Australian Government Department of Agriculture ABARES



Australia's State of the Forests Report 2013

Criterion 6

Maintenance and enhancement of long term multiple socio-economic benefits to meet the needs of societies





Processed hardwood timber from native production forests.

Criterion 6 Maintenance and enhancement of long term multiple socio-economic benefits to meet the needs of societies

The 17 indicators in this criterion are designed to show the extent to which Australia's forests contribute to national and regional economies, benefit personal and community wellbeing, and support cultural values. Socio-economic data are important measures of the monetary and non-monetary value and benefits of forests to society. In addition, Australian communities, especially Aboriginal and Torres Strait Islander communities (referred to as Indigenous communities in SOFR 2013), have strong social, spiritual and cultural attachments to forests, whether for traditional needs, provision of wood and non-wood forest products and other benefits, direct and indirect employment, or active and passive recreation.

The indicators in this criterion are considered in five sub-criteria.

Production and consumption

Wood from forests provides employment for workers in harvesting and processing, revenues to governments, and incomes to landholders and businesses. Analysis of trends in the value of wood and wood products harvested from Australia's forests enables an assessment of a portion of the socio-economic benefits derived from forests. Consumption trends over time provide a measure of the capacity of forest and wood-processing industries, through domestic production and importation, to meet Australian society's demand for wood products, and a measure of the industry's contribution to the national economy. Wood and wood product categories examined in this report are sawn wood; wood-based panels; and pulpwood, woodchips, paper, cardboard and fibreboard.

Rising global and national demands for forest products, with consequent increased demands on forest resources, have led to calls for greater reuse and recycling of forest products. Considerable quantities of wood-based forest products, such as structural timbers, pulp, paper and sawmill residue, are recycled in Australia.

Although wood is economically the most valuable forest product, many Australian non-wood forest products (NWFPs) are harvested and sold commercially, including for emerging export markets. Some NWFP industries are based on wild harvesting and hunting, including hunting of feral animals such as wild pig and deer.

Australia's forests also provide a range of other services, such as carbon sequestration, soil conservation, protection of catchments for water production, ecotourism, and biodiversity conservation. These can broadly be divided into amenity services and environmental services. Markets or other economic mechanisms exist for some of these services, allowing forest-based services to provide monetary value as well as social and environmental benefits.

Investment

The quantity of investment and expenditure in developing, maintaining and obtaining goods and services from forests is a measure of the economic commitment to forest utilisation and management.

The Australian, state and territory governments undertake many activities that, together, constitute forest management. A range of data on investment in forest management is available, although differences in the classification of activities, accounting arrangements and reporting timelines means that it is not possible to calculate national expenditure on forest management. Similarly, information on investment by the private sector, whether for native forest management or for plantation establishment, is either not collected or is not publicly available because it is commercial-in-confidence; expenditure on the management of nature conservation reserves is also generally unavailable in a consistent form. However, data are available on establishment of new plantations and re-establishment of harvested plantations, as indicators of investment in future wood availability.

Investment in research, development and adoption of new or improved technologies can lead to improvements in forest management and industry practices. The focus of research and development in the forestry and logging subsector is on improving wood production, harvesting and transport; and identifying new markets for standing wood. Research and development in the wood product manufacturing subsector tends to focus on identifying new forest-based products and processing methods, such as new applications for timber in construction, new timber treatments, and new export markets. Research and development in the pulp, paper and converted paper product manufacturing subsector covers a range of areas, such as energy efficiency in pulping and drying, and the development of new products.

Tourism and recreation

Australia's forests are highly valued for tourism and recreation, and a wide range of forest-based recreation and tourism opportunities is available. Some facilities, such as walking and riding tracks, picnic sites and campgrounds, are provided specifically to meet the needs of recreational visitors and tourists. Other facilities, such as roads and vehicular tracks, are provided for a range of management purposes but are also available for use for recreation and tourism. The dispersed nature of forest tourism and recreation nationally means that data are limited across jurisdictions and tenures, and difficult to compile nationally.

An area of forest is considered to be available for recreation and tourism if there is no legal or other prohibition on public access to the forest. Most publicly owned forested lands designated for multiple use or as nature conservation reserves are available for recreation and tourism. Some data are collected for areas where visitors have to pay for access to private land (e.g. forest wildlife parks).

Although various outdoor recreation and tourism activities, such as bushwalking and camping, are allowed in most public forests, some areas have exclusions or restrictions to ensure visitor safety, or to protect specific scientific, natural, cultural or water-supply values. Other activities such as horse-riding and mountain-bike riding may be permitted only in certain areas. Limited road, track and trail access, a lack of facilities and other practical considerations may also restrict or prevent public use of forests.

One way to measure the financial value of the amenity service of forest-based tourism and recreation is to estimate the number of people visiting forests in various tenures, and how much money they spend to do so. Changes in visitor numbers to national and state parks and to forests in other tenures can reflect changes in the perceived value of forests; it should be noted, however, that not all national parks are forested, and moreover that data on visitor numbers are not comprehensive.

Cultural, spiritual and social values

Forests are recognised as one of Australia's greatest natural assets and are highly valued by the community for their wide range of environmental and socio-economic benefits. Understanding the importance that people place on Australia's forests provides an insight into the acceptance and approval by communities of activities related to forest management. The extent to which Indigenous people participate in forest management reflects their connection with the land, and the integration of Indigenous values into forest management practice, policy and decision-making.

Access, management and ownership are key parts of the relationship of Indigenous people with land. The Indigenous estate can be broadly divided into land tenure and management categories based on the degree of Indigenous ownership, management and other rights over the land. Effective Indigenous participation can occur through a variety of direct or consultative mechanisms, but it is difficult to measure the extent of this participation at the national scale. All state and territory jurisdictions maintain registers of Indigenous heritage sites that afford legal protection to registered sites, including those in forests, and also provide a level of protection for heritage sites that are not yet included in the register.

Australia's forests include many sites that provide evidence of the interactions between non Indigenous people and forest landscapes, and the activities that have taken place on the continent since first European settlement. A wide variety of forest sites, features, structures and landscapes have recorded non-Indigenous cultural value.

Employment, worker welfare, and community resilience

Employment is an important measure of the contribution of forests to viable communities and the national economy. Reductions in forest-sector employment can indicate a reduced economic contribution from forests, and may have implications for forest-dependent communities. A sustainable industry will maintain wage rates, workforce health and worker safety at levels that are comparable with national averages for similar occupations.

The Australian forest and wood products sector has undergone significant structural changes in recent years, with reductions in the areas of native forest available for harvest and consequently in the volume of wood harvested from native forests, reduced investment in new plantations, and reduced demand for wood products. Moreover, older processing facilities have been closed or decommissioned. Such changes have economic and social implications for forest-dependent communities.

The capacity of both Indigenous and non-Indigenous communities to accommodate and adapt to change is influenced by their level of economic dependence on the forestry industries, and by the resources they are able to draw on to assist them in responding to change. Resilient communities can adapt to, and remain viable in, changing social and economic conditions. Community resilience can be conceptualised and measured in different ways. It is sometimes interchangeable with adaptive capacity, since increasing adaptive capacity will enhance community resilience.



The town of Bright in north-east Victoria.

Key findings

Key findings are a condensed version of the Key points presented at the start of individual indicators in this criterion.

Production and consumption

- A total of 26.6 million cubic metres of logs were harvested in Australia in 2010–11, a decrease from 27.2 million cubic metres in 2006–07. Over this period, the volume of hardwood logs harvested from native forests declined from 8.6 million cubic metres to 6.3 million cubic metres, a decrease of 26%. The volume of logs harvested in softwood and hardwood plantations (plus a small volume of softwoods harvested from native forests) increased from 18.6 million cubic metres in 2006–07 to 20.2 million metres in 2010–11, an increase of 8.6%. In 2010–11, 76% of the volume of logs harvested in Australia was from plantations.
- Indexed to 2010–11 prices to adjust for inflation¹³², the value of logs harvested from native forests and plantations decreased from \$1.93 billion to \$1.85 billion between 2006–07 and 2010–11, a decrease of 3.9%. Indexed to 2010–11 prices, the turnover (sales and service income) of the wood and wood products industries increased from \$23.8 billion to \$24.0 billion between 2006–07 and 2010–11, an increase of 0.9%. The value added by the wood and wood products industries in 2006–07 was \$7.4 billion, a contribution to Australia's gross domestic product of 0.68%; the value added in 2010–11 was \$8.3 billion, representing a contribution to gross domestic product of 0.59%.
- The most recent (2011–12) estimate of the gross annual value of production of NWFPs regarded as having high forest dependence was \$198 million. However, information on the production, consumption and trade of NWFPs is often difficult to obtain because of the small size and dispersed nature of the industries.
- In addition to providing wood and non-wood forest products, Australia's forests provide a range of amenity and ecosystem services, such as carbon sequestration, soil conservation, watershed protection, ecotourism and biodiversity conservation. Markets exist for few of these services. National numbers are not collected to enable estimation of the number of people visiting forests or the total economic benefit of these services.
- The total value of wood product imports increased from \$4.3 billion in 2006–07 to \$4.4 billion in 2010–11, and the total value of wood product exports increased from \$2.4 billion to \$2.5 billion (unadjusted for inflation). The trade deficit in wood products therefore increased slightly, from \$1.91 billion in 2006–07 to \$1.93 billion in 2010–11, and Australia remains a net importer of wood and wood products.

¹³² Dollar amounts are only adjusted for inflation where specified.

- The highest-value export category of wood products in 2010–11 was woodchips (\$884.4 million). Printing and writing paper accounted for the largest proportion, by value, of Australia's imports of wood products in 2010–11 (30.6%).
- Consumption of hardwood sawn wood decreased from 1.23 million cubic metres in 2006–07 to 0.748 million cubic metres in 2010–11. In comparison, the consumption of softwood sawn wood increased from 4.1 million cubic metres to 4.3 million cubic metres over the same period.
- The collection rate of recycled paper and paperboard products increased from 66.3% in 2006–07 to 77.4% in 2010–11, with an increase in exports of recovered paper, particularly to China.
- Households reused and recycled more waste paper products in 2009 than in 2006. Australia-wide, household recycling and reuse increased from 91.5% to 95% over this period.

Investment

- The annual rate of establishment of new hardwood and softwood plantations in Australia, a measure of investment in future wood availability, declined from 87 thousand hectares in 2006–07 to 10 thousand hectares in 2010–11. Annual investment in new plantations thus decreased substantially over this period.
- Combined, the forestry and logging subsector, the wood product manufacturing subsector, and the pulp, paper and converted paper product manufacturing subsector accumulated about \$6.0 billion of fixed capital between 2006–07 and 2010–11, including in new plantations, equipment and buildings. Fixed capital formation net of depreciation and amortisation over this period was estimated to be \$1.08 billion.
- Australian Bureau of Statistics data show that total expenditure on research and development (R&D) reported by businesses in the forest and wood product sector declined from \$164 million to \$137 million between 2005–06 and 2008–09. Business R&D expenditure increased in the forestry and logging subsector but decreased in the wood product manufacturing subsector and the pulp, paper and converted paper product manufacturing subsector.
- A separate survey of the forest and forest products sector, using a different definition of the sector from that used by the Australian Bureau of Statistics, estimated R&D expenditure at \$106 million in 2007–08. Adjusted for inflation, and using a consistent methodology over time, the expenditure on forestry and forest product R&D is estimated to have declined by 13.4% between 1981–82 and 2007–08.

Tourism and recreation

- Nationally, 10.1 million hectares of publicly owned multiple-use forest and 20.7 million hectares of forest in nature conservation reserve are available for recreation and tourism, a total of 30.8 million hectares of publicly owned forest available nationally for these uses. Additional private forest areas are available, usually under commercial arrangements. Substantial areas of reserved forest in northern Australia, such as in Kakadu National Park, are on private land tenure and are available for recreation and tourism through leasing and management arrangements with the Australian Government.
- A wide range of forest-based recreation and tourism services is available in Australia to meet demand by the general public, but a national estimate of the number of people visiting forests is unavailable. In forest areas for which data are available, the number of areas, tracks and sites available for recreation and tourism activities remained the same or increased over the reporting period.

Cultural, spiritual and social values

- The Indigenous estate can be divided into four land tenure and management categories: Indigenous owned and managed, Indigenous managed, Indigenous co-managed and Other special rights.
- In 2011, 41.9 million hectares of forest land (34% of Australia's total forest area) were in the Indigenous estate. This is an increase of 22.1 million hectares over the figure reported in SOFR 2008. The increase was driven primarily by improved availability of spatial information on Indigenous land tenure, as well as a real increase in the area of land over which Indigenous people have legislated rights. Of the total area of forest in the Indigenous estate, 31.7 million hectares (76%) is in Queensland and the Northern Territory.
- Approximately 4.4 million hectares of forest are on Indigenous owned and managed lands where the legislated management intent is conservation. The total area of forest on sites with Indigenous heritage value listed on the Register of the National Estate in 2011 was 1.5 million hectares, of which 1.2 million hectares (81%) was in Queensland and the Northern Territory.
- Effective Indigenous participation can occur through a variety of direct or consultative mechanisms, but it is difficult to measure the extent of Indigenous participation through these mechanisms at the national scale.
- Data on non-Indigenous heritage sites in Australia have been compiled in a national dataset based on non-Indigenous heritage lists and registers from all jurisdictions. Across all jurisdictions combined, the total forest area on heritagelisted sites is estimated at 7.3 million hectares. This is an overall increase of 6.8 million hectares since SOFR 2008, attributable to compilation and reporting of the new dataset.
- Several surveys conducted between 2006 and 2012 have provided considerable insight into the attitudes of Australians to a range of forest-related issues.

- More than 40% of the respondents to an Australia-wide series of surveys agreed that Australia's native forests were being managed sustainably. The proportion of respondents who agreed that 'we should not be cutting down any trees for wood products' decreased between 2009 and 2012, and the proportion of respondents who agreed that 'we should use more wood because it is more environmentally friendly than alternative materials' increased. Harvesting trees is viewed favourably only if the trees are replaced with new ones.
- The level of understanding about the role of forests in carbon storage is high and increasing. In 2012, more than 90% of respondents agreed that trees absorb carbon dioxide, and 71% (up from 52% in 2008) agreed that 'carbon is stored in wood, even after the tree is harvested'.
- In south-west Western Australia and Tasmania, views are polarised on the acceptability of eucalypt plantations for pulp and paper, and pine plantations for timber.
- About 80% of respondents to a survey in south and central rural New South Wales indicated that they would consider planting trees for carbon sequestration, and nearly 70% indicated that being paid for carbon sequestration would increase the likelihood that they would plant trees for purposes such as reducing land degradation and providing shelter for stock.

Employment, worker welfare and community resilience

- Total direct employment in the forest sector was estimated at 73,267 people in 2011, down from 85,254 people in 2006. Direct employment declined from 2006 to 2011 in the forestry and logging subsector; the wood product manufacturing subsector; the pulp, paper and converted paper product manufacturing subsector; and the timber wholesaling subsector. Direct employment in the forestry support services subsector increased.
- A study on Tasmania by the Cooperative Research Centre for Forestry, using different employment categories, showed that forest-related employment in Tasmania fell by 46% in the period from 2006 to 2011, from 6,409 to 3,460 people. The number of forest-related businesses in Tasmania also fell over this time.
- Total wages and salaries in the wood and wood product industries varied in the range \$3.8 billion to \$4.2 billion from 2005–06 to 2010–11. The average wage over the period (not adjusted for inflation) increased in the forestry and logging subsector; in the wood product manufacturing subsector; and in the pulp, paper and converted paper product manufacturing subsector.
- Average annual wages in the forestry and logging subsector were estimated at \$34,467 in 2010–11, which is high compared with most other primary sectors, but low compared with the mining sector. The average wage in the wood product manufacturing subsector was estimated at \$48,568 in 2010–11, which is lower than in most other manufacturing industries. In comparison,

the average annual wage in the pulp, paper and converted paper product manufacturing subsector was estimated at \$72,381 in 2010–11.

- The number of serious injury claims in both the forestry and logging and the wood and paper product manufacturing subsectors has declined in recent years. There were 25 reported compensated fatalities in the forestry and logging subsector and 21 compensated fatalities in the wood and paper product manufacturing subsectors between 2003–04 and 2009–10.
- A reduction in wood harvest from native forest, lower investment in establishment of new plantations, reduced demand for wood products, and the closure of large mills, had significant impacts on forest-dependent communities over the period from 2006 to 2011.
- In 2011, there were 28 Statistical Local Areas (SLAs) in which 4% or more of the working population (the level used to show medium-to-high relative community dependence on forests) was employed in forest and wood products industries. Of these, 24 SLAs showed a decline in employment in the forest and wood products industries over the period from 2006 to 2011. Several of these SLAs also had relatively low rankings in an adaptive capacity index that combined the levels of training qualifications and skills, income, and community participation, with regional industry diversity.
- Access to native forest enables Indigenous people to practise and maintain cultural values, leading to an improved sense of wellbeing, and personal and community resilience. The financial and educational resources developed through engagement with commercial forest management activities can help build the capacity of Indigenous peoples to manage change, and increase broader community resilience. Successful Indigenous forest-sector projects can deliver both social and economic benefits, strengthening the resilience of Indigenous communities in the face of social and economic change.



Woodchips being stockpiled for export, Eden, New South Wales.

Indicator 6.1a

Value and volume of wood and wood products

Rationale

This indicator measures the size and economic contribution of the wood products sector to Australia's economy. Analysis of trends in the value and volume of wood and wood products enables socio-economic benefits derived from the forest industry to be assessed.

Key points

- A total of 26.6 million cubic metres of logs were harvested in Australia in 2010–11, a decrease from 27.2 million cubic metres in 2006–07. Over this period, the volume of hardwood logs harvested from native forests declined from 8.6 million cubic metres to 6.3 million cubic metres, a decrease of 26%. In comparison, the volume of logs harvested in softwood and hardwood plantations (plus native forest softwoods) increased from 18.6 million cubic metres to 20.2 million cubic metres, an increase of 8.6%. In 2010–11, 76% of the volume of logs harvested in Australia was from plantations.
- The value of logs harvested from native forests and plantations increased by 8.1% over the period, from \$1.71 billion in 2006–07 to \$1.85 billion in 2010–11¹³³. However, adjusting to 2010–11 prices (that is, adjusting for inflation), the value of logs decreased by 3.9%, from \$1.93 billion to \$1.85 billion in 2010–11.
- Industry turnover (sales and service income) of the wood and wood products industries increased from \$21.2 billion to \$24.0 billion between 2006–07 and 2010–11, an increase of 13.6%. Adjusting to 2010–11 prices, the turnover in these industries increased by 0.9% from \$23.8 billion to \$24.0 billion over the period.
- The value added by the wood and wood products industries in 2006–07 was \$7.4 billion, a contribution to Australia's gross domestic product of 0.68%. The value added in 2010–11 was \$8.3 billion, representing a contribution to gross domestic product of 0.59%.

This indicator presents information on the value and volume of wood and wood products that are directly generated by industry. Secondary or flow-on economic activity, such as turnover generated through indirect employment, is not examined. Estimates of value and volume of wood products are subject to various assumptions, as noted in figure legends; the assumptions for volume estimates may be different from the assumptions for value estimates.

Two estimates of value are presented in this indicator: 'actual' and 'adjusted to 2010–11 prices'. Actual values, often called 'nominal' values, are the values actually recorded in the reporting period, with no further adjustments. In comparison, the 'adjusted to 2010–11 prices' estimate indexes the actual values against the consumer price index (CPI), a measure of inflation on the price of goods and services over time. The CPI index is sourced from the ABS (2012a).

