation estate and associated processing. The 165,000 ha hectares of softwood plantation established in the region make up 11.6% of Australia's total of 1,035,400 hectares of softwood plantations (ABARES 2016). Multiple wood and paper processors operate in the region, ensuring the logs harvested from these plantations undergo considerable 'value-adding' prior to finished products being sent to domestic and international wholesale and retail markets.

The economic value of an industry can be estimated using a range of different measures. One common measure is the value of final gross output, defined as the sale value of the products produced by the industry at the end point of sale (excluding sales of products or services occurring at earlier points in the supply chain to avoid double counting). The direct gross output from the processors of the South West Slopes region was \$1,050 million in 2015-16. This figure can be compared with:

- The total expenditure of the tourism sector for the Snowy Mountains region (a region that includes the ski resorts in the Kosciusko region) of \$472 million in 2015-16 (Destination NSW 2016)
- The total gross output of \$526 million by the agricultural sector to the point of the farm gate in the local government areas of Tumut, Tumbarumba, Gundagai, Wagga Wagga, Greater Hume and Albury in 2010-11¹ (RMCG, 2016).

The economic contribution of the plantation-based softwoods sector is therefore significant on a regional level, and is a major driver of the regional economy.

For this study, the economic value measure used is the total net expenditure of the industry in the region, after taking into account transfers between different parts of the industry. This figure is less than total value of output as it measures what is spent by the industry rather than the sale value of output. Direct net expenditure is a useful measure of the amount the industry contributes to the local economy, as it excludes transfers of profits to head companies located outside the region.

In total, in 2015-16, the local industry generated \$734.8 million in direct net expenditure as a result of investment in growing, harvesting, log haulage and processing of wood and paper products in the region. Table 1 summarises expenditure generated at different stages of growing, harvest and processing. It then shows expenditure net of transfers within the industry – this 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 this net figure include payments made to harvest, haulage, roading, earthworks and silvicultural contractors by plantation managers, and payments made to plantation managers or to other processors for fibre inputs used by wood and paper processors. The majority of expenditure is generated in the processing sector, both in gross and net terms.

¹ This figure does not include Bombala, and as such is an underestimate although not a substantial underestimate; it also does not include all of the manufacturing jobs dependent on agriculture in the region.

Table 1 Direct expenditure generated by the South West Slopes plantation industry, 2015-16, by supply chain stage

Supply chain stage	Gross total expenditure in 2015-16 (\$m)	Net expenditure excluding transfers to other plantation sectors (\$m)
Establishing & growing plantations	148.2	64.4
Harvest & haulage of logs to processors	68.8	68.8
Wood and paper processing	846.4	601.5
TOTAL	N/A (includes 'double counting' if summed)	734.8

Businesses in the industry were asked to identify key expenditure items, including spending on inputs and supplies, wages and salaries, and other key items. This was further analysed through use of input-output modelling (see Appendix 1 for details). Table 2 summarises the total spend across the industry on key items. Wages and salaries account for around 21% (i.e., \$1 in every \$5 of expenditure) of total industry expenditure, and is the largest single item of expenses recorded by the industry survey.

Table 2 Expenditure of the South West Slopes plantation industry, 2015-16, by industry sector

Expenditure within the South West Slopes region	Value (\$m)	Proportion of total (%)
Wages/Salaries	155.2	21%
Other Services	103.3	14%
Electricity, Gas, Water and Waste Services	78.5	11%
Manufacturing	58.5	8%
Retail and Wholesale Trade	38.4	5%
Communication	21.4	3%
Transport, Postal and Warehousing	17.1	2%
Agriculture	14.9	2%
Other	13.6	2%
Accommodation and Food Services	10.4	1%
Professional, Scientific and Technical Services	9.4	1%
Education and Training	5.7	1%
Construction	5.1	1%
Mining	0.3	0%
Sub-total	531.9	72%
Expenditure outside the South West Slopes region	202.9	28%
Total	734.8	100%

Table 3 identifies the economic contribution of the South West Slopes plantation industry, by sector, including total value of output, contribution to Gross Regional Product (GRP), and contribution to household income. The industry generated a total of \$2,130 million of gross value of output for the region in 2015-16, including \$955 million from flow-on effects. Contribution to GRP (or the 'value-added' to the economy) in the region was \$1,014 million, including \$580 million from flow-on effects.

The largest single component of expenditure for the industry overall was wages and salaries, with \$155 million injected directly into the regional economy via household incomes. Including flow-on effects, the total contribution of the industry to household income in the region was \$468 million in 2015-16.

The idea of 'flow-on' impacts can often seem intangible. In reality, these flow-on effects involve the generation of economic activity in many businesses that have a high level of dependence on the presence of the plantation industry, and whose survival relies on its presence. An example of this is a small business supplying specialty parts to the forest and other industries that was established in the region originally to supply the forest industry, and has since expanded into supplying to other industries over time. The business remains very dependent on the forest industry, with any downturn in the industry having a significant impact on their business. As a supply business, the employment and economic activity generated in this business is considered a 'flow-on' effect of the industry, and they are an example of the many businesses on which the success of the industry depends. This is just one example of the many businesses in which jobs are created as part of the flow-on effects of the industry through the supply chain, and highlights the very real dependence of these often highly specialised businesses on the presence of the industry.

Table 3 Economic contribution of the South West Slopes plantation industry, by sector – value of output, Gross Regional Product, and household income, 2015-16

	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 (\$m)	255.0	1,983.5	165.9	8.9	45.0	2,129.7
Direct (\$m)	195.8	1,049.6	72.3	3.9	20.6	1,013.5
Production-induced (\$m)	21.9	419.8	35.7	1.7	8.8	487.8
Consumption-induced (\$m)	30.8	373.2	47.1	2.8	13.1	467.0
Gross Regional Product (\$m)	113.7	803.8	71.4	4.5	20.9	1,014.2
Direct (\$m)	82.6	319.4	22.4	1.7	7.9	433.9
Production-induced (\$m)	13.0	265.4	21.4	1.1	5.3	306.3
Consumption-induced (\$m)	18.1	219.0	27.6	1.7	7.7	274.0
Household Income (\$m)	30.9	373.6	47.1	2.8	13.1	467.5
Direct (\$m)	13.1	116.2	18.9	1.2	5.7	155.2
Production-induced (\$m)	8.8	149.8	14.7	0.8	3.7	177.7
Consumption-induced (\$m)	8.9	107.5	13.6	0.8	3.8	134.6

The contribution of the industry to the economy of New South Wales is larger than that to the South West Slopes. The main reason for this is that it includes expenditures made outside of the region by businesses in the South West Slopes. Some examples of these expenditures are fuel, communication services, some wood inputs to processors and other services. The contribution of the South West Slopes softwood plantation industry to the economy of New South Wales in 2015-16 was around \$1,153 million in GRP and \$561 million in household income, each including flow-on effects (see Appendix 1).

Conclusions

The contribution of the softwood plantation industry to the GRP of the South West Slopes in 2015-16 was \$1014 million, including flow-on effects. It thus adds significant value to the regional economy. The direct net expenditure of the industry (the amount spent by the industry, rather than the sales value of its output), was \$735 million in 2015-16. Of this total expenditure, over 80% was contributed by the wood and paper processing sector, with the balance fairly evenly split between forest growers and the harvesting/haulage contracting sector.

The largest single component of expenditure for the industry overall was wages and salaries, with \$155 million injected directly into the regional economy via household incomes in 2015-16. When the flow-on effects of this are included, the total contribution of the industry on household income in the region was \$468 million.

The contribution of the South West Slopes softwood plantation industry to the economy of New South Wales in 2015-16 was around \$1,153 million in GRP and \$561 million in household income, each including flow-on effects.

4. Employment generated by the industry

The softwood plantations located in the South West Slopes region generate a large number of jobs in businesses ranging from nurseries growing seedlings and silvicultural contractors preparing ground for plantings, through to harvest and haulage of logs to processors, and processing of logs and residues into wood and paper products. Most of these jobs (92.3%) are located within the region, largely due to the establishment of multiple wood and paper processing facilities in the region. As well as generating employment locally, the jobs of some people living in other regions depend on the softwood plantations in the South West Slopes.

The employment generated by the softwood industry in the South West Slopes is detailed in this section, focusing on:

- The total number of direct and indirect jobs generated by the industry as of February 2017
- Jobs generated at different points in the supply chain
- Jobs generated in different local government areas (LGAs)
- Dependence of different LGAs on the employment generated by the industry, and
- Employment trends over time in the industry.

Direct and indirect employment – February 2017

The South West Slopes softwood plantation industry generated a total of 1,917 direct jobs within the region as of February 2017. This includes all jobs located within the region that depend on the softwood plantation industry, as well as those jobs generated outside the region as a result of the growing, harvest, haulage or initial processing of products from plantations located in the South West Slopes. A further 3,458 jobs were generated in the region 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. This high number of flow-on jobs is predominantly due to the presence of the large wood and paper manufacturing sector in the region, which generates substantial flow-on effects. A total of 5,375 jobs are therefore supported by the operations of the softwood industry in the SW Slopes region. A total of 6,026 jobs are supported across New South Wales by the industry in the SW Slopes region (Appendix 1).

Employment by industry sector – February 2017

Of the 1,917 direct jobs, 15.2% were generated at the 'growing' stage (in the establishment and management of growing plantations), predominantly in nurseries, silvicultural contracting firms and forest management companies (Table 4). A further 17.8% was generated by the harvesting of plantations and the transport of logs to processing facilities: this was mostly

generated in harvest and haulage companies based within the region. The majority of the direct industry employment – 66.0% - was generated by the processing of logs into a wide range of products in the multiple wood and paper processors located in the region. Other direct employment (just over 1% of total direct jobs) included jobs in forestry education and training, and jobs in the sale of specialised forest industry equipment.

Table 4 highlights the importance of having a strong and diverse range of wood and paper processors located within the region. Logs in the region are predominantly delivered to processors located within the region: only 13.6% of logs harvested in 2016 were delivered to processors located outside the region. The diversity of production occurring in the local region provides markets for all log types harvested, and also ensures that residues generated by some processors can be utilised by others.

Table 4 Direct employment generated by the South West Slopes plantation industry, February 2017, by industry sector

Industry sector	Employment generated in South West Slopes (persons)	Employment generated outside South West Slopes (persons)	TOTAL direct employment generated by South West Slopes softwood plantations
Growers (forest management companies) ¹	153	21	174
Nurseries, silvicultural & roading contracting businesses	79	38	117
Harvest & haulage contracting businesses	318	23	341
Wood and paper processing ²	1199	62	1261
Other (including consultants, equipment sales, training) ²	21	3	24
TOTAL	1770	147	1917
¹ Data includes some jobs in nursery sector where a grower had an integrated nursery operation			
² The jobs generated in these sectors includes people involved in wholesaling of products produced by these processors.			

The flow-on employment generated by the softwood plantation industry includes a wide range of jobs. Economic modelling using the EconSearch RISE model identified employment multipliers generated by the industry, shown in Table 5. These show that for every direct job generated by the industry, a total of 2.8 jobs were created through a combination of production-induced and consumption-induced effects (see Appendix 1). This means that a total of 5,375 jobs in the South West Slopes are directly or indirectly dependent on the softwood plantation industry. This multiplier is higher than in previous studies (see Appendix 2), for two reasons. First, labour productivity has grown substantially in the South West Slopes plantation industry over time, increasing output relative to direct employment. As labour productivity grows, more inputs and support services will be demanded per direct job in forestry. With the region having several mills that have invested in recent years in new technology and processes that increase labour productivity, the result is an increase in flow-on employment across the region per direct job in forestry, which explains an increase in the employment multiplier over time. Second, the South West Slopes region is unusually self-contained compared to many other regions as it has two major centres (Albury and Wagga

Wagga) that supply the inputs and services to industry that would need to be imported by industry in other regions. This reduces the leakages to imports in each round of flow-on expenditure and results in higher multipliers in the SWS region relative to other similar regions. The highly integrated nature of the plantation industry also contributes to this.

The flow-on effects vary in size in different parts of the industry, shown in Table 6. The processing sector delivers the highest proportion of indirect employment, with a Type II multiplier of 3.2 – which can be compared to lower levels of employment support contributed by other sectors with Type II multipliers of around 2.0.

Table 5 Employment multipliers: indirect employment generated by the South West Slopes plantation industry

Type of multiplier	Description	Multiplier estimate	Total employment
None	Direct jobs only	1.0	1,917
Type I	Direct jobs + production-induced jobs	1.9	3,682
Type II	Direct jobs + production-induced jobs + consumption-induced jobs	2.8	5,375

Table 6 Direct and flow-on employment generated by the South West Slopes plantation industry, 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
Direct employment	174	1,261	342	24	117	1,917
Production-induced employment	99	1,464	157	8	37	1,765
Consumption-induced employment	112	1,353	171	10	47	1,693
Total employment (direct and flow-on)	385	4,078	669	42	202	5,375

Employment by local government area – February 2017

Table 7 shows the direct employment generated in different local government areas (LGAs) within the South West Slopes by the softwood plantations located within the region. It also shows the number of jobs generated in LGAs neighbouring the region, and in LGAs located further away. Table 7 shows jobs based on the worker's place of residence – in other words, it shows where workers live. This has been done rather than showing jobs based on where a person works, as much of the spending and social activity undertaken by workers typically occurs near their residence, rather than near their workplace.

Table 7 shows data by LGA using LGA boundaries that existed prior to the mergers of LGAs that began in 2016. This enables more precise identification of where workers are located. However, as some LGAs have been merged into larger single regional councils, these are also identified in Table 7.

The largest number of jobs is located in Tumut, with 903 jobs directly dependent on the softwood plantation industry, a result of both a large number of jobs in wood and paper processing and many forest management and harvest and haulage workers being based in Tumut. This is followed by Bombala, with 240 jobs, and Tumbarumba, with 234 jobs. While only 160 workers live in Albury, a further 50 of those employed in Albury and other nearby areas live in Wodonga, with 210 workers living in the combined cities of Albury-Wodonga. A total of 175 workers live in Wagga Wagga LGA.

Table 7 Direct employment generated by the South West Slopes plantation industry, Feb 2017, by local government area

Local government area name (2017)	Local government area name (2016, prior to council mergers)	Employed in establishing and managing plantations to point of harvest (<i>nurseries, managers, silvicultural contractors</i>)	Employed in harvest & haulage contracting	Employed in wood or paper processing	Total number of people directly employed in the plantation industry
City of Albury	City of Albury ¹	3	29	127	160
City of Wagga Wagga	City of Wagga Wagga	1	14	160	175
Greater Hume Shire	Greater Hume Shire	12	10	19	41
Gundagai Shire Council	Gundagai Shire Council	5	7	5	17
Snowy-Monaro Regional Council	Bombala Shire	49	73	118	240
	Cooma-Monaro Shire	1	0	0	1
	Snowy River Shire	0	0	0	0
Snowy Valleys Council	Tumbarumba Shire	26	54	154	234
	Tumut Shire	155	132	616	903
Nearby LGAs (Bega Shire, Narrandera Shire, Yass, Wodonga)		21	19	40	80
Employment located in other regions		42	4	22	68
TOTAL		315	342	1261	1917

¹ Note that this does not include workers who live in Wodonga; approximately 50 workers employed in Albury live in Wodonga and are recorded in 'nearby LGAs'

Dependence of South West Slopes local government areas on the softwood plantation industry

The actual number of jobs held by residents of a particular LGA, may not be a good indicator of the extent to which individual LGAs depend on the softwood plantation industry for local jobs. This is particularly the case in the South West Slopes, which includes both big and small LGAs. The City of Albury had a population of 47,808 in 2011 and the City of Wagga Wagga had a population of 59,459; in contrast, Gundagai had a population of 3,663, the previous LGA of Tumbarumba had a total population of 3,357, and Tumut of 10,935².

To understand how dependent an LGA is on the industry, it helps to examine the proportion of all jobs that depend on the industry. This provides an understanding of the extent to which a local area depends on the industry for employment of its workforce. To do this, we identified the proportion of the *employed workforce* in each LGA that was employed directly in the softwood plantation industry. The employed workforce means all people employed for a wage or salary, and excludes those who are unemployed. Table 8 shows the proportion of the employed workforce who worked directly in the softwood plantation industry as of February 2017. Note that these estimates have one key limitation: the size of the employed labour force is based on data from the 2011 *Census of Population and Housing*, and it is likely that the size of the employed workforce has changed in each LGA by up to 5% since the time these data were produced. While more recent estimates of workforce size do exist, they have an estimated error of more than 8% in most of the LGAs of the South West Slopes, meaning they are usually less reliable than 2011 Census data. This information will be updated once data are released (in late 2017) from the 2016 *Census of Population and Housing*.

Across the entire South West Slopes region, 2.4% of jobs depend directly on the softwood plantation industry, a relatively high proportion given the region includes two of Australia's largest regional cities with diverse economies (Wagga Wagga and Albury) as well as major regional towns. Based on the size of the employed workforce in 2011, the LGAs with the greatest proportion of their workforce employed in the forest industry are Bombala (with 22% of all workers directly employed in the industry), Tumut (with 18.6% of all workers directly employed in the industry), and Tumbarumba (with 16.2% of all workers directly employed in the industry). The large size of the workforce in Albury and Wagga Wagga means that less than 1% of workers in these two LGAs depend directly on the industry for employment.

Table 8 Dependence of the workforce on softwood plantation industry jobs, by local government area

Local government area name (2017)	Local government area name (2016, prior to council mergers)	Total size of workforce (2011) ¹	Total number of workers directly employed in the softwood plantation industry	% workers employed in the softwood plantation industry
City of Albury	City of Albury	22,433	160	0.7%
City of Wagga Wagga	City of Wagga Wagga	29,070	175	0.6%

² Data source: ABS 2011 *Census of Population and Housing*, data obtained from TableBuilderPro Place of Usual Residence database

Greater Hume Shire	Greater Hume Shire	4,559	41	0.9%
Gundagai Shire Council	Gundagai Shire Council	1,682	17	1.0%
Snowy-Monaro Regional Council	Bombala Shire	1,092	240	22.0%
	Cooma-Monaro Shire	4,486	1	0.0%
	Snowy River Shire	3,870	0	0.0%
Snowy Valleys Council	Tumbarumba Shire	1,446	234	16.2%
	Tumut Shire	4,858	903	18.6%
Nearby LGAs (Bega Shire, Narrandera Shire)	Not analysed as very small proportion of workforce depends on South West Slopes softwood plantation industry			
Employment located in other regions				
Total - South West Slopes region (excludes workers living outside the region)		73,496	1,771	2.4%

¹Data source: ABS 2011 *Census of Population and Housing*, data obtained from TableBuilderPro Place of Usual Residence database. Note that accurate estimates of size of the employed workforce are generated between Censuses, but have a high standard error for most regional LGAs and therefore were not suitable. More up to date data on size of the employed workforce as of August 2016 will be available in mid-2017 when 2016 Census data are released.

Employment trends over time

This section analyses how the employment generated by the softwood plantations located in the South West Slopes has changed over time. There are limitations in identifying trends over time, namely that (see Appendix 2 for further detail):

- Previous studies have defined the South West Slopes more narrowly, typically excluding the Snowy-Monaro Regional Council from the region.
- Previous studies that examined forest industry employment in Bombala did not also include the Snowy River and Cooma-Monaro council areas, as these had not been amalgamated with Bombala to form the Snowy-Monaro Regional Council
- Previous studies have sometimes used slightly different definitions of what jobs are considered to be directly generated by the industry, although differences are usually minor
- The only consistent employment estimates generated over time are those from the ABS Census of Population and Housing; however, Census estimates
 - Include employment dependent on native forests and plantations, whereas this study examined plantations only
 - Were last generated in 2011, with data from the 2016 *Census* to be released in October 2017
 - Included employment in secondary and tertiary processing industries such as construction of cabinets and joinery that are not always captured in the survey done for this study as these industries often use wood products imported from other regions
 - often include haulage contracting employment in the transport sector, rather than in the forest, wood or paper industries.

These factors reduce the comparability of previous estimates with those in this report. To provide an initial estimate of change over time, three different time-series were produced:

- Table 9 shows employment over time generated by the South West Slopes plantation industry, excluding Bombala. This enables comparison of findings of past studies with the findings of this one using a comparable region. This suggests a small decline in employment between 2003-04 and 2017, of 45 jobs, which in turn demonstrates that ongoing investment in expansion of key processors, particularly Visy, has enabled maintenance of employment despite investment in more labour efficient technologies reducing the number of workers needed per unit of wood and paper products produced
- Table 10 shows employment over time using data from the ABS *Census*, compared to data we generated in 2017 for the region using the ABS definitions of the industry, which include native forest-dependent employment as well as plantation employment. This time series is not genuinely comparable over time, due to the substantial differences between Census estimates and estimates from the survey, but also suggests a very small decline in employment between 2011 and 2017.
- Table 11 shows employment by LGA over time, using the ABS *Census* and data from this study. This highlights the differences in estimates produced by the Census versus this study; after accounting for these differences, it again suggests employment has stayed relatively stable since 2011, although with some decline.