Contribution of the forest and wood products industry

The value added by the Australian forest and wood products industry was \$7.4 billion in 2006–07 ('Industry value added'¹³⁴), contributing 0.68% of Australia's gross domestic product (GDP) in that year. In 2010–11, this Industry value added increased to \$8.3 billion. However, because national GDP grew faster over this period, the contribution of the industry to Australia's GDP in 2010–11 was 0.59% (ABARES 2013a).

¹³³ Dollar amounts are not adjusted for inflation unless this is specified.

¹³⁴ In the context of SOFR 2013, 'Industry value added' omits some downstream parts of the industry, particularly wholesaling, retailing and value-adding (and thus the manufacturing of some commodities).

Harvested logs

A total of 26.6 million cubic metres of logs were harvested in Australia in 2010–11, a decrease from 27.2 million cubic metres in 2006–07 (Table 6.1; see Table 2.12 for more detail). More than half (56.4%) of logs harvested in Australia in 2010–11 were softwood, almost completely from plantations. The remainder was mostly hardwoods sourced from native forests (23.8%) and from plantations (19.8%). A very small proportion of the total log harvest is composed of native forest softwoods.

Australia's forest resource base has therefore changed in recent years. In 2006–07, the native forest hardwood log harvest contributed 31.4% of the total harvested log volume (8.6 million cubic metres), but this declined to 23.8% (6.3 million cubic metres) in 2010–11, a fall of around 26% (Figure 6.1). The largest falls in native forest hardwood harvest were in two main areas: logs harvested for woodchip export (Figure 6.14), and saw and veneer logs (Figure 6.6). Native forest hardwood logs for woodchip export declined from 4.7 million cubic metres to 3.2 million cubic metres between 2006–07 and 2010–11, a fall of 30.7%. Harvest of native forest hardwood saw and veneer logs experienced the second largest fall (23.4%), from 2.9 million cubic metres to 2.3 million cubic metres. The decline in native forest hardwood log harvests corresponded with increases in log harvests from Australia's hardwood plantation estate (Figure 6.1), which rose from 4.1 million cubic metres in 2006-07 to 5.3 million cubic metres in 2010–11. The largest change came from a higher harvest of hardwood plantation logs for woodchip export, which increased from 3.6 million cubic metres to 4.9 million cubic metres between 2006-07 and 2010-11. Harvest of softwood logs from both native and plantation forests also increased 2.7% from 2006-07 to 2010-11, from 14.6 million cubic metres to 15.0 million cubic metres. Overall, the volume of logs harvested in softwood and hardwood plantations (plus the small proportion of harvested native forest softwood) increased from 18.6 million cubic metres in 2006-07 to 20.2 million cubic metres in 2010-11, an increase of 8.6%, and 76% of the volume of logs harvested in Australia in 2010-11 was from plantations.

The actual value of harvested logs increased by 8.1% between 2006–07 and 2010–11, from \$1.71 billion to \$1.85 billion. However, the adjusted value of harvested logs, indexed to 2010–11 prices, declined by 3.9% from \$1.93 billion to \$1.85 billion over the period (Figure 6.2).

The largest contributors to Australia's total log harvest in 2010–11, in both volume and value terms, were Victoria, New South Wales, Tasmania and Western Australia (Figures 6.3 and 6.4). The average value of logs differs in different states, due largely to differences in the type of log harvested (such as softwood or hardwood) and wood source (such as native forest or plantation).

Table 6.1:	Volume	of loas	harvested	by loa	tvpe
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Log type		Volu ('000	me harvested cubic metres)		
	2006–07	2007–08	2008–09	2009–10	2010–11
Native forest hardwood ^a	8,551	8,940	7,739	6,589	6,326
Hardwood plantation	4,052	4,270	4,746	4,555	5,259
Softwood plantation ^b	14,590	15,157	13,314	14,433	14,981
Total	27,192	28,368	25,799	25,577	26,567

a Does not include the small proportion of native forest softwood logs reported in this Indicator under softwood plantation.

^b Includes a small proportion of native forest softwood logs.

Note: Totals may not tally due to rounding.

Source: ABARES (2013a).



Native and plantation forest near Bright, Victoria.

Figure 6.1: Volume of logs harvested, 2006–07 to 2010–11



Note: Softwood plantation logs include a small proportion of native forest softwood logs. Source: ABARES (2013a).

Figure 6.2: Value^a of logs harvested, actual and adjusted, 2006–07 to 2010–11



^a Estimated gross value of logs delivered to mill door or wharf gate.

Source: Adjusted values are indexed to 2010–11 prices using actual values reported in ABARES (2013a) and the consumer price index as reported in ABS (2012a).



Figure 6.3: Volume of logs harvested, 2010–11, by jurisdiction

Figure 6.4: Value of logs harvested, 2010–11, by jurisdiction



Wood products

Turnover ('sales and service income') in the Australian wood and wood products industries (defined according to the Australian and New Zealand Standard Industrial Classifications given in Figure 6.5) increased from \$21.2 billion to \$24.0 billion between 2006–07 and 2010–11, an increase of 13.6% (Figure 6.5; ABARES 2013a). After adjusting to 2010–11 prices, the turnover in these industries increased by 0.9% over the period, from \$23.8 billion to \$24.0 billion. The wood and wood products industries contributed 5.7% of total national value added of manufacturing in 2006–07, and 6.2% in 2010–11 (ABARES 2013a).

Sawn wood

The total production of sawn wood declined from 5.2 million cubic metres in 2006–07 to 4.6 million cubic metres in 2010–11. There was a small decline in sawn softwood production, from 4.0 million cubic metres in 2006–07 to 3.8 million cubic metres in 2010–11 (a decrease of 4.6%). In comparison, sawn hardwood production experienced a larger decline, from 1.2 million to 730 thousand cubic metres (36.6%) (Figure 6.6).

Changes in sawn hardwood and softwood production over the period reflect the response of the wood products industry to competitive pressures, expectations of future wood product demand and log supply (Burns and Burke 2012), and resource availability. Over the reporting period, growing interest in forest conservation in Australia has reduced access to native forest for wood production, thereby reducing the amount of hardwood sawlogs available for the industry. The hardwood plantation estate, which is estimated to have harvested 5.3 million cubic metres of hardwood logs in 2010–11, supplied only around 38 thousand cubic metres of sawlog. The remainder was pulplogs for domestic paper production, wood-based panels, and woodchip export (ABARES 2012g).

In comparison, the sawn softwood industry relies almost entirely on plantations, and is thus less sensitive to reductions in native forest access. However, easing activity in housing construction—a major consumer of sawn softwood—over the reporting period, as well as relatively cheaper imports because of the high value of the Australian dollar later in the reporting period, have also increased competitive pressure on the sawn softwood industry.

The actual value of sawn wood production increased from \$3.7 billion to \$3.8 billion between 2006–07 and 2010–11 (Figure 6.7).



A sawmill employee grading freshly sawn timber.

Figure 6.5: Value of turnover in wood and wood products industries^a, 2006–07 to 2010–11



 The wood and wood products industries relate here to the Australian and New Zealand Standard Industrial Classification 2006 Division A, Subdivision 3—forestry and logging; Division C, Subdivision 14—wood product manufacturing; and Division C, Subdivision 15—pulp, paper and paperboard manufacturing (Trewin and Pink 2006).

Source: Adjusted values are indexed to 2010–11 prices using actual values reported in ABARES (2013a) and the consumer price index (CPI) as reported in ABS (2012a).





Note: Hardwood logs are the total of native forest hardwood logs and hardwood plantation logs. Softwood plantation logs include a small proportion of native forest softwood logs.

Source: ABARES (2013a).

Figure 6.7: Value^a of sawn wood production^b, 2006–07 to 2010–11



^a Values are expressed in terms of turnover.

^b Sawn wood production relates here to the Australian and New Zealand Standard Industrial Classification 2006 Division C, Subdivision 14/1411—log sawmilling; and Division C, Subdivision 14/1413—timber re-sawing and dressing (Trewin and Pink 2006).

Source: Adjusted values are indexed to 2010–11 prices using actual values reported in ABARES (2013a) and the consumer price index as reported in ABS (2012a).

Wood-based panels

The total volume of wood-based panel production was reasonably steady in the period 2006–07 to 2010–11, although there were changes in the mix of products. The establishment of new infrastructure and the commissioning of two export veneer mills in 2007–08 by Ta Ann led to a significant increase in veneer production and export (mostly to Malaysia). Medium-density fibreboard was the only product that declined in production over the period, from 680 thousand cubic metres in 2006–07 to 605 thousand cubic metres in 2010–11 (Figure 6.8).

The actual value of Australia's wood-based panel production increased from \$1.5 billion in 2006–07 to \$1.6 billion in 2010–11 (Figure 6.9).



Timber framing used in building construction.



Figure 6.8: Volume of wood-based panel production, 2006–07 to 2010–11

Source: ABARES (2013a).





Values are expressed in terms of turnover.

 Wood-based panel production relates here to the Australian and New Zealand Standard Industrial Classification 2006
Division C, Subdivision 14/1493—plywood and veneer; and Division C, Subdivision 14/1494—reconstituted wood products (Trewin and Pink 2006).

Source: Adjusted values are indexed to 2010–11 prices using actual values reported in ABARES (2013a) and the consumer price index as reported in ABS (2012a).

Paper and paperboard products

In 2010–11, Australia produced 3.2 million tonnes of paper and paperboard, consisting of newsprint, printing and writing papers, household and sanitary products, and packaging and industrial products. Of these products, production of packaging and industrial goods increased the most, from 1.9 million tonnes in 2006–07 to 2.2 million tonnes in 2010–11 (Figure 6.10). In comparison, the production of printing and writing goods decreased from 693 thousand tonnes to 342 thousand tonnes—that is, by 50.6%—over the period, the largest fall in production within this reporting category.

The actual value of Australia's paper and paperboard production increased from \$9.6 billion in 2006–07 to \$10.9 billion in 2010–11, a 13.7% increase. However, when indexed to 2010–11 prices, the value increased more modestly, from \$10.8 billion in 2006–07 to \$10.9 billion in 2010–11, after declining for most of the period (Figure 6.11).



Newsprint and printing paper products.

Figure 6.10: Volume of paper and paperboard production, 2006–07 to 2010–11



Source: ABARES (2013a).





a Values are expressed in terms of turnover.

Paper and paperboard production relates here to the Australian and New Zealand Standard Industrial Classification 2006 Division C, Subdivision 15/1510—paper and paper product manufacturing (Trewin and Pink 2006).

Source: Adjusted values are indexed to 2010–11 prices using actual values reported in ABARES (2013a) and the consumer price index (CPI) as reported in ABS (2012a).

Pulpwood for domestic pulp and paper manufacturing

The volume of pulplogs harvested for domestic pulp and paper production increased by 32.1%, from 3.1 million cubic metres in 2006–07 to 4.1 million cubic metres in 2010–11. Throughout the period, softwood plantations contributed more than 70% of pulp for domestic pulp and paper manufacturing each year. The remaining 30% is sourced from native forests and hardwood plantations (Figure 6.12).

The actual value of pulpwood harvested for pulp and paper manufacture increased from \$131 million to \$189 million between 2006–07 and 2010–11. In comparison, the adjusted value of the pulpwood, indexed to 2010–11 prices, increased from \$147 million to \$189 million (Figure 6.13).

Pulpwood for exported woodchips

In 2010–11, Australia exported 9.4 million tonnes of woodchips, compared with 9.6 million tonnes in 2006–07. Of this, softwood woodchip exports decreased from 1.3 million tonnes in 2006–07 to 1.2 million tonnes in 2010–11 (a decrease of 3.8%), and hardwood woodchip exports decreased from 8.3 million tonnes to 8.1 million tonnes (a decrease of 2.5%) over the same period (Figure 6.14).

The value of both softwood and hardwood woodchip exports decreased between 2006–07 and 2010–11. The actual value of hardwood woodchip exports decreased from \$795 million in 2006–07 to \$766 million in 2010–11. Indexed to 2010–2011 prices, the value of hardwood woodchip exports decreased from \$894 million in 2006–07 to \$766 million in 2010–11 (Figure 6.15).

The actual value of softwood woodchip exports decreased from \$155 million in 2006–07 to \$119 million in 2010–11 (Figure 6.16).

Figure 6.12: Volume of pulpwood for domestic pulp and paper manufacturing, 2006–07 to 2010–11



Note: Softwood plantation logs include a small proportion of native forest softwood logs. Source: ABARES (2013a).





^a Estimated gross value of logs delivered to mill door or wharf gate.

Source: Adjusted values are indexed to 2010–11 prices using actual values reported in ABARES (2013a) and the consumer price index as reported in ABS (2012a).





Source: ABARES (2013a).





^a Values are expressed in terms of free-on-board value.

Source: Adjusted values are indexed to 2010–11 prices using actual values reported in ABARES (2013a) and the consumer price index as reported in ABS (2012a).





^a Values are expressed in terms of free-on-board value.

Source: Adjusted values are indexed to 2010–11 prices using actual values reported in ABARES (2013a) and the consumer price index as reported in ABS (2012a).

Indicator 6.1b

Values, quantities and use of non-wood forest products

Rationale

This indicator measures the quantities, values and usage of non-wood products. It enables socio-economic benefits to be monitored by ascertaining trends in quantities, values and usage of non-wood products.

Key points

- Many Australian non-wood forest products (NWFPs) are commercialised, including for emerging export markets.
- Some NWFP industries are based, partly or wholly, on wild harvesting and hunting, including of animals that are considered to be pests, such as wild pigs and deer.
- The most recent estimate of the gross annual value of production of NWFPs regarded as having high forest dependence was \$198 million.
- In 2010–11, Australia's emerging plant industries had an estimated gross value of production of about \$530 million, and the emerging animal industries had an estimated gross value of production of \$382 million. Because these data on emerging industries include data on non-forest plants and animals as well as data on forest plants and animals, the values provide an upper limit to the value of emerging NWFP industries.

Non-wood forest products (NWFPs) are products of biological origin other than wood derived from forests. In some countries, NWFPs are still harvested predominantly for subsistence purposes. In Australia, however, many NWFPs have been commercialised and are traded both domestically and internationally (Hansda 2009, RIRDC 2010). This indicator provides an overview of selected commercialised NWFPs; there are insufficient data to examine other NWFPs.

Additional information about the sustainability of NWFPs is presented in Indicators 2.1c and 2.1d. Case study 6.4 in Indicator 6.1d covers the native plant food industry. Some tree-based industries—such as horticultural crops—are not discussed in this indicator because they are not generally based on forests and are regarded as distinct from the forest industry.

Classification of non-wood forest products

Not all products reviewed in this indicator are fully forestdependent, because some of the plants and animals on which they are based also exist outside forests. Data limitations are a major barrier to providing a complete measure of the harvested quantities, market value and usage of NWFPs.

The non-exhaustive list of NWFPs in Table 6.2 features products considered to have high forest dependence or to be derived from forest-based animal and plant stocks. The estimated gross value of production of these products was \$126 million in 2006–07 and \$198 million in 2011–12. These figures do not include forest-related production in the kangaroo and wallaby industry (discussed below). A component of the buffalo and goat industry (Foster in press) comprising the harvest of feral animals would also derive from forests, but these industries are not reported here. Table 6.2: Estimated gross value of production of selected non-wood forest products

	Value (\$ '000)		
Sector	2006–07	2011–12	
Crocodiles	10,179	51,859	
Deer	3,047	1,659	
Game pigs	12,738	8,697	
Eucalyptus oil	1,100	1,260	
Tea-tree oil	11,021	12,132	
Native bush foodsª	6,828	17,915	
Sandalwood	9,906	14,740	
Honey and beeswax	70,000	85,000	
Truffles	1,640	5,152	
Total	126,459	198,414	

^a See Case study 6.4 in Indicator 6.1d for further discussion of this industry. Note: Gross value of production is the value placed on recorded production at the wholesale prices realised in the marketplace, where the marketplace is at a market point to be consumed locally or exported, refers to a raw material for a secondary industry, or is at a market point before being value-added by an industry. In many cases, the value of production of an industry will be less than the value of exports because of substantial value-adding through processing before export.

Source: ABARES (2013b), Foster (in press).

Crocodiles

The Australian crocodile industry is mostly farm-based, but wild crocodile eggs are also harvested. The industry raises mainly saltwater crocodiles (*Crocodylus porosus*) for skin products, meat and eggs, although a few farms also raise freshwater crocodiles (*C. johnstoni*) (Shim-Prydon and Camacho-Barreto 2007). Saltwater crocodile eggs can be considered NWFPs because they are often taken from forested (melaleuca) wetlands (SOFR 2008).

The Australian crocodile industry produced 23,278 hides in 2006–07 and 48,532 hides in 2011–12 (Table 6.3), of which about 74% was exported in 2011–12. The major end market for Australian crocodile skins is the manufacture of high-quality leather goods, some of which are exported. Other parts of the crocodile (such as teeth, skulls and feet) are used as components in accessories, jewellery, medicine, the food industry (see below) and the production of oils. Australian crocodile meat production, exports and domestic consumption in 2006–07 and 2011–12 are shown in Table 6.4.

Table 6.3: Australian crocodile hide production and exports, 2006–07 and 2011–12

Product statistic	2006–07	2011–12
Production		
Number of hides (saltwater and freshwater)	23,278	48,532
Exports		
Number of hides (freshwater)	3	516
Number of hides (saltwater)	20,479	36,044
Number of leather pieces	88	3

Source: ABS (2013), Foster (in press).

Table 6.4: Australian crocodile meat production, exports and domestic consumption, 2006–07 and 2011–12

Product statistic	2006–07	2011–12
Production (tonnes)	116.4	243.0
Exports (tonnes)	12.6	25.9
Domestic consumption (tonnes) ^a	103.8	217.1

Domestic consumption is calculated as production less exports.
Source: ABS (2013), Foster (in press).

The Northern Territory reported a harvest of

36,796 crocodile eggs from farms and the wild in 2010–11 (Table 6.5). The major market for crocodile eggs is food consumption. To help prevent overharvesting, the Northern Territory Government regulates the harvest of crocodile eggs by requiring and managing permits for harvest.

Table 6.5: Crocodile egg harvest, from farms and the wild, Northern Territory, 2006–07 to 2010–11

Period	2006–07	2007–08	2008–09	2009–10	2010–11
Number of eggs	40,702	37,608	33,117	33,078	36,796

Source: Northern Territory Department of Natural Resources, Environment, the Arts and Sport.

Deer

Deer are raised on farms for consumer markets. In some parts of Australia, wild (feral) deer are a pest species. The main products from deer farming are venison and velvet antler. Australia's herd comprises approximately 50% fallow deer (*Dama dama*), 40% red deer (*Cervus elaphus*), 7% rusa deer (*C. timorensis*), and 3% elk (*C. canadensis*) (Foster 2009).

Feral deer are common and widespread in forested areas of Queensland, South Australia, Tasmania and Victoria (Figure 6.17); they are less common in New South Wales and Western Australia (NLWRA 2008). Feral deer are commonly hunted for recreation and as a method of pest management.



Saltwater crocodile, Kakadu National Park, Northern Territory.

Figure 6.17: Location of feral deer populations, Australia



Table 6.6 shows the volume of venison production, exports and consumption, as well as the number of live deer and deer hides exported, in 2006–07 and 2011–12. Volumes in Table 6.6 include venison sourced from commercial deer farms. Australia also imports venison from New Zealand, but no data are available on the quantity or value of that trade.

Table 6.6: Venison production, exports and consumption, and exports of live deer and deer hides, 2006–07 and 2011–12 $\,$

Product statistic	2006-07	2011–12
Venison production (tonnes) ^a	616	223
Venison exports (tonnes) ^a	523	190
Domestic venison consumption (tonnes) ^b	93	33
Live deer exports (number)	404	0
Deer hide exports (number)	16,989	4,415

^a Venison production and exports are reported as hot carcass weight.