Overall, the data in Table 9 to Table 11 suggest that the total amount of jobs directly dependent on the forest industry in the South West Slopes has declined by approximately 5%, or slightly less, in the last six years. This is not surprising for an industry in which a large proportion of jobs are reliant on manufacturing. Investment in new technology in the manufacturing sector, a requirement for maintaining competitiveness over time, typically results in declining employment even as production volumes are increasing. For example, between 2006 and 2011, the total number of manufacturing jobs in Australia declined by 5.2%, from 952,016 to 902,829 jobs³.

Table 11 suggests that employment trends have varied depending on LGA. In particular, key factors influencing total forest industry employment in different LGAs (including changes in both the native forest and softwood plantation industries) include:

- Employment declined in Albury and Greater Hume SHire, a consequence of closure of the regional office of ForestryCorp, restructuring of existing industries, downsizing and subsequent closure of the Kimberly Clark non-woven fabrics mill (making components of hygiene products, nappies and surgical gowns. Employees at the mill appear to have been classified by the ABS into paper manufacturing categories)
- Employment grew in Bombala, predominantly due to the opening of the Dongwha sawmill in 2013
- Employment declined slightly in Wagga Wagga, due to investment in more efficient processing technology at key processors.
- Employment grew in Tumbarumba and Tumut, due to relocation of some forest management company staff to Tumut, expansion of the Visy mill and Hyne mill, and some harvest and haulage firms locating more of their workers in these LGAs.

³ Data source: ABS 2006 and 2011 Census of Population and Housing; data obtained from the TableBuilderPro database using the ANZSIC 2006 'Manufacturing' 1 digit classification.

Table 9 Softwood plantation industry employment in the South West Slopes over time – excluding Bombala

Source	Total softwood plantation employment estimated in South West Slopes region excluding Bombala				
	1991-92	1996-97	2001-02	2003-04	2017
URS Forestry 2004				1,748	
Schirmer et al 2005	1,548	1,811	1,731	1,682	
This study – whole region excluding Bombala					1,637

Table 10 Total forest industry employment in the South West Slopes over time – including Bombala

Source	Total forest industry employment: includes all jobs dependent on the softwood plantation, hardwood plantation and native forest industries		
	2006	2011	2017
ABS <i>Census of Population and Housing</i>	1,962	1,825	
This study – all forest industry employment located within South West Slopes region, including Bombala			1,792

Table 11 Total forest industry employment in the South West Slopes over time – by local government area

Local government area (2016, before council amalgamations)	2006 (ABS Census)	2011 (ABS Census)	2017 (this study, data not directly comparable to Census)	Differences between Census estimates and estimates from this study
City of Albury	423	340	165	Census classified jobs at a Kimberly Clark Australia plant as being in the paper industry despite not involving fibre inputs (approx. 60 jobs); Albury also had approx. 50 jobs in wooden structural fitting and component manufacturing (e.g. cabinet making) not captured in this study as they did not directly involve softwood products from mill in the region; there was a small decline in other manufacturing jobs and closure of an office employing some foresters (approx. 30 jobs). After accounting for this, there is only a small decline in employment in Albury, most of which is likely a result of closure of the Holbrook sawmill.
City of Wagga Wagga	249	304	185	In 2011, close to 100 people were employed in Wagga Wagga in wooden structural fitting and component manufacturing. These jobs were not captured in our survey as they did not directly utilise softwood inputs from the mills in the region.
Greater Hume Shire	116	56	41	Closure of a sawmill in Holbrook led to some decline in employment between 2006 and 2011. Reasons for differences between 2011 and 2017 are unknown.
Gundagai Shire Council	25	28	17	Some of this change may be due to processing workers relocating to Tumut, although this could not be confirmed.
Bombala Shire	157	163	246	Opening of the Dongwha sawmill was associated with some growth in employment.
Cooma-Monaro Shire	37	22	1	It is likely some workers dependent on the native forest industry live in this LGA and were not captured in our study.
Snowy River Shire	9	9	0	It is likely some workers dependent on the native forest industry live in this LGA and were not captured in our study.
Tumbarumba Shire	202	185	234	Expansion of the Hyne Timbers mill and expansion of some harvest and haulage contracting activity since 2011 has contributed to growth in jobs; our study also captures haulage jobs not counted as part of the forest industry in the Census.
Tumut Shire	744	718	903	Expansion of processing has contributed to growth in jobs; our study also captures haulage jobs not counted as part of the forest industry in the Census.
TOTAL (excludes jobs generated in other LGAs that depend on plantations in the South West Slopes)	1962	1825	1792	

Conclusions

A total of 1,917 jobs are directly dependent on the softwood plantations located in the South West Slopes region as of February 2017, and when flow-on jobs are included, this increases to a total of 5,375 jobs directly or indirectly dependent on the softwood plantation industry in the region. This included jobs in businesses ranging from:

- nurseries growing seedlings
- silvicultural contractors preparing land for planting
- harvest and haulage of logs for processors
- processing of logs and residues into wood and paper products.

Most of these jobs (92.3%) are located within the region, largely due to the establishment of multiple wood and paper processing facilities in the region. Of the 1,917 direct jobs, 15.2% were generated at the 'growing' stage (in the establishment and management of growing plantations), predominantly in nurseries, silvicultural contracting firms and forest management companies. A further 17.8% were generated by the harvesting of plantations and the transport of logs to processing facilities. The majority of the direct industry employment – 66.0% - was generated by the processing of logs into a wide range of products by the various wood and paper processors located in the region. Other direct employment (just over 1% of total direct jobs) included jobs in forestry education and training, and jobs in the sale of specialised forest industry equipment.

The largest number of jobs is located in Tumut, with 903 jobs directly dependent on the softwood plantation industry, followed by Bombala, with 240 jobs, and Tumbarumba, with 234 jobs. While only 160 workers live in Albury, a further 50 of those employed in Albury and other nearby areas live in Wodonga, with 210 workers living in the combined cities of Albury-Wodonga. A total of 175 workers live in Wagga Wagga LGA. Across the entire South West Slopes region, 2.4% of jobs depend directly on the softwood plantation industry, increasing to 6.7% of employment once flow-on effects are included as well as direct effects. The LGAs with the greatest proportion of their workforce employed in the forest industry are Bombala (with 22% of all workers directly employed in the industry), Tumut (with 18.6% of all workers directly employed in the industry), and Tumbarumba (with 16.2% of all workers directly employed in the industry). In each of these LGAs, once flow-on effects are taken into account, 50% or more of the workforce is likely to depend directly or indirectly on the softwood plantation industry.

While it is difficult to compare different estimates of jobs produced at different points in time, available information suggests the number of jobs dependent on the industry has declined only slightly in recent years, with this decline typical of manufacturing-dependent industries Australia-wide in which production is typically becoming more labour efficient over time.

5. Workforce socio-demographic characteristics

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 chapter and the next consider the challenges of maintaining the sizeable workforce of the softwood plantation industry in the South West Slopes.

This chapter examines the jobs being offered by the softwood plantation industry in the South West Slopes, including the working hours and incomes available compared to other industries. The working conditions in the industry will influence the ability of businesses in the industry to both recruit new workers and to retain their existing workforce.

The socio-demographic characteristics of workers are then examined, focusing on the gender and age composition of the workforce, and employment of people who identify as Aboriginal and Torres Strait Islanders. This provides insight into whether the industry is successfully utilising and 'tapping into' all parts of the available labour force in the region.

Job characteristics: hours of work

All businesses in the region were asked to report on the proportion of their workforce working full-time, part-time and in casual positions as part of the survey of businesses. The majority of jobs were full-time, comprising 72% of workers employed in plantation growing businesses; 88% of harvest and haulage contractors; 93% of wood and paper processing workers, and 57% of silvicultural and nursery workers (Table 12). Overall, 88% of industry workers had full-time jobs⁴, 2% worked part-time and 10% were casual workers. Casual work was more common than part-time, predominantly in growing, nursery and silvicultural businesses in which casual workers contribute to seasonal activities such as tree planting.

Table 12 Full-time, part-time and casual work in the softwood plantation industry

	Full-time	Part-time	Casual
Growers	72%	3%	26%
Harvest and haulage contractors	88%	6%	6%
Processors	93%	1%	6%
Silvicultural contracting and nurseries	57%	0%	43%
Whole industry	88%	2%	10%

This is consistent with data from the ABS Census of Population and Housing for 2011, which also shows a predominance of full-time workers in most parts of the industry. Table 13 shows the proportion of people who reported working full-time and part-time as of 2011, and shows that in 2011 only 8% of forest industry workers were employed part-time, compared to

⁴ This includes a small number of workers who were subcontracted rather than directly employed: subcontractors typically worked full-time hours.

32% of the broader workforce in the South West Slopes⁵. The data collected from businesses suggests that this has not changed substantially since 2011.

Table 13 Proportion of workforce employed full-time and part-time, 2011

	Employed full-time	Employed part-time
Forestry (154 workers)	90%	10%
Logging (128 workers)	92%	8%
Forestry Support Services (63 workers)	90%	10%
Wood product manufacturing - sawmilling, dressing, resawing, woodchipping (514 workers)	94%	6%
Wooden structural fitting and component manufacturing (150 workers)	85%	15%
Veneer and plywood manufacturing (72 workers)	89%	11%
Reconstituted wood product manufacturing (85 workers)	92%	8%
Pulp, paper and paperboard manufacturing (165 workers)	93%	7%
Corrugated paperboard and paperboard container manufacturing (273 workers)	94%	6%
Forest industry workforce (1604 workers provided information)	92%	8%
Employed labour force, South West Slopes (all industries)	68%	32%

Data source: ABS Census of Population and Housing, 2011, TableBuilderPro *Place of Usual Residence* database

Census data were also analysed to identify whether many workers were working high numbers of hours per week. As discussed further in Appendix 2, 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. Across the South West Slopes workforce as a whole (including all industries, not just softwood plantations), 18% of workers reported working more than 49 hours a week in 2011 (Table 14). In the forest industry, however, 28% of workers reported working more than 49 hours 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, due to shift work. These long hours can act as a disincentive to workers and reduce retention of workers.

Table 14 Working hours by industry sector

Workforce sector	Works >49 hours
Forestry (154 workers)	15%
Logging (128 workers)	66%
Forestry Support Services (63 workers)	41%
Wood product manufacturing - sawmilling, dressing, resawing, woodchipping (514 workers)	16%
Wooden structural fitting and component manufacturing (150 workers)	19%
Veneer and plywood manufacturing (72 workers)	29%
Reconstituted wood product manufacturing (85 workers)	22%
Pulp, paper and paperboard manufacturing (165 workers)	30%
Corrugated paperboard and paperboard container manufacturing (273 workers)	42%
Softwood plantation industry (all workers)	28%
South West Slopes employed labour force (including workers in all industries)	18%

⁵ This is based on the information provided by employed people to the Census, and excludes those who were away from work, or who did not answer the relevant question on the Census.

Job characteristics: income

Forest industry workers in the South West Slopes generally earned higher incomes than the average for the region, based on 2011 Census data (Table 15). Forest industry workers were both less likely to earn low levels of income, and more likely to earn high income compared to other workers in the same local government areas. This was the case in all local government areas except Wagga Wagga, where a slightly higher proportion of the workforce earned low incomes and fewer earned high incomes, something associated with use of relatively low-skilled workers in some wood product manufacturing facilities in this region.

The overall industry can be expected to have continued to offer higher than average incomes since 2011. As described in detail in Chapter 6, most softwood plantation businesses reported they could offer competitive wages in 2017. This suggests the industry is paying competitive wages compared to other industries in the South West Slopes region and contributing positively to spending ability of households in the region through providing higher than average incomes. One of the key reasons for this higher than average income is the relatively higher proportion of forest industry workers who are employed full-time.

Table 15 Income of forest industry workforce

	Low income (% earning <\$600/week)		High income (% earning >\$1250/week)	
	Forestry sector	Total workforce	Forestry sector	Total workforce
Bombala	6.5	23.5	33.1	22.1
Albury	6.3	12.7	61.1	31.3
Greater Hume Shire – eastern part	0.0	23.4	59.1	29.2
Greater Hume Shire – western part	0.0	29.1	35.7	23.0
Gundagai	0.0	24.0	44.0	25.6
Tumbarumba	6.1	20.8	20.7	27.3
Tumut Shire	7.6	18.6	41.0	29.6
Wagga Wagga – city area	17.6	13.4	17.6	31.3
Wagga Wagga – rural areas	0.0	25.8	52.9	30.9

Worker characteristics: Gender

The forest industry in Australia has traditionally predominantly employed men, with relatively few women working in the industry (ABARES 2015). Analysis of 2011 Census data, shown in Appendix 2, showed that as of 2011 only around 13% of workers in the South West Slopes forest industry were female. Data collected from businesses in the softwood industry in 2017 suggests there has been little change in this figure: as shown in Table 16, only 11% of the workforce was female (10% of full-time workers and 18% of part-time workers). Employment of women was highest amongst forest management companies (growers), where 17% of workers were female, and in silvicultural contracting and nursery worker (15%). Only 8% of harvest and haulage contractors were female, and 10% of those employed in wood and paper processing.

This suggests the industry is not successfully accessing the female labour force in the region. As of 2011, 47% of the labour force in the South West Slopes was female⁶, yet very few of the workers available in the female labour force are being successfully recruited into the forest industry. The lack of attractiveness of the industry to female workers places constraints on the ability of the industry to successfully attract the best workers. 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 16 Workforce characteristics: gender

	Male workers	Female workers	Full-time men	Full-time women	Part-time/casual men	Part-time/casual women
Growers	83%	17%	83%	17%	83%	17%
Harvest and haulage contractors	92%	8%	92%	8%	91%	9%
Processors	90%	10%	91%	9%	80%	20%
Silvicultural contractors and nurseries	85%	15%	88%	12%	81%	19%
Whole industry	89%	11%	90%	10%	82%	18%

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

Worker characteristics: Age

As of 2011, Census data showed that forest industry workers in the South West Slopes were slightly less likely to be aged under 25, and slightly more likely to be aged between 35 and 54, compared to the rest of the workforce in the South West Slopes (aged to 2.6% of the workforce).

Table 17). Analysis of the age profile of different parts of the industry, presented in detailed in Appendix 2, suggests that the average age of the workforce is higher for those employed in pulp and paper manufacturing, and for those employed in reconstituted wood manufacturing (e.g. particleboard and associated products). It also showed that there is low recruitment of young workers aged 25 or less into logging, forestry, pulp, paper and paperboard manufacturing, and reconstituted wood manufacturing.

Overall, our findings suggest that as of 2011 the forest industry workforce was not substantially older than was typical for the South West Slopes region as a whole. This analysis will be updated when data become available for the 2016 Census of Population and Housing, identifying if the softwood plantation industry workforce has aged more rapidly than the rest of the workforce of the South West Slopes between 2011 and 2016.

Worker characteristics: employment of Aboriginal and Torres Strait Islander workers

⁶ Data source: ABS 2011 Census of Population and Housing, TableBuilderPro database, Place of Usual Residence.

Data from the 2011 Census of Population and Housing were analysed to identify the proportion of the workforce who were Aboriginal or Torres Strait Islanders. In Tumbarumba and Bombala, the forestry workforce had a higher proportion of Indigenous employees (2.7% and 1.8%) than was typical for the broader workforce (0.6% and 1.3%) respectively. In other local government areas, employment of Indigenous workers was usually slightly lower in the forest industry compared to other industries (see Appendix 2). For example, 2.0% of forestry workers in Tumut were Indigenous compared to 2.6% of the workforce.

Table 17 Age distribution of the forest industry workforce by sector, 2011 South West Slopes region NSW

	15-24 years	25-34 years	35-44 years	45-54 years	55-64 years	65 years or older
Forestry (154 workers)	7%	19%	23%	32%	16%	3%
Logging (128 workers)	5%	23%	30%	25%	13%	4%
Forestry Support Services (63 workers)	11%	19%	11%	30%	17%	11%
Wood product manufacturing - sawmilling, dressing, resawing, woodchipping (514 workers)	15%	21%	20%	28%	14%	2%
Wooden structural fitting and component manufacturing (150 workers)	27%	21%	23%	19%	11%	0%
Veneer and plywood manufacturing (72 workers)	26%	33%	19%	21%	0%	0%
Reconstituted wood product manufacturing (85 workers)	4%	18%	18%	48%	13%	0%
Pulp, paper and paperboard manufacturing (165 workers)	2%	16%	27%	34%	21%	0%
Corrugated paperboard and paperboard container manufacturing (273 workers)	7%	26%	34%	22%	8%	3%
Timber wholesaling (32 workers)	16%	9%	31%	19%	25%	0%
Paper product wholesaling (84 workers)	19%	24%	15%	26%	15%	0%
South West Slopes forest industry workforce	12%	22%	24%	28%	13%	2%
South West Slopes workforce (all industries)	15%	20%	21%	23%	16%	4%

Conclusions

The forest industry is providing more full-time jobs and paying higher wages than many other industries in the South West Slopes, characteristics that may make the industry attractive to workers. However, a high proportion of workers – 28% - worked more than 49 hours per week. Working hours of this length can reduce attractiveness of the industry as they reduce work-life balance. Part of the reason for this high proportion of workers reporting long hours will include the use of shift rotations at mills in which workers have long hours during a shift period but then several days off work. This type of shift work has been shown in previous studies to be associated with higher rates of injury and reduced ability to engage in social groups and organisations (see Mylek and Schirmer 2015).

The industry employs very few women, and this does not appear to be changing over time, with only 11% of the industry's workforce being female in 2017, and a similar proportion being female in 2011. This is of concern as it means the industry is failing to recruit workers from what represents a very large proportion of the available workforce. While in some LGAs the industry employs relatively high numbers of Indigenous workers, in others it does not, suggesting potential to recruit a more diverse workforce.

While in 2011 the industry's workforce was not substantially older than the workforce of the South West Slopes as a whole, there was low recruitment of young workers aged 25 or less into logging, forestry, pulp, paper and paperboard manufacturing, and reconstituted wood manufacturing.

Overall, this suggests that the industry is offering full-time, long working hour jobs that have good pay and are particularly attractive to men, and is maintaining recruitment of men into the industry in most parts of the industry. The biggest socio-demographic challenge is to achieve recruitment of a greater diversity of workers, particularly women, into the industry. This may be achieved through actions such as offering jobs with more flexibility in terms of work hours, but will likely also require challenging and changing key aspects of the culture of the industry that continues to make it more appealing to male than female workers.

6. Industry skills and training needs

Ongoing investment in new technology and business processes at all stages of the supply chain, together with a large workforce, means the South West Slopes softwood plantation industry has a need for ongoing training of existing workers, and for recruitment of skilled workers. The region has a dedicated forestry training facility, the Forest Industry Training Centre, based in Tumut at the Riverina Institute of TAFE. This facility provides training in a wide range of skills needed by the diverse workforce of the softwood plantation industry in the region, with training being provided at a range of sites and workplaces to suit industry needs.

This chapter examines the workforce needs of the industry, focusing on skills and training needs in the industry. First, a summary of the key skills needs in the industry is provided, together with analysis of how these needs are evolving over time based on examination of change in time in worker occupations within the industry. Second, the skills and training needs identified by businesses in the region are examined, including how businesses are currently sourcing training for their workers. A brief overview of formal skills attainment in the industry, and how this is changing, is then provided. Finally, key worker recruitment and retention challenges identified by businesses in the region are analysed. Some implications of these findings for skills and training needs of the local workforce are then discussed.

Industry skills needs

The softwood plantation industry needs workers with a diverse range of skills. Workers in the industry include, experts in breeding trees to produce optimal fibre characteristics; nursery growers; skilled machinery operators; operational managers able to optimise complex plantation establishment, management and harvest schedules; engineers and chemists able to manage processing operations to produce composite wood products and pulp and paper 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 paper processing.

Businesses were asked about the skills they needed in their workforce, with 21 businesses providing verbal feedback on these needs via phone conversations as part of the survey process⁷. Most who discussed skills needs focused on the areas where they were having difficulty recruiting, which were:

- **Information and communication technology (ICT) skills.** These were particularly needed for managers, administrative staff, and increasingly for machinery and plant operators. This need was identified across all types of businesses. Rather than specialised ICT staff, the need identified was for ICT skills that are integrated into these occupations, enabling workers to effectively and efficiently utilise existing technologies. Associated with this need was concern about lack of access to reliable and fast internet to support use of ICT in a range of areas in the industry, including in the field as part of mobile plant operations, and in offices of businesses that are located in rural and

⁷ Other businesses did not identify specific skills needs when asked via phone, so have not been included in this number.

regional locations. Some businesses discussed specific types of specialised ICT skills, including GIS skills, operations tracking, and skills in outward-facing ICT such as website and social media site maintenance and updating (e.g. Facebook sites), as well as skills in use of online business and financial management software

- **Specialist professionals:** Challenges recruiting specialist professionals in the areas of horticulture, mechanics, engineering (including physical and chemical engineering), and finance were reported by a diversity of businesses. While the particular specialties varied, there was commonality in challenges reported being focused on people with specialist skills. In most cases, businesses needed relatively few people with these specialties but relied heavily on them
- **Mechanics:** Some harvest and haulage and processing businesses reported difficulty accessing adequate skilled mechanics to service their specialised vehicles and machinery
- **Middle managers:** Some reported finding it difficult to recruit locally-based middle managers with adequate experience and ability to act as managers
- **Skilled drivers:** Some harvest and haulage companies identified that they found it increasingly difficult to recruit skilled truck drivers, and were having to invest increasing amounts in skilling up relatively inexperienced drivers in order to maintain their workforce.

No businesses reported challenges in recruiting less skilled workers, although one silvicultural firm identified that backpacker tax changes may adversely affect their ability to recruit casual planting crews, as they often rely on backpackers.

To gain a broader picture of the types of skills needed, Census data were examined to identify the occupations of workers employed in the forest industry. In the 2011 Census, the people who worked in the forest industry in the South West Slopes were recorded as working in more than 100 different occupations, reflecting the diversity of skilled workers needed by the industry. Table 18 summarises the occupations reported by forest industry workers living in the South West Slopes in the 2011 Census. Common occupations reported included:

- **Forestry sector:** Specialist professionals such as scientists (25%), general forestry workers (27%) and mobile plant operators (19%) were the most common occupations
- **Logging:** Mobile plant operation was the most common occupation (43% of workers), followed by general forestry workers (14%), clerical/administration positions (9%) and automotive and engineering trade workers (9%)
- **Forestry support services:** Only around half of workers had information available, most of whom reported being science professionals or forestry workers
- **Wood product manufacturing:** machine and stationary or mobile plant operators (42%) and factory process workers (22%) were the most common occupations reported
- **Wooden structural fitting and component manufacturing:** The most common occupations were technicians and trades workers (34%) and construction trades workers (30%), followed by clerical/administration positions (10%)
- **Veneer and plywood manufacturing and reconstituted wood product manufacturing:** For both these categories the most common occupations were factory process workers and machine and stationary plant operators
- **Pulp, paper and paperboard manufacturing:** Machine and stationary plant operators (26%) and engineering trades workers (14%) were the most common categories

- **Corrugated paperboard and paperboard container manufacturing:** Engineering and science professionals (29%) and machine and stationary plant operators (23%) were the most common occupations.

Change in occupations between 2006 and 2011 was also examined (Table 19). While the changes identified over time have limitations due to limitations of the data⁸, the areas in which most change between 2006 and 2001 was identified were:

- Some growth in business management professionals including human resources and marketing management
- Growth in machinery and stationary plant operators, reflecting increasing use of plant operators and some reduction in use of factory process workers who directly handle logs or wood products in processing plants.

Overall, this analysis suggests that the key types of skilled workers required by the industry are diverse and include:

- Machinery operators, mobile plant and stationary plant operators
- Engineering and science professionals
- Automotive and mechanical specialists
- Clerical and administrative workers
- Factory process workers, although there were fewer of these compared to plant operators.

⁸ This analysis will be updated in late 2017 to include data from the 2016 Census once it is released by the ABS. This comparison over time has several limitations: some of the change will be due to differences in how particular workers were categorised in Census data rather than due to actual functional changes in their work roles.

Table 18 Occupations of forest industry workers in the South West Slopes, 2011

	Forestry (150 workers)	Logging (128 workers)	Forestry Support Services (34 workers)	Wood product manufacturing - sawmilling, dressing, resawing, woodchipping (395 workers)	Wooden structural fitting and component manufacturing (151 workers)	Veneer and plywood manufacturing (73 workers)	Reconstituted wood product manufacturing (84 workers)	Pulp, paper and paperboard manufacturing (163 workers)	Corrugated paperboard and paperboard container manufacturing (273 workers)
Technicians and Trades Workers - general	0%	0%	0%	5%	34%	4%	0%	2%	2%
Electrotechnology and Telecommunications Trades Workers	0%	0%	0%	8%	0%	4%	7%	9%	0%
Construction Trades Workers	0%	0%	0%	0%	30%	0%	0%	0%	0%
Automotive and Engineering Trades Workers	5%	9%	0%	7%	2%	5%	12%	14%	1%
Engineering, ICT and Science Technicians	3%	0%	0%	2%	0%	0%	0%	9%	3%
Business, Human Resource, Marketing and Health professionals	0%	4%	0%	1%	0%	0%	0%	3%	2%
Design, Engineering, Science and Transport Professionals	25%	0%	32%	0%	0%	0%	0%	9%	29%
Chief Executives, General Managers and Legislators	4%	0%	0%	0%	0%	0%	0%	0%	0%
Specialist Managers	7%	6%	9%	6%	7%	10%	6%	7%	12%
Office Managers and Program Administrators	0%	0%	0%	0%	5%	0%	0%	0%	2%
Clerical, Clerks, Receptionists, Personal Assistants and Secretaries, Administrative workers	3%	9%	0%	4%	10%	0%	4%	0%	5%
Sales Representatives, Agents, Assistants and Salespersons	0%	0%	0%	1%	3%	0%	5%	0%	0%
Machine and Stationary Plant Operators	0%	5%	0%	28%	6%	26%	24%	26%	23%
Mobile Plant Operators	19%	43%	15%	14%	0%	8%	20%	4%	6%
Road and Rail Drivers	6%	8%	0%	0%	0%	0%	0%	0%	3%
Factory Process Workers	0%	2%	0%	22%	3%	33%	23%	6%	9%
Farm, Forestry and Garden Workers	27%	14%	44%	0%	0%	0%	0%	0%	0%
Other occupations	0%	0%	0%	4%	0%	10%	0%	11%	3%

Table 19 Change in occupations of forest industry workers in the South West Slopes, 2006-2011

	Forestry (150 workers)	Logging (128 workers)	Forestry Support Services (34 workers)	Wood product manufacturing - sawmilling, dressing, resawing, woodchipping (395 workers)	Wooden structural fitting and component manufacturing (151 workers)	Veneer and plywood manufacturing (73 workers)	Reconstituted wood product manufacturing (84 workers)	Pulp, paper and paperboard manufacturing (163 workers)	Corrugated paperboard and paperboard container manufacturing (273 workers)
Technicians and Trades Workers - general	-1%	0%	0%	4%	0%	4%	7%	2%	-1%
Electrotechnology and Telecommunications Trades Workers	0%	0%	0%	0%	-2%	0%	-29%	0%	0%
Construction Trades Workers	1%	-4%	-10%	-2%	2%	5%	11%	0%	-3%
Automotive and Engineering Trades Workers	0%	0%	0%	1%	-2%	0%	-1%	5%	-5%
Engineering, ICT and Science Technicians	0%	4%	0%	0%	0%	0%	0%	-2%	1%
Business, Human Resource, Marketing and Health professionals	10%	-3%	15%	-1%	0%	0%	0%	-2%	1%
Design, Engineering, Science and Transport Professionals	4%	0%	0%	-3%	-4%	0%	-3%	0%	0%
Chief Executives, General Managers and Legislators	-1%	4%	-1%	0%	0%	10%	0%	-3%	3%
Specialist Managers	-3%	0%	0%	0%	2%	0%	-3%	0%	2%
Office Managers and Program Administrators	-1%	2%	-11%	2%	2%	0%	-3%	-4%	3%
Clerical, Clerks, Receptionists, Personal Assistants and Secretaries, Administrative workers	0%	0%	0%	1%	0%	0%	2%	0%	-2%
Sales Representatives, Agents, Assistants and Salespersons	-2%	-2%	0%	5%	3%	2%	20%	2%	3%
Machine and Stationary Plant Operators	1%	9%	11%	0%	0%	-4%	20%	1%	1%
Mobile Plant Operators	4%	-4%	-4%	-1%	0%	0%	0%	0%	0%
Road and Rail Drivers	0%	0%	0%	-8%	-2%	-12%	17%	-2%	3%
Factory Process Workers	-8%	-5%	0%	-1%	0%	0%	0%	-2%	0%
Farm, Forestry and Garden Workers	-4%	0%	0%	2%	-3%	-2%	-3%	4%	1%
Other occupations	-1%	0%	0%	4%	0%	4%	7%	2%	-1%

Skills and training needs

After identifying general skills needs, businesses were asked to answer a series of survey questions regarding the specific skills sets required by some or all of their workforce, whether they required workers to have formal accreditation in these skills, and how they currently provided training. These questions were answered by all plantation growers, all but one processor and 50% of harvest and haulage contractors (employing approx. 80% of all harvest and haulage workers). However, only two silvicultural contractors answered these questions⁹.

First, businesses were asked whether any of their workers (i) needed skills in and (ii) were required to have formal accreditation in, any of the following areas:

- Chainsaw and other hand-held machinery (eg brushcutter, pruning)
- Heavy machinery operation
- Fire fighting
- Occupational health and safety training.
- Compliance training e.g. training in compliance needed for regulatory or certification bodies
- IT/ software training specialised to the industry e.g. for plant operation, in-field survey
- Business and financial management
- Road transport/driver training for haulage drivers
- Community relations/community engagement
- Forest ecology and silviculture including plant identification
- Forest operations planning and management
- Marketing/sales

Table 20 shows the proportion of businesses reporting that some or all of their workers required skills in each area of competency, and the proportion who required formal accreditation of these skills.

Businesses most commonly reported needing workers with general skills that are relevant to many types of businesses: occupational health and safety training, and business and financial management, with 84% of businesses reporting a need for skilled workers in these areas, and 58% requiring some kind of formal accreditation of staff. Businesses that did not report a need for these skills were generally smaller-sized contracting businesses (harvest, haulage and silvicultural).

The next most common skills needed by businesses were heavy machinery operating skills, compliance training (eg training in meeting compliance standards of regulatory or certification authorities), and fire fighting, required by between 74% and 79% of businesses, with formal accreditation required by 53% to 58%.

⁹ Most silvicultural contractors completed a shorter survey form after reporting having limited time and electing to provide verbal feedback on their skills and training needs, which was reported in the previous section.

Training in ICT products specialised to the industry was needed by 63% of businesses (least commonly by processors and silvicultural contractors); however, few businesses required workers to have formal accreditation in these skills, with the exception of some processors.

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 operations planning and management or forest ecology and silviculture, while these were important skills for growers, silvicultural contractors, and for many harvest and haulage contractors. Road transport and driver training was most important for harvest and haulage contractors, although it was also important to many others in the industry.

Table 20 Skills and accreditation needs reported by softwood plantation businesses in the South West Slopes

	All businesses (includes silvicultural contractors)		Growers		Harvest and haulage contractors		Processors	
	Need skills	Require accreditation	Need skills	Require accreditation	Need skills	Require accreditation	Need skills	Require accreditation
Occupational health and safety training	84%	58%	100%	25%	80%	80%	100%	83%
Business and financial management	84%	58%	100%	25%	80%	60%	100%	100%
Heavy machinery operation	79%	58%	50%	50%	100%	80%	100%	67%
Compliance training	79%	58%	100%	50%	80%	60%	100%	83%
Fire fighting	74%	53%	100%	75%	80%	40%	83%	67%
Chainsaw and other hand-held machinery	68%	58%	100%	100%	60%	60%	67%	50%
IT/ software training specialised to the industry	63%	21%	100%	0%	80%	20%	67%	50%
Forest operations planning and management	53%	37%	100%	75%	100%	60%	17%	17%
Marketing/sales	53%	21%	100%	0%	20%	20%	67%	50%
Road transport/driver training for haulage drivers	47%	42%	25%	0%	80%	80%	50%	50%
Community relations/ engagement	47%	16%	100%	0%	40%	20%	50%	33%
Forest ecology and silviculture	32%	26%	100%	50%	40%	40%	0%	17%

Businesses were also asked to identify how they currently provided training in each of the skills areas in which they identified having needs, selecting from the following options:

- In-house training provided by other staff, not accredited
- In-house training by experts hired by the business
- Accredited courses with registered training organisations.

Table 21 shows the proportion of businesses who deliver skills training in different competency areas via in-house training by other staff, in-house training by an expert, or training via a registered training organisation:

- Registered training organisations were most commonly used to provide training in machinery operation, occupational health and safety, forest operations planning and management, and road transport and driver training, being used by 78% or more of all businesses. In some cases this was supplemented by in-house training
- Registered training organisations were also the most common methods for training in business and financial management, heavy machinery operation, and fire fighting, although less than 70% of businesses used this formal training and around one-third opted for in-house training by other staff
- Compliance training was delivered through an RTO for half of all businesses, and as in-house training by other staff in the other half, suggesting opportunities for additional provision of training in this area through more formal mechanisms
- Forest ecology and silvicultural was similarly sometimes delivered through an RTO and sometimes through in-house training by other staff
- In-house training was more common than use of a registered training organisations for marketing/sales, IT/software training, and community relations/engagement.

Table 21 Types of training used to build staff skills

	Registered training organisation	In-house training by other staff	In-house training by expert
Chainsaw and other hand-held machinery (eg brushcutter, pruning)	92%	23%	0%
Occupational health and safety training.	81%	38%	19%
Forest operations planning and management	80%	20%	10%
Road transport/driver training for haulage drivers	78%	11%	11%
Business and financial management	69%	31%	19%
Heavy machinery operation	67%	33%	20%
Fire fighting	57%	36%	14%
Compliance training	53%	53%	20%
Forest ecology and silviculture including plant identification	50%	50%	0%
Marketing/sales	30%	50%	20%
IT/ software training specialised to the industry	25%	42%	25%
Community relations/ engagement	22%	44%	11%

Formal skills attainment

Formal qualifications do not always reflect the skills of a given workforce, particularly in cases where skills have been learned on the job – for example, through in-house business training such as that identified in Table 21 in the previous section. Having a formal qualification does, however, provide an idea of the extent to which workers have skills that are formally recognised and thus able to be better transferred between workplaces and even industries. The importance of having benchmarks by which to ensure workers have a specific level of competencies is reflected in growing rates of formal educational attainment

across many Australian industries, with skills previously learned informally now often delivered as formal qualifications.

Formal educational attainment is also an important indicator of the extent to which workers have foundational skills in literacy and numeracy that are widely recognised as critical to enabling workers to gain new skills and competencies through their working life (Skills Australia 2010). Engaging in formal educational attainment is also beneficial beyond enabling workers to attain specific competencies: the process of formal learning builds foundational learning, literacy and numeracy skills that enable workers to have the ability to more rapidly adapt to changing industry requirements, and which have been identified as critical to increasing the productivity of Australia's labour force into the future (Skills Australia 2010).

The extent of formal skills attainment by workers, in the form of completing the high school certificate and post-high school qualifications including certificates, diplomas and degrees, was assessed by analysing data from the ABS *Census of Population and Housing*.

As of 2011, forest industry workers in most parts of the industry were less likely to have completed high school than those working in other industries, with the exception of those employed in some types of paper manufacturing (Table 22).

Table 22 Change in rates of high school attainment, 2006-2011, South West Slopes NSW

	2006: % completed year 12	2011: % completed year 12	Change 2006-2011
Forestry	32%	40%	+8%
Logging	13%	17%	+4%
Forestry Support Services	35%	31%	-4%
Wood product manufacturing - sawmilling, dressing, resawing, woodchipping	25%	25%	0%
Wooden structural fitting and component manufacturing	27%	33%	+6%
Veneer and plywood manufacturing	21%	30%	+9%
Reconstituted wood product manufacturing	37%	17%	-20%
Pulp, paper and paperboard manufacturing	44%	37%	-7%
Corrugated paperboard and paperboard container manufacturing	46%	57%	+11%
Timber wholesaling	23%	17%	-6%
Paper product wholesaling	46%	44%	-2%
Employed people, all industries	44%	48%	+4%

Between 2006 and 2011, the proportion of South West Slopes workers (across all sectors within the industry) who had completed Year 12 of high school or equivalent grew by 4%. High school attainment increased at above average rates between 2006 and 2011 in some parts of the industry (forestry, wood structural fitting and component manufacturing, corrugated paperboard and paper board manufacturing, and veneer and plywood manufacturing), but fell in other industry sectors. Overall, this suggests that the industry is more likely than most others in the South West Slopes to employ workers who are likely to lack foundational numeracy and literacy skills often considered fundamental to underpinning the type of skilled workforce needed to increase productivity rates (Skills Australia 2010).

Table 23 compares the proportion of workers in 2006 and 2011 with no post-school attainment, and those whose highest level of attainment was (i) Certificate III, (ii) Certificate IV, and (iii) Bachelor degree. In most parts of the forest industry, workers were less likely than those in other industries to have a post-school qualification. However, completion of Certificate III and IV qualifications was higher than average in some forest industry sectors,

particularly for those employed in reconstituted wood, laminate, veneer and paper manufacturing. Completion of a Bachelor degree was higher than the average for the South West Slopes labour force in the forestry sector and some parts of the paper industry, but lower than average in all other parts of the industry.

Across the South West Slopes workforce as a whole (including all industries, not just forestry), the proportion of workers with no post-school educational attainment fell by 5% between 2006 and 2011, from 47% to 42%. Within the forest industry, the change in skills depended on the part of the industry examined: the proportion of workers with post-school qualifications rose in the sectors of forestry, logging, wood product manufacturing, and veneer and plywood manufacturing. In other parts of the industry, there was not a comparable increase in post-school attainment. Further detail is provided in Appendix 2.

These data are several years old, and will be updated to include 2016 data as soon as this information is available (in late 2017). The high proportion of businesses reporting that they require formal accreditation for some of the competencies required in their workforce suggests it is likely that rates of formal educational attainment have increased in the industry since 2011. However, with many businesses not requiring formal competency training in key skill areas, and the industry having a lower 'base' of formally qualified workers as of 2011, this remains a key area in which further formalisation of training in workplace competencies can benefit the industry. Formal training by registered training organisations can better enable updating of skills and ensure a specific level of competency is required of workers in different areas.

Table 23 Post-school qualification attainment: change in rate of post-school qualification attainment, 2006 to 2011, South West Slopes NSW

	2006: % with no post-school qualification	2011: % with no post-school qualification	2006: % with Certificate III	2011: % with Certificate III	2006: % with Certificate IV	2011: % with Certificate IV	2006: % with Bachelor degree	2011: % with Bachelor degree
Forestry	58%	45%	14%	19%	4%	8%	16%	20%
Logging	60%	56%	35%	27%	0%	7%	2%	3%
Forestry Support Services	57%	58%	11%	12%	6%	6%	21%	12%
Wood product manufacturing - sawmilling, dressing, resawing, woodchipping	67%	63%	25%	28%	1%	4%	2%	2%
Wooden structural fitting and component manufacturing	36%	36%	59%	59%	0%	2%	0%	2%
Veneer and plywood manufacturing	79%	70%	21%	22%	0%	8%	0%	0%
Reconstituted wood product manufacturing	55%	58%	32%	38%	5%	0%	4%	0%
Pulp, paper and paperboard manufacturing	30%	31%	36%	39%	4%	7%	13%	10%
Corrugated paperboard and paperboard container manufacturing	39%	36%	34%	31%	2%	6%	11%	15%
Timber wholesaling	67%	66%	25%	28%	4%	6%	4%	0%
Paper product wholesaling	71%	69%	12%	12%	0%	7%	0%	4%
<i>All employed people in South West Slopes (all industries)</i>	47%	42%	22%	23%	3%	4%	12%	14%

Recruiting workers and contractors

In addition to identifying the types of skills required in the workforce and the methods used to build competencies via training and formal qualifications, 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.

As shown in Figure 1, the types of staff that were most challenging to recruit were managers and high level professional staff, with 93% of businesses reporting difficulty recruiting these types of workers. This was followed by transport workers, with 80% finding it difficult to recruit staff. Sixty per cent found it challenging to source finance/book keeping staff, and only 20% found this easy. Almost six in ten (58%) found it difficult to source skilled machinery operators, and the remainder found it 'neither difficult or easy'. Recruiting field staff was somewhat easier, although 40% still found this difficult. Most businesses found it relatively easy to source administrative workers.