^b Venison consumption is calculated as venison production less venison exports. Notes:

Australia imports venison from New Zealand, but no data are available on the quantity or value of venison imports.

The proportion of wild harvest from forests is unknown.

Source: Foster (in press).

Velvet antlers are widely used in traditional Asian medicines. In 2006–07 and 2011–12, Australia exported nearly its entire production of velvet antlers, and apparent domestic consumption was around 510 kilograms (Table 6.7). However, actual domestic consumption of deer antlers may be higher as a result of imports (the extent of which is not reported) or use of previously held inventories.

Table 6.7: Velvet antler production, exports and consumption, 2006–07 and 2011–12 $\,$

Product statistic	2006–07	2011–12
Production (kg)	20,877	12,089
Exports (kg)	20,361	11,577
Domestic consumption (kg) ^a	516	512

• Domestic consumption is calculated as production less exports.

Source: Foster (in press).

Figure 6.18: Location of feral pig populations, Australia



Game pigs

The game pig industry is based on the harvest of feral pigs (*Sus scrofa*), primarily in northern and eastern Australia, where they are more prevalent (Figure 6.18). This industry is distinct from the mature Australian pork industry, which has more stringent health and safety requirements for its products. Game pigs are hunted for their meat, as a recreational activity and as a pest management practice.

Table 6.8 shows the number of reported game pig kills, and game pig meat production, exports and consumption, in 2006–07 and 2011–12. Almost all the production was exported. Domestic consumption for both periods was 20 tonnes.

Table 6.8: Number of game pig kills, and game pig meat
production, exports and consumption, 2006–07 and 2011–12

Product statistic	2006-07	2011–12
Kills (number)	165,300	112,400
Meat production (tonnes)	2,066	1,405
Meat exports (tonnes)	2,046	1,385
Domestic meat consumption (tonnes) ^a	20	20

 Domestic consumption is the implied level of consumption, calculated as production less exports.
Source: Foster (in press).

Kangaroo and wallaby

Kangaroos and wallabies are harvested from the wild by shooters. An industry has developed over the past 30 years from this harvest, producing meat for human consumption and pet food, and skins. Kangaroos and wallabies are harvested under a quota system administered by the state, territory and Australian governments, based on the principles of sustainability (see Indicator 2.1d).

Kangaroos (common wallaroo or euro, *Macropus robustus*; eastern grey kangaroo, *M. giganteus*; red kangaroo, *M. rufus*; and western grey kangaroo, *M. fuliginosus*) are harvested commercially for meat and skins in New South Wales, Queensland, South Australia and Western Australia. Bennett's wallaby (*M. rufogriseus*) and the Tasmanian pademelon (*Thylogale billardierii*) are commercially harvested in Tasmania from Flinders and King islands. All these species dwell in both forests and non-forests, and are common and not endangered. Other kangaroo and wallaby species are protected from commercial harvesting.

The total commercial harvest of kangaroos was 1.77 million in 2011–12, with a gross value of \$28.6 million, around 50% less than figures reported in 2005–06 (Table 6.9). The value of exports of kangaroo products (meat and skins) decreased from \$99 million in 2006–07 to \$47 million in 2011–12. Export destinations for kangaroo meat in 2011–12 were South Africa (28% of total exports), Germany (19%), Netherlands (17%), Papua New Guinea (14%), and Belgium (11%) (Foster in press). Kangaroo skins are now the largest component of the kangaroo export industry by value, with exports totalling \$25.7 million in 2011–12. The proportion of production and value from kangaroos derived from forests (animals living or sheltering in forests) is unknown.

Wallabies are commercially harvested for meat and skin. Agreed quotas and numbers of wallabies harvested (including pademelons) are based on management plans (see Indicator 2.1d). Export of wallaby product from Tasmania ceased after 2007–08. The Tasmanian Government allows harvesting of wallabies for the domestic market, provided the harvesting is within sustainable levels. Production of wallaby meat in Tasmania was estimated to be around 29 tonnes in 2011–12, and the gross value of wallaby production was \$250,000 (Table 6.10).



Kangaroo skin, the largest component of the kangaroo export industry.

Table 6.9: Kangaroo products: production, export and value, Australia

Product statistic	2005–06	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12
Harvest							
Harvest quota ('000)ª	3,809	3,641	3,765	4,264	4,141	3,870	5,408
Harvest ('000)	3,431	3,017	2,674	2,516	1,985	1,752	1,768
Gross value of production (\$'000)	59,843	54,073	35,665	45,232	25,765	27,869	28,646
Meat production							
Human consumption (tonnes)	15,567	16,176	16,968	15,920	10,863	9,237	12,350
Pet food (tonnes)	21,648	16,344	11,419	10,572	9,238	8,052	5,320
Total <mark>(tonnes)</mark>	37,215	32,520	28,387	26,492	20,101	17,290	17,670
Exports							
Meat <mark>(tonnes)</mark>	11,445	13,788	12,289	8,873	3,907	2,983	4,525
Pet food (tonnes)	607	585	327	405	213	133	328
Hides, skins, leather ('000 pieces)	2,691	2,505	2,524	1,895	1,535	1,372	1,827
Total export value (\$'000)	92,958	99,223	89,367	77,672	43,599	36,093	46,553

• Quota figures are for calendar year—for example, quota in 2011-12 refers to quota for 2012; includes sustainable quotas and special quotas.

Source: Foster (in press); Australian Bureau of Agricultural and Resource Economics and Sciences databases, using data from the Australian Bureau of Statistics; Australian Government Department of Sustainability, Environment, Water, Population and Communities; Levies Revenue Service.

	Table 6.10: Wallaby	/ products ^a :	production,	export and	value.	Tasmania
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Product statistic	2005–06	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12
Harvest							
Harvest quota (number) ^b	34,750	27,000	0	26,000	10,000	0	0
Harvest (number) ^b	9,054	10,180	0	6,360	9,223	9,500	10,000
Meat (tonnes) ^b	20.9	23.7	20.7	22.1	22.1	27.7	28.6
Gross value of production (\$'000)	226	255	-	129	231	238	250
Exports							
Meat (tonnes)	5	0	0	0	0	0	0
Hides, skins, leather (pieces)	0	0	250	0	0	0	0
Total export value (\$'000)	59	0	6	0	0	0	0

- = not available

Includes pademelon.

^b Data as reported in source.

Source: Foster (in press); FPA (2012a); Australian Bureau of Agricultural and Resource Economics and Sciences databases, using data from the Australian Bureau of Statistics; Australian Government Department of Sustainability, Environment, Water, Population and Communities; Levies Revenue Service.

Beekeeping

There is a significant beekeeping industry in most states of Australia, producing products such as honey, dried pollen, beeswax, royal jelly, propolis and bee venom. The industry also performs (often paid) pollination services, and there is a trade in queen and packaged bees. An estimated 80% of Australia's honey is derived from eucalypts and related species (Somerville 2010).

In 2008, the estimated production of honey in Australia was 21,000 tonnes, of which 7,800 tonnes was exported. An estimated 4,411 tonnes of honey was imported in that year; domestic consumption, therefore, was 17,611 tonnes (Table 6.11). Production of honey in 2011–12 was 23,872 tonnes, imports were 3,638 tonnes, exports were 4,879 tonnes, and consumption was 22,631 tonnes. Australia also manufactures honey-based products for both domestic and international markets. Table 6.11 shows domestic distribution of honey to end-use markets. Supermarkets and other retail outlets constituted 68% of the domestic market in 2008 and 74% in 2011–12.

Table 6.11: Volume of Australian honey production, export, import and consumption, 2008 and 2011–12

	(toni	nes)
Product statistic	2008	2011–12
Farm gate		
Production	21,000	23,872
Imports	4,411	3,638
Exports	7,800	4,879
Bulk	3,510	2,683
Packed	4,290	2,195
Domestic consumption ^a	17,611	22,631
End-use market		
Processing/manufacturing	4,774	5,000
Supermarkets	9,198	10,184
Other retail	2,759	6,547
Food services	880	900
Total end-use market	17,611	22,631

 Consumption is calculated as production plus imports less exports.
Source: ABS (2013), Kneebone (2010), Australian Bureau of Agricultural and Resource Economics and Sciences databases.

Eucalyptus oil

Eucalyptus oil is an essential oil extracted from the leaves of species of *Eucalyptus*. It is used in perfumes, as a topical treatment in therapy, and as a food additive and industrial chemical. Other Australian essential oils are sandalwood, tea-tree and boronia.

Table 6.12 shows Australia's production, exports and consumption of eucalyptus oil in 2006–07 and 2011–12. Exports of Australian eucalyptus oil include re-exports, such as after reprocessing activities undertaken in southern Africa. Australia is also reported to import eucalyptus oil, but no data on the quantity of such imports are available (RIRDC 2008a).

Table 6.12: Eucalyptus oil production, exports and consumption, 2006–07 and 2011–12

	(tonnes)				
Product statistic	2006–07	2011–12			
Production	103	120			
Exportsª	83	149			
Domestic consumption ^b	20	n			

n = negative, more export than production

^a Includes re-exports; could also include stock from previous year.

Consumption is calculated as production less exports.

Note: Import data for eucalyptus oil were unavailable in both periods. Source: ABS (2013), Foster (in press).

Tea-tree oil

Tea-tree oil from *Melaleuca* species has applications in the pharmaceutical industry because of its antiseptic and anti-inflammatory properties (RIRDC 2007b). It is used in topical treatments to treat fungal, bacterial and viral infections, as well as bruises and skin allergies. It also has industrial applications, such as in solvents and disinfectants.

Table 6.13 presents data on production, exports and consumption of Australian tea-tree oil in 2006–07 and 2011–12. More tea-tree oil was exported in 2006–07 than was produced annually, implying export of stored stock. Consumption in 2011–12 was 27 tonnes.

Table 6.13: Tea-tree oil production, exports and consumption, 2006–07 and 2011–12

	(tonnes)		
Product statistic	2006–07	2011–12	
Production	379	400	
Exports ^a	446	373	
Domestic consumption ^b	n	27	

n = negative, more export than production

 Figures in 2006–07 include exports of 'other essential oils', as reported by New South Wales and Queensland (which are Australia's largest producers of tea tree oil).

Consumption is calculated as production less exports.

Source: ABS (2013), Foster (in press).

Sandalwood products

Australia's current sandalwood production comes primarily from harvesting of native stands of *Santalum spicatum* in Western Australia and *S. lanceolatum* in Queensland. Indicator 2.1d provides detailed national production figures from 2005–06 to 2011–12. Western Australia produces most of the sandalwood in Australia (Table 6.14). Harvesting in Western Australia is based on an allowable cut as specified in the *Sandalwood (Limitation of Removal of Sandalwood) Order 1996* under the *Sandalwood Act 1929* (Indicator 2.1c), and an inquiry into the industry is in progress (WA Legislative Council 2012). Indicator 2.1c discusses the sustainability of sandalwood production in Western Australia. Around 130 tonnes of *S. lanceolatum* was harvested in Queensland in 2011–12, the smallest harvest since 2006–07. Sandalwood harvesting in Queensland is regulated by the state government, and the production quota is around 550 tonnes.

In 2012, there were more than 15 thousand hectares of *S. spicatum* plantations in Western Australia; there were also more than 8 thousand hectares of *S. album* plantations, mostly in Western Australia (Foster, in press). These plantations are reported in the 'Other forest' category in Indicator 1.1a. The first major harvestings of plantation sandalwood are expected for *S. album* in 2013 or 2014 (Foster in press).

Table 6.14 presents the estimated annual value, supply, consumption and export of Australian sandalwood for the period 2005–06 to 2011–12. The sandalwood harvest in Australia during this period varied from 2,459 tonnes to 3,073 tonnes, with 480–930 tonnes consumed domestically each year. Sandalwood oil production ranged from 10.6 tonnes in 2008–09 to 19.6 tonnes in 2010–11. Most of the oil was exported; domestic consumption of oil ranged from 0.6 tonnes to 2.0 tonnes annually (Table 6.14). The estimated gross value of production of sandalwood in Australia varied from \$9.9 million in 2006–07 to \$18.6 million in 2007–08, with the value in 2011–12 being



Australian sandalwood oil floating on residual aqueous condensate following extraction by steam distillation, Mt Romance Sandalwood Australia Pty Ltd factory, Albany, Western Australia.

\$14.7 million. The estimated value of Australian exports of sandalwood products in 2011–12 was \$21.6 million (Table 6.14). Around 60% of Australian sandalwood exports go to Taiwan, with Australia suppling 43% of Taiwan's sandalwood imports (Foster in press).

Table 6.14: Sandalwood production, value, consumption and exports, 2005–06 to 2011–12

Product statistic	2005–06	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12
Production							
Wood, Western Australia (tonnes)	2,512	2,369	2,269	2,601	2,857	2,864	2,814
Wood, Queensland (tonnes)	132	118	190	274	167	209	130
Total, wood (tonnes)	2,644	2,486	2,459	2,875	3,024	3,073	2,944
Sandalwood oil (tonnes)	14.0	14.0	12.0	10.6	19.2	19.6	15.7
Gross value of production (\$'000)ª	10,999	9,906	18,560	12,196	16,870	17,806	14,740
Export ^b							
Wood ^c							
Volume <mark>(tonnes)</mark>	1,944	1,786	1,909	2,395	2,114	2,143	2,210
Value (\$'000)	17,030	13,544	18,730	13,208	15,332	16,142	14,385
Unit value <mark>(\$/tonne)</mark>	8,760	7,582	9,814	5,514	7,253	7,532	6,508
Oil							
Volume <mark>(tonnes)</mark>	12	12	11	10	18	19	15
Value (\$'000)	9,600	9,600	5,775	5,117	8,673	8,920	7,252
Unit value <mark>(\$/kg)</mark>	800	800	1,050	1,066	953	959	988
Total							
Export value (\$'000)	26,630	23,144	24,505	18,325	24,005	25,063	21,636
Domestic consumption ^b							
Wood (tonnes) ^d	700	700	550	480	910	930	734
Oil (tonnes)	2	2	1	0.6	1.2	0.6	0.7

^a Gross value of production does not include added value of oil conversion.

^b Harvested sandalwood can be stored for a period of time before further trading, processing, domestic consumption or export. Product reported as exported may include material currently in storage prior to export or potential domestic processing. Domestic consumption is the implied level of consumption, calculated as production less exports.

^c Includes unprocessed wood and processed product such as sandalwood powder.

d Wood consumption is primarily converted to sandalwood oil.

Source: ABS (2013), Foster (in press), Australian Bureau of Agricultural and Resource Economics and Sciences databases.



Sandalwood use in ceremonial incense coils.

Other non-wood forest product-based industries

Australia produces a range of other non-wood products that are at least partly forest-dependent, including wildflowers, other native plants, herbs, spices, nuts, and vegetables and fruits as native bush foods, but limited information is available about these products. The Australian native bush food industry was estimated to have a gross value of production of \$17.9 million in 2011–12, up from \$6.8 million in 2006–07 (Foster 2009, Foster in press). This estimate includes the production of various Australian bush foods, including bush tomato, lemon aspen, lemon myrtle, muntries, native pepper, quandong, native mint, wattle seed, riberry, native citrus and wild plums. Some tree-based industries, such as horticultural crops, are generally regarded to be distinct from the forest industry.

Total value of emerging industries

Estimates of emerging animal and plant industries provide an upper limit to the total value of emerging NWFP-based industries, because many of these enterprises may use nonforest landscapes, such as rangelands and irrigated areas.

According to Foster (in press), Australia's emerging plant industries had an estimated gross value of production



Forest wildflower, Queensland.

(GVP) of about \$530 million in 2011–12, an increase from \$308 million in 2006–07. These industries include activities and products relating to native Australian flora, such as native flowers, bush food, native plant oils and sandalwood. Around 14% of total plant-based GVP for emerging plant industries was accounted for by essential oils (boronia, eucalyptus, teatree and sandalwood), bush foods (mainly lemon myrtle, but also bush tomato, Davidson's plum, Kakadu plum, mountain pepper, native limes, quandong and wattleseed: see Case study 6.4), and wildflowers and foliage, the majority of which are forest-dwelling species.

The GVP of the emerging animal industries (including seaweed and inland aquaculture) was estimated at about \$382 million in 2011–12, an increase from \$293 million in 2006-07. Nearly 90% of the GVP of emerging animal industries was from harvest of wild resources such as kangaroos, wallabies, wild pigs and feral goats (Foster in press). This estimate excludes the added value arising from the control of animal populations that can adversely affect agricultural systems and the environment. Around 12% of the estimated animal-based GVP was generated by the farming or wild harvesting of Australian native animals such as kangaroos, crocodiles, emus (farming only), possums, wallabies, Murray cod (farming only) and freshwater crustaceans (predominantly farmed), all of which are forest-dwelling species; farmed stock has been derived from wild stock.

Indicator 6.1c

Value of forest-based services

Rationale

This indicator measures forest-based services such as ecosystem services, carbon credits, salinity mitigation and ecotourism. Forest-based services provide economic values and contribute to the sustainability of forests by providing significant social and environmental benefits.

Key points

- In addition to providing wood and non-wood forest products, Australia's forests provide a range of other services, such as carbon sequestration, soil conservation, watershed protection, ecotourism and biodiversity conservation. These services can broadly be divided into amenity services and ecosystem services. Markets exist for few of these services.
- One way to measure the financial value of forest-based ecotourism is to estimate the number of people visiting forests in various tenures, and the amount they spend. Changes in visitor numbers can reflect changes in the perceived value of ecotourism.
- In general, there is limited data on the value attributed to forest-based services.

The services and benefits provided by forests can be categorised by a number of frameworks (Australia21 2012)¹³⁵. The Millennium Ecosystem Assessment (MEA 2005) defines ecosystem services as those processes of ecosystems that support (directly or indirectly) human wellbeing (Figure 6.19). A common classification of ecosystem services is into:

- supporting services (e.g. soil formation, nutrient cycling)
- provisioning services (e.g. provision of wood in growing trees, clean water in streams and rivers, genetic resources)
- regulating services (e.g. regulation of water flows)
- cultural services (e.g. recreation, ecotourism, amenity, aesthetic and heritage values).

Ecosystem services are provided by ecosystems without human input (e.g. supply of clean water, growth of trees). These services become benefits with human input (e.g. collection of water, harvesting of wood). Common ecosystem services in forests are provision of wood, non-wood forest products and wildlife habitat; provision of high-quality water; carbon sequestration and storage; and provision of recreation opportunities.

The concept of ecosystem services—how they are valued and their role—and the overall value of natural ecosystems is of growing interest to decision makers and the public with regard to how ecosystem services contribute to human quality of life and wellbeing (DEWHA 2009a). Some intermediate ecosystem services support other, final ecosystem services. Some, but not all, of these services or their associated benefits have a financial value or are tradable in markets. Case study 6.1 describes an approach to the valuation of forest-based ecosystem services in south-east Queensland.

¹³⁵ www.daff.gov.au/natural-resources/ecosystem-services.

In addition to providing wood for wood-based industries (considered in Indicator 6.1a) and non-wood forest products (considered in Indicator 6.1b), forests provide a wide range of environmental (ecosystem) services. Storage and sequestration of carbon is addressed further in Indicators 5.1a and 7.1c, water and soil are addressed in Indicators 4.1a–e, and a case study on valuation of water is included in this indicator (Case study 6.3).