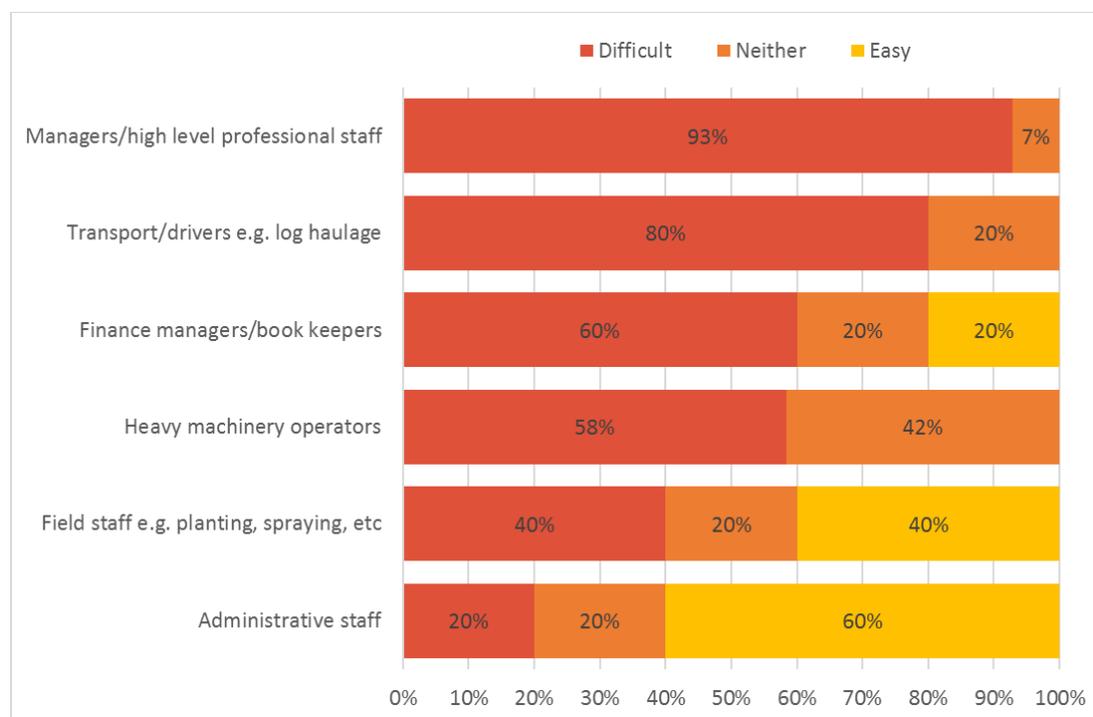


Figure 1 Level of difficulty involved in recruiting different types of workers, as rated by South West Slopes softwood industry businesses

When 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, nurseries and pruning. Silvicultural contractors who undertake site preparation, planting, spraying and fertilising were more difficult to source (Figure 2).

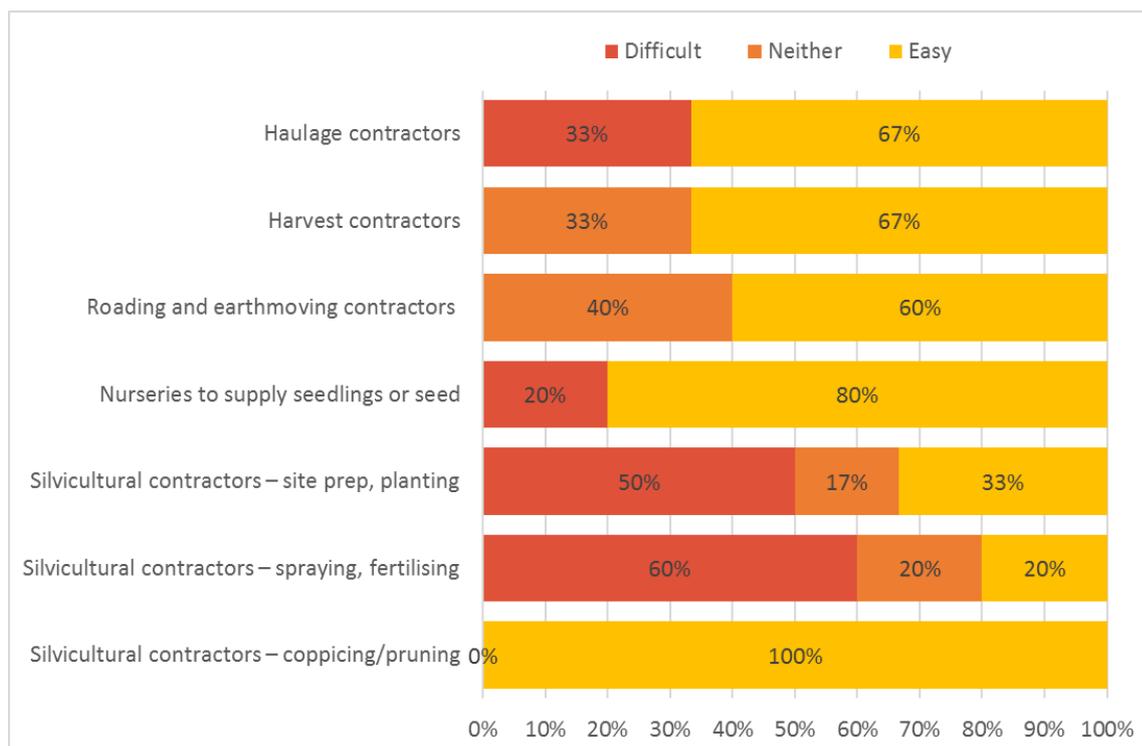


Figure 2 Level of difficulty involved in recruiting different types of contractors, as rated by South West Slopes businesses involved in engaging contractors

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 82% reporting that this was a big issue for them (Figure 3). For 76%, the investment and time required to build workforce skills was a big issue, while 65% reported there was a lack of local workers with skills needed by their business. In many cases (60% of businesses), skills obtained in other industries were not easily transferable to the softwood industry, reducing the ability of businesses to recruit workers from other industries.

Almost two-thirds (63%) of businesses reported that a key challenge was workers not wishing to shift to the community their employer was based in. Related to this, 56% reported that a lack of employment opportunities for partners/spouses of workers in the local region affected their ability to recruit workers.

Less than 35% of businesses reported that competition from other industries on wages or working conditions, negative perceptions or lack of confidence in the industry, or lack of affordable accommodation, were issues for recruitment.

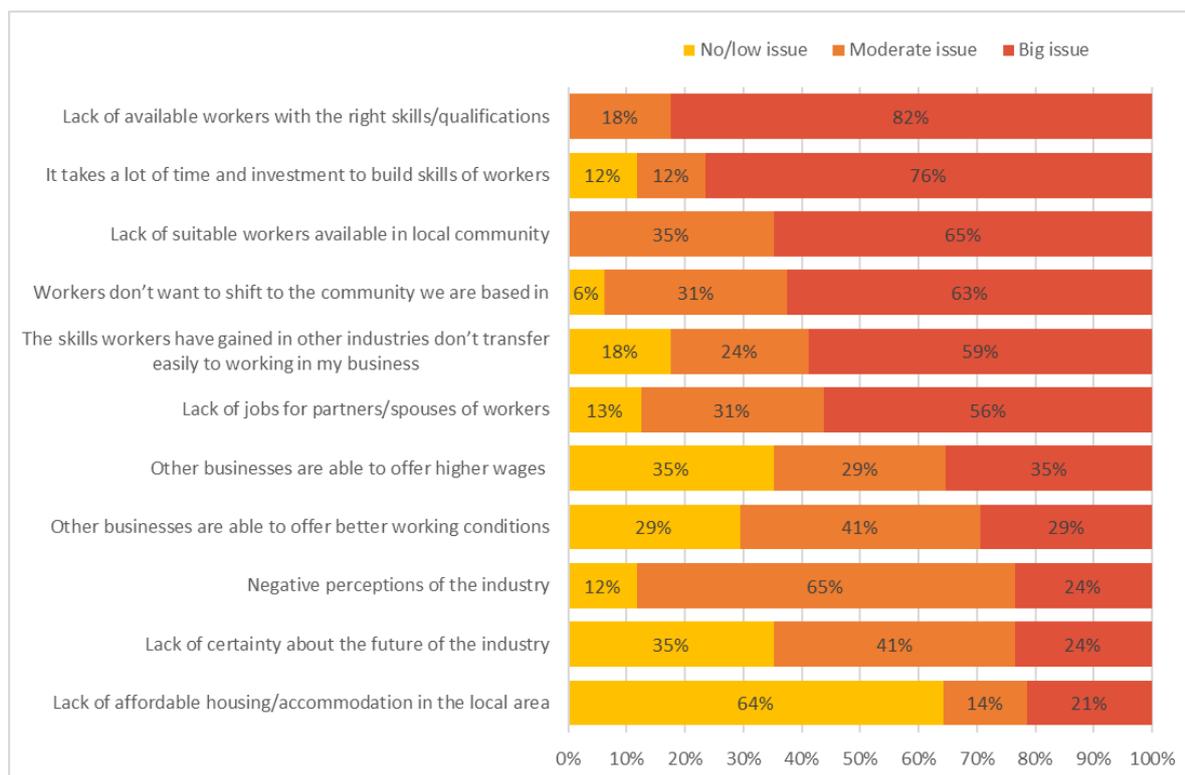


Figure 3 Key issues preventing recruitment of skilled workers into the South West Slopes softwood industry

Conclusions

As the softwood industry evolves, there is growing demand for workers with specialised skills, including specialist engineers, scientists and mechanics. More generally there is increasing demand for skilled mobile and fixed plant operators. Demand for less skilled factory process operators is declining. A need to have a skilled haulage workforce and to have workers with high level finance, middle management and ICT skills remains strong, with ICT skills needs occurring across most occupations within the industry.

While many businesses use registered training organisations to provide skills training, the industry workforce continues to have lower than average formal educational qualifications. This presents a key challenge for the industry, with formal educational attainment providing not only specific competencies, but also providing the base skills (in literacy, numeracy and overall learning skills) needed by workers to continue to learn new skills and adapt to ongoing change in the industry associated with increasing efficiency and productivity. This suggests a strong need to continue to strengthen investment in providing formal accredited training opportunities for the workforce, which cover the diversity of competencies identified as important across the industry.

Recruiting skilled managers and professional staff, transport workers, finance managers and heavy machinery operators is difficult for many businesses in the region, suggesting a critical need to address the challenges that are causing a lack of skilled staff. These challenges include a lack of suitably skilled local workers, the high cost of in-house training of staff, and difficulty attracting skilled workers from elsewhere to live in the region.

7. Business and market outlook and challenges

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 the key areas in which the industry is going well versus experiencing some challenges. They provide further insight into the areas in which investment may be needed to maintain a successful industry into the future.

Overall business conditions

Businesses were asked 'how would you describe business conditions for your business at the moment?' Of the 22 businesses who completed this question, none reported that conditions were 'easier than usual', while 11 (50%) reported they were 'more challenging than usual' and 50% that they were 'about the same as usual'. This was similar across the industry: around half of businesses involved in growing, contracting and processing identified experiencing challenging conditions and half typical conditions.

Business performance

Businesses were asked to self-rate their business profitability, ability to service their business debt, and cash flow. When asked to rate their profitability, on a seven point scale from 'making a large loss' to 'making a large profit' with 'breaking even' in the middle:

- None of the 16 businesses who completed this question reported making a loss
- Two reported they were breaking even
- Seven reported making a 'small profit'
- Seven reported making a 'moderate profit'
- None reported making a 'large profit'.

All industry sectors were similar in their reported, with just under half of businesses in each part of the industry reporting a small profit, just under half a moderate profit, and a very small number reporting breaking even.

When asked to rate how easy or difficult it was to service their business debt, a measure of the financial stress a business may be under, only eight businesses chose to answer the question, and all of these answered 'neither easy or difficult to service my debt'. Those who chose not to answer reported either having no debt to service, that they did not wish to answer the question, or that they lacked access to information to answer the question (for example, in some cases this information was available only in a business head office located outside the region).

When asked about their cash flow, another useful measure of short-term financial stress, eight of the 10 businesses who answered this question reported having 'good cash flow' and two reported having 'neither good or bad cash flow'. Of those who did not answer, the key challenge was obtaining the information, particularly for those in large businesses in which in some cases the person answering the survey was not aware of day to day cash flow circumstances.

Overall, despite the low response for some questions, this suggests most businesses are confident in their profitability and are not experiencing substantial financial stress.

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. In total, 19 businesses answered these questions. As shown in Figure 4:

- 53% of businesses felt they were likely to grow their profitability, and 41% that revenue would grow, with only 24% and 18% 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 12% of businesses expected to increasing workforce size while 24% expected to reduce their number of workers
- Most planned to invest in their business: 65% were planning to invest in new capital equipment and 59% in new business systems, with few reporting that they were unlikely to invest in their business.

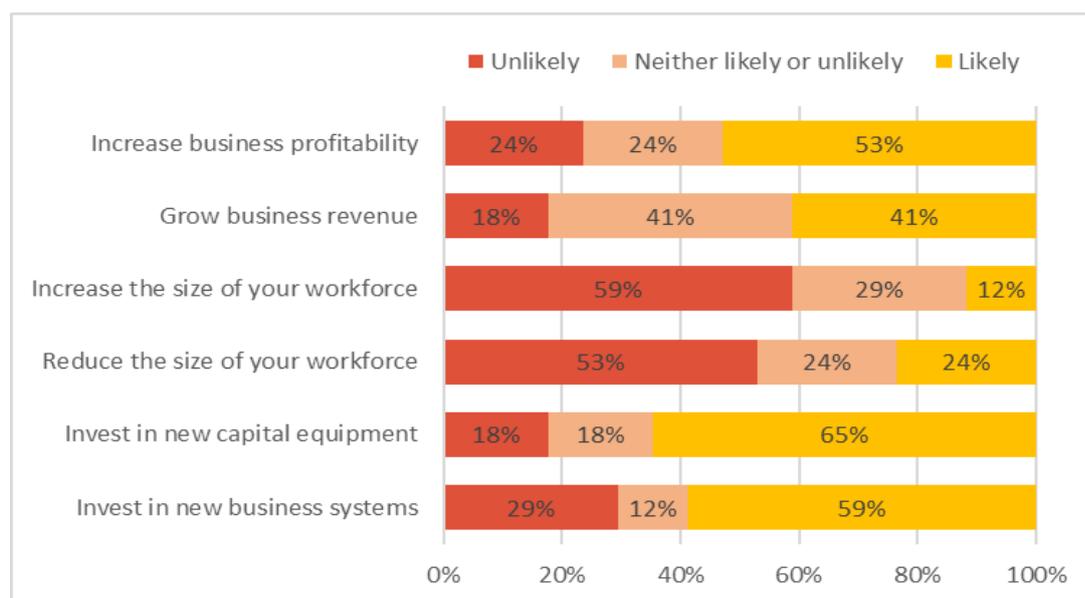


Figure 4 Expectations for business revenue, profitability, workforce size and investment over the next 12 months

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. Of 21 businesses who answered this question:

- 6 felt demand would grow; these were predominantly contracting, equipment supply and consulting businesses
- 12 felt demand would remain the same (spread across all parts of the industry)
- 3 felt demand would shrink: these were all growers or processors.

Following this, businesses were asked 'what factors would enable you to invest more in your business'. This question was either completed in the survey, or answered on the phone, with a total of 29 businesses providing their perspectives:

- Growers most commonly reported that having increased demand for logs, and cheaper land to enable expansion of plantations, would enable them to expand investment
- Harvest, haulage and silvicultural contractors most commonly identified having secure and longer term contracts as the factor affecting their ability to invest, with all respondents in these categories reporting that having better security of contracts would enable them to invest more in their business
- Processors reported a need for increased market demand, which some described as needing growth in overall demand for wood or paper products, and others described as their business needing to gain increased market share. The other challenges were supply related, with concern about high costs of inputs and high transport costs, particularly for those transporting logs from outside the region to feed into their mills with associated high transport costs.

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, however some businesses also identified other potential challenges:

- Growers reported loss of demand for timber products and loss of clients in the form of plantation owners seeking management services as key potential challenges
- Contractors reported non-renewal of contracts as a key factors that would trigger downsizing or closure; a smaller number also mentioned changes in industrial relations, complexity of managing work health and safety regulations, and change in government policy regarding the forest industry as potential triggers
- Processors most commonly reported lack of fibre supply in the region as a factor likely to trigger downsizing, particularly lack of access to quality wood resources. This was a significant concern for several processors who reported that a critical need for them was a larger plantation resource established within an economic transport distance of their mill. Declining market conditions were the other common trigger for downsizing/closure identified, and this was associated with concern about the effects about increasing competition from imported products and growing costs of production, particularly electricity costs for some.

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 17 businesses who completed these questions, including all of the largest employing businesses in the South West Slopes softwood industry, the most common challenges in the last three years were falling prices for their goods or services, rising input costs, and difficulty obtaining labour, with around half of all businesses reporting these issues (Figure 5). Poor telecommunications and lack of industry investment were also challenges for a significant proportion (just over 40%) of all businesses.

Rising input costs and rising costs of labour were more commonly reported by wood and paper processors than any other type of business. Poor telecommunications, meanwhile, was not typically reported as a problem by processors, but was an issue for most growers and contracting businesses.

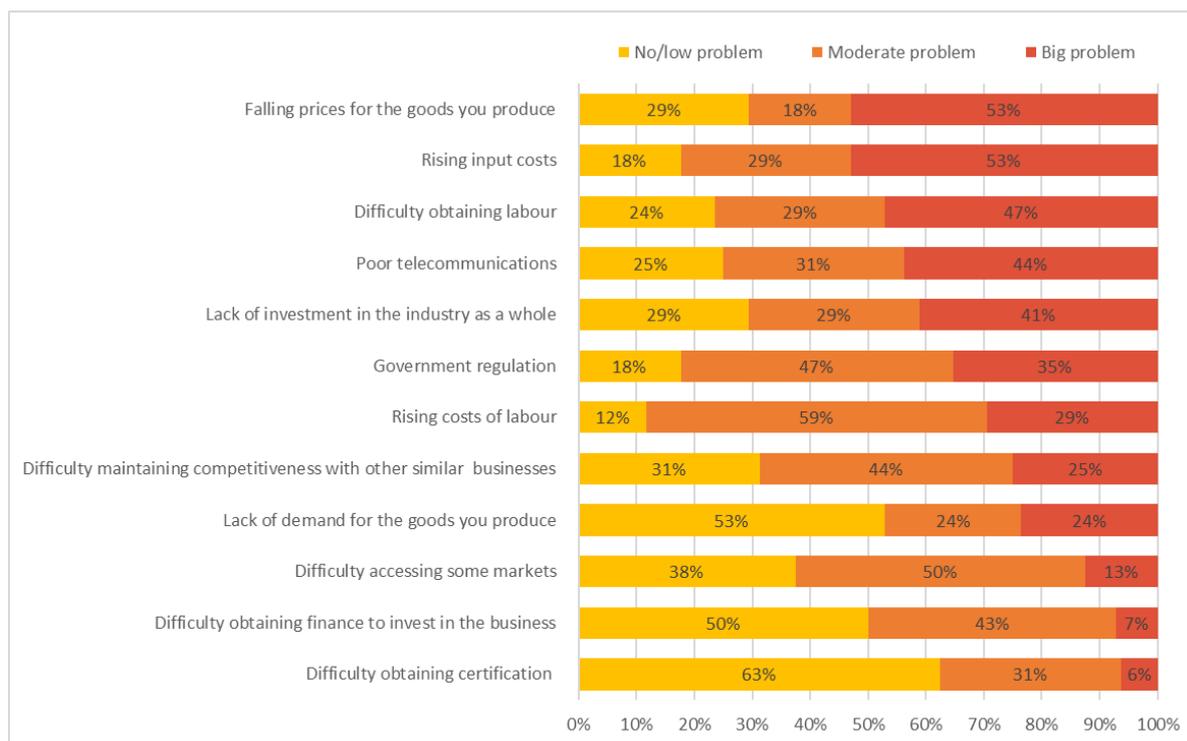


Figure 5 Challenges experienced by softwood plantation businesses in the South West Slopes

Conclusions

Overall, business conditions were cautiously optimistic for much of the South West Slopes plantation industry as of February 2017, although many businesses felt business conditions were more challenging than usual. Most felt demand for their services or products would remain stable over the next 12 months, and few felt it would decline. Most reported being slightly to moderately profitable, and few reported difficulties with either servicing of debt or business cash flow. Twice as many felt they would increase revenue and profitability in the next 12 months than felt these would not increase, and most were planning to invest in their business. However, this cautiously optimistic outlook will not bring employment growth, with more businesses (24%) planning to downsize than to increase size of their workforce (12%).

A key challenge for the industry is ensuring access to a suitable supply of fibre for wood and paper processors: with 30% of inputs sourced from outside the region, this is a critical factor affecting the future outlook for processors. Maintaining competitiveness in a market place with increasing competition from imports was also identified as a key challenge. For contractors, lack of certainty about future contracts reduced their ability to invest in their business. Falling prices, rising input costs, difficulty obtaining labour and poor telecommunications were the four most commonly reported challenges experienced by businesses in the last three years.

8. Conclusions: future industry workforce and investment needs

The findings of this report reinforce the importance of the softwood plantation industry to the South West Slopes economy, both in terms of economic activity and employment, particularly for Tumut, Tumbarumba and Bombala. The findings also highlight the importance of maintaining and growing investment in skills and training to ensure the industry can access a skilled regional workforce into the future, and the key future investment needs for the industry as a whole.

Skills and training needs

The forest growing, harvesting, hauling, and processing industries have all undergone significant change over the last few decades, as processes become more automated and capital is used to replace labour. This change has delivered a world-scale, internationally competitive, industry offering opportunities for highly skilled professional and scientific workers, as well as involving upskilling of what was traditionally a relatively low-skilled manufacturing workforce.

At present, the industry directly employs 1,917 people and generates an estimated 3,458 additional flow-on jobs. The study findings suggest that, if market conditions remain favourable, the workforce will remain stable in the short term, with a slight decline over time as labour efficiency and productivity improve. The skills required of this large workforce will continue to change, with three key types of skills and labour force needs identified.

1. There are skills needed by large numbers of workers. Machinery operators, drivers and field workers will need increased levels of formal accreditation and competencies in specialised machinery operation. They will also increasingly require IT skills as their jobs more often require use of IT systems, and core numeracy and literacy competencies as part of meeting reporting and compliance requirements within workplaces. These skills will be needed across a large number of workers, particularly in the processing and harvest/haulage sectors, and there is a need to continue to invest in the capacity of TAFE (and other registered training organisations) to provide these training needs. In some competency areas, businesses are currently providing mostly in-house training, but also report that this has high costs. Continued investment to enable TAFE or other RTOs to deliver these competencies can support development of the industry, particularly in the areas of training related to haulage, fixed and mobile plant operation, and compliance training (specialised to industry), as well as in more generic skills in IT, business administration, finance etc. The recruitment of female workers from the regional workforce also needs to increase, to sustainably maintain this large workforce over time, as does recruitment of younger workers in some parts of the industry.

2. There is a growing need for a small number of specialised professionals, many of which are hard to recruit locally. This results in a high likelihood of ending up with remote/outsourced use of professionals, unless the industry can overcome the challenges of getting these professionals into the region. Being able to provide employment opportunities for partners/spouses when relocating employees into the region is one action that can help attract more high-level skilled workers in to the region, and encourage existing workers to remain in the region.

3. There also appears to be a strong need for staff with more generic skills applicable across many industries, including business management, financial management, IT and administrative jobs. Maintaining this part of the workforce requires the industry to recruit better from the whole workforce in the region, again suggesting a need to address the low rates of recruitment of women, and to provide support to upskill existing members of the workforce in some of these skills.

Future investment needs of the industry

One of the key challenges facing the industry is difficulty sourcing fibre inputs from plantations in the region, with the transport costs of bringing in fibre inputs from other regions a significant challenge for many businesses, and a lack of additional fibre within economic transport distance reducing the ability of mills to invest and expand in order to maintain competitiveness. The high level of reliance on fibre imported from other regions to meet current levels of production places a fairly high level of risk on existing operations, particularly into the future as resource from other regions may be required by processors in those regions located closer to the plantations. Into the future, the ability of the existing industry to expand levels of production (either to reach full design capacity and/or to install new capacity) is severely limited by this lack of local resource, as is the attractiveness of the region to processors seeking to make new investments. Unless additional plantations are established in the region, the size of the industry will not expand, and is likely to shrink if businesses cannot maintain access to fibre currently imported from other regions, or if markets change to make importing that fibre uneconomic.

Another challenge for processors is to maintain (and increase) efficiency and competitiveness, with particular challenges being rising labour costs, rising input costs (fibre and energy in particular), high transport costs, and the need to be able to expand or upgrade in order to stay competitive. In this context, the investment required to establish new plantations should also be considered as essential infrastructure to be delivered.

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Appendix 1 Study methods

This Appendix describes the methods used to collect and analyse data in the study, focusing on the three key methods used:

- Survey of the South West Slopes forest industry
- Analysis of data from the Australian Bureau of Statistics
- Economic modelling.

In addition to these three methods, previous studies conducted in the region were reviewed and their findings referred to where relevant in the report.

Industry survey

An initial review of available sources of data on the industry (see Appendix 2) identified that there are no existing data sources that provide suitable data to answer the key questions posed in this study, focused on socio-demographic characteristics of the industry, and skills and training needs. It was therefore necessary to conduct a survey of the forest, wood and paper industry in the region to collect new data on the industry.

Questionnaire design

The content of the questionnaire was designed after consultation with (i) members of the industry located in the region and (ii) forest industry stakeholders Australia wide. Consultation with local industry representatives ensured the questions were designed to be relevant to the South West Slopes, and included consultation with staff involved in skills and training provision for forest industry workers, plantation management, wood and paper manufacturing. Consultation with stakeholders across Australia included consultation with staff employed in forest policy, skills and training for forestry workers, economic analysis of the industry, and industry reporting and certification. In total, 21 people were consulted in the process of developing the questionnaire and asked to comment on the draft questionnaire.

Based on consultation with these people, the questionnaire included questions on the following topics:

- Dependence on native forest, softwood plantations, hardwood plantations and other sources of fibre. This enables identification of the amount of employment and economic activity generated by each of these sectors
- Employment by local government area. This enables identification of how much the economy of different LGAs depends on the forest industry
- Key business activities including area of forest/plantation managed, harvested, hauled, and volume of wood and fibre inputs and outputs. This enables analysis of different sectors of the industry
- Supply chain linkages, with businesses asked to identify their key suppliers and customers. This enables spatial tracing of the flow of wood and paper products
- Skills, training and worker recruitment needs, with a detailed set of questions asked on this about the key areas in which businesses have unmet skills needs and difficulty recruiting workers

- Business and market outlook, including plans for investment or downsizing, to identify the overall likely near-term future for the industry
- Forest certification, including views about the benefits and costs of market certification processes.

The survey did not include questions about some topics that initial consultation identified were difficult for most businesses to answer. This included asking about the formal educational qualifications held by workers, with many businesses reporting they do not have extensive records of this, and about many demographic characteristics of the workforce, again because many businesses do not have record keeping identifying these characteristics.

Survey scope

To produce robust and up-to-date data on employment, skills and training needs and economic value of the industry, all businesses involved in the growing, managing, harvesting, transporting or processing of commercial wood or paper products in the region were asked to take part in the survey. The survey was designed to capture all initial processing of logs into wood and paper products, as well as processing of log residues produced as part of one manufacturing process into wood or paper products. It did not include jobs dependent on native forests or on already manufactured wood or paper products imported from other regions into the South West Slopes. Appendix 2 further discusses the scope of the definition of the forest industry used in the report.

Sampling

A total of 59 businesses were identified as operating in the South West Slopes or utilising logs produced from plantations in the South West Slopes, in the following business categories:

- Plantation management agencies/businesses
- Nurseries
- Silvicultural contractors
- Harvest and haulage contractors
- Wood and paper processors
- Other businesses, including sales, consultants and training.

Of these businesses:

- 9 were large businesses employing 100 or more workers. All large businesses completed the survey
- 7 were medium sized businesses employing 20-99 workers. Of these, 5 completed the survey and 2 provided basic information by phone but did not complete all survey questions
- 12 were small-medium businesses employing 10-19 workers. Of these, 7 completed the full survey, 3 completed a smaller number of questions by phone, and 2 did not participate in the survey
- The remainder (31 businesses) were small businesses employing less than 10 workers. Of these, 16 completed the survey, 7 completed a small number of questions by phone, and 8 did not participate in the survey.

In total, 63% of businesses completed the full survey and 83% completed the core questions on the survey. Those who completed the survey included all businesses employing more than 50 people, all plantation managers and all wood and paper processors.

Analysis

Survey data were analysed using Microsoft Excel. A key part of the analysis process was using available data to impute employment and expenditure data for those businesses who did not participate in the survey.

To ensure employment and expenditure estimates could be accurately imputed for those businesses who did not participate in the survey, we prioritised surveying those businesses who answers could enable estimation of economic activity in businesses that did not participate in the survey. In particular, the survey was designed to capture data enabling estimation of employment in the contracting sector, as contracting businesses were least likely to take part in the survey. Plantation managers were asked to identify their level of spending on silvicultural, harvest and haulage contracting. Plantation managers and others with expertise in the contracting sector were also asked to provide information on the size of different contracting businesses. These data were used to impute employment and expenditure estimates for the contracting businesses who did not complete these questions on the survey.

Analysis of ABS data

In addition to collecting data directly from the industry, available data from the ABS were analysed to provide additional insight, particularly into socio-demographic characteristics of the forest industry workforce. Previous reviews of available data on the forest, wood and paper industries in Australia have identified that the only robust data available on socio-economic characteristics of the workforce, other than that produced via direct surveys of the industry, is produced in the five-yearly *Census of Population and Housing* (Schirmer et al. 2013). The Census classifies all employed people by their industry of employment, and these data can be interrogated to profile socio-demographic characteristics of the workforce.

Census data from the 2006 and 2011 Censuses were analysed for this report, using the ABS product 'TableBuilderPro'. TableBuilderPro enables the user to build customised tables of data that cross-tabulate characteristics of people, for example cross-tabulating industry of employment by gender, age, income, or place of residence.

Data from the 2016 Census were not yet released at the time of preparation of this report, and the report will be updated once data are available (release dates at the time of writing for 2016 Census data on industry of employment were expected to be October 2017). This means that all Census data presented in the report are several years old, and have potential to be out of date.

The Census data has some other limitations. These are explained in further detail in Appendix 2, but include the following:

- Workers are classified into specific industries of employment based on the Australia-New Zealand Standard Industrial Classification. This classification includes categories for most aspects of the industry (for example, forestry, logging, wood product and paper product manufacturing), but excludes most log haulage drivers, who are classified as belonging to the transport industry. It thus undercounts some employment in the industry

- It is not possible to identify which jobs depend on plantations versus native forests or imported or recycled timber. For example, some workers employed in wooden component manufacturing in Albury and Wagga Wagga are working in businesses which do not directly use timber produced in the South West Slopes (for example, they may work in joinery or wooden cabinet construction, which often uses timber imported from other regions or countries)
- The ABS randomises data each time it is requested in the TableBuilderPro product (or from other Census products). This means that the number of workers is randomly adjusted by a small number to protect privacy, usually by anywhere from one to five workers. This means that when analysing regions with very small numbers of workers, data can be considered reliable only to within $\pm 10\%$ or $\pm 20\%$ in many cases. It also means that when replicating the analysis undertaken for this study, any replication will arrive at slightly different numbers due to the randomisation process.
- In some cases, there is mis-classification of workers in Census data. This was identified as part of this study. For example, workers at a Kimberly Clark Australia's non-woven fabrics plant in Albury were classified as being part of the paper manufacturing industry despite the plant not making products from wood fibre into paper products (it manufactured surgical gowns, hygiene products and nappy components from plastic raw materials).

Economic modelling

The estimates of regional economic contribution presented in this report use a model known as the RISE model (Regional Industry Structure and Employment).

The RISE model has input-output analysis as its core. Input-output models provide a detailed picture of the structure of an economy at a particular point in time. The model provides a basis for analysis of inter-sectoral relationships within the economy. Accordingly, this makes the model ideal for regional impact and regional contributions analysis.

The RISE model format was originally developed by EconSearch Pty Ltd as a user-friendly Excel based tool for use by regional development analysts in South Australia. EconSearch was contracted to develop a set of easy to use regional impact models that could be assist regional planning at both a state and regional level.

The first set of South Australian models were commissioned by the Regional Communities Consultative Council in 2004. They were updated in 2007 for the SA Department of Trade and Economic Development, and updated again in 2010, 2013 and annually since for the SA Department of Premier and Cabinet.

EconSearch also developed a set of RISE models at the local government area (non-metropolitan) and regional level for the Victorian Department of Primary Industries in 2010. These models were updated in 2013 for the Department of Environment and Primary Industries.

EconSearch has also developed many one-off, single region RISE models for a range of socio-economic impact analysis projects throughout Australia including several in NSW. RISE models of the South West Slopes and NSW in 2015-16 were constructed for this project to assess the economic contribution of the forestry industry in the South West Slopes region and at state level.

The South West Slopes model consists of the local government areas of the City of Albury, City of Wagga Wagga, Greater Hume Shire, Gundagai Shire Council, Snowy-Monaro Regional Council (the former Shires of Bombala, Cooma-Monaro and Snowy River), and the Snowy Valleys Council (amalgamated from the former Shires of Tumut and Tumbarumba).

RISE Model Extensions

The RISE model can be distinguished from the standard input-output model through a number of features or add-ons that allow for more realistic assessments of regional economic impacts. These include the following:

Price Response Model - One of the key limitations of a standard input-output model is its lack of flexibility to take into account different scenarios of market response and regional adjustment for impact analysis. The price sensitive RISE model is a development of the conventional input-output model which provides for non-linearity in production in both primary and intermediate inputs. The model extension delivers results (e.g. multipliers and simulated impacts) that are more closely aligned with CGE modelling yet with greater rigour and credibility for analysis at a local scale.

Demographic Economic Model - The RISE model has also been extended as demographic-economic (DECON) models. The two key characteristics of the DECON model, when compared with a standard economic model, are as follows.

1. The introduction of a population 'sector' (or row and column in the model) makes it possible to estimate the impact on local population levels of employment growth or decline.
2. The introduction of an unemployed 'sector' makes it possible to account for the consumption-induced impact of the unemployed in response to economic growth or decline.

Tourism Satellite Accounts – The tourism industry is not defined as a separate industry in the standard industry classification system used by ABS and others. The ABS has developed a set of “satellite accounts” at the national level and a process that can be adopted at the regional level to better define the tourism industry. This process has been adopted in the RISE model so that tourism industry impacts can be directly assessed.

Overview of economic concepts

Economic activity indicators: the primary focus of this report is the generation of economic activity resulting from the forestry industry. The key economic activity indicators considered in the analysis are gross regional product (GRP) and employment.

Gross regional product (GRP): is a measure of the contribution of an activity to the regional economy. The direct GRP of an industry is measured as value of gross output (business revenue) less the cost of goods and services (including imports) used in producing the output. In other words, it can be measured as the sum of wages and profits. It represents payments to the primary inputs of production (labour, capital and land). Using GRP as a measure of economic impact avoids the problem of double counting that may arise from using value of output for this purpose.

FTE: is an indicator of employment and measures a worker's involvement in a project or industry activity. An FTE of 1.0 means that the person is equivalent to a full-time worker, while an FTE of 0.5 signals that the worker is only half-time.

Categories of economic activity in the forestry supply chain

A useful way to think about economic activity and economic impact (as measured by GRP and employment) is to refer to the supply chain (Figure A1.1).

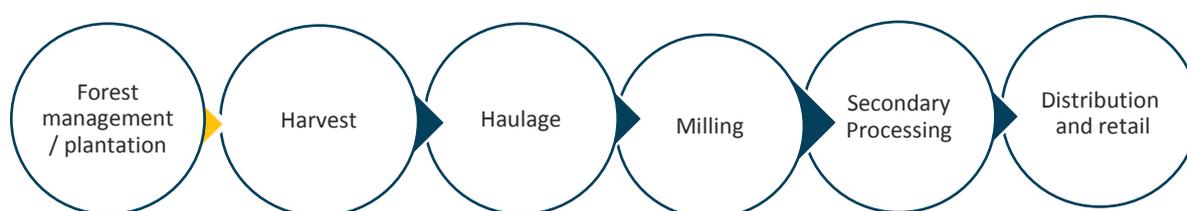


Figure A1.1 Forestry industry supply chain

Broadly speaking, each economic indicator has four levels of economic impact across the economy. For example, with respect to employment:

- 1) Direct employment – this is employment in those firms, businesses and organisations that are directly engaged in forestry activity. In this study this includes:
 - a) Plantation/Forest management
 - b) Harvesting and haulage
 - c) Paper production and sawmilling
- 2) First round employment – refers to employment in firms that supply inputs and services to the 'direct employment' businesses, i.e. those categorised under #1 above.
 - a) Forestry-input sectors including all inputs used by forestry such as fuel, electricity, water and chemicals
 - b) Forestry service sectors
 - c) Packaging for timber processing
 - d) Business support services
 - e) Other inputs.
- 3) *Industrial-support employment* – is the term applied to 'second and subsequent round' effects as successive waves of output increases occur in the economy to provide industrial support, as a response to the original forestry industry expenditure, i.e. the activity in sectors that provide goods and services to those businesses that supply directly to the forestry industry. This category excludes any employment associated with increased household consumption.
- 4) *Consumption-induced employment* – is the term applied to those effects induced by increased household income associated with the original forestry industry expenditure. The expenditure of household income associated with all three categories of employment (direct, first round and industrial-support) will generate economic activity that will in itself generate jobs.

In this report we use the terms 'direct', 'production-induced', 'consumption-induced', 'flow-on' and 'total' to describe the economic impacts across the economy:

- 'production-induced' = the combination of the first round impact and the industrial support impact (2+3)
- 'consumption-induced' = the consumption-induced impact (4)
- 'flow-on' = the combination of the consumption-induced and production-induced economic impacts (2+3+4)
- 'total' = the combination of all the economic impacts in the economy, i.e. the combination of the direct and flow-on economic impacts (1+2+3+4)

These categories are illustrated in Figure .

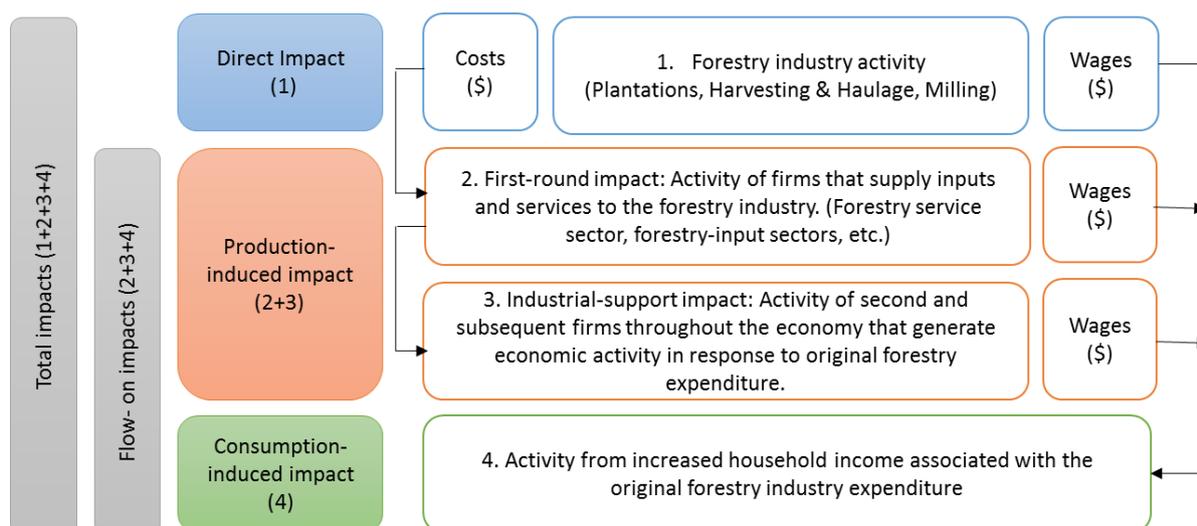


Figure A1.2 Levels of economic impact across the economy

The direct, flow-on and total economic contributions (GRP and employment) are provided for 5 sectors of the forestry industry and the industry as whole:

- 1) Growers (forest management companies)
- 2) Harvest & haulage contracting businesses
- 3) Wood and paper processing
- 4) Other (including consultants, equipment sales, training)
- 5) Nurseries, silvicultural & roading contracting businesses
- 6) Whole Industry (excludes transfers)

Limitations

The economic consequence of the presence of the forestry industry will be felt in many aspects of activity in the regions, ranging from levels of regional output, income and employment, to land prices (including residential, commercial and industrial land), house and building prices, local government rates, supply and demand of labour, demand and supply of urban infrastructure and so on. Unfortunately, fully comprehensive models that include all aspects of regional economic activity and economic phenomena have not been satisfactorily developed for impact analysis at a regional level in Australia.