The production of quantities of high-quality water is a good example of an environmental service derived from forests (Bren et al. 2011; Case study 6.3). Traditionally, many such services have been treated as public goods with little or no financial value, but more recently mechanisms have been developed to encourage payments for some of those services. These include government programs that pay landholders to manage forests and other types of native vegetation for environmental benefits. Other mechanisms will derive from legislation in regard to carbon emissions (see Indicator 7.1a), which may enable farmers and other landholders to receive payments for reducing greenhouse gas emissions through avoided deforestation and forest management, and for increasing carbon sequestration through reforestation and revegetation activities on their lands.

Ecotourism

The aesthetic quality of forests can be viewed as an amenity service that benefits the ecotourism sector. Ecotourism generates considerable benefits for communities by providing tourist services, as well by supporting complementary sectors such as restaurants and resorts (see Indicator 6.3b).

Tourist visits to national and state parks, and forests in other tenures, provide an indication of forest use for ecotourism, although not all national parks are fully forested (some contain no forest). Approximately 8 million visits were made by international and domestic tourists to forest destinations in New South Wales in both 2009 and 2010 (Table 6.15). In South Australia, the recorded number of visitors to state forests managed by ForestrySA declined over the five-year period to 2010–11 (Table 6.16).

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Figure 6.19: Millennium Ecosystem Assessment's overview of ecosystem services



Source: Millennium Ecosystem Assessment; redrawn by Fusebox, Melbourne, from DEWHA (2009a).

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Case study 6.1: The South East Queensland Ecosystem Services Project

The south-east Queensland (SEQ) region is rapidly developing, with an expected increase in population to 4 million by 2031 (DERM 2009), placing strong development pressures on ecosystems, resources and the environment. The *South East Queensland Natural Resource Management Plan 2009–2031* (DERM 2009) has as a guiding principle that 'The natural environment supplies a range of goods and services. These goods and services are known as "ecosystem services" and the preservation and management of these are essential for the region's response to climate change, long-term economic, social, cultural and environmental sustainability, and community quality-of-life'.

The South East Queensland Ecosystem Services Project commenced in 2005 (Maynard et al. 2010), to:

- identify, measure and value the ecosystem services provided by the SEQ region
- provide tools for a consistent approach to assessing ecosystem services in SEQ
- incorporate ecosystem services into natural resource decision-making in a way that addresses the need to protect, manage and enhance ecosystems in SEQ, while contributing to the general wellbeing of the regional human population.

The key aim of the project was to develop an ecosystem services framework based on concepts in the Millennium Ecosystem Assessment (MEA 2005), with modifications to make it more suitable for application at the regional scale and for the particular conditions of SEQ. This tool has enabled government, industry, business, researchers, non-government organisations and land managers to apply the concept of ecosystem services in management, planning and policy. In 2009, ecosystem services and the framework were incorporated into state planning policy through the statutory regional plan for managing growth and development in SEQ: the *South East Queensland Regional Plan 2009–2031* (QDIP 2009).

An adaptive participatory approach was adopted to develop the framework (Maynard et al. 2012), which included direct participation of experts and stakeholders. A detailed classification of ecosystems, ecosystem functions, ecosystem services and human wellbeing was undertaken. Other features of the approach included the use of relatively simple systems models based on subjective expert judgments about causal connections among key variables, transparency in reporting of results, and the generation of spatial information to support planning (Petter et al. 2012).

Ecosystem services were valued by experts and the community using a scoring and ranking system, with weighting applied based on the services' relative contributions to the wellbeing of the SEQ community. The framework is presented as linkages and weightings between its constituent parts. The baseline information supporting the framework can be revised dynamically using outcomes of management and planning decisions. Figure 6.20 illustrates these linkages using rainforest ecosystems. Outcomes of the South East Queensland Ecosystem Services Project are reported in more detail in Maynard et al. (2010, 2012) and Petter et al. (2012).



Figure 6.20: Ecosystem services and linkages

Note: This is a simplified model of links between functions occurring in a rainforest ecosystem, the services they have the potential to provide, and how this can contribute to human wellbeing (see www.ecosystemservicesseq com.au/constituents-of-well-being.html). Diagram for illustration only. Redrawn by Fusebox Design, Melbourne. © SEQ Catchments.

Table 6.15: International and domestic visitors to forest nature-based tourism destinations, New South Wales, 2009 and 2010

Destination	Number of visitors ('000)							
			2010					
	International	Domestic	Total	International	Domestic	Total		
National and state parks	1,327	1,853	3,180	1,379	1,794	3,173		
Botanical and public gardens	1,164	766	1,930	1,198	693	1,891		
Bushwalking/rainforest	807	1,982	2,789	815	2,136	2,951		
Total	3,298	4,601	7,899	3,392	4,623	8,015		

Source: Tourism NSW (2009, 2010).

Table 6.16: Visitors to state forests, South Australia, 2006–07 to 2010–11

Year	2006–07	2007–08	2008–09	2009–10	2010–11
Number of visitors ('000)	212	191	146	149	145

Notes:

The fall in visitor numbers after 2007–08 is partly a result of a change in the methodology to record visits to state forests in South Australia.

Figures shown are the number of visitors to Mount Lofty Ranges and Mid North forest reserves only; the number of visitors to Green Triangle forests is unrecorded. Source: SAFC (2007, 2008, 2009, 2010, 2011).

Markets for forest-based conservation services

A range of government programs that seek to enhance forestbased services provided by private land, such as biodiversity conservation, do so by allotting value to conservation actions with market-based mechanisms. These include programs that offer information support, positive branding or the opportunity for formal protection of land. Other programs offer a range of funding mechanisms, including direct payments and grants, reduced council rates, taxation benefits and in-kind contributions. In exchange for receiving this funding, landholders agree to undertake activities that promote biodiversity conservation, retention of native vegetation or improvements in natural resource management. Such initiatives usually have monitoring mechanisms to provide assurance that participants are meeting their conservation obligations. The BushBids program in South Australia is an example (see Case study 6.2).



Mel and Nick Crouch, working on their property at Finnis, Mount Lofty Ranges, South Australia, which is part of the BushBids program. The Eastern Mount Lofty Ranges BushBids program is run by the South Australian Murray Darling Basin Natural Resource Management Board.

Case study 6.2: BushBids supports biodiversity stewardship in the eastern Mount Lofty Ranges

The South Australian BushBids program for the eastern Mount Lofty Ranges is a market-based initiative to conserve native vegetation on private land. Its four main objectives are to:

- protect and enhance the biodiversity of the eastern Mount Lofty Ranges
- improve the condition of native vegetation
- increase the area of native vegetation actively managed for conservation
- increase the area of native vegetation protected in long-term conservation agreements.

Under the BushBids program, applicants negotiate and agree on 10-year management plans and actions for the conservation of native vegetation on their land, in return for financial payments. A cost–benefit score called the Biodiversity Benefits Index (BBI) is used to determine the relative value for money offered by each bid; the higher the BBI, the greater the biodiversity outcome.

Two BushBids rounds had taken place by the end of 2008, producing 39 successful bids, with management plans covering a total of 2,256 hectares of private forest land. The total amount invested in the program to 2008 was \$1,229,677. More locations have been included under subsequent rounds.

Source: O'Connor et al. (2008).

Case study 6.3: Valuation of water from forested catchments

Forest vegetation is intimately connected to the hydrological cycle on forest land, and forest management actions will be reflected in changes in hydrological flows. The common finding of many studies around the world is that forest harvesting leads to a decrease in site transpiration and hence an increase in stream flow. Regrowth forests of one Australian species—*Eucalyptus regnans* (mountain ash)—use more water than older forests of this species; this has been taken to be the case for other species as well but has not been so formally demonstrated. The broader link between forest transpiration and rainfall has also not yet been elucidated.

Quantification and valuation of water flowing from forests is always challenging (Bren 2009). The value of water when purchased through a tap or a bottle is fixed, but the value of water in the landscape is not. The following factors need to be taken into account.

- If river flows are already very high, the value of additional water is negligible—at times of flooding, it might even be negative.
- Water released or absorbed as a consequence of forest management activities is geographically dispersed and often only detectable at periods of high flows.
- As suggested by an Amazon Basin study (Rodriguez et al. 2010), water released as a consequence of forest modification can be absorbed by riparian (streamside) processes and may not reach a point of collection.
- Valuation of forested catchments involves a trade-off between water quality and water quantity—that is, these catchments produce clean and sustained stream flow but a lower volume of water than many other forms of land use.
- The outcome of forest water valuations depends heavily on the interest rate adopted, because of the long time periods involved in changing forest characteristics and thus the long time periods for a (water) return on (forest management) investment. Most successful valuations consider a range of interest rates but base their decisions essentially on public-good criteria—the function of the valuation is to provide insight on these criteria.

Many economists argue that the closest guide to the valuation of water in a river system is given by the 'spot water price' in irrigation areas. Typically, this fluctuates between zero and \$2,000 per megalitre, but a common historical price used to value water has been around \$200 per megalitre for water that is already in a storage location and with enough gravitational energy to flow to the purchaser (see for example Bren 2009). City users of river or dam water often pay a much higher price than irrigators, which can further complicate the valuation of water.

More dramatic examples of the marginal valuation of water from forested landscapes involve cities that are faced with drought or an inadequate catchment area, and have constructed large pipelines to remote areas, commissioned desalination plants or accessed deep groundwater. In these cases, there is a large energy component implicit in the cost of water delivered, and the marginal value of the water can be very high—typically \$5–10,000 per megalitre. Such solutions highlight the relative cheapness of water from traditional forested catchments, where the major cost is the simple collection and distribution of the water. Methods that might increase the yield of water from forested catchments but not impair conservation values are under investigation.

Source: Bren L.

Indicator 6.1d

Production and consumption, and import/export of wood, wood products and non-wood products

Rationale

This indicator measures the consumption of forest-based products in Australia. Consumption trends over time provide a measure of the ability of Australian forest and timber industries, through both domestic production and importation, to meet Australian society's demand for forest-based products and of the industries contribution to the economy.

Key points

- Australia is a net importer of wood and wood products. The total value of wood product imports increased from \$4.3 billion in 2006–07 to \$4.4 billion in 2010–11, and the total value of wood product exports increased from \$2.4 billion to \$2.5 billion (unadjusted for inflation). The trade deficit in wood products therefore increased slightly, from \$1.91 billion in 2006–07 to \$1.93 billion in 2010–11. This was due to an increase in imports of sawn wood and wood-based panels linked to the strong Australian dollar, and an oversupply of wood products in international markets as a result of a slowdown in the United States housing market, especially in the second half of the reporting period.
- The highest value export category for wood products in 2010–11 was woodchips (\$884.4 million). The largest share of the export woodchip trade in 2006–07 to 2010–11 went to Japan, but exports to China have increased in recent years.
- Printing and writing paper accounted for the largest proportion, by value, of Australia's imports of wood products in 2010–11 (30.6%).
- Consumption of sawn wood decreased by 6% between 2006–07 and 2010–11, from 5.3 million cubic metres to 5.0 million cubic metres. Consumption of hardwood sawn wood decreased from 1.23 million cubic metres in 2006–07 to 748 thousand cubic metres in 2010–11, but consumption of softwood sawn wood increased from 4.1 million cubic metres to 4.3 million cubic metres over this period.
- Information on the production, consumption and trade of non-wood forest products is often difficult to obtain because of the generally small size of industries based on these products and their dispersed nature.

This indicator reports on the production, consumption and trade of wood, wood products and non-wood products by product category. Categories of wood and wood products are sawn wood, wood based panels, and paper and paperboard. Because of their small size and highly dispersed nature, and (consequently) the relative lack of information about them, non-wood forest products are mostly dealt with in this report (including in Indicators 2.1d and 6.1b) in case studies.

Domestic consumption is assessed and reported by assuming that it equals domestic production plus imports minus exports. The production figures used in this indicator are those reported in Indicator 6.1a and sourced from ABARES (2012g).

Trade performance

Australia is a net importer of wood and wood products. The total value of imported wood products increased from \$4.3 billion in 2006–07 to about \$4.4 billion in 2010–11 (Figure 6.21). Most of the increase was driven by an increased demand for sawn wood and wood-based panels. A significant slowdown in the United States housing market, and a strong Australian dollar, made the Australian market an attractive destination for sawn wood from other countries, for at least the second half of the reporting period (Burke and Townsend 2011).

The value of wood and wood product exports increased from \$2.4 billion in 2006–07 to \$2.5 billion in 2010–11, primarily as a result of growth in exports of recovered paper and roundwood. The trade deficit in wood products increased slightly, from \$1.91 billion in 2006–07 to \$1.93 billion in 2010–11.

Australia's largest export wood product, by value, was woodchips (Table 6.17). Nevertheless, trade in this commodity declined in the wake of the slowdown that



Figure 6.21: Trade balance in wood and wood products, 2006–07 to 2010–11

Figure 6.22: Dwellings and housing commencements, 2006–07 to 2010–11



Source: ABARES (2012g).

occurred in many advanced economies in 2007–08. The Japanese paper industry, Australia's largest export market for woodchips, contracted after 2008; a number of Japanese paper mills closed permanently, and production moved to countries with domestic supplies of wood fibre. To some extent, the decline in exports to the Japanese market was offset by an increase in exports to China.

Sawn wood

Softwood sawn wood is commonly used in housing construction for wall frames and roof trusses. Hence, one of the key factors influencing consumption of sawn wood is domestic housing demand (Burke and Townsend 2011). Annual dwellings commencements, which include high-rise apartment blocks, were about 3% higher in 2010–11 than in 2006–07, but housing commencements (excluding multidwellings such as apartments) fell by 9% (Figure 6.22).

Hardwood sawn wood is generally used where strength is important and for decorative purposes—for example, for flooring, decking, joinery and furniture.

Table 6.17: Forest product exports, 2010-11

Product type	Export value (\$ million)	Proportion (%)
Woodchipsª	884.4	35.7
Roundwood	197.6	8.0
Recovered paper	240.0	9.7
Sawn wood		
Softwood sawn wood	71.7	2.9
Hardwood sawn wood	43.2	1.7
Wood-based panels		
Veneers	52.1	2.1
Plywood	1.7	0.1
Particleboard	2.4	0.1
Hardboard	2.1	0.1
Medium-density fibreboard	39.4	1.6
Softboard and other fibreboards	0.6	0.0
Paper and paperboard		
Newsprint	13.3	0.5
Printing and writing	88.4	3.6
Household and sanitary	94.0	3.8
Packaging and industrial	551.7	22.3
Other wood products	191.4	7.7
Total	2,474.1	100.0

^a See Indicator 6.1a.

Source: ABARES (2012g).





Note: Consumption = production plus imports less exports. Includes trade of roughsawn and dressed sawn wood. Source: ABARES (2012g).





Note: Consumption = production plus imports less exports. Includes trade of roughsawn and dressed sawn wood. Source: ABARES (2012g).

Australia's consumption of sawn wood decreased by 6% between 2006–07 and 2010–11, from 5.3 million cubic metres to 5.0 million cubic metres. Consumption of hardwood sawn wood decreased by 39.2% between 2006–07 and 2010–11, from 1.23 million cubic metres to 748.2 thousand cubic metres (Figure 6.23). In comparison, the consumption of softwood sawn wood increased by 4.3%, from 4.1 million cubic metres to 4.3 million cubic metres (Figure 6.24).

Wood-based panels

Wood-based panels are manufactured wood products such as medium-density fibreboard and particleboard. They have various applications, such as flooring, joinery (e.g. kitchen benches and cupboards), furniture and housing construction. The consumption of wood-based panels increased between 2006–07 and 2010–11 (Figure 6.25), from 1.9 million cubic metres to 2.1 million cubic metres. The increase in domestic demand was partly met by imports, which rose from 430 thousand cubic metres in 2006–07 to 480 thousand cubic metres in 2010–11. The consumption of medium-density fibreboard increased by 31% in the period 2006–07 to 2010–11, from 447 thousand cubic metres to 585 thousand cubic metres (Figure 6.26). Production and export of medium-density fibreboard fell over the same period, partly as a result of competition arising from the continued expansion, after 2002, of the Chinese wood-based panel industry (Low et al. 2011).

The annual production and consumption of particleboard varied similarly between 2006–07 and 2010–11, while imports were relatively steady (Figure 6.27). The biggest fall was in exports of particleboard, which fell by 71%, from 18 thousand cubic metres in 2006–07 to six thousand cubic metres in 2010–11.



Figure 6.25: Wood-based panel production, trade and consumption, 2006–07 to 2010–11

Note: Estimate includes decorative veneer and veneer production, which is mainly for export for plywood production (commenced in 2007–08). It excludes veneer produced domestically for plywood production in integrated plywood mills and laminated veneer lumber production (confidential from July 2003). Consumption = production plus imports less exports. Source: ABARES (2012g).



Figure 6.26: Medium-density fibreboard production, trade and consumption, 2006–07 to 2010–11

Note: Consumption = production plus imports less exports. Source: ABARES (2012g).





Note: Consumption = production plus imports less exports. Source: ABARES (2012g).

Paper and paperboard

The paper and paperboard category of wood products includes newsprint, printing and writing paper, household and sanitary paper, and wrapping and packaging paper. It excludes recovered paper, and paper and paperboard products used for construction and special purposes (such as kraft and special thin papers). Packaging and industrial paper accounted for 69%, by volume, of Australia's total paper and paperboard production in 2010–11; the remainder comprised newsprint (14%), printing and writing paper (11%), and household and sanitary paper (6%).

Australia produced 3.2 million tonnes of paper products in 2010–11, a decline of about 1.4% compared with 2006–07 (Figure 6.28). The consumption of paper products, which was about 4 million tonnes in 2006–07, also declined over the period (by 4.3%). However, consumption still exceeded domestic production.

Non-wood forest products

Non-wood forest products (NWFPs) include tree bark collected for paintings, sandalwood, seeds, bush flowers, furniture, native foods, bee products, water, minerals, and animal meat and skins (see also Indicators 2.1d and 6.1b). Several industries based on NWFPs have developed capacity to supply commercial markets. Case study 6.4 describes the native plant food industry, a proportion of which is based on forests.

In addition to provision of wood and non-wood forest products, forests provide a range of environmental services, such as carbon sequestration, visual amenity (of value, for example, to the ecotourism industry), soil conservation, water production, and the conservation of biodiversity and cultural heritage. See Indicator 6.1c for a further discussion on these environmental services.

Figure 6.28: Paper and paperboard production, trade and consumption, 2006–07 to 2010–11



Notes:

Consumption = production plus imports less exports. Excludes recovered paper. Source: ABARES (2012g).



Paper production

Case study 6.4: Native plant food industry

The native plant food industry cultivates, or harvests in the wild, the fruits, leaves and seeds of plants that are native to Australia. Table 6.18 lists the main commercially used native plant foods associated with forests. Some are mainly cultivated (such as aniseed myrtle, lemon myrtle and riberry), while a significant component of other native plant foods is collected by wild harvest. Most native plant foods are sold frozen, dried or milled—there is only low market interest in native fresh fruit and herbs.

Table 6.18: Commercially used native plant foods associated with forests

Species name	
Aniseed myrtle	Backhousia anisata
Davidson's plum	Davidsonia spp.
Kakadu plum	Terminalia ferdinandiana
Lemon aspen	Acronychia acidula and A. oblongifolia
Lemon myrtle	Backhousia citriodora
Native citrus	Citrus glauca, C. australasica and other C. spp.
Native pepper	Tasmannia lanceolata and other T. spp.
Riberry	Syzygium luehmannii
Quandong	Santalum acuminatum
Wattle seed	Acacia victoriae and other A. spp.

Source: Salvin et al. (2008).