Results

Table A1.1 Economic impacts of the South West Slopes plantation industry, by sector, on the South West Slopes region and on New South Wales

	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)
South West Slopes						
Output (\$m)	255.0	1,983.5	165.9	8.9	45.0	2,129.7
Direct (\$m)	195.8	1,049.6	72.3	3.9	20.6	1,013.5
Production-induced (\$m)	21.9	419.8	35.7	1.7	8.8	487.8
Consumption-induced (\$m)	30.8	373.2	47.1	2.8	13.1	467.0
GRP (\$m)	113.7	803.8	71.4	4.5	20.9	1,014.2
Direct (\$m)	82.6	319.4	22.4	1.7	7.9	433.9
Production-induced (\$m)	13.0	265.4	21.4	1.1	5.3	306.3
Consumption-induced (\$m)	18.1	219.0	27.6	1.7	7.7	274.0
Household Income (\$m)	30.9	373.6	47.1	2.8	13.1	467.5
Direct (\$m)	13.1	116.2	18.9	1.2	5.7	155.2
Production-induced (\$m)	8.8	149.8	14.7	0.8	3.7	177.7
Consumption-induced (\$m)	8.9	107.5	13.6	0.8	3.8	134.6
Employment (total)	385	4,078	669	42	202	5,375
Direct (total)	174	1,261	342	24	117	1,917
Production-induced (total)	99	1,464	157	8	37	1,765
Consumption-induced (total)	112	1,353	171	10	47	1,693
New South Wales						
Output (\$m)	307.8	2,153.6	196.1	11.8	65.1	2,394.5
Direct (\$m)	215.2	1,049.6	72.3	3.9	25.2	1,026.2
Production-induced (\$m)	37.9	563.0	54.0	3.2	16.2	674.2
Consumption-induced (\$m)	54.7	541.1	69.9	4.7	23.7	694.1
GRP (\$m)	136.6	893.2	86.5	6.0	30.7	1,153.1
Direct (\$m)	89.1	319.4	22.4	1.7	9.7	442.2
Production-induced (\$m)	16.3	265.4	24.3	1.6	7.5	315.2
Consumption-induced (\$m)	31.2	308.4	39.8	2.7	13.5	395.6
Household Income (\$m)	44.2	437.6	56.5	3.8	19.2	561.3
Direct (\$m)	16.6	116.2	18.9	1.2	6.9	159.9
Production-induced (\$m)	11.5	161.3	17.0	1.2	5.2	196.2
Consumption-induced (\$m)	16.2	160.0	20.7	1.4	7.0	205.2
Employment (total)	482	4,513.1	728	51	252	6,026.3
Direct (total)	194	1,283	342	25	126	1,969
Production-induced (total)	110	1,464	158	10	49	1,791
Consumption-induced (total)	179	1,766	228	15	77	2,266

Appendix 2 Analysis of previous studies and socio-economic data

This Appendix provides a review of available information on the economic and socio-demographic characteristics of the forest industry in the South West Slopes of NSW, as of December 2016. It is based on examination of past reports examining the South West Slopes plantation industry and their findings, and analysis of available data sets from the Australian Bureau of Statistics (ABS) and Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES). These data are presented in an Appendix as they are largely out of date. Much of the data presented in this report is several years old, as available information on the forest industry in the region prior to the new data collected in this study was limited.

This Appendix provides context on the study region, and a detailed examination of findings of past studies, as well as more detailed analysis of ABS data from the 2006 and 2011 Census of Population and Housing which provides additional context and background to the information presented in the main report.

Available data sources

Prior to the data collection conducted for this study, data on the forest industry in the South West Slopes was available from two sources:

- Previous 'one-off' studies that examined part or all of the South West Slopes forest industry at a particular point in time
- Data produced by agencies such as the ABS and ABARES: where this information has been produced at small scales that enable regional analysis, this data can be analysed to produce information on the industry in the region.

Past 'one-off' studies of the South West Slopes forest industry

Several previous studies and reports have produced profiles of the employment and/or economic activity generated by the forest industry in the South West Slopes. These have not all defined the region in the same way, have examined various aspects of the industry, and have been conducted at various points in time. The key previous studies are:

- Margules Groome Poyry P/L (1995): Margules Groome Poyry produced an analysis of the economic impact of the NSW timber industry as a whole, including softwood plantations and native forests. They produced information on the South West Slopes, but defined regions differently: part of the South West Slopes was reported in their 'Murray' region and part in their 'Murrumbidgee' region. The Murrumbidgee region included Tumut, Gundagai, Wagga Wagga, and parts of Greater Hume Shire, as well as shires to the West extending to Griffith and Hay. The Murray region included Albury, most of Tumbarumba, parts of Greater Hume, and shires to the west of Albury extending to the state border. The study examined area of plantations, volume of production, described processing activities, and produced detailed estimates of direct and indirect employment

and economic value, using a number of indicators, as well as economic flow modelling of the value added at different steps in forest growing, harvesting and processing.

- URS Forestry (2003): This study evaluated the impacts of the Visy pulp and paper mill on the forest industry and economy of the Tumut region. It included specific analysis of likely effects of the mill on rates of return from plantations, on sawmillers in the region, on local contractors, on local business and on local employment.
- URS Forestry (2004): URS produced a profile of the value of the timber industry in the South West Slopes region. The South West Slopes was defined as including Albury, Greater Hume, Gundagai, Tumbarumba, Tumut and Wagga Wagga. This study did not include Bombala. The report produced estimates of total employment and value of production, total area of plantation, log production volumes. It included only direct employment and economic value and not flow-on economic and employment impacts. The study examined softwood plantations only.
- Centre for International Economics (2005): This study examined privately owned softwood plantations in the Bombala region (focusing on Willmott Forests, the principle manager of private softwood plantations in the region), and examined socio-economic effects of Willmott Forests' activities on the Bombala region in terms of population, employment, and economic value.
- Schirmer et al. (2005): The Bureau of Rural Sciences conducted an analysis of the socio-economic impacts of plantation forestry in the South West Slopes over the period 1991 to 2004. The study examined direct and indirect employment, direct and indirect economic value, volume of production, and effects of the industry on local population, employment growth, and housing markets. The South West Slopes was defined as including Albury, Greater Hume, Gundagai, Tumbarumba, Tumut and Wagga Wagga. This study did not include Bombala. The study examined softwood plantations only.
- Snowy-Monaro Plantations Landscape Strategy Reference Group (2005). This project was focused on the Bombala region, and produced a number of detailed information papers on the Managed Investment Scheme (MIS) investment occurring in the region at the time; land use in the region; social change in the region; impacts of plantations on things such as aesthetics, health and water quantity; and potential future scenarios for change in the plantation industry.
- Visy Community Consultative Committee (2005). This report examined attitudes of residents of Tumut Shire toward the Visy mill. A total of 559 residents completed surveys on their views. The report examined how community members perceived impacts of the mill on different aspects of the community including amenities, jobs, economic activity, the environment, population, real estate, social opportunities, and road traffic.
- Tumut Shire Council (2010): As part of the Shire Development Strategy, Tumut Shire Council produced some data on key issues affecting the future of the timber industry in the shire, including employment, ageing of the workforce, and the need to obtain supply of logs from outside the region for local processors.

Past reports are mostly at least a decade old or older, with very little recently produced information on the industry. This limits the insights that can be gained from past studies. These studies were drawn on where relevant in the main part of this report to provide historical context and to identify trends over time.

Sources of data on the South West Slopes forest industry

Very few datasets are available that provide insight into the South West Slopes forest industry. This challenge is not limited to the South West Slopes region: several reports in the

last 20 years have highlighted that there is a lack of readily available information on the social and economic contributions of the forest industry to different regions across Australia, and have investigated what can be assessed using existing information (these studies are reviewed in Schirmer et al. 2013). A comprehensive evaluation of the availability of data in 2013 identified that direct surveys of the industry are necessary to produce accurate and up to date information on employment and socio-demographic characteristics of the industry (Schirmer et al. 2013). This report also identified that the only source of data that provides reliable estimates of employment and socio-demographic characteristics is the ABS *Census of Population and Housing*. In general, better information is available on biophysical aspects of the industry such as area of plantations, and poorer information on economic and socio-demographic aspects of the industry:

- Data on the area of plantations is produced regularly as part of ABARES' National Plantation Inventory (see ABARES 2016). The National Plantation Inventory included the South West Slopes as part of its 'Murray Valley' reporting region, which covers a larger region extending into Victoria. The NPI also provides downloadable GIS products enabling estimation of plantation areas for more specific regions
- ABARES *Australian Forest and Wood Product Statistics* produces 6 monthly updates on national production of forest and wood products, reported to state level, as well as imports and exports of wood and paper products. However, data are not produced at a regional level, meaning they cannot be used to examine the South West Slopes region. Two reports (in 2012 and 2013) have included a socio-demographic profile of forest industry workers at regional level, using data from the 2006 and 2011 Censuses
- The ABS conducts several surveys that collect data on employment, output and economic value by industry. However, data are not released from these surveys (including the Industry Survey, Manufacturing Industry Survey, and Labour Force Survey) at regional scales: data are typically released for Australia and in some cases States only. Therefore these data cannot provide insight into the South West Slopes region.
- The 5-yearly ABS *Census of Population and Housing* produces comprehensive data that can be used to profile socio-demographic characteristics of employment in the forest industry, with some limitations. The most recent Census data available is from 2011; data from the 2016 Census is being released from June 2017, but data on employment by industry will only be available in October 2017.

This report includes specific analysis of data from the 2011 *Census of Population and Housing* (2011 Census) and from the 2006 *Census of Population and Housing* (2006 Census), as these are the only comprehensive data sources that can be analysed to provide insight into socio-demographic characteristics of the industry. These data can be used to analyse numbers of jobs by forest industry sector, dependence of communities on employment in the industry, socio-demographic characteristics of workers, and educational attainment of workers.

However, there are some important limitations to Census data. In particular:

- Data produced in the Census does not distinguish between plantation and native forest dependent employment
- Some forest industry jobs are not classified by the ABS as being in the industry: specifically, many log haulage drivers are classified in the 'transport' industry and cannot be identified as dependent on the forest industry. Therefore ABS Census estimates will undercount total employment in the industry.

Definitions

South West Slopes region

For this project, the South West Slopes region was defined as being comprised of the following local government areas:

- Albury
- Greater Hume
- Gundagai
- Snowy-Monaro Regional Council (former local government areas of Bombala, Cooma-Monaro and Snowy River)
- Snowy Valleys Council (former local government areas of Tumbarumba and Tumut)
- Wagga Wagga

While in 2016 the Tumbarumba and Tumut local government areas were amalgamated to form the Snowy Valleys Council, where possible in this report we provide data for each separately, given that until recently they were separate council areas.

As Bombala Shire was amalgamated in 2016 with Cooma-Monaro and Snowy River Shire to form the Snowy Monaro Regional Council, we have included data for all three of these previous Shires in the analysis in this report wherever possible. This is important as, going forward, data are likely to only be available for the Snowy Monaro Regional Council area as a whole.

We also report on forest industry employment in Bega Valley Shire in this Appendix as initial discussions indicated that a reasonable proportion of the forest industry employment in this Shire could potentially depend on softwood plantations in the South West Slopes, although there is a significant component generated by native forest employment. However, the subsequent data collection suggested this employment was relatively small.

In addition, a small number of those working in mills located in Wagga Wagga live in Narrandera Shire, and as such Narrandera Shire is included in statistics provided in this Appendix.

Forest type

This project examines the softwood plantation industry in the South West Slopes of NSW. It does not examine the native forest industry. However, in many cases it is not possible to distinguish between employment dependent on softwood plantations versus native forests using ABS data. Where this is the case, this is noted in this report. Based on information available from previous reports and the survey of businesses conducted for this study:

- In Tumut, Albury, Greater Hume, Gundagai, Narrandera and Wagga Wagga, forest industry employment is almost entirely dependent on softwood plantations
- In Tumbarumba the large majority of forest industry employment is based on softwood plantations, with a small amount dependent on native forestry
- In Bombala (and the nearby areas of Cooma-Monaro, Snowy River and Bega Valley) employment in the industry is based on both softwood plantations and native forest.

Forest industry

When assessing socio-economic impacts of the forest industry, it is critical to identify clearly what is considered a job that is a direct part of the forest industry, and what is an 'indirect' or flow-on job that is generated as a result of forest industry activity, but does not form part of the industry.

Most previous studies have used definitions of the forest industry that follow the Australia New Zealand Standard Industry Classification (ANZSIC) (ABS/SNZ 2013). This classification includes several categories of workers who are considered to work in the forest, wood and paper product industries. These categories are listed in Box A2.1. They have some limitations, which are also noted in Box A2.1. In particular, the ABS data do not differentiate between employment that is dependent on native forests versus plantations, and so where data are presented for areas such as Bombala, they will include both plantation-dependent and native forest-dependent employment.

Box A2.1: Employment categories forming part of the 'forest industry' in the ANZSIC classification of industries

Data produced by the ABS include estimates of employment generated in the following industry sectors, which together make up what we refer to as the 'forest industry' in this report:

Forestry & logging:

- **Forestry** – defined as employment in forest and plantation management, this category also includes some forestry consultants and specialists in areas such as site assessment
- **Logging** – defined as employment in harvesting timber; note that ANZSIC excludes haulage employment which is included as part of the transport industry. Therefore these numbers underestimate employment in harvest and haulage contracting
- **Forestry Support Services** – this includes silvicultural services and some consultants

Wood product and furniture manufacturing:

- **Log Sawmilling** – Employment in sawmills involving sawmilling of green timber and sometimes drying of sawntimber
- **Wood Chipping** – Employment in woodchip processing, either in a woodchip mill or in-field woodchip production
- **Timber Resawing and Dressing** – Employment in timber resawing and dressing, e.g. production of moulded timber from initial rough sawn timber
- **Log Sawmilling and Timber Dressing, not further defined** – employment identified as being in wood processing but unable to be classified into either log sawmilling, wood chipping or timber resawing and dressing
- **Prefabricated Wooden Building Manufacturing**
- **Wooden Structural Fitting and Component Manufacturing**
- **Veneer and Plywood Manufacturing**
- **Reconstituted Wood Product Manufacturing**
- **Other Wood Product Manufacturing**
- **Wooden Furniture and Upholstered Seat Manufacturing**

Pulp, paper and paper product manufacturing:

- **Pulp, Paper and Paperboard Manufacturing**
- **Corrugated Paperboard and Paperboard Container Manufacturing**. Note that workers employed at the Visy mill in Tumut are typically classified by the ABS as belonging to this category despite the mill producing kraft paper rather than specific paperboard and container products.
- **Sanitary Paper Product Manufacturing**
- **Other Pulp, Paper and Converted Paper Product Manufacturing**

Wholesaling

- **Timber Wholesaling**
- **Paper Product Wholesaling**

The definition in Box A2.1 extends to wholesale sales of products, but does not include retail sales of wood products. This is because the majority of retailers of wood products also sell non-wood products and are not typically classified as being in the forest industry, but rather as being businesses outside the forest industry in which flow-on employment is generated as a consequence of the forest industry's activities. Similarly, the 'forestry support services' category includes businesses specific to the forest industry such as silvicultural firms, but does not include businesses such as the cleaning companies who might clean offices, accounting firms or others, all of whom are considered to be employed in industries outside forestry. Indirect (flow-on) economic assessments are typically used to identify the number of flow-on jobs generated by the forest industry in these other industries.

South-West Slopes forest industry – historical profile

The following sections provide a historical profile of the South West Slopes forest industry using data available prior to collection of data for this study. In many cases, the data available are several years old. Data are presented in the following sections:

- **Direct and indirect employment:** *the number of jobs directly and indirectly dependent on the industry*
- **Regional dependence on forest industry employment:** *the proportion of regional employment dependent on the industry*
- **Socio-demographic characteristics of workers:** *characteristics of forest industry workers compared to the general workers, including age, gender, income and educational attainment*
- **Direct and indirect economic value:** *estimates of the direct and indirect economic value of the industry*
- **Volume of production, supply chain and product flows:** *available information on production and product flows.*

Direct and indirect employment

Previous studies have produced a number of estimates of the total employment generated by the forest industry in the South West Slopes or in specific parts of the region such as Tumut or Bombala. Table A2.1 summarises the estimates produced in past studies. Previous studies generally indicate an increase in jobs in the early 1990s, with employment increasing from approximately 1,100 to 1,250 direct jobs in the early 1990s, to a total of 1,600 to 1,800 direct jobs by 2004. When indirect employment is included, past studies estimate growth from 2,300 to 2,500 direct and indirect jobs in the early 1990s, to between 3,200 and 3,600 direct and indirect jobs by 2004. The variance in numbers reflects differences in the estimates produced by the different studies listed in Table A2.1.

The only study that produced time series estimates of employment over time was Schirmer et al. (2005), which found that, for a region that included all parts of the South West Slopes except Bombala, direct employment rose between 1991-92 and subsequently declined slightly to 2003-04, during a period in which the volume harvested and transported more than doubled. This reflects a trend common to many primary and secondary industries, where over time increasing efficiency of production means employment remains stable or declines as production volumes grow, with similar trends occurring in industries associated with agriculture and mining (Schirmer et al. 2005). Previous studies have identified that most of the employment generated by the industry is located in Tumut, with significant numbers

also working in Albury, Wagga Wagga, Tumbarumba and Bombala, and relatively small numbers of workers located in Gundagai and Greater Hume Shire.

Table A2.1 Employment in the South West Slopes forest industry: summary of findings of previous studies

Year	Region & forest types examined	Direct employment	Indirect employment	Study from which data sourced
1995	Murrumbidgee region, native forest and plantation (Tumut, Wagga Wagga, Gundagai, and areas further west)	1,137; >90% dependent on softwood plantations	Additional 1,167 flow-on jobs	Margules Groome Poyry (1995)
1995	Murray region, native forest and plantation (Albury, Holbrook, Tumbarumba included as well as areas west of Albury)	1,349; >90% dependent on softwood plantations	Additional 1,656 flow-on jobs	
2003	Tumut, Visy Industries pulp and paper mill	190 (at Visy mill)	Estimated 180 flow-on jobs	URS Forestry (2003)
2004	South West Slopes (Albury, Greater Hume Shire, Gundagai, Tumbarumba, Tumut, Wagga Wagga), softwood plantations and native forest	1,828 jobs: - 1,748 softwood plantation - 80 native forest	Additional 1,828 flow-on jobs	URS Forestry (2004)
2005	Bombala, private softwood plantation, forest management and processing	135	For every \$1 million, 8 direct and flow-on jobs created	CIE (2005)
1991-92	South West Slopes (Albury, Greater Hume Shire, Gundagai, Tumbarumba, Tumut, Wagga Wagga), softwood plantations only	1,548	For every direct job, an additional 0.8 to 1.3 indirect jobs created, depending on sector of industry	Schirmer et al. (2005)
1996-97		1,811		
2001-02		1,731		
2003-04		1,682		
2010	South West Slopes	1,700 (note: unclear where data were sourced from)	Not estimated	Tumut Shire Council (2010)

As most estimates of employment from past studies were more than 10 years old, data from the ABS 2011 Census was also analysed to identify employment generated by the industry as of 2011. Table A2.2 summarises total employment estimated in the forest industry in 2011, based on the ABS 2011 Census, for each local government area in the study region and for the region as a whole. The local government area boundaries shown are those from 2011, as these enable smaller scale analysis that is possible using the amalgamated council boundaries introduced in 2016. ABS data enable estimation of direct employment only.

These data show that by 2011, direct employment in the forest industry in the 'core' South West Slopes region (including Bombala, which was excluded from most previous studies) was 1,901 people. Even taking into account that ABS data will underestimate employment in log haulage (as previously noted, log transport is classified into the 'transport industry' with all other transport worker), this suggests relatively little change in employment between 2004 and 2011 (in 2004 previous studies estimated employment of between 1,700 and 1,800 people excluding Bombala).

The largest numbers of industry workers were located in Tumut (729 workers), Albury (365), and Wagga Wagga (334), with 287 in Bega Valley, 180 in Tumbarumba and 168 in Bombala. Tables A2.3 to A3.5 provide more detailed breakdown of the number of workers employed in different sectors of the industry in 2011, using ABS 2011 Census data. They highlight the importance of the processing sector to the employment generated: almost half (49.3%) of jobs were dependent on wood product manufacturing, 27.1% on pulp and paper manufacturing, 17.4% on management and harvest of forests, and 6.2% on wholesale activities. These estimates exclude most log haulage workers for the reasons noted above.

The majority of workers employed in the forest industry in the region live in the same LGA they work in. Table A2.6 compares the place of residence and place of work of those working in the industry. It shows that of the workers employed in forestry businesses located in Albury, 76% also lived in Albury, 15% lived in Wodonga, Victoria, 4% lived in Greater Hume Shire, and 6% lived in the Shire of Indigo in Victoria. Of Tumbarumba forest industry workers, 81% lived in Tumbarumba while 17% lived in Tumut and 2% in Greater Hume Shire. Wagga Wagga workers lived predominantly in Wagga Wagga (92%) but some lived in Coolamon and Narrandera (4% in each). Of Tumut's large number of workers, 91% lived in Tumut Shire, and the remainder in Gundagai (4%), Wagga Wagga (4%) and Tumbarumba (1%). Nine per cent of those working in Bombala lived in Bega Valley Shire, and a small proportion in East Gippsland (4%), while 87% lived in Bombala Shire.

Table A2.2 Forest, wood and paper industry employment, 2011 – summary by key industry sectors

Local Government Area	Forestry and logging	Wood product and furniture manufacturing	Pulp, paper and paper product manufacturing	Wholesaling	TOTAL FOREST, WOOD AND PAPER INDUSTRY EMPLOYMENT
Albury (C)	13	85	236	31	365
Bombala (A)	81	80	0	7	168
Cooma-Monaro (A)	9	17	0	9	35
Greater Hume Shire (A)	5	32	17	0	54
Gundagai (A)	0	13	10	4	27
Snowy River (A)	5	4	0	0	9
Tumbarumba (A)	45	135	0	0	180
Tumut Shire (A)	173	331	218	7	729
Wagga Wagga (C)	0	240	35	59	334
SOUTH WEST SLOPES region	331	937	516	117	1901
<i>Additional employment generated in other local government areas where some workers are known to depend on South West Slopes plantations</i>					
Bega Valley (A)	93	166	8	20	287
Narrandera (A)	6	42	0	8	56
EXPANDED SOUTH WEST SLOPES REGION	430	1145	524	145	2244

Table A2.3 Forest, wood and paper industry employment, 2011 – employment in forestry and logging by subsector

Local Government Area	Forestry	Logging	Forestry Support Services	TOTAL FORESTRY AND LOGGING
Albury (C)	5	8	0	13
Bombala (A)	30	38	13	81
Cooma-Monaro (A)	4	5	0	9
Greater Hume Shire (A)	5	0	0	5
Gundagai (A)	0	0	0	0
Snowy River (A)	5	0	0	5
Tumbarumba (A)	19	18	8	45
Tumut Shire (A)	89	63	21	173
Wagga Wagga (C)	0	0	0	0
SOUTH WEST SLOPES REGION	157	132	42	331
<i>Additional employment generated in other local government areas where some workers are known to depend on South West Slopes plantations</i>				
Bega Valley (A)	31	47	15	93
Narrandera (A)	6	0	0	6
EXPANDED SOUTH WEST SLOPES REGION	194	179	57	430

Table A2.4 Forest, wood and paper industry employment, 2011 – employment in wood product and furniture manufacturing by subsector

Local Government Area	Log Saw-milling	Wood Chipping	Timber Resawining and Dressing	Log Sawmilling and Timber Dressing, nfd	Prefabricated Wooden Building Manufacturing	Wooden Structural Fitting and Component Manufacturing	Veneer and Plywood Manufacturing	Reconstituted Wood Product Manufacturing	Other Wood Product Manufacturing	Wooden Furniture and Upholstered Seat Manufacturing	TOTAL WOOD PRODUCT AND FURNITURE MANUFACTURING
Albury (C)	0	6	0	0	0	35	0	4	13	27	85
Bombala (A)	60	5	0	5	0	0	0	0	10	0	80
Cooma-Monaro (A)	0	0	0	0	0	9	0	0	0	8	17
Greater Hume Shire (A)	12	0	0	0	0	11	0	0	6	3	32
Gundagai (A)	4	0	9	0	0	0	0	0	0	0	13
Snowy River (A)	0	0	0	0	0	4	0	0	0	0	4
Tumbarumba (A)	115	0	0	5	0	0	0	0	15	0	135
Tumut Shire (A)	54	0	140	13	0	10	0	70	40	4	331
Wagga Wagga (C)	3	0	0	10	0	92	75	11	20	29	240
SOUTH WEST SLOPES REGION	248	11	149	33	0	161	75	85	104	71	937
<i>Additional employment generated in other local government areas where some workers are known to depend on South West Slopes plantations</i>											
Bega Valley (A)	35	52	0	5	0	32	0	0	34	8	166
Narrandera (A)	21	0	0	0	0	11	0	0	10	0	42
EXPANDED SOUTH WEST SLOPES REGION	304	63	149	38	0	204	75	85	148	79	1145

Table A2.5 Forest, wood and paper industry employment, 2011 – employment in pulp, paper and paper product manufacturing by subsector

Local Government Area	Pulp, Paper and Paperboard Manufacturing	Corrugated Paperboard and Paperboard Container Manufacturing	Sanitary Paper Product Manufacturing	Other Pulp, Paper and Converted Paper Product Manufacturing	TOTAL PULP, PAPER AND PAPER PRODUCT MANUFACTURING
Albury (C)	131	53	30	22	236
Bombala (A)	0	0	0	0	0
Cooma-Monaro (A)	0	0	0	0	0
Greater Hume Shire (A)	11	6	0	0	17
Gundagai (A)	0	10	0	0	10
Snowy River (A)	0	0	0	0	0
Tumbarumba (A)	0	0	0	0	0
Tumut Shire (A)	15	180	0	23	218
Wagga Wagga (C)	4	22	0	9	35
SOUTH WEST SLOPES REGION	161	271	30	54	516
<i>Additional employment generated in other local government areas where some workers are known to depend on South West Slopes plantations</i>					
Bega Valley (A)	8	0	0	0	8
Narrandera (A)	0	0	0	0	0
EXPANDED SOUTH WEST SLOPES REGION	169	271	30	54	524

Table A2.6 Place of residence of workers employed in the forest industry in the South West Slopes, by local government area

Forest industry workers	Works in Albury	Works in Bombala	Works in Cooma-Monaro	Works in Greater Hume Shire	Works in Gundagai	Works in Snowy River	Works in Tumbarumba	Works in Tumut Shire	Works in Wagga Wagga	Works in Bega Valley	Works in Narrandera
Lives in Albury	76%	0%	0%	0%	No forestry workers were recorded as having a place of work in Gundagai in the 2011 Census. However, 4% of Tumut's forestry workers lived in Gundagai	0%	0%	0%	0%	0%	0%
Lives in Bega Valley	0%	9%	0%	0%		0%	0%	0%	0%	98%	0%
Lives in Bombala	0%	87%	0%	0%		0%	0%	0%	0%	2%	0%
Lives in Coolamon	0%	0%	0%	0%		0%	0%	0%	4%	0%	0%
Lives in Cooma-Monaro	0%	0%	100%	0%		0%	0%	0%	0%	0%	0%
Lives in Greater Hume Shire	4%	0%	0%	100%		0%	2%	0%	0%	0%	0%
Lives in Gundagai	0%	0%	0%	0%		0%	0%	4%	0%	0%	0%
Lives in Narrandera	0%	0%	0%	0%		0%	0%	0%	4%	0%	100%
Lives in Snowy River	0%	0%	0%	0%		100%	0%	0%	0%	0%	0%
Lives in Tumbarumba	0%	0%	0%	0%		0%	81%	1%	0%	0%	0%
Lives in Tumut Shire	0%	0%	0%	0%		0%	17%	91%	0%	0%	0%
Lives in Wagga Wagga	0%	0%	0%	0%		0%	0%	4%	92%	0%	0%
Lives in East Gippsland (VIC)	0%	4%	0%	0%		0%	0%	0%	0%	0%	0%
Lives in Indigo (VIC)	6%	0%	0%	0%		0%	0%	0%	0%	0%	0%
Lives in Wodonga (VIC)	15%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Total	100%	100%	100%	100%		100%	100%	100%	100%	100%	100%

Historical dependence on forest industry employment

This section examines the historical importance of the forest industry to regional employment. Few previous studies have examined this: while several have estimated direct and indirect employment, very few have examined the proportion of jobs in a given region that depend on the forest industry, and usually only for a single shire: for example, Tumut Shire Council (2010) estimated that 25% of all jobs in Tumut Shire depended on the forest industry.

As noted earlier, in 2011, ABS data indicate that the largest numbers of industry workers were located in Tumut (729 workers), Albury (365), and Wagga Wagga (334), with 287 in Bega Valley, 180 in Tumbarumba and 168 in Bombala. As shown in Table A2.7, as of 2011 Bombala was the most dependent on forest industry employment, with 16% of the workforce directly employed in the industry, while 15% of Tumut workers were directly employed in the industry, and 13% of the Tumbarumba employed workforce.

Another way of examining household dependence on the forest industry is to examine how many of the region's 'working households' – meaning a household in which one or more members is participating in the labour force, either through being employed or through seeking employment - have one or more members working in the forest industry. This is shown in Table A2.8, and shows relatively similar findings to those on the overall proportion of employment dependent on the industry.

Table A2.7 Forest, wood and paper industry employment, 2011 – summary by key industry sectors

Local Government Area	TOTAL FOREST, WOOD AND PAPER INDUSTRY EMPLOYMENT	% employment directly dependent on forest, wood and paper industries
Albury (C)	365	2%
Bombala (A)	168	16%
Cooma-Monaro (A)	35	1%
Greater Hume Shire (A)	54	1%
Gundagai (A)	27	2%
Snowy River (A)	9	0%
Tumbarumba (A)	180	13%
Tumut Shire (A)	729	15%
Wagga Wagga (C)	334	1%
SOUTH WEST SLOPES REGION	1901	3%
<i>Additional employment generated in other local government areas where some workers are known to depend on South West Slopes plantations</i>		
Bega Valley (A)	287	2%
Narrandera (A)	56	2%
EXPANDED SOUTH WEST SLOPES REGION	2244	3%

Table A2.8 Forest, wood and paper industry employment, 2011 – proportion of households reliant on the industry for some or all household income

Local Government Area	TOTAL FOREST, WOOD AND PAPER INDUSTRY EMPLOYMENT	% of working households in which a member is directly employed in forest, wood and paper industries
Albury (C)	365	2%
Bombala (A)	168	15%
Cooma-Monaro (A)	35	1%
Greater Hume Shire (A)	54	1%
Gundagai (A)	27	2%
Snowy River (A)	9	1%
Tumbarumba (A)	180	13%
Tumut Shire (A)	729	15%
Wagga Wagga (C)	334	1%
SOUTH WEST SLOPES REGION	1901	3%
<i>Findings for other local government areas where some workers are known to depend on South West Slopes plantations</i>		
Bega Valley (A)	287	3%
Narrandera (A)	56	2%
EXPANDED SOUTH WEST SLOPES REGION	2244	3%

Socio-demographic characteristics of workers

This section provides an expanded examination of socio-demographic characteristics of workers; some key aspects of this analysis are also reported in the main body of the report.

There are a number of reasons to understand socio-demographic characteristics of forest industry workers. Schirmer et al. (2013) identified in a study of Victorian forest industry workers that understanding socio-demographic characteristics provides insights into likely future challenges for the workforce such as difficulty with recruitment, low skills attainment or pressures emerging from needs of the broader household (for example, the need for partners of workers to have paid employment, often in industries other than forestry). Similarly Schirmer and Mylek (2015) identified that if the wellbeing of workers is not well understood, this can create challenges with maintaining a viable workforce.

Some specific issues identified in past studies of forest industry workers as being of relevance include maintaining a workforce with good diversity, ensuring good income and working conditions for workers, and educational attainment (see Schirmer et al. 2013, Schirmer and Mylek 2015):

- **Workforce diversity.** Overall, having access to a diverse pool of workers is positive for an industry, as it means there is a larger labour force to recruit from, and diverse perspective to inform work practices. Diversity can come in many forms, including diversity in age, gender, and cultural group:
 - **Age:** If workers in an industry are ageing rapidly and few young workers are entering the industry, this can indicate difficulty maintaining recruitment into the future. Understanding the demographic shape of the industry can also help identify likely household needs: for example, if many workers are aged 30-54, they are likely to need access to good schools and/or child care for children, and employment opportunities for spouses. Concerns about ageing of the forest industry workforce have been noted in some past work (Tumut Shire Council 2010).
 - **Gender:** If an industry predominantly employs one gender, this indicates there is a more limited pool for worker recruitment, and that any expansion may require a dedicated effort to specifically recruit workers from the other gender. Past studies indicate employment in the forest industry is predominantly male, with few female workers (Schirmer et al. 2005, ABARES 2013).
 - **Indigenous employment:** Employment of Indigenous people is often reported as an indicator for the forest industry, which has typically been a strong employer of Aboriginal and Torres Strait Islanders compared to other industries (ABARES 2013).
- **Income and dependence on the industry:** The income earned by workers, and the extent to which it supports their household, is an important determinant of sustainability of the workforce overall. Workers earning low incomes are less likely to stay in the industry if alternative work opportunities arise. If they have spouses/partners who work outside the industry (particularly for higher income), they are likely to leave the industry if their spouse/partner needs to shift for their employment:
 - **Household dependence:** In many cases, the future of industries based in regional communities depends on availability of jobs for spouses as much as the attractiveness of jobs in the industry. Understanding how many forest industry workers live in households where another member of the household has a paid job, and how many live in households where all income depends

on the forest industry, helps identify vulnerability of the industry to changes in availability of employment for spouses. A study of Victorian forest industry workers identified that many forest workers are the sole income earner in their household, making those households highly vulnerable to change in forest industry jobs (Schirmer et al. 2013).

- **Income compared to other industries:** If workers are being paid a wage that is relatively higher than the wage paid to workers in other local industries, this typically indicates positive recruitment potential; however, if workers in other industries earn relatively higher wages for similarly skilled occupations, it is likely to be difficult to recruit adequate skilled workers into the forest industry and the industry may experience an outflow of workers.
- **Working conditions and worker wellbeing:** Work conditions are a significant contributor to workforce retention, which is higher in positive working conditions and lower in poor working conditions. Maintaining worker wellbeing also helps maintain labour force retention and increases recruitment of new workers. Two indicators of work conditions and worker wellbeing are possible from ABS data:
 - **Work hours.** Multiple studies have shown that very long work hours are associated with higher rates of workplace accidents and with poorer health and wellbeing of workers, and working rotating shifts is similarly associated with higher rates of workplace injury. While there is no universally agreed definition of 'long hours', working more than 49 hours a week on a regular basis is considered likely to increase risks to worker health and wellbeing. Conversely, being underemployed – working fewer hours than desired – can also be associated with poorer wellbeing.
 - **Volunteering.** Participating in the local community by volunteering not only helps contribute to community life and wellbeing, but can also benefit the wellbeing of the worker who wellbeing, through a range of mechanisms including increasing their social connections and increasing satisfaction with life overall.
- **Educational attainment.** Many industries require increasing levels of educational attainment for workers, particularly as jobs once considered relatively unskilled increasingly require engagement with sophisticated technology and the use of a wide range of skills. Rapid change in the skills required for many jobs also means that it is important workers have the numeracy, literacy and learning skills to be able to successfully adapt to changing work requirements.

Very few previous studies have examined socio-demographic characteristics of forest industry workers. Given this, this section is predominantly based on specific analysis of the *ABS 2011 Census of Population and Housing (2011 Census)*. Data have been obtained from the *ABS TableBuilder* online database product, which enables building of customised data tables from Census data.

First, a basic profile of key socio-demographic characteristics of the forest industry workforce in the region is presented, including age, gender, income, educational attainment and work hours. This is followed by a more detailed analysis of educational attainment of forest industry workers in the region.

Workforce diversity

Forest industry workers in the region are slightly less likely to be aged under 25, and in some parts of the region much older than the average worker, particularly in Bombala, Tumbarumba and to a lesser extent Tumut (Table A2.9). This suggests that the forest industry workforce is older than is typical for other industries in these three LGAs, and

suggests potential challenges for maintaining a skilled workforce as those aged over 55 approach retirement. This finding is consistent with concerns about ageing of the forest industry workforce reported in some past studies, and raised in Tumut Shire Council's 2010 development strategy.

To better identify in which sectors workers are older than average, 2011 Census data were analysed by sector (Table A2.10). The findings suggest that the following sectors have more ageing of the workforce than other parts of the industry: pulp, paper and paperboard manufacturing (most workers in this category are those employed at Norske Skog; Visy employees are predominantly classified by the ABS in the corrugated paperboard and paperboard container category); timber wholesaling; and reconstituted wood manufacturing. There is low recruitment of young workers aged 25 or less into logging, forestry, pulp paper and paperboard manufacturing, and reconstituted wood manufacturing.

Table A2.9 Age distribution of the forest industry workforce

	% aged <25yrs		% aged >55yrs	
	Forestry sector	Total workforce	Forestry sector	Total workforce
	%	%	%	%
Bega Valley	11.1	12.5	27.5	26.4
Bombala	14.6	10.5	18.3	30.7
Cooma-Monaro	0.0	13.3	0.0	24.6
Albury	9.5	18.1	17.6	18.2
Greater Hume Shire – eastern part	0.0	11.5	26.9	27.0
Greater Hume Shire – western part	0.0	11.2	12.5	28.9
Gundagai	17.2	16.0	0.0	25.7
Narrandera	22.0	11.4	8.0	25.6
Tumbarumba	11.8	9.6	13.4	30.5
Tumut Shire	9.2	13.9	17.5	21.7
Wagga Wagga – city area	23.7	20.9	13.8	16.5
Wagga Wagga – rural areas	0.0	11.7	0.0	29.2
Australia	11.7	15.3	17.1	17.5

Table A2.10 Age distribution of the forest industry workforce by sector, South West Slopes region NSW (including local government areas of Albury, Bombala, Greater Hume, Gundagai, Tumbarumba, Tumut and Wagga Wagga)

	15-24 years	25-34 years	35-44 years	45-54 years	55-64 years	65 years+
Forestry (154 workers)	7%	19%	23%	32%	16%	3%
Logging (128 workers)	5%	23%	30%	25%	13%	4%
Forestry Support Services (63 workers)	11%	19%	11%	30%	17%	11%
Wood product manufacturing - sawmilling, dressing, resawing, woodchipping (514 workers)	15%	21%	20%	28%	14%	2%
Wooden structural fitting and component manufacturing (150 workers)	27%	21%	23%	19%	11%	0%
Veneer and plywood manufacturing (72 workers)	26%	33%	19%	21%	0%	0%
Reconstituted wood product manufacturing (85 workers)	4%	18%	18%	48%	13%	0%
Pulp, paper and paperboard manufacturing (165 workers)	2%	16%	27%	34%	21%	0%
Corrugated paperboard and paperboard container manufacturing (273 workers)	7%	26%	34%	22%	8%	3%
Timber wholesaling (32 workers)	16%	9%	31%	19%	25%	0%
Paper product wholesaling (84 workers)	19%	24%	15%	26%	15%	0%

The industry employs significantly fewer women than other industries in the region, and has slightly higher employment of Indigenous workers compared to other industries, particularly in Tumbarumba, Bega Valley and Bombala (Table A2.11). This pattern holds across different industry sectors.

Table A2.11 Female and Indigenous employment in the forest industry workforce

	Female employment		Indigenous employment	
	Forestry sector	Total workforce	Forestry sector	Total workforce
	%	%	%	%
Bega Valley	13.2	48.4	2.2	1.4
Bombala	9.8	43.0	1.8	1.3
Cooma-Monaro	14.3	47.4	0.0	1.5
Albury	11.1	48.5	1.3	1.1
Greater Hume Shire – eastern part	20.0	46.2	0.0	0.5
Greater Hume Shire – western part	0.0	43.9	0.0	1.0
Gundagai	22.6	42.9	0.0	1.9
Narrandera	18.0	45.1	0.0	5.9
Tumbarumba	16.8	42.0	2.7	0.6
Tumut Shire	11.0	43.8	2.0	2.6
Wagga Wagga – city area	13.4	47.2	2.2	2.7
Wagga Wagga – rural areas	20.8	45.5	0.0	1.0
Australia	18.7	46.8	1.5	1.4

Income

Forest industry workers generally earn higher incomes than the average for the region they live in. They are both less likely to earn low levels of income, and more likely to earn high income compared to other workers in the same local government areas (Table A2.12). This suggests the industry is paying competitive wages compared to other industries in the South West Slopes region and contributing positively to spending ability of households in the region through providing higher than average incomes.

Table A2.12 Income of forest industry workforce

	Low income (% earning <\$600/week)		High income (% earning >\$1250/week)	
	Forestry sector	Total workforce	Forestry sector	Total workforce
	%	%	%	%
Bega Valley	9.1	21.9	39.3	24.9
Bombala	6.5	23.5	33.1	22.1
Cooma-Monaro	33.3	19.2	0.0	32.4
Albury	6.3	12.7	61.1	31.3
Greater Hume Shire – eastern part	0.0	23.4	59.1	29.2
Greater Hume Shire – western part	0.0	29.1	35.7	23.0
Gundagai	0.0	24.0	44.0	25.6
Narrandera	10.5	24.6	0.0	21.2
Tumbarumba	6.1	20.8	20.7	27.3
Tumut Shire	7.6	18.6	41.0	29.6
Wagga Wagga – city area	17.6	13.4	17.6	31.3
Wagga Wagga – rural areas	0.0	25.8	52.9	30.9
Australia	12.5	11.3	27.7	41.1

One of the reasons for this higher than average income is that a large proportion of forest industry workers are employed full-time. Table A2.13 compares the proportion of South West Slopes forestry workers employed full-time and part-time, by industry sector. Of all employed people working in the South West Slopes (including all industries, not just forestry), 63% were employed full-time in 2011, while 30% worked part-time and the remainder were either away from work on Census night or did not provide information on the hours they worked. In comparison, in all but one sector of the forest industry, more than 80% of workers were employed full-time and 16% or less employed part-time. The exception was paper wholesaling, where much of the workforce was employed part-time.