The native food industry had an estimated gross value of production of around \$6.8 million in 2007, and there were about 500 active participants in the industry in 2008 (although this estimate excludes a large number of Indigenous Australian participants involved in the traditional cultivation and harvesting of native foods) (Foster 2009). Various factors limit the further commercialisation of native foods, including high harvesting costs, a lack of reliability of harvests and sustainability issues. Some foods that are already intensively cultivated, such as lemon myrtle, lack sufficient market interest to justify further expansion. There is also a limited international market for Australian native plant foods (RIRDC 2008b, 2010).

Growers of native foods are typically widely dispersed and isolated from each other. Information about the financial performance and position of the native food industry is difficult to obtain, although organisations such as the Australian Native Food Industry Limited, the Queensland Bush Food Association and the South Australian Native Food Association Inc. provide industry representation (RIRDC 2008b, 2010).



Packaged native plant foods from the Northern Territory.



Sandalwood (Santalum spicatum) tree with nuts, Western Australia.

Indicator 6.1e

Degree of recycling of forest products

Rationale

This indicator measures the extent to which recycling or reuse of forest products occurs. As global demand for forest products increase, there is a growing need to meet societal demands for recycling of forest products.

Key points

- Australia produced about 14.2 million cubic metres of woodchips and particles, and about 2.5 million cubic metres of wood residue in 2011. Some of these products were exported: 8.7 million cubic metres of woodchips and particles and 67 thousand cubic metres of wood residue were exported, with an export value of \$US791 million and \$US82 million, respectively.
- The collection rate of recycled paper and paperboard products increased from 66.3% in 2006–07 to 77.4% in 2010–11. The utilisation rate of this recovered material also increased, but by a smaller amount from 54.0% to 56.5%. An increase in exports of recovered paper, particularly to China, explains the difference between recovery and utilisation rates.
- Households reused and recycled more waste paper products in 2009 than in 2006. Australia-wide, household recycling and reuse increased from 91.5% to 95% over this period. The Northern Territory had the largest reported increase in household recycling and reuse, from 73.7% in 2006 to 93.1% in 2009.

This indicator measures the extent to which wood-based forest products such as structural timbers, pulp, paper and sawmill residue are recycled in Australia. Non-wood forest products may also be recycled or reused—for example, through composting for use in agriculture and floriculture —but the extent of this is not assessed in the indicator.

Industrial wood waste market

Industrial wood waste consists of wood residue left over after production. For example, sawmills process round logs to produce square or rectangular sawn wood, and so produce a range of by-products from this dimensional conversion process that can be either disposed of or reintegrated into the production cycle. Burns and Burke (2012) estimate that most of the residue produced in Australian sawmills is sold as woodchips. Some residue is also used as fuel in mill boilers for generation of heat and electricity, and for gardening, animal bedding or firewood.

The Food and Agriculture Organization of the United Nations (FAO) distinguishes two types of wood waste: woodchips and particles, and wood residue. 'Woodchips and particles' comprises wood waste that has deliberately been reduced to small pieces in the manufacture of other wood products, such as for pulping, engineered wood products such as particleboard and fibreboard, and fuel¹³⁶. 'Wood residue' comprises wood waste that has not been reduced to chips or particles, such as sawdust, sawmill rejects, edging and trimmings, and veneer log cores and rejects. There is ongoing research to identify new applications for industrial wood waste, such as biomass for input to electricity production.

A total of 14.2 million cubic metres of chips and particles and 2.5 million cubic metres of wood residue was produced in Australia in 2011 (Table 6.19). These estimates include all exports of woodchips and particles, including those from forests grown specifically for pulpwood production. Some

¹³⁶ This FAO's definition of woodchips and particle is thus wider than the ABARES definition of woodchips, which is confined to chips produced from logs (roundwood).

Table 6.19: Australian industrial wood waste production and trade, 2006-11

Product	2006	2007	2008	2009	2010	2011
Woodchips and particles ^a						
Production ('000 cubic metres)	16,563	17,181	19,679	18,088	13,696	14,178
Export quantity ('000 cubic metres)	11,524	12,191	12,282	9,549	10,404	8,732
Import quantity ('000 cubic metres)	14	13	39	22	28	40
Export value (US\$ '000)	677,871	834,279	956,834	669,929	834,965	790,752
Import value (US\$ '000)	1,514	908	1,879	1,044	1,232	1,929
Wood residue						
Production ('000 cubic metres)	2,633	2,300	2,300	2,300	2,577	2,466
Export quantity ('000 cubic metres)	3	5	3	11	59	67
Import quantity ('000 cubic metres)	4	4	3	2	3	4
Export value (US\$ '000)	166	346	563	1,316	6,371	8,208
Import value (US\$ '000)	1,514	908	1,879	1,044	1,232	1,929

Note: Estimates are subject to sampling and other errors.

• The FAO definition of woodchips and particles is wider than the ABARES definition of woodchips, which is confined to chips produced from logs (roundwood). Source: FAO (2013).

residues derived from sawmilling were used for further processing, such as by panel and pulp manufacturers and woodchip exporters. Other wood waste that could not be used for further processing may have been sold for other products or disposed of by industry.

Paper recycling

Paper recycling is measured on the basis of 'collection rate' and 'utilisation rate'. The collection rate is the volume of recovered paper (recovered paper used for domestic paper production, plus recovered paper exported, less recovered paper imported) divided by the volume of paper and paperboard that is consumed domestically. The utilisation rate is the volume of recovered paper used in domestic paper production divided by the total volume of domestic paper production.

The consumption of paper and paper products was relatively stable in the period 2006–07 to 2010–11, and the collection rate increased from 66.3% to 77.4% (Figure 6.29). The utilisation rate also increased, but by a smaller amount—from 54.0% in 2006–07 to 56.5% in 2010–11. The difference in the collection and utilisation rates is explained by an increase in the export of recovered paper, particularly to China.

Household recycling and reuse patterns

Household recycling and reuse of waste paper, cardboard and newspaper products increased in all states and territories between 2006 and 2009 (Figure 6.30). Australia-wide, it increased from 91.5% to 95%. In this period for the Northern Territory, recycling or reuse of waste paper products increased from 73.7% to 93.1%.

Waste streams

In 2010, the then Environment Protection and Heritage Council identified three waste streams in Australia: municipal solid waste, commercial and industrial waste, and construction and demolition waste. It is estimated that, in 2007, paper and cardboard constituted about 15.5% of commercial and industrial waste and 13% of municipal solid waste sent to landfill (Table 6.20). Wood and wood waste accounted for 12.5% of commercial and industrial waste and 1% of municipal solid waste sent to landfill. In 2005, an estimated 1.1 million cubic metres of structural timber in the construction and demolition waste stream was either recycled or disposed of in landfill (EPHC 2010).

Waste is also disposed of as litter—for example, bottle corks, construction waste, cigarette packets, fast-food containers and tissues. Clean Up Australia estimated that paper, cardboard and wood comprised about 12.8% of all rubbish collected as a result of the Clean Up Australia Day initiative in 2011¹³⁷.

Initiatives to reduce wood waste

In November 2009, the environment ministers of the Australian, state and territory governments endorsed the National Waste Policy, which aims to reduce the amount of waste that is generated and disposed of by industry and households. The policy includes strategies to increase the recycling of waste products. For example, there are initiatives to change community attitudes so that people are more conscious about waste and recycling. There are also initiatives to introduce national standards and specifications for recycled construction, demolition and organic materials to encourage demand for recycled products (EPHC 2010). Box 6.1 shows that recycling of most forest products from commercial and industrial sources increased in Victoria over a three-year period.

¹³⁷ http://www.cleanupaustraliaday.org.au/.


Figure 6.29: Consumption, collection rate and utilisation rate of paper and paper products, 2006–07 to 2010–11

Note: Estimates are subject to sampling and other errors. Source: ABARES (2013c).



Figure 6.30: Proportion of waste paper products recycled or reused by households, March 2006 and March 2009

Note: Estimates are subject to sampling and other errors. Source: ABS (2009).

Table 6.20: Major sources of rubbish in landfills in Australia, 2006–11

			Proport	ion (%)		
Type of rubbish	2006	2007	2008	2009	2010	2011
Plastics	33.7	33.1	31.7	28.5	31.3	32.0
Foam and polystyrene	5.2	4.4	4.8	3.5	7.7	3.9
Glass	11.7	15.5	13.1	16.4	10.5	14.0
Rubber	1.8	2.3	1.7	1.4	1.1	1.2
Paper and cardboard	15.9	15.1	12.6	12.7	14.7	11.3
Metals	13.2	13.4	14.6	17.5	12.4	14.2
Wood	2.1	1.8	3.8	2.2	1.1	1.5
Not classified	16.4	14.4	17.7	17.8	21.2	22.0
Total	100	100	100	100	100	100

Note: Estimates are subject to sampling and other errors. Source: CUAD (2011).

Box 6.1: Recycling of forest products in Victoria

Sustainability Victoria reported the recycling volumes of forest products between 2006–07 and 2008–09 (Table 6.21). The most widely recycled forest products in Victoria in this period were cardboard and paper packaging. Victoria also recycled 158 thousand tonnes of timber and 154.6 thousand tonnes of sawdust and other forestry residuals in 2008–09.

Table 6.21: Recycling of forest products in Victoria

Product type	2006–07	2007–08	2008–09
Paper-based products ('000 tonnes)			
Cardboard and paper packaging	389.2	422.2	468.4
Newsprint and magazines	121.8	131.9	160.0
Printing and writing paper	72.8	123.8	92.8
Telephone books	1.9	0.9	0.1
Other (mixed paper)	236.3	275.4	410.4
Other wood products ('000 tonnes)			
Timber	196.0	122.5	158.0
Sawdust and other forestry residuals	143.9	66.7	154.6

Notes:

'Timber' includes all wood and timber products (other than packaging and pallets) from commercial and industrial sources.

'Sawdust and other forestry residuals' includes bark (from forestry residues), sawdust and woodchips (rejected from export).

Source: Sustainability Victoria.

Indicator 6.2a

Investment and expenditure in forest management

Rationale

This indicator quantifies investment and expenditure in developing, maintaining, and obtaining goods and services from forests. It provides an indication of the long term and short term commitment to forest management, further processing and other forest uses.

Key points

- The Australian, state and territory governments undertake many activities that, together, constitute forest management. A range of state government data on forest management expenditure are presented, but the ability to compare these measures of investment is limited by differences in the classification of activities that constitute forest management, in accounting arrangements, and in reporting timelines. It is therefore also not possible to estimate national expenditure on forest management.
- Investment in new plantations, as well as re-establishment of harvested plantations, is important for future wood availability. The annual establishment rate of new hardwood and softwood plantations in Australia declined from 87 thousand hectares in 2006–07 to 10 thousand hectares in 2010–11. Declines occurred in all states, but there was a slight increase in the rate of establishment of new plantations in the Northern Territory. Investment in newly established plantations declined in parallel with the decline in area of new plantations established.
- Combined, the forestry and logging subsector, wood product manufacturing subsector, and pulp, paper and converted paper product manufacturing subsector accumulated about \$6.0 billion of fixed capital between 2006–07 and 2010–11, including new plantations, equipment and buildings. Depreciation and amortisation expenses over the same period were estimated at \$4.92 billion. Capital formation net of depreciation and amortisation was therefore estimated to be \$1.08 billion.

This indicator provides an overview of investment in forest management for forests providing goods and services. This includes expenditure by state and territory governments, investment in establishment of new plantations and replanting of existing plantations, and investment in harvesting and in manufacturing involving forest products. Expenditure on management of conservation reserves or national parks is generally not included. Information on forest investment is scarce; in particular, investment by the private sector, both in native forest management and plantation establishment, is either not available or is treated as commercial-in-confidence and therefore not publicly available.

Expenditure by state and territory governments

The Australian, state and territory governments undertake many activities that, together, constitute forest management. These include management of weeds and pest animals; forest fire management; forest monitoring; inventory; biological surveys; provision of recreational opportunities; and silvicultural, post-harvest and wildlife-management practices. However, the states and territories vary in the way they classify activities that constitute forest management, in the detail they provide on expenditure, and in the methods used for accounting for the valuation and depreciation of assets. These differences limit the comparability of investments in forest management between jurisdictions. The data presented below for various agencies therefore vary widely, depending on the nature of the information available, and are generally not directly comparable.

In some states and territory jurisdictions, a proportion of native forest was progressively reassigned over the reporting period from multiple-use public forest (including public forest used for wood production) to public nature conservation reserves. The general lack of consistent data on expenditure on forest management, and the absence of data for some tenures (such as many conservation reserves), make it difficult to determine whether expenditure on forest management decreased as a result of such changes in tenure classification.

New South Wales

Forests NSW¹³⁸ is a state government agency that manages more than 2 million hectares of native and plantation forests in New South Wales. It undertakes a range of activities aimed at developing, maintaining, and obtaining goods and services from state forests; these include harvest supervision and assessment of environmental compliance, management of weeds and animal pests, fire management (including hazard reduction burning and wildfire fighting and prevention), and provision of recreational opportunities. Table 6.22 shows the expenditure by Forests NSW on these activities in the period 2006–07 to 2010–11.

Overall, expenditure on reported forest management activities in state forests in New South Wales was reasonably stable over the period. Expenditure on firefighting declined substantially as a result of a decrease in the proportion of the state forest estate affected by wildfire over the reporting period (from 3.9% in 2006–07 to less than 1% in 2010–11).

Queensland

The Department of Environment and Resource Management is responsible for managing Queensland's land, water and vegetation resources, including forest resources¹³⁹. The rights to the state-owned plantations were sold in 2010 with the rights now held by HQPlantations Pty Ltd under a 99-year licence arrangement. Comprehensive information on forestspecific investment and expenditure is not available.

South Australia

In South Australia, ForestrySA primarily manages plantations but also has responsibility for some native forests managed for conservation purposes. The agency's total expenditure in 2010–11, including employee benefits, payments to contractors, investments in information technology, depreciation and amortisation, was \$83.9 million, down slightly on the \$86.7 million expended in 2009–10 (Table 6.23). The expenditure of ForestrySA on forest management activities is not separately reported.

Table 6.22: Expenditure on forest management in New South Wales state forests, 2006-07 to 2010-11

			(\$'000)		
Activity	2006–07	2007–08	2008–09	2009–10	2010–11
Harvest management					
Supervision and environmental compliance-native forests	6,219	5,164	5,561	5,454	5,184
Harvest planning and pre-harvest surveys	-	-	3,997	4,755	5,022
Other forest management activities					
Firefighting and fire prevention—wildfire	3,000	1,800	1,000	2,400	100
Hazard reduction burning	8,200	9,800	9,600	8,300	5,700
Weed management	779	597	899	1,125	1,019
Animal pest management	586	546	585	591	392
Recreation and tourism					
Recreation and tourism	2,721	2,092	2,437	2,547	2,408
Training and employee development					
Training	2,300	2,200	1,800	1,850	2,680

– = not available

Notes:

Data are for forests managed by Forests NSW only.

It is possible that the reported expenditure on the various aspects of forest management are not mutually exclusive, so figures cannot be summed.

Source: Forests NSW (2009, 2010b, 2011).

Table 6.23: Total expenditure by ForestrySA, 2005–06 to 2010–11

Activity	2005–06	2006–07	2007–08	2008–09	2009–10	2010–11
Expenditure (\$ million)	87.2	90.5	89.5	84.8	86.7	83.9

Note: Values are total expenditure of the agency, not just expenditure on forest management. Source: SAFC (2007, 2008, 2009, 2010, 2011).

¹³⁸ From January 2013, the Forestry Corporation of NSW.

¹³⁹ From April 2012, the Queensland Department of Agriculture, Fisheries and Forestry is responsible for Queensland's forest resources.

Tasmania

In Tasmania, the Department of Primary Industries, Parks, Water and Environment (DPIPWE) has a number of programs for the management and protection of Tasmanian forests, including the valuation and protection of old-growth forests, and improvement of soil, air and water quality. Forestry Tasmania, a separate entity from DPIPWE, is responsible for the sustainable management of 1.5 million hectares of state forest for optimal community benefit, including the sustainable production and delivery of forest products and services; the facilitation of new forest-based industries; the conservation of natural and cultural heritage values; and the provision of education, recreation and tourism services. The expenditure of Forestry Tasmania on forest management activities is not separately reported. However, total operating costs, which include expenditure on forest management, research, and operational and other activities, were about \$140 million annually over the reporting period (Table 6.24).

Victoria

In Victoria, the Department of Sustainability and Environment (DSE)¹⁴⁰ is responsible for managing state forests. VicForests is a separate, state-owned business that is responsible for the sustainable harvest, regeneration and commercial sale of wood from Victoria's public forests on behalf of the Victorian Government. Table 6.25 indicates the planned and actual budget for the management by DSE of state-run parks and forests in Victoria for 2009–10 and 2010–11. The difference between planned and actual expenditure is a result of various factors, including the 2011 Victorian floods.

Western Australia

In Western Australia, the Department of Environment and Conservation (DEC)¹⁴¹ is responsible for protecting the environment, including forests, and conserving Western Australia's fauna and flora, including forest-dwelling species. Table 6.26 indicates the annual expenditure by DEC on nature conservation (including on non-forested land) and on sustainable forest management (in state forests and timber reserves) over the period 2006–07 to 2010–11. Total expenditure on nature conservation increased over the period. Expenditure on sustainable forest management was lower in total, but much higher on an area basis, and fluctuated from year to year.

Table 6.24: Total operating expenditure by Forestry Tasmania, 2006–07 to 2010–11

Activity	2006–07	2007–08	2008–09	2009–10	2010–11
Expenditure (\$ million)	138.1	141.1	140.5	136.1	146.7

Note: Values are total expenditure of the agency, not just expenditure on forest management. Source: Forestry Tasmania (2011a, Table 6.4).

Table 6.25: Planned and actual expenditure for management of state-run parks and forests, Victoria, 2009–10 and 2010–11

Activity	2009–10	2010–11
Planned expenditure (\$ million)	156.7	187.4
Actual expenditure (\$ million)	179.8	206.3

Note: Data are only for parks and forests managed by the Department of Sustainability and Environment. Source: DSE (2010, 2011).

Table 6.26: Expenditure on nature conservation and sustainable forest management in state-owned parks and forests, Western Australia, 2006–07 to 2010–11

Activity		2006–07	2007–08	2008–09	2009–10	2010–11
Nature conservation ^a	Total expenditure (\$ '000)	107,423	113,602	117,577	119,706	131,451
	Unit cost <mark>(\$/hectare)</mark>	3.98	4.16	4.30	4.35	4.76
Sustainable forest management ^b	Total expenditure (\$ '000)	48,981	40,539	53,627	46,360	48,539
	Unit cost (\$/hectare)	37.74	31.24	41.33	35.73	37.41

a Includes non-forested land.

^b The unit cost used for sustainable forest management is the accrual-basis average gross cost per hectare of managing state forests and timber reserves in accordance with the relevant management plan.

Note: Data are for parks and forests managed by the Department of Environment and Conservation only. Source: DEC (2007, 2008b, 2009b, 2010b, 2011).

¹⁴⁰ From April 2013, the Department of Environment and Primary Industries.

¹⁴¹ From July 2013, the Department of Parks and Wildlife.

Investment in plantations

Investment in the establishment of new plantations is one form of investment for obtaining wood from forest land. Australia-wide, there was a decline in the rate of establishment of new plantations between 2006–07 (when 86,600 hectares were established) and 2010–11 (when 9,600 hectares were established) (Table 6.27). Across this period, the new plantations that were established were predominantly hardwoods.

New South Wales

Table 6.28 indicates the plantation areas established or re-established by Forests NSW¹⁴² in the period 2006–11, and the estimated annual costs associated with site preparation, planting, and post-planting fertilisation and management. In 2006–07, Forests NSW established or re-established 8,149 hectares of plantation, most of which was softwood. The associated costs for that year were \$15.8 million. In 2010–11, the area of plantations established or re established increased to 11,046 hectares, at a cost of \$17.2 million.