Table A2.13 Proportion of workers employed full-time and part-time, by industry sector

	Employed full-time	Employed part-time	Employed, away from work	Employed, hours of work not stated
Forestry (154 workers)	86%	10%	5%	0%
Logging (128 workers)	81%	7%	9%	4%
Forestry Support Services (63 workers)	82%	9%	9%	0%
Wood product manufacturing - sawmilling, dressing, resawing, woodchipping (514 workers)	88%	6%	3%	3%
Wooden structural fitting and component manufacturing (150 workers)	85%	15%	0%	0%
Veneer and plywood manufacturing (72 workers)	89%	11%	0%	0%
Reconstituted wood product manufacturing (85 workers)	84%	7%	6%	3%
Pulp, paper and paperboard manufacturing (165 workers)	84%	6%	10%	0%
Corrugated paperboard and paperboard container manufacturing (273 workers)	91%	6%	3%	0%
Timber wholesaling (32 workers)	84%	16%	0%	0%
Paper product wholesaling (84 workers)	38%	58%	4%	0%
Employed labour force, SWS (all industries)	63%	30%	4%	2%

Another way of examining the contribution of the income earned by forest industry workers to households in the region is to examine the extent to which households depend on this income. Across all forest industry households in the South West Slopes, 2011 Census data analysis shows that 73% lived in dual (or multiple) income households while 27% of forest industry workers were the sole income earner in their households. This compares to 66% of working households having more than one income, and 34% being sole income earner households.

Work hours and volunteering

Forest industry workers are less likely to volunteer than those in other industries, and more likely to work long hours (defined as 49 hours per week or more) (Table A2.15). This is not simply a consequence of the high proportion of workers employed full-time, as the measure of working hours specifically examined those working much longer than normal full-time hours. Table A2.16 identifies which sectors of the industry have a higher proportion of workers who work very long hours. Three sectors have much higher proportions of workers who work long hours: logging (66%) corrugated paperboard and paperboard container manufacturing (42%) and forestry support services (41%).

Table A2.15 Volunteering and work hours of forest industry workers

Statistical Local Area (in most cases, SLAs are identical to local government areas; in some cases an LGA is split into more than one LGA)	% workers who volunteered in 12 months prior to Census		Long working hours - % workforce working 49 hours or more per week	
	Forestry sector	Total workforce	Forestry sector	Total workforce
	%	%	%	%
Bega Valley	22.8	29.0	25.5	15.5
Bombala	26.6	43.0	34.4	24.3
Cooma-Monaro	23.8	29.4	14.3	18.7
Albury	17.7	25.2	31.4	21.8
Greater Hume Shire – eastern part	26.8	37.1	11.9	22.7
Greater Hume Shire – western part	36.0	32.6	21.7	23.1
Gundagai	16.7	34.6	37.9	25.5
Narrandera	16.6	23.1	23.9	14.8
Tumbarumba	32.1	34.5	14.3	23.6
Tumut Shire	15.2	41.4	22.6	26.1
Wagga Wagga – city area	21.7	32.2	36.0	28.8
Wagga Wagga – rural areas	15.4	21.3	22.9	15.6
Australia	15.1	19.8	18.9	17.1

Table A2.16 Working hours by industry sector

	Works <49 hours	Works >49 hours
Forestry (154 workers)	85%	15%
Logging (128 workers)	34%	66%
Forestry Support Services (63 workers)	59%	41%
Wood product manufacturing - sawmilling, dressing, resawing, woodchipping (514 workers)	84%	16%
Wooden structural fitting and component manufacturing (150 workers)	81%	19%
Veneer and plywood manufacturing (72 workers)	71%	29%
Reconstituted wood product manufacturing (85 workers)	78%	22%
Pulp, paper and paperboard manufacturing (165 workers)	70%	30%
Corrugated paperboard and paperboard container manufacturing (273 workers)	57%	42%
Timber wholesaling (32 workers)	100%	0%
Paper product wholesaling (84 workers)	95%	5%
All employed labour force (including workers in all industries)	82%	18%

Educational attainment

Forest industry workers are less likely to have completed Year 12 or equivalent than workers in other industries (Table A2.17). This is the case across all parts of the South West Slopes.

When examined by industry sector (Table A2.18), high school completion rates were highest in 2011 in the paper manufacturing (all categories), forestry and paper product wholesaling sectors. They were lowest in logging, timber wholesaling and reconstituted wood product manufacturing.

Table A2.17 High school completion rates: comparison of forestry workforce and total workforce, 2011, by local government area

	Education - % who have attained Year 12 education	
	Forestry sector	Total workforce
	%	%
Bega Valley	27.2	44.4
Bombala	27.1	37.8
Cooma-Monaro	19.0	48.7
Albury	40.1	50.9
Greater Hume Shire – eastern part	26.1	42.4
Greater Hume Shire – western part	21.9	38.0
Gundagai	10.0	36.5
Narrandera	18.4	35.5
Tumbarumba	27.9	37.0
Tumut Shire	33.0	37.8
Wagga Wagga – city area	34.3	52.2
Wagga Wagga – rural areas	41.7	44.8
Australia	41.3	61.2

Table A2.18 High school completion rates: comparison of different forest industry sectors in the South West Slopes, 2011

	% completed year 12	% completed year 11	% completed year 10	% did not complete year 10
Forestry (186 workers)	40%	9%	35%	16%
Logging (176 workers)	17%	13%	46%	24%
Forestry Support Services (58 workers)	31%	7%	43%	19%
Wood product manufacturing - sawmilling, dressing, resawing, woodchipping (641 workers)	25%	9%	49%	17%
Wooden structural fitting and component manufacturing (200 workers)	33%	14%	49%	5%
Veneer and plywood manufacturing (76 workers)	30%	18%	51%	0%
Reconstituted wood product manufacturing (77 workers)	17%	8%	65%	10%
Pulp, paper and paperboard manufacturing (209 workers)	37%	13%	37%	13%
Corrugated paperboard and paperboard container manufacturing (263 workers)	57%	11%	26%	5%
Timber wholesaling (54 workers)	17%	22%	33%	28%
Paper product wholesaling (90 workers)	44%	9%	34%	12%
Employed people, all industries (63,960 workers)	48%	10%	32%	9%

Table A2.19 compares rates of high school attainment in 2006 and 2011. In the South West Slopes, across all industries, there was an increase of 4% in the proportion of workers who had completed Year 12 between 2006 and 2011. Across the forest industry, high school attainment increased at above average rates in forestry, wood structural fitting and component manufacturing, corrugated paperboard and paper board manufacturing, and veneer and plywood manufacturing. However, rates of high school attainment fell amongst those employed in forestry support services, reconstituted wood product manufacturing, pulp paper and paperboard manufacturing, timber and paper product wholesaling.

Table A2.19 Change in rates of high school attainment, 2006-2011, South West Slopes NSW

	2006: % completed year 12	2011: % completed year 12	Change 2006- 2011
Forestry	32%	40%	+8%
Logging	13%	17%	+4%
Forestry Support Services	35%	31%	-4%
Wood product manufacturing - sawmilling, dressing, resawing, woodchipping	25%	25%	0%
Wooden structural fitting and component manufacturing	27%	33%	+6%
Veneer and plywood manufacturing	21%	30%	+9%
Reconstituted wood product manufacturing	37%	17%	-20%
Pulp, paper and paperboard manufacturing	44%	37%	-7%
Corrugated paperboard and paperboard container manufacturing	46%	57%	+11%
Timber wholesaling	23%	17%	-6%
Paper product wholesaling	46%	44%	-2%
Employed people, all industries	44%	48%	+4%

Many workers in the industry obtain a range of post-school qualifications, including certificates, diplomas and degrees. Table A2.20 summarises the proportion of workers who in 2011 had attained different types of post-school qualification:

Across all industries, 42% of workers had no post-school qualification. Within the forest industry, those working in logging, forestry support services, wood product manufacturing (including veneer, plywood and reconstituted products) and wholesaling commonly had no post-school qualifications, with 56-70% of workers in these sectors having no post-school education. However, those employed in wood structural fitting and component manufacturing, and in pulp and paper manufacturing, were more likely than average to have post-school qualifications.

The most common post-school qualification for most forest industry workers was a Certificate III qualification, particularly for those employed in manufacturing industries and logging. Bachelor degrees were more common amongst those working in forestry, and also in the paper manufacturing sector, and less common in other sectors.

Table A2.20 Post-school qualification attainment: comparison of different forest industry sectors in the South West Slopes, 2011

	% with no post-school qualification	% Certificate I or II	% Certificate III	% Certificate IV	% Diploma	% Bachelor degree	% Post-graduate degree
Forestry (184 workers)	45%	2%	19%	8%	5%	20%	2%
Logging (175 workers)	56%	3%	27%	7%	5%	3%	0%
Forestry Support Services (50 workers)	58%	0%	12%	6%	6%	12%	6%
Wood product manufacturing - sawmilling, dressing, resawing, woodchipping (614 workers)	63%	1%	28%	4%	2%	2%	0%
Wooden structural fitting and component manufacturing (190 workers)	36%	2%	59%	2%	0%	2%	0%
Veneer and plywood manufacturing (76 workers)	70%	0%	22%	8%	0%	0%	0%
Reconstituted wood product manufacturing (73 workers)	58%	0%	38%	0%	4%	0%	0%
Pulp, paper and paperboard manufacturing (206 workers)	31%	0%	39%	7%	9%	10%	4%
Corrugated paperboard and paperboard container manufacturing (251 workers)	36%	3%	31%	6%	7%	15%	1%
Timber wholesaling (50 workers)	66%	0%	28%	6%	0%	0%	0%
Paper product wholesaling (85 workers)	69%	4%	12%	7%	5%	4%	0%
Employed people, all industries (workers)	42%	2%	23%	4%	9%	14%	5%

Table A2.21 compares rates of attainment of post-school qualification in 2006 and 2011, comparing the proportion of workers with no post-school attainment, and those whose highest level of attainment was (i) Certificate III, (ii) Certificate IV, and (iii) Bachelor degree. As very small proportion of workers have attained other levels of post-school qualification, it is not possible to compare rates of qualification for Certificate I and II, Diplomas or Postgraduate degrees over time with a high degree of confidence in rates of change.

Across the whole workforce of the South West Slopes, the proportion of workers with no post-school educational attainment fell by 5% between 2006 and 2011, from 47% to 42%. In the areas of forestry, logging, wood product manufacturing, and veneer and plywood manufacturing, there was a similar change with more workers having attained post school qualifications. However, in all of these the proportion of workers with no post high-school qualification remained higher than average in 2011. Rates of post-school qualification attainment varied:

- In the forestry sector, the proportion with a Bachelor degree or Certificate IV increased more rapidly than average for the workforce as a whole

- In the logging sector, rates of completion of Certificate IV increased, and there was a corresponding decrease in the proportion attaining Certificate III as their highest qualification, likely because many had now completed a Certificate IV
- In forestry support services there was very little change in rates of post-school attainment
- Rates of completion of Certificate III or IV rose slightly in most manufacturing sectors between 2006 and 2011.

Table A2.21 Post-school qualification attainment: change in rate of post-school qualification attainment, 2006 to 2011, South West Slopes NSW

	2006: % with no post-school qualification	2011: % with no post-school qualification	2006: % with Certificate III	2011: % with Certificate III	2006: % with Certificate IV	2011: % with Certificate IV	2006: % with Bachelor or degree	2011: % with Bachelor degree
Forestry	58%	45%	14%	19%	4%	8%	16%	20%
Logging	60%	56%	35%	27%	0%	7%	2%	3%
Forestry Support Services	57%	58%	11%	12%	6%	6%	21%	12%
Wood product manufacturing - sawmilling, dressing, resawing, woodchipping	67%	63%	25%	28%	1%	4%	2%	2%
Wooden structural fitting and component manufacturing	36%	36%	59%	59%	0%	2%	0%	2%
Veneer and plywood manufacturing	79%	70%	21%	22%	0%	8%	0%	0%
Reconstituted wood product manufacturing	55%	58%	32%	38%	5%	0%	4%	0%
Pulp, paper and paperboard manufacturing	30%	31%	36%	39%	4%	7%	13%	10%
Corrugated paperboard and paperboard container manufacturing	39%	36%	34%	31%	2%	6%	11%	15%
Timber wholesaling	67%	66%	25%	28%	4%	6%	4%	0%
Paper product wholesaling	71%	69%	12%	12%	0%	7%	0%	4%
Employed people, all industries	47%	42%	22%	23%	3%	4%	12%	14%

A different way of examining educational attainment is to identify the occupations forest industry workers are recorded as working in. The Census asks working people to identify both their place of work, which enables identification of industry of employment, and the type of work they do – their occupation.

Table A2.22 summarises the occupations reported by forest industry workers living in the South West Slopes in the 2011 Census. These data have limitations: in particular, for some parts of the forest industry not all workers provided information on their occupation. Common occupations reported included:

- Forestry sector: Specialists professionals such as scientists (25%), general forestry workers (27%) and mobile plant operators (19%) were the most common occupations
- Logging: Mobile plant operation was the most common occupation (43% of workers), followed by general forestry workers (14%), clerical/administration positions (9%) and automotive and engineering trade workers (9%)
- Forestry support services: Only around half of workers had information available, most of whom reported being science professionals or forestry workers
- Wood product manufacturing: machine and stationary or mobile plant operators (42%) and factory process workers (22%) were the most common occupations reported
- Wooden structural fitting and component manufacturing: The most common occupations were technicians and trades workers (34%) and construction trades workers (30%), followed by clerical/administration positions (10%)
- Veneer and plywood manufacturing and reconstituted wood product manufacturing: For both these categories the most common occupations were factory process workers and machine and stationary plant operators
- Pulp, paper and paperboard manufacturing: Machine and stationary plant operators (26%) and engineering trades workers (14%) were the most common categories
- Corrugated paperboard and paperboard container manufacturing: Engineering and science professionals (29%) and machine and stationary plant operators (23%) were the most common occupations.

Table A2.22 Occupations of forest industry workers in the South West Slopes, 2011

	Forestry (150 workers)	Logging (128 workers)	Forestry Support Services (34 workers)	Wood product manufacturing - sawmilling, dressing, resawing, woodchipping (395 workers)	Wooden structural fitting and component manufacturing (151 workers)	Veneer and plywood manufacturing (73 workers)	Reconstituted wood product manufacturing (84 workers)	Pulp, paper and paperboard manufacturing (163 workers)	Corrugated paperboard and paperboard container manufacturing (273 workers)
Technicians and Trades Workers - general	0%	0%	0%	5%	34%	4%	0%	2%	2%
Electrotechnology and Telecommunications Trades Workers	0%	0%	0%	8%	0%	4%	7%	9%	0%
Construction Trades Workers	0%	0%	0%	0%	30%	0%	0%	0%	0%
Automotive and Engineering Trades Workers	5%	9%	0%	7%	2%	5%	12%	14%	1%
Engineering, ICT and Science Technicians	3%	0%	0%	2%	0%	0%	0%	9%	3%
Business, Human Resource, Marketing and Health professionals	0%	4%	0%	1%	0%	0%	0%	3%	2%
Design, Engineering, Science and Transport Professionals	25%	0%	32%	0%	0%	0%	0%	9%	29%
Chief Executives, General Managers and Legislators	4%	0%	0%	0%	0%	0%	0%	0%	0%
Specialist Managers	7%	6%	9%	6%	7%	10%	6%	7%	12%
Office Managers and Program Administrators	0%	0%	0%	0%	5%	0%	0%	0%	2%
Clerical, Clerks, Receptionists, Personal Assistants and Secretaries, Administrative workers	3%	9%	0%	4%	10%	0%	4%	0%	5%
Sales Representatives, Agents, Assistants and Salepersons	0%	0%	0%	1%	3%	0%	5%	0%	0%
Machine and Stationary Plant Operators	0%	5%	0%	28%	6%	26%	24%	26%	23%
Mobile Plant Operators	19%	43%	15%	14%	0%	8%	20%	4%	6%
Road and Rail Drivers	6%	8%	0%	0%	0%	0%	0%	0%	3%
Factory Process Workers	0%	2%	0%	22%	3%	33%	23%	6%	9%
Farm, Forestry and Garden	27%	14%	44%	0%	0%	0%	0%	0%	0%

Workers										
Other occupations	0%	0%	0%	4%	0%	10%	0%	11%		3%

Historical estimates of direct and indirect economic value

Several past studies have estimated the direct and indirect economic value generated by the forest industry in the South West Slopes, or in parts of the South West Slopes. Findings of these studies are summarised in Table A2.23. In the mid 2000's, annual direct value of output at the point at which processed products left mills was estimated at approximately \$574.5 million in two different studies; by 2010, Tumut Shire estimated this had increased to \$620 million or more.

Table A2.23 Economic value of the South West Slopes forest industry: summary of findings of previous studies

Year	Region & forest types examined	Direct economic value	Indirect economic value	Study from which data sourced
1995	Murrumbidgee region, native forest and plantation (Tumut, Wagga Wagga, Gundagai, and areas further west)	\$123 million value of output at point of final product leaving softwood mills in region (excludes native forest)	\$72.3 million flow-on effect (including production and consumption-induced flow-on) generated (excludes native forest)	Margules Groome Poyry (1995)
1995	Murray region, native forest and plantation (Albury, Holbrook, Tumbarumba included as well as areas west of Albury)	\$178 million value of output at point of final product leaving softwood mills in region (excludes native forest)	\$117.4 million flow-on effect (including production and consumption-induced flow-on) generated (excludes native forest)	
2003	Tumut, Visy Industries pulp and paper mill	Not estimated	Not estimated	URS Forestry (2003)
2004	South West Slopes (Albury, Greater Hume Shire, Gundagai, Tumbarumba, Tumut, Wagga Wagga), softwood plantations and native forest	\$574.47 million (softwood plantation) plus \$8.65 million native forest. Measured as value of output.	Estimated multiplier of 2 (meaning an additional \$574.47 million of indirect value generated)	URS Forestry (2004)
2005	Bombala, private softwood plantation, forest management and processing	Value of output from sawmill \$16 million annually, plus \$2 million in forestry operations	Not estimated	CIE (2005)
1993-94	South West Slopes (Albury, Greater Hume Shire, Gundagai, Tumbarumba, Tumut, Wagga Wagga), softwood plantations only	\$401.4 million (softwood plantations, value of output, measured in 2002-03 dollars)	For every dollar spent, an additional \$0.94 to \$1.32 was generated, depending on the stage of processing examined	Schirmer et al. (2005)
2002-03	South West Slopes (Albury, Greater Hume Shire, Gundagai, Tumbarumba, Tumut, Wagga Wagga), softwood plantations only	\$574.5 million (softwood plantation, value of output, measured in 2002-03 dollars)		
2010	South West Slopes	Reports that annual value of production exceeds \$620 million	Not estimated	Tumut Shire Council (2010)

In addition to identifying the total quantum of value of production, some past studies have examined what proportion of this value is captured within the region in the form of expenditure occurring within versus outside the region. Schirmer et al. (2005) identified that 93% of spending on wages and salaries occurred within the region, as did 80% of spending on building and plant maintenance, 25% of spending on inputs to processing other than wood and fibre (eg chemical supplies), 90% of training expenditure, 80% of inputs to plantation growing and management such as seedlings and payments to contractors, and 90% of spending on road maintenance and construction. This indicates that a large majority of the economic value generated by the industry was, as of 2004, captured within the region, providing benefit to the region's economy.

Historical volume of production, supply chain and product flows

Most previous studies of the region have identified the following information for the region:

- Area of plantation established
- Volume of logs harvested
- Volume of production of key products, at varying levels of detail
- In some cases, spatial distribution of flows of (i) logs and (ii) products into and out of the study region. In particular, URS Forestry (2004) produced a useful visual flow diagram of the spatial flow of products into and out of the region.

In all past studies, the boundaries of the South West Slopes region have differed to those identified for the current study, which unlike past studies includes Bombala as part of the region. The spatial patterns of flows of wood products have also changed over time, as have volumes of production and types of production (for example, the most recent reports were typically produced before Stage II of the Visy mill opened). Given this, the findings of past studies are substantially out of date, and are not examined in this review report.

Conclusions

Prior to the work conducted for this study, no new studies had been conducted for more than a decade, and the most recent robust data produced by the ABS was in 2011. The historical information available highlighted the high dependence of the region on forest industry employment, part particularly in Bombala, Tumut and Tumbarumba. It also highlighted that the industry paid relatively high incomes, but recruited relatively few women into the workforce. The information included in Appendix 2 was used to help identify the types of information subsequently collected in the survey of forest industry businesses in the region.