Northern Territory

The size of the Northern Territory's predominantly hardwood public and private forest plantation estate was estimated at 40,200 hectares in 2010–11. Of this, 37,800 hectares were classed as hardwood plantations, and 2,400 hectares were softwood plantations (ABARES 2012h). About 11,300 hectares of new hardwood plantations were established in the five years to 2010–11, which represents a considerable expansion in tropical forestry in northern Australia.

Table 6.27: Area of new plantation establishment, 2006-07 to 2010-11

				Arec	a ('000 hecto	ires)			
Plantation type and year	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Australia
Hardwood									
2006-07	0.0	8.0	0.2	6.7	7.1	25.0	15.7	13.4	76.1
2007-08	0.0	11.1	3.6	9.9	3.5	18.0	9.8	10.3	66.0
2008-09	0.0	10.9	2.3	5.6	0.2	14.9	2.5	6.8	43.2
2009-10	0.0	1.0	3.0	3.0	0.0	3.9	2.3	7.8	21.0
2010-11	0.0	0.0	2.2	1.1	0.0	1.2	3.1	0.4	7.9
Softwood									
2006-07	0.0	5.7	0.0	1.0	0.2	1.4	0.6	1.6	10.5
2007-08	0.0	0.9	0.0	0.4	0.0	2.0	0.5	2.5	6.3
2008-09	0.0	2.3	0.0	1.2	0.5	0.1	0.5	1.8	6.4
2009-10	0.0	0.4	0.0	0.7	0.1	0.2	0.8	0.5	3.0
2010-11	0.0	0.3	0.0	0.8	0.1	0.4	0.0	0.0	1.7
Total									
2006-07	0.0	13.6	0.2	7.7	7.3	26.5	16.2	15.0	86.6
2007-08	0.0	12.0	3.6	10.3	3.5	20.0	10.2	12.8	72.3
2008-09	0.0	13.1	2.3	6.8	0.8	15.1	2.9	8.6	49.7
2009-10	0.0	1.4	3.0	3.6	0.1	4.0	3.1	8.3	23.5
2010-11	0.0	0.3	2.2	1.9	0.1	1.5	3.1	0.4	9.6

Notes:

Figures are areas of new public and private plantation.

Areas replanted as plantation following final harvest of a pre-existing plantation are excluded.

Totals may not tally due to rounding.

Source: ABARES (2012h).

Table 6.28: Area and cost of plantings in state-owned plantations, New South Wales, 2006-07 to 2010-11

Activity	2006–07	2007–08	2008–09	2009–10	2010–11
New plantation establishment (hectares)	1,350	370	1,596	472	352
Re-established plantations (hectares)	6,799	6,129	9,223	12,088	10,694
Total plantations established (hectares)	8,149	6,499	10,819	12,560	11,046
Cost (\$ million)	15.8	13.7	20.8	20.9	17.2

Note: Data are for plantations controlled by Forests NSW only. Source: Forests NSW (2012a,b).

¹⁴² From January 2013, the Forestry Corporation of NSW.

Queensland

The estimated area of Queensland's public and private plantation estate varied over the period 2006–07 to 2010–11, and was 232,500 hectares in 2011. Of this area, 40,900 hectares is hardwood, 189,100 hectares is softwood, and the remaining 2,500 hectares is of unknown type (ABARES 2012h). New plantation establishment declined from 7,700 hectares in 2006–07 to 1,920 hectares in 2010–11.

South Australia

The estimated area of South Australia's public and private plantation estate increased over the period 2006–07 to 2010–11, and was 188,500 hectares in 2010–11. Of this, approximately 128,500 hectares (68% of the total) is softwood, while 59,700 hectares (32% of the total) is hardwood, and there is a small area (300 hectares) where the type is unknown (ABARES 2012h). The establishment of new plantations decreased substantially over the period, from 7,320 hectares in 2006–07 to 130 hectares in 2010–11.

ForestrySA manages South Australia's state-owned plantation estate. Table 6.29 presents the estimated cost and area of plantings undertaken by ForestrySA (including the re-establishment of plantations after harvesting) in the period 2006–07 to 2010–11. ForestrySA also reported the acquisition of new land for planting activities over the reporting period.

Tasmania

Tasmania's private and public plantation estate was estimated to be 310,700 hectares in 2010–11. Of this, 235,600 hectares was hardwood, and the remaining 75,100 hectares was softwood. The establishment of new plantations in Tasmania declined substantially from 26,480 hectares in 2006–07 to 1,540 hectares in 2010–11 (ABARES 2012h).

Forestry Tasmania manages state-owned forests, and the remaining plantations are controlled by the private sector. Information on plantation establishment and replanting costs was available for forests managed by Forestry Tasmania only. Forestry Tasmania planted or replanted 1,620 hectares of plantations in 2010–11, less than one-third of the area planted or replanted in 2006–07 (Table 6.30). The total investment in plantation establishment fell by nearly half, from \$16.1 million to \$8.1 million.

Victoria

Victoria's public and private plantation estate expanded in the period 2006–07 to 2010–11, reaching 432,900 hectares in 2010–11. Around 225,900 hectares were softwood plantations, and 205,800 hectares were hardwood (the remaining 1,200 hectares could not be identified as either hardwood or softwood) (ABARES 2012h). There was a decline in the establishment of new plantations, particularly hardwood.

Western Australia

The estimated area of public and private hardwood and softwood Industrial plantations (and therefore excluding sandalwood) in Western Australia varied over the reporting period, but increased overall to 412,600 hectares in 2010–11. Establishment of new plantations declined from nearly 15,000 hectares in 2006–07 to 440 hectares in 2010–11 (ABARES 2012h).

The Forest Products Commission (FPC) is responsible for the harvesting and sale of state-owned wood assets in both plantations and native forests. The commission was also involved in establishing sandalwood plantations from 2006–07 to 2010–11. Table 6.31 shows the FPC's planned and actual annual plantation establishment (including sandalwood and joint-venture plantations, and replanting existing plantations) on commission-controlled plantations on agricultural land in the period 2006–07 to 2010–11. The FPC's investment in new plantations (including re-established plantations and sandalwood) increased from \$9.1 million in 2006–07 to a high of \$18.6 million in 2009–10, before falling to a five-year low of \$7.7 million in 2010–11.

Table 6.29: Area and cost of new plantings in state-owned plantations, South Australia, 2006–07 to 2010–11

Activity	2006–07	2007–08	2008–09	2009–10	2010–11
Plantation established (hectares)	3,033	4,159	3,307	3,287	2,762
Cost of new plantings (\$ '000)	3,434	2,793	3,115	5,432	1,808

Notes:

Cost of new plantings is reported as standing value, which includes the value of the plantings and all costs associated with establishment.

Data are for plantations controlled by ForestrySA only.

Source: SAFC (2007, 2008, 2009, 2010, 2011).

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Activity	2006–07	2007–08	2008–09	2009–10	2010–11
Total area planted and replanted (hectares)	5,216	5,561	4,083	2,381	1,620
Plantation establishment costs (\$ '000)	16,147	14,433	12,094	8,070	8,094

Notes:

Costs include contractor expenses and replanting.

Area and costs include plantations established through joint ventures controlled by Forestry Tasmania.

Source: Forestry Tasmania (2008, 2009a, 2009b, 2010b, 2010c, 2011a, 2011b).

Table 6.31: Area and cost of plantation establishment under Forest Products Commission schemes, Western Australia, 2006–07 to 2010–11

Activity	2006–07	2007–08	2008–09	2009–10	2010–11
Planned area (hectares)	5,941	8,015	10,094	9,974	600
Actual area (hectares)	5,411	7,032	7,034	10,216	636
Cost (\$ '000)	9,147	12,880	15,947	18,643	7,724

Notes:

For plantations controlled by Forest Products Commission only, including new and re-established plantations, joint-venture plantations and sandalwood. Cost for new plantations includes hardwood, softwood, joint-venture and sandalwood plantations.

Planned and actual area figures relate to December to February quarters for each financial year, as reported by Forest Products Commission. Source: FPC (2007, 2008, 2009, 2010, 2011).

Investment in harvesting and manufacturing

Investment in the Australian forest industry has been estimated by the Australian Bureau of Statistics (ABS) for the following three subsectors taken from the 2006 Australian and New Zealand Standard Industrial Classification (Trewin and Pink 2006):

- forestry and logging
- wood product manufacturing
- pulp, paper and converted paper product manufacturing.

Four parameters have been used by the ABS to measure investment and expenditure in various areas of the economy. Estimates are based on random sampling of the industry and are subject to sampling and non-sampling errors. Moreover, changes in accounting methods adopted by industry, including approaches to asset valuation and depreciation, may affect the accuracy of estimates. The four parameters are:

- gross fixed capital formation (GFCF), which is the total value of fixed-asset acquisitions (such as establishment of new plantations, purchase of machinery, acquisition of goodwill and intellectual property rights) less any fixedasset disposals
- depreciation and amortisation, which allocate the cost of an asset over its service life (Fraser and Ormiston 2010) and are considered expenses. Depreciation and amortisation do not include asset impairment, and therefore do not include revaluation of standing timber
- capital formation net of depreciation and amortisation, which is GFCF minus depreciation and amortisation, and reflects the net formation of new productive capacity
- inventories, which are intermediate goods (such as raw materials, fuels, containers), and goods held for sale or distribution. Reasons for accumulation of inventory can range from anticipatory investment to overinvestment, and reasons for reduction in inventory can range from increased sales to impairments in the value of inventory holdings.

Combined, the forestry and logging subsector, wood product manufacturing subsector, and pulp, paper and converted paper product manufacturing subsector accumulated about \$6.0 billion of fixed capital between 2006–07 and 2010–11, including new plantations, equipment and buildings. Depreciation and amortisation expenses over the same period were estimated at \$4.92 billion. Capital formation net of depreciation and amortisation was therefore estimated to be \$1.08 billion.

Forestry and logging

Forestry and logging consists of enterprises that are mainly engaged in growing and harvesting wood for commercial benefit. This category also includes the gathering of other forest products, such as plant or animal products from a forest environment (Trewin and Pink 2006).

Table 6.32 presents estimates of investment and expenditure in the forestry and logging subsector for the period 2006–07 to 2010–11. GFCF was estimated at \$207 million in 2010–11, and depreciation and amortisation was estimated at \$130 million, giving capital formation net of depreciation and amortisation of \$77 million in that year. Unlike many manufacturing sectors, the estimate of fixed capital formation in this subsector can include acquisitions of natural resource fixed assets, such as plantations, which can appreciate in value as trees grow. Reported inventory holdings in the forestry and logging subsector declined by \$96 million between 2008–09 and 2010–11.

Wood product manufacturing

Wood product manufacturing comprises enterprises engaged in log sawmilling and timber dressing, woodchipping, timber re-sawing and dressing, and the production of engineered wood products.

Capital formation net of depreciation and amortisation in the wood product manufacturing subsector also varied substantially from year to year (Table 6.33) but was low compared with that of the forestry and logging subsector, as a result of the relatively high rate of aggregate depreciation and amortisation. Inventory holdings in the subsector grew each year in the period 2006–07 to 2010–11.

Table 6.32: Investment and expenditure in the Australian forestry and logging subsector, 2006–07 to 2010–11

	(\$ million)							
Parameter	2006–07	2007–08	2008–09	2009–10	2010–11	Total 2006–11	Total 2006–11ª	
Gross fixed capital formation	293	318	449	366	207	1,633	1,734	
Depreciation and amortisation	130	226	164	176	130	826	877	
Capital formation net of depreciation and amortisation	163	92	285	190	77	807	857	
Change in inventory (over previous year/through period)	14	16	7	-88	-8	-59	-58	

 $^{\scriptscriptstyle \alpha}$ $\,$ Total adjusted for inflation to 2010–11 dollars. Other figures are not adjusted for inflation.

Source: ABS (2011a, 2012b).

Table 6.33: Investment and expenditure in the Australian wood product manufacturing subsector, 2006-07 to 2010-11

	(\$ million)							
Parameter	2006–07	2007–08	2008–09	2009–10	2010–11	Total 2006–11	Total 2006–11ª	
Gross fixed capital formation	346	486	433	450	302	2,017	2,141	
Depreciation and amortisation	312	286	322	366	385	1,671	1,764	
Capital formation net of depreciation and amortisation	34	200	111	84	-83	346	377	
Change in inventory (over previous year/through period)	45	132	165	82	79	503	532	

Total adjusted for inflation to 2010–11 dollars. Other figures are not adjusted for inflation.
Source: ABS (2011a, 2012b).

Table 6.34: Investment and expenditure in the Australian pulp, paper and converted paper product manufacturing subsector, 2006–07 to 2010–11

	(\$ million)							
Parameter	2006–07	2007–08	2008–09	2009–10	2010–11	Total 2006–11	Total 2006–11ª	
Gross fixed capital formation	387	620	458	458	423	2,346	2,488	
Depreciation and amortisation	403	465	458	577	521	2,424	2,558	
Capital formation net of depreciation and amortisation	-16	155	0	-119	-98	-78	-70	
Change in inventory (over previous year/through period)	24	24	-10	-166	86	-42	-43	

• Total adjusted for inflation to 2010–11 dollars. Other figures are not adjusted for inflation.

Source: ABS (2011a, 2012b).

Pulp, paper and converted paper product manufacturing

The pulp, paper and converted paper product manufacturing subsector includes products such as newsprint, writing paper, paper pulp and wood pulp, as well as corrugated paper products such as cardboard boxes, paper bags, paper stationery and sanitary paper.

Depreciation and amortisation in the subsector was in excess of GFCF over much of the reporting period. The negative value for capital formation net of depreciation and amortisation suggests that investment in the subsector's fixed capital holdings is not sufficient to cover depreciation and amortisation. In comparison, inventory holdings increased in 2010–11 after declines in previous years. The increase in the value of inventory holdings reflects an increase in the value of the subsector's short-term capital (Table 6.34).



Containers made from pulp, paper and converted paper products.

Indicator 6.2b

Investment in research, development, extension and use of new and improved technologies

Rationale

This indicator monitors the investment in, and adoption of, new or improved technologies in forest management and in forest-based industries. It also quantifies the level of research and development. Significant investment in research, development and new technologies result in continual improvements to forest management practices.

Key points

- Australian Bureau of Statistics (ABS) data show that, between 2005–06 and 2008–09, total expenditure on research and development (R&D) reported by businesses in the forest and wood product sector declined from \$164 million to \$137 million. Only partial data on R&D expenditure are available from the ABS for 2009–10 and 2010–11.
- From 2005–06 to 2010–11, the ABS reported that business R&D expenditure increased from \$15.6 million to \$33.2 million in the forestry and logging subsector, but decreased from \$76.3 million to \$62.4 million in the wood product manufacturing subsector. Business R&D expenditure in the pulp, paper and converted paper product manufacturing subsector declined from \$71.1 million in 2007–08 to \$53.8 million in 2008–09.
- A separate survey of the forest and forest products sector, using a different definition of the sector from that used by the ABS, showed R&D expenditure of \$106 million in 2007–08. Adjusted for inflation, expenditure on forestry and forest products R&D has declined by 13.4% between 1981–82 and 2007–08.

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This indicator provides an overview of research and development (R&D) investment in the forest and wood products sector.

ABS survey data

The Australian Bureau of Statistics (ABS) collects data from businesses on their R&D expenditure across three forest and wood products subsectors: forestry and logging; wood product manufacturing; and pulp, paper and converted paper product manufacturing.

R&D is defined by the ABS as 'systematic investigation or experimentation involving innovation or technical risk, the outcome of which is new knowledge, with or without a specific practical application, or new or improved products, processes, materials, devices or services' (ABS 2012c). Accordingly, this category excludes expenditure that expands production capacity using existing technologies (e.g. silvicultural management), but includes expenditure on basic research ('research') and on ways of applying basic research in practice ('experimental development'). The ABS data include only intramural expenditure (expenditure undertaken within the sector) on R&D of \$100,000 or more; extramural R&D (undertaken entirely by another entity outside this sector) is excluded.

R&D in the forestry and logging subsector can focus on ways to improve wood production and harvesting of wood products, or on identifying new markets for standing wood (such as a market for carbon emissions). Research in the wood product manufacturing subsector aims to identify new forest-based products and methods for processed forest products (excluding pulp, paper and cardboard), such as new applications for timber in construction (Bayne and Page 2009), new timber treatments, and the identification of new export markets. Research in the pulp, paper and converted paper product manufacturing subsector covers a range of areas, such as energy efficiency in the pulping and drying of wood, and the development of new wood-based products.

Parameter	2005–06	2006–07	2007–08	2008–09	2009–10	2010–11
Forestry and logging (\$ million)	15.6	20.1	22.0	26.0	37.6	33.2
Wood product manufacturing (\$ million)	76.3	55.2	51.3	57.1	57.5	62.4
Pulp, paper and converted paper product manufacturing (\$ million)	72.2	70.7	71.1	53.8	-	-
Total research expenditure in forestry (\$ million)	164	146	144	137	-	-
Total business expenditure in Australia (\$ million)	10,434	12,639	15,047	17,264	16,685	17,880
Proportion of expenditure that is forestry expenditure (%)	1.6	1.2	1.0	0.8	-	-

Table 6.35: Business R&D expenditure in the forest and wood products sector, and proportion of total business R&D expenditure, 2005–06 to 2010–11

- = not available

Note: Totals may not tally due to rounding.

Source: ABS (2011b, 2012d).

The total estimated R&D expenditure by forest-sector businesses in the three subsectors in 2008–09 was \$137 million (Table 6.35; data are incomplete for 2009–10 and 2010–11). This is a decline of \$27 million (16%) from 2005–06. Forest-sector business R&D expenditure declined as a proportion of total business R&D expenditure from 1.6% in 2005–06 to 0.8% in 2008–09.

Business R&D expenditure in the forestry and logging subsector more than doubled over the reporting period, while business R&D expenditure in the wood product manufacturing subsector decreased, as did business R&D expenditure in the pulp, paper and converted paper product manufacturing subsector over that part of the period for which data are available.

A review of investment needs in the pulp and paper industry, presented to the Australian Government, incorporates the R&D strategy for the Australian pulp, paper and converted paper product industry (Pulp and Paper Industry Strategy Group 2010). In the past, R&D by Australian companies has led to major improvements in the pulping and forming of paper, which have been taken up by the rest of the world (Pulp and Paper Industry Strategy Group 2010).



A research scientist examining native plant seeds under a microscope.

Independent survey data

The ABS data are derived from self-reporting of R&D expenditure by business entities, and differ from other estimates of R&D expenditure in the forest and forest products sector, due in part to differing survey methodologies and definitions.

A series of surveys conducted by Turner and Lambert (2011) has used a consistent methodology to collect data on expenditure on R&D on forestry and forest products for two segments of the sector at intervals from 1981-82 to 2007-08. 'Forestry R&D' was defined by Turner and Lambert as including research relating to the commercial management and protection of forests, including environmental and ecological considerations, but not research on areas managed specifically for conservation (e.g. forest areas in public nature conservation areas such as national parks), or costs of monitoring growth, health, nutrition or biodiversity. 'Forest products R&D' was defined by Turner and Lambert as including R&D on value-adding to timber but not work on final product development (e.g. furniture production), production runs in mills, environmental monitoring or quality control assessment. For both segments, estimates included contributions from both public and private sources, and not just expenditure by business alone.

According to the results of the Turner and Lambert surveys, the estimated total expenditure on forestry and forest products R&D in 2007–08 was about \$106 million (Figure 6.31). The data also show that, although expenditure on forest R&D increased in the period 1981–82 to 2007–08, when adjusted for inflation expenditure declined over the period by about 0.45% per year.

The difference between the estimates of Turner and Lambert (\$106 million in 2007–08; Figure 6.31) and those of the ABS (\$144 million in 2007–08; Table 6.35) may be explained by the inclusion in the ABS data of R&D on secondary wood products, by the underestimation of overheads by Turner and Lambert, and by the possibility that companies in the forest and wood product sector included a broader range of activities (such as production runs) in their definitions of R&D for the ABS survey (J Turner, pers. comm., July 2012).





Note: Figures were adjusted for inflation to 1981–82 prices using the consumer price index (ABS 2012a). Source: Turner and Lambert (2011).



Hardwood veneer.

Indicator 6.3a

Area of forest available for public recreation/tourism

Rationale

This indicator measures the area of forest available for use by the community for recreation and tourism purposes. This provides an indication of the emphasis placed by society on the management of forest for recreation and tourism.

Key points

- Most publicly owned multiple-use and nature conservation forests in Australia are available to the general public for recreation or tourism purposes, with 30.8 million hectares available nationally for these uses. This figure comprises 10.1 million hectares of multiple-use forest and 20.7 million hectares of nature conservation reserve.
- Additional private forest areas are available, usually under commercial arrangements. Some substantial areas of reserved forest in northern Australia, such as in Kakadu National Park, are on private land tenure but available for recreation and tourism.
- Some forests that are generally available for public recreation and tourism may be closed temporarily, mainly to ensure the safety of the general public when certain forest management activities occur. Forest areas may also be closed permanently to recreation and tourism if these activities are likely to compromise, or are not compatible with, the primary objective of management for these forest areas.

This indicator reports the area of forest available for recreation and tourism in Australia. For the purpose of this indicator, an area of forest is considered to be available for recreation and tourism if there are no legal or other forms of prohibition on access to the forest for recreation and tourism activities. This includes areas where patrons may have to pay for public access to private land (e.g. a wildlife park).

Forests on public land

Most publicly owned forested lands designated for multiple use or nature conservation are available for general recreation and tourism purposes. Nationally, 30.8 million hectares of forest are available for general tourism and recreation across the public reservation and multiple-use forest estates (Table 6.36), as determined from the national forest coverage (Indicator 1.1a) and data provided by jurisdictional agencies on the proportions of forest on each tenure directly available for recreation and tourism. This figure comprises 10.1 million hectares of available multiple-use forest, and 20.7 million hectares of available nature conservation reserve.

Although various outdoor recreation and tourism activities may be undertaken in most public forests, some areas have exclusions or restrictions for visitor safety, or to protect specific scientific, natural, cultural or water supply values (IFA 2007). Publicly owned forest areas that are closed permanently to the public, and therefore not available for general recreation and tourism, include areas designated for scientific reference, study or research; conservation areas; some water catchment areas; significant Indigenous cultural heritage sites; and defence training areas.

Forests that are generally available for public recreation and tourism may be closed temporarily during wood harvesting, extreme fire weather or other climatic events, total fire bans, fuel reduction burning, control of feral animals or weeds, or special events (e.g. car rallies). Inadequate road, track or trail access, a lack of facilities and other practical considerations may also restrict or prevent public use of multiple-use and nature conservation forests. Some of these access restrictions (e.g. due to pest and weed control) are more likely to apply to Australia's publicly owned plantation forests than to multiple-use native forests. For particular forest areas, forest management plans may specify the types of visitor Table 6.36: Area and proportion of forest available for general recreation and tourism on public land, by jurisdiction and tenure class

Jurisdiction	Mul	tiple-use public for	est	Natu	Total public land		
	Total areaª ('000 hectares)	Proportion available for recreation and tourism (%)	Area available for recreation and tourism ('000 hectares)	Total areaª,b ('000 hectares)	Proportion available for recreation and tourism (%)	Area available for recreation and tourism ('000 hectares)	Area available for recreation and tourism ('000 hectares)
ACT	4	100 ^c	4	115	99c	114	118
NSW	2,022	99 ^d	2,002	5,581	88e	4,911	6,913
NT	0	n.a.	0	13	100 ^f	13	13
Qld	2,905	99 ^g	2,876	5,098	100	5,098	7,974
SA	20	100 ^h	20	1,509	100 ^h	1,509	1,529
Tas.	923	100 ⁱ	923	1,240	100 ⁱ	1,240	2,163
Vic.	2,994	99	2,964	3,313	97	3,214	6,178
WA	1,291	100 ^j	1,291	4,610	100j	4,610	5,901
Australia	10,159	99	10,080	21,478	94	20,709	30,789

n.a. = not applicable

See Indicator 1.1a.

^b Does not include reserves on private or leasehold land. This particularly affects the NT, where much of the reserved forest estate available for recreation and tourism is on private or leasehold lands (e.g. Kakadu National Park).

^c Data from ACT Environment and Sustainable Development.

^d Data from Forests NSW.

Data from Parks and Wildlife Group, NSW Office of Environment and Heritage.

^f Availability of 100% assumed, as no data provided by jurisdiction.

9 Data from SOFR 2008.

h Data from Primary Industries and Regions SA, Forestry, and based on all forest reserves in SA managed by ForestrySA, excluding non-forest areas.

Data from FPA (2012).

^j Data from WA Department of Environment and Conservation, and for the south-west forest region only; access to some forest areas for general recreation and tourism may be restricted due to the presence or potential spread of Phytophthora dieback, reservoir protection zones, or visitor safety requirements.

Note: Figures may differ from those reported in state and territory or regional reports on regional forest agreements as a result of different forest-type mapping or more recent data.

Totals may not tally due to rounding.

activities that are permissible and the conditions of use that apply. In forests not subject to forest management plans, the broad policies of the responsible forest management agency usually indicate the types of recreation and tourism that may take place.



A competitive mountain-bike rider in native forest, Wyena, Tasmania.

Forests on private and leasehold land

Public access for recreation and tourism to forests on private land is generally limited, although few data are available on this. If access is required, it would be on application to the private landowner or manager for permission to undertake specified activities in the forest area, unless specific commercial arrangements are advertised (e.g. a wildlife park). The same applies for forests on leasehold land, which is mostly privately managed under long-term pastoral leases that grant the lessee rights of custodianship of the land—these leases impart a level of responsibility for the management of the land.

Of the nearly 82 million hectares of forest on private and leasehold land (Indicator 1.1a), around 6 million hectares (7%) is in the National Reserve System (Indicator 1.1c). The Northern Territory contains more than 3.7 million hectares of reserved private or leasehold land, including reserved Indigenous land. Much of the land is available for recreation and tourism, including Kakadu National Park, which is private land leased to the Australian Government and which contains close to 900 thousand hectares of forest.

Indicator 6.3b

Range and use of recreation/tourism activities available

Rationale

This indicator assesses the range and number of recreation and tourism facilities provided in forests, their level of use and their contribution to the broader tourism sector. Appropriate and well managed facilities help to optimise visitor satisfaction as well as minimising environmental impacts associated with recreation and tourism.

Key points

- A wide range of forest-based recreation and tourism services are available in Australia to meet demand by the general public. The data reported here are for recreation and tourism on public land.
- For those forests for which data were available, the number of areas, tracks and sites available for recreation and tourism activities remained the same or increased over the reporting period.
- Forest management agencies have strategies in place to actively manage forest areas with high recreation and tourism use within their jurisdictions.

This indicator reports the range of recreation and tourism facilities available in forests and how much the facilities are used. Some facilities, such as walking or riding tracks, picnic sites and campgrounds, are provided solely for recreation or tourism. Other facilities, such as roads and vehicular tracks, are provided for a range of management purposes but are also available for use for recreation and tourism.

In each state and territory, forest management aims to provide a balanced range of opportunities for recreational pursuits such as walking, running, cycling, climbing, fishing, camping, snow activities and water sports—consistent with demand, resources and environmental concerns, as well as facilities appropriate for each forest setting. As noted in the Institute of Foresters of Australia Forest Policy Statement no. 5.5 (IFA 2007):

The range of recreation and tourism activities that can be undertaken in Australia's forests also differ in their impact on the land, vegetation, wildlife and other forest values, such as water quality. Generally, any activity pursued occasionally and at a low level of intensity, and within management constraints, poses little threat to the environment. However, as the intensity and frequency increase, or when constraints are not followed conflicts and negative impacts on forest values can arise.

State forests and national parks

Australia's state forests, also known as multiple-use public forests, are generally open to the broadest range of public recreation and tourism activities available in Australia's forests. State forests also have the fewest restrictions on public recreation and tourism activities (see Indicator 6.3a). Australia's national parks place greater limitations on recreation and tourism activities, because conservation is the management priority. The recreational opportunities in Australia's state forests complement those in national parks activities that are not allowed or are restricted in national parks—such as four-wheel driving, trail-bike riding, horse riding and hunting—and have a lower level of restriction with regard to companion dogs.

State forests also provide a range of recreational opportunities that are generally available free of charge to the public, including use of picnic and camping areas, and access to state forest roads for vehicular activities. Some national parks and facilities in national parks are accessed via an entrance gate with an entrance fee, and many national parks charge fees for overnight camping or require registration to access popular multi-day hiking trails. A proportion of these fees generally goes towards the ongoing maintenance of facilities and the management of national parks. Organised events and tourism activities in state forests and national parks are administered by permit systems and involve a cost to the public.

As an example of the spread of recreation and tourism activities in state forests, data on issued permits are presented for New South Wales (Table 6.37). In 2010–11, Forests NSW

Table 6.37: Number of permits issued by Forests NSW for organised recreational activities in New South Wales state forests, 2008–09 to 2010–11

Activity	2008–09	2009–10	2010–11
Bow hunting/archery	3	2	10
Bushwalking	5	8	7
Car and bike rallies/events	32	40	48
Ecotourism/four-wheel drive tours	21	7	14
Education/outdoor education schools	27	11	9
Fossicking	116	152	320
Horse, trail and endurance rides	24	24	28
Mountain-bike rallies	51	38	42
Orienteering/mountain runs/triathlon	22	26	24
Training/exercises	35	34	56
Other	181	126	10
Total	517	468	568

a The number of fossicking permits has increased over time, partly because permits are now issued to individuals rather than groups; the actual number of participants may not have increased.

Source: Forests NSW.

Table 6.38: Tracks, sites and events provided for recreation and tourism in public multiple-use forests, 2005-06 and 2010-11

Activity	Unit	Australia	Victoria		
		2005–06	2010–11	2005–06	2010–11
Walking or running	km of tracks	304	304	715	761
Cycling	km of tracks	232	252	170	320
Riding or walking animals	km of tracks	84	170	170	40
Drivingª	km of roads	130	200	733	1,700
Cultural heritage appreciation	number of managed sites	1	20	34	42
Events or festivals	number of events	2	353	151	152
Fishing ^b	number of managed sites	1	1	25	33
Hunting	number of managed sites	0	-	-	-
Nature study	number of sites	11	11	_	-
Camping	number of sites	21	21	227	240
Picnicking and playing	number of sites	27	27	226	250
Watercraft (motorised)	number of sites	0	1	2	2
Watercraft (non-motorised)	number of sites	1	1	5	11

– = no data

• Victoria's data for driving refer to promoted two-wheel drive and four-wheel drive touring routes, a subset of the total available open public road network.

^b For some activities such as fishing, there can be multiple locations for fishing in multiple-use forest; the recorded figures are for sites specifically promoted for fishing. Note: Victorian data are derived from the Department of Sustainability and Environment's Recreation Facilities Database for multiple-use forests, and variations from SOFR 2008 may be due to better data capture.

Source: State agencies.

issued more than 500 special-purpose permits for activities in New South Wales state forests; the greatest number of permits was issued for fossicking. Other activities for which permits were issued included car rallies, adventure races, bike rallies, mountain-bike races, club sporting activities, and events such as dance parties and festivals.

Some state forest agencies conduct visitor surveys and have a good understanding of visitor needs and expectations; others provide sites and facilities in response to local demand and patterns of existing use. As examples, Table 6.38 presents data on tracks, sites and events available for forest-based recreation and tourism activities in public multiple-use forests in South Australia and Victoria. These data do not include sites and facilities managed by local governments or the commercial and private sectors, or sites in national parks.

Numbers of visitors

Visitor numbers in public forests (state forests, national parks and other reserves) are monitored by a mixture of counts and estimates by agency staff. Count data are based on entry fees, traffic counters, camping permits and surveys and are relatively accurate formal mechanisms for monitoring usage, whereas estimates are less accurate, informal mechanisms.

Usage is a difficult parameter to measure because most forests have many entry points and visitor use is dispersed. In addition, usage can vary dramatically according to the day of the week and the season, and increases greatly during school holidays. Sites that are well signposted and promoted in various media receive many more visits than lesser known sites, where usage is more dependent on word of mouth. Because of the free access to state forests and the many entrance points, data on usage levels are generally not collected. However, some specific locations do collect usage data—for example, Cumberland State Forest in Sydney's north-west, which attracts more than 100 thousand visitors per year (see Case study 6.5).

In Tasmania, climbing, abseiling, caving, nature observation, photography, swimming and other activities all take place in state forests, national parks and reserves. Hunting continues to be allowed in state forests and on some reserve classes—game reserves, conservation areas and regional reserves. No significant changes have been observed in the nature or level of these activities over the period 2006–2011. However, over the period 2006–2011, mountain-bike activity has increased in some parks and reserves. In response, special mountain-bike tracks have been developed.

Across Tasmania's national park system generally, the annual number of visitors remained relatively constant from 2005–06 to 2008–09, then declined (FPA 2012). The decline in visitor numbers was across the whole state, with no single park or forest destination showing a significantly greater decline than any other, and was in response to a combination of factors, including a stronger Australian dollar impacting on costs for international visitors.

Western Australian data from the Department of Environment and Conservation show that annual visitation to areas covered by the Western Australian *Forest Management Plan* reached 6.9 million visits in 2010–11—an increase of 2.1 million visits (43%) since 2003–04. Demand for use of land covered by the plan for recreation and tourism is expected to continue to grow in line with population growth in the south-west of Western Australia (CCWA 2012a).

In the Northern Territory, very little land is available for general recreation and tourism outside of national parks and reserves. Permission is required to visit all private land (Aboriginal freehold land and other freehold land, with the exception of Kakadu National Park) and leasehold land (pastoral land). This permission is given on request in most instances, but no member of the public is permitted to visit such areas unannounced. Annual visitor (vehicle) numbers to the main Northern Territory Government–managed forested parks and reserves decreased from 1.2 million in 2007 to 1.1 million in 2010.

In South Australia, just over 145,000 visitors were recorded in ForestrySA reserves in 2010–11. Because of limitations in data collection, such as multiple unmonitored access points and limited resources, it is estimated that actual numbers may be more than twice this recorded figure.



Diamond Tree fire tower, in karri (*Eucalyptus diversicolor*) tree near Manjimup, Western Australia.

Case study 6.5: Cumberland State Forest

Cumberland State Forest, located in West Pennant Hills, Sydney, is Australia's only metropolitan state forest. It contains 40 hectares of native forest. The original, privately owned land was cleared in 1908 and used for farming. In 1938, management of the land was taken over by the then NSW Forestry Commission, and the land was dedicated as a state forest in 1939. One-third was planted as an arboretum with native tree species from around Australia, while the rest was allowed to regenerate naturally.

Cumberland State Forest attracts more than 100 thousand visitors each year. A wide range of recreational activities are undertaken, including walking, picnicking and nature study. The arboretum, visitor centre, cafe and nursery are all areas of interest within the forest (Figure 6.32). Cumberland State Forest also offers a volunteer program that provides an opportunity for visitors to take part in revegetation and forest regeneration activities.

A forest school education program, run by Forests NSW¹⁴³, is also offered at Cumberland State Forest. The program includes excursions designed to match the curriculum of all levels of education up to high school. The excursions provide education about a wide range of sustainable land management issues. More than four thousand school children take part in excursions at Cumberland State Forest each year.

The Cumberland Forest Fair, a community event, attracts an additional five thousand visitors to the forest.

continued overleaf

¹⁴³ From January 2013, the Forestry Corporation of NSW.

Case study 6.5: Cumberland State Forest continued





Cumberland State Forest

www.forestrycorporation.com.au



WARNING – You are visiting a forest which contains many unseen and unpredictable hazards that cannot be removed or controlled. These may be exacerbated during periods of extreme weather – fire, flood, wind and rain. Because of this you are entering the forest at your own risk. Other forest hazards include, but are not limited to, overhead hazards from tree limbs and uneven or slippery surfaces. Watch out for vehicles and pedestrians.

Disclaimer – This map is not guaranteed to be free from error or ornission. Therefore, the State of New South Wales, Forestry Corporation of NSW and its employees dickaim liability for any act done or omission made on the information on the map and any consequences such acts or omissions. Forestry Corporation of NSW or its employees are not responsible for any damage caused to your person or property.

Source: <u>http://www.forestrycorporation.com.au/__data/assets/pdf_file/0007/440179/cumberland-sf-map.pdf</u> More details are available at: <u>http://www.forestrycorporation.com.au/__data/assets/pdf_file/0007/440179/cumberland-sf-map.pdf</u>

Indicator 6.4a

Area of forest to which Indigenous people have use and rights that protect their special values and are recognised through formal and informal management regimes

Rationale

This indicator monitors the degree to which land is placed under appropriate tenure classifications or management regimes to protect Indigenous peoples' values in forests. An acceptable level of accountability for the protection of Indigenous peoples' cultural, religious, social and spiritual needs and values is an essential part of forest management.

Key points

- Access, management and ownership are key parts of the relationship of Indigenous people with land. The Indigenous estate can be broadly divided into four land tenure and management categories: Indigenous owned and managed, Indigenous managed, Indigenous co-managed and Other special rights.
- Nationally, in 2011 there were 309.9 million hectares of land in the Indigenous estate, of which 41.9 million hectares was forested, corresponding to 34% of Australia's total forest area. This is an increase of 22.1 million hectares of forested land in the Indigenous estate over the figure reported in SOFR 2008. The increase has been driven primarily by improved availability of spatial information on Indigenous land tenure, as well as an increase in the area of land over which Indigenous people have legislated rights.
- Of the 41.9 million hectares of forested land in the Indigenous estate, 31.7 million hectares (76%) is in Queensland and the Northern Territory.
- The total area of forest located within sites with Indigenous heritage value registered on the Register of the National Estate in 2011 was 1.5 million hectares, of which 1.2 million hectares (81%) is in Queensland and the Northern Territory.

Indigenous land access, management or ownership

In SOFR 2008, information from the Indigenous Land Corporation was used to report on the area of forest over which Indigenous people had use and other rights that enabled the protection of special Indigenous values. This information provided a snapshot of all lands that were owned or managed by Indigenous community groups and agencies in 2003. However, it did not differentiate lands that were legally owned and controlled by Indigenous people from lands that were owned by other parties and managed by Indigenous people, such as Crown-owned leasehold lands.

Since 2003, the amount of Indigenous land tenure information accessible through government agencies at the national and state and territory levels has increased significantly. There has also been a significant increase in the area of land under formal management regimes over which Indigenous people have rights that enable them to protect their special values. Table 6.39 provides a list of the datasets collected for use in SOFR 2013 and other projects (including the National Indigenous Forestry Strategy¹⁴⁴: DAFF 2005); more detailed descriptions of each land category and its importance to Indigenous people, history and usage are given in Indicator 6.4c.

¹⁴⁴ www.daff.gov.au/forestry/policies/nifs.

Table 6.39: Datasets compiled on areas of forest over which Indigenous people have use and rights

Title	Year of currency	Source agency and data availability
Indigenous owned and managed		
Indigenous Protected Areas	2011	DSEWPaC ^{o,} available at Discover Information Geographically website (www.environment.gov.au/metadataexplorer/explorer.jsp)
Northern Territory Aboriginal Lands Trust lands	2011	Northern Territory Department of Lands and Planning ^b (<u>www.lands.nt.gov.au</u>)
Indigenous Land Corporation owned and granted	2011	Indigenous Land Corporation (<u>www.ilc.gov.au/Land-Acquisition/</u> Land-Purchased/Land-Purchased-All-States)
Indigenous Land Corporation Indigenous estate ^c	2003	Indigenous Land Corporation (<u>www.ilc.gov.au</u>)
Queensland Deed of Grant in Trust	2009	Queensland Department of Environment and Resource Management ^d (<u>http://dds.information.qld.gov.au/dds/</u>)
Indigenous managed		
Western Australian Aboriginal Lands Trust	2009	Western Australia Department of Indigenous Affairs ^e (<u>www.dia.wa.gov.au</u>)
Western Australian Indigenous pastoral leases	2009	Western Australia Land Information Authority, trading as WA Landgate (www.landgate.wa.gov.au/corporate.nsf/web/index.html)
Leased-back nature reserves	2010	State and territory government conservation agencies, and the DSEWPaC ^a Collaborative Australian Protected Area Database 2010; available at Discover Information Geographically website (www.environment.gov.au/metadataexplorer/explorer.jsp)
Indigenous co-managed		
Nature conservation reserve memoranda of understanding	2010	State and territory government conservation agencies, and the DSEWPaC ^a Collaborative Australian Protected Area Database 2010; available at Discover Information Geographically website (www.environment.gov.au/metadataexplorer/explorer.jsp)
World Heritage Area memoranda of understanding	2010	State and territory government conservation agencies, and the DSEWPaC ^a Australian World Heritage Areas dataset; available at Discover Information Geographically website (www.environment.gov.au/metadataexplorer/explorer.jsp)
Other special rights		
Native title determinations	2011	National Native Title Tribunal (NNTT) (<u>www.nntt.gov.au/Mediation-</u> and-agreement-making-services/Geospatial-services/Pages/Spatial- <u>Data.aspx</u>)
Indigenous land use agreements	2011	National Native Title Tribunal (<u>www.nntt.gov.au/Mediation-and-</u> agreement-making-services/Geospatial-services/Pages/ Spatial-Data asax)

DSEWPaC = Australian Government Department of Sustainability, Environment, Water, Population and Communities

^a From September 2013, the Department of the Environment.

^b From October 2012, the Department of Lands, Planning and Environment.

^c There are some known errors in this dataset.

^d From April 2012, the Department of Environment and Heritage Protection.

e From July 2013, the Department of Aboriginal Affairs (<u>www.daa.wa.gov.au</u>).

Source: Australian Bureau of Agricultural and Resource Economics and Sciences.

For reporting purposes, the information collected on Indigenous land tenure has been grouped into four categories (Table 6.39), which are shown on the map in Figure 6.33:

- Indigenous owned and managed —freehold lands that are both owned and managed by Indigenous communities
- Indigenous managed—lands that are managed but not owned by Indigenous communities (e.g. Crown reserves and leases); and lands that are owned by Indigenous people, but have formal shared management agreements with Australian and state and territory government agencies (e.g. leased-back nature conservation reserves)
- Indigenous co-managed—lands that are owned and managed by other parties, but have formal, legally binding agreements in place to include input from Indigenous people in the process of developing and implementing a management plan (e.g. nature conservation reserve memoranda of understanding)
- Other special rights—lands subject to native title determinations and active Indigenous land use agreements. These are independent of tenure and, in most cases, do not grant ownership or management rights of land to Indigenous communities. They can provide for the right to access areas of cultural significance, or a legal requirement for consultation with the local Indigenous community before any major development activities take place.

In all jurisdictions, government agencies responsible for the management of nature conservation reserves consult informally with Indigenous community groups and representatives as part of normal operations. Consultation with community groups, including Indigenous people, improves relations between these agencies and local communities and leads to a range of positive outcomes for agencies, community groups and the environment. However, since these arrangements are not identified explicitly as Indigenous co-management arrangements, they are not counted in Table 6.40 and not shown in Figure 6.33. SOFR 2008 reported a total of 122 million hectares of land in the Indigenous estate, of which 20.8 million hectares was forested (14% of Australia's total forest area). In 2011, the national Indigenous estate contained 309.9 million hectares of land, of which 41.9 million hectares was forested (Table 6.40)—this is 34% of Australia's total forest area. Of the 41.9 million hectares of forested land in the Indigenous estate, 31.7 million hectares (76%) is in Queensland and the Northern Territory.

The 41.9 million hectares of Indigenous forested land comprises 13.5 million hectares of forested land that is Indigenous owned and managed, 2.4 million hectares of forested land that is Indigenous managed, 5.4 million hectares of forested land that has co-management arrangements in place with government agencies, and 20.6 million hectares of forested land over which Other special rights (including native title determinations and Indigenous land use agreements) have been granted. Three major drivers are associated with the changes in estimated areas of forest in the Indigenous estate compared with the areas presented in SOFR 2008:

- the new method of estimating Australia's forest extent (Indicator 1.1a)
- improved availability and accessibility of spatial information on Indigenous land tenure from Australian and state and territory government agencies (Table 6.39)
- a real increase in the total area of land over which Indigenous people have legislated rights.

Figure 6.33: Forest on Indigenous owned and managed lands, Indigenous managed lands, Indigenous co-managed lands, and lands with Other special rights



Table 6.40: Area of land, including forest land, under Indigenous ownership and management, Indigenous management, Indigenous co-management and Other special rights

		Area ('000 hectares)								
Management category	Land cover type	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Australia
Indigenous owned and managed	All	0	434	64,068	4,997	20,351	62	11	16,109	106,032
	Forest	0	129	9,280	3,329	240	8	5	550	13,542
Indigenous managed	All	0	105	1,331	1,254	2,132	0	44	25,041	29,908
	Forest	0	28	461	1,002	74	0	27	808	2,400
Indigenous co-managed	All	106	2,920	196	2,436	3,077	1,383	222	5,494	15,834
	Forest	100	2,213	52	1,884	20	750	187	156	5,364
Other special rights	All	0	730	20,217	46,206	21,969	0	8,156	60,847	158,125
	Forest	0	366	691	15,045	371	0	2,857	1,293	20,622
Total	All	106	4,189	85,812	54,894	47,529	1,445	8,432	107,492	309,899
	Forest	100	2,735	10,485	21,260	705	758	3,076	2,807	41,928

Note: Totals may not tally due to rounding.

Source: Australian Bureau of Agricultural and Resource Economics and Sciences.

A land parcel may be subject to more than one type of management. To avoid double-counting, land has been classified for this indicator into the highest applicable of the four Indigenous land tenure and management categories—for example, a land parcel that is a declared Indigenous Protected Area but is also subject to a native title determination is reported here as Indigenous owned and managed.

Indigenous heritage protection

The Commonwealth, state and territory laws that protect Indigenous cultural heritage in Australia are the:

- Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)
- Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (Commonwealth)
- Aboriginal Land Rights (Northern Territory) Act 1976 (Commonwealth)
- Heritage Act 2004 (Australian Capital Territory)
- National Parks and Wildlife Act 1974 (New South Wales)
- Northern Territory Aboriginal Sacred Sites Act 1989 (Northern Territory)
- Heritage Act 2011 (Northern Territory)
- Aboriginal Cultural Heritage Act 2003 (Queensland)
- Torres Strait Islander Cultural Heritage Act 2003 (Queensland)
- Aboriginal Heritage Act 1988 (South Australia)
- Aboriginal Relics Act 1975 (Tasmania)
- Aboriginal Heritage Act 2006 (Victoria)
- Heritage Act 1994 (Victoria)
- Aboriginal Heritage Act 1972 (Western Australia).

All jurisdictions maintain Indigenous heritage site lists or registers. The legislation affords protection to all sites, including those situated in forests. It was not possible to collate these heritage lists spatially across each jurisdiction because of cultural sensitivities, privacy reasons and a lack of electronic spatial information for Indigenous heritage sites. Indigenous heritage sites are generally protected irrespective of their registration.

All states and territories have legislation, regulations, codes of practice and management prescriptions that govern the management of Indigenous heritage sites in forests. These instruments provide a level of protection for Indigenous heritage sites that are not yet included in the relevant Indigenous heritage site register.

Between 1975 and 2007, the Australian Government maintained the Register of the National Estate (RNE), a national list of places with historical, natural or Indigenous heritage significance. Each site was protected under the *Australian Heritage Commission Act 1975* (repealed in 2004) and the *Environment Protection and Biodiversity Conservation Act 1999*. The RNE was frozen in 2007 and ceased to be recognised as a statutory list in February 2012. Nevertheless, the RNE was still recognised in June 2011 (the end of the nominal reporting period for SOFR 2013), so the area of forest with Indigenous heritage significance listed on the RNE in June 2011 is reported here. Figure 6.34 shows the distribution of these areas across Australia.

The total area of forest located within sites with Indigenous heritage value registered on the RNE is 1.49 million hectares (Table 6.41), of which 1.2 million hectares (81%) is in Queensland and the Northern Territory. The forest types in the areas of forest with Indigenous heritage value registered on the RNE are predominantly Eucalypt medium open forest and Eucalypt medium woodland forest (70% of all forests on Indigenous sites; Table 6.41). SOFR 2008 reported 1.57 million hectares of forest within sites with Indigenous heritage value registered on the RNE. The difference between the values reported here and in SOFR 2008 is due solely to the new method of estimating Australia's forest extent (see Indicator 1.1a), since there has been no change in the total area or number of Indigenous sites on the RNE. Figure 6.34: Forests on Indigenous sites on the Register of the National Estate



Table 6.41: Area of native forest on the Register of the National Estate for Indigenous values

		Area ('000 hectares)							
Forest type	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Australia
Acacia	0	10	0	47	0	0	1	1	59
Callitris	0	1	0	5	1	0	19	0	25
Casuarina	0	6	3	0	2	0	1	0	14
Eucalypt	0	56	439	525	12	1	134	3	1,173
Eucalypt mallee open	0	0	0	0	1	0	0	0	1
Eucalypt mallee woodland	0	0	0	0	7	0	1	2	10
Eucalypt low closed	0	0	1	0	0	0	0	0	1
Eucalypt low open	0	0	20	43	0	0	0	0	64
Eucalypt low woodland	0	4	13	12	2	0	0	1	33
Eucalypt medium closed	0	0	1	0	0	0	0	0	1
Eucalypt medium open	0	13	255	45	0	1	51	0	365
Eucalypt medium woodland	0	31	149	416	2	0	82	0	680
Eucalypt tall closed	0	1	0	0	0	0	0	0	1
Eucalypt tall open	0	7	0	9	0	0	0	0	17
Eucalypt tall woodland	0	0	0	0	0	0	0	0	0
Mangrove	0	1	2	13	0	0	0	0	16
Melaleuca	0	0	87	27	0	0	3	0	119
Rainforest	0	2	23	13	0	0	0	0	38
Other native forest ^a	0	9	10	16	0	0	15	0	50
Total	0	85	566	646	16	3	174	3	1,493

 Other native forest comprises a range of minor forest types, including Agonis, Atalaya, Banksia, Hakea, Grevillea, Heterodendron, Leptospermum, Lophostemon and Syncarpia (named after their dominant genera), as well as native forests where the type is unknown.

Notes: No plantation forests are on the Register of the National Estate for Indigenous values.

Totals may not tally due to rounding.

Source: Australian Bureau of Agricultural and Resource Economics and Sciences, National Forest Inventory.

Case study 6.6: Protection of Aboriginal heritage in forests in South Australia

In South Australia, the *Aboriginal Heritage Act* 1988 provides for the identification, protection and preservation of Aboriginal (Indigenous) remains and archaeological sites and objects on all land, including forests, irrespective of land tenure. These sites and objects include:

- culturally modified trees (such as scar trees)
- burial mounds or sites
- middens or other sites used for camping or eating
- remnants of shelters
- cooking utensils or other tools
- stone flint sites or objects of technology
- cultural artefacts, paintings and carvings.

If Aboriginal remains and/or archaeological sites or objects exist at a site, including forest sites, a process is begun to develop a management plan to protect the area in consultation with regional Aboriginal authorities and communities.

To ensure that the forest industry is aware of its responsibilities under the *Aboriginal Heritage Act* 1988, Primary Industries and Regions South Australia (PIRSA) Forestry commissioned the publication of a fact sheet and internet video, *Aboriginal Heritage and Forestry*. In addition, PIRSA Forestry's *Guidelines for Plantation Forestry in South Australia 2009* outline the requirement to comply with the *Aboriginal Heritage Act 1988*.

The fact sheets and videos are available at: <u>www.</u> pir.sa.gov.au/forestry/publications_index/forestry_ development_information/fact_sheets2/aboriginal_ heritage_and_forestry.



Tiwi forestry worker pruning plantation trees, Melville Island, Northern Territory.

Indicator 6.4b

Registered places of non-Indigenous cultural value in forests that are formally managed to protect those values

Rationale

This indicator measures and monitors management regimes for non-Indigenous cultural values, such as historical, research, education, aesthetic, and social heritage values. Maintaining these values is integral to the protection of non-Indigenous peoples values associated with forests.

Key points

- A Non-Indigenous Heritage Sites of Australia dataset has been developed that compiles current non-Indigenous heritage lists and registers from all jurisdictions into a national dataset.
- Across all jurisdictions, the forest area on heritagelisted sites covers 7.3 million hectares. This is an overall increase of 6.8 million hectares of forest on heritagelisted sites since SOFR 2008, due to the use of the new dataset.

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Australia's forests include many sites that provide evidence of the interactions between non-Indigenous people and forest landscapes, and the activities that have taken place on the continent since European settlement. A wide variety of historical, research, education, aesthetic and social heritage sites, features, structures and landscapes have cultural value at a local, regional, state, national and international level.

The Australian Government's Register of the National Estate (RNE) dataset was established in 1975 under the *Australian Heritage Commission Act 1975* (repealed in 2004) as a register of sites of local, state and national significance. This Act provided all registered sites with a basic level of statutory protection, limited to actions of the Australian Government and its agencies (see Indicator 1.1c).

In 1997, the Council of Australian Governments (COAG) agreed that it was more appropriate for heritage listing and protection to be the responsibility of the government agencies that were best placed to deliver agreed outcomes. This recognised that state and territory governments had passed their own legislation to protect sites that they considered to be significant at the state and territory level. To protect sites with national significance, the Australian Government

created the National Heritage List (NHL) and the Commonwealth Heritage List in 2004, through amendments to the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Australian sites registered on the UNESCO World Heritage List (WHL) are also protected under this Act (see Indicator 1.1c). The RNE was frozen in 2007 by amendments that flowed from the 1997 COAG agreement, and it ceased to be recognised as a statutory listing on 19 February 2012. Table 6.42 summarises all heritage registers that currently record sites of heritage significance at the national and state and territory levels.

In SOFR 2008 (Indicator 1.1c), the RNE dataset was used to report on the area of heritage sites on forested land that were registered for their historical and natural heritage values. For SOFR 2013, the electronic spatial versions of each of the databases listed in Table 6.42 have been collected from the relevant agencies and compiled at the national scale. Indigenous sites were removed from these registers, as this indicator focuses specifically on non-Indigenous cultural values; most states and territories record Indigenous sites on separate Indigenous heritage registers. This derived national dataset is referred to as the Non-Indigenous Heritage Sites of Australia (NIHSA) dataset. The RNE dataset that was used in SOFR 2008 was not an input to the new NIHSA dataset. Each dataset used to compile the NIHSA dataset was current as at June 2011, which is the end of the nominal reporting period for SOFR 2013.

The sites in the NIHSA dataset are afforded protection (under the relevant Acts) from disturbance by any person, while the sites on the RNE were only afforded protection from actions of the Australian Government.

It is recognised that heritage registers are also compiled at the local government level in some areas of Australia; however, it was not possible to compile the extensive list of such datasets for use in this report.

Table 6.42: Heritage registers by jurisdiction and relevant legislation

Heritage register	Jurisdiction	Relevant legislation	Agency responsible at June 2011	Description of register
World Heritage List	International. Maintained by UNESCO World Heritage Centre Secretariat	EPBC Act	DSEWPaCª	Sites of outstanding universal value that are registered on the UNESCO World Heritage List
National Heritage List	Australia	EPBC Act	DSEWPaC°	Sites of outstanding heritage value to the Australian nation
Commonwealth Heritage List	Australia	EPBC Act	DSEWPaC⁰	Sites of significant heritage value that are owned or controlled by the Australian Government
ACT Heritage Register	Australian Capital Territory	Heritage Act 2004	Environment and Sustainable Development Directorate	Significant heritage places and objects with historical relevance to the people of the Australian Capital Territory
New South Wales State Heritage Register	New South Wales	Heritage Act 1977	Department of Premier and Cabinet, Office of Environment and Heritage	Places of heritage significance to the New South Wales community
Northern Territory Heritage Register	Northern Territory	Heritage Conservation Act 2011	Department of Natural Resources, Environment, the Arts and Sport ^b	Places and objects with heritage significance to the Northern Territory
Queensland Heritage Register	Queensland	Queensland Heritage Act 1992	Department of Environment and Resource Management ^c	Sites of cultural heritage significance to Queensland
South Australian Heritage Places	South Australia	Heritage Places Act 1993 and Development Act 1993	Department of Environment and Natural Resources ^d	Places of heritage significance to South Australia
Tasmanian Heritage Register	Tasmania	Historic Cultural Heritage Act 1995	Department of Primary Industries, Parks, Water and Environment	Places of historical cultural heritage significance to the whole of Tasmania
Victorian Heritage Register	Victoria	Heritage Act 1995	Department of Planning and Community Development	Victoria's most significant heritage places and objects
Western Australian State Register of Heritage Places	Western Australia	Heritage of Western Australia Act 1990	Department of Planning	Places of state cultural heritage significance

DSEWPaC = Australian Government Department of Sustainability, Environment, Water, Population and Communities; EPBC Act = Environment Protection and Biodiversity Conservation Act 1999; UNESCO = United Nations Educational, Scientific and Cultural Organization

^a From September 2013, the Department of the Environment.

^b From October 2012, the Department of Lands, Planning and Environment.

^c From April 2012, the Department of Environment and Heritage Protection.

^d From July 2012, the Department of Environment, Water and Natural Resources.

Source: Australian Bureau of Agricultural and Resource Economics and Sciences

Sites in the NIHSA dataset cover 61.6 million hectares across all jurisdictions, of which 7.3 million hectares are forested (Table 6.43; Figure 6.35). These 7.3 million hectares of forest on non-Indigenous heritage sites represent an increase of 6.8 million hectares over the area reported in SOFR 2008. This substantial increase was primarily driven by use of the new NIHSA dataset; the previous datasets did not include substantial areas of heritage-listed forest, such as the Wet Tropics of Queensland World Heritage Area.

Many of these registered heritage sites are not registered with the specific objective of protecting and conserving forests, although many of the larger sites are listed to protect landscapes that include forests and other wooded lands. Examples of these larger sites (and their heritage register category from Table 6.42) are Kakadu National Park in the Northern Territory (WHL), the Tasmanian Wilderness (WHL), Gondwana Rainforests of Australia in New South Wales and Queensland (NHL), Australian Alps National Parks and Reserves in the Australian Capital Territory, New South Wales and Victoria (NHL), High Conservation Value Old Growth Forests in New South Wales (New South Wales State Heritage Register) and the Grampians National Park in Victoria (Victorian Heritage Register).

Sites in the NIHSA dataset are located across all tenure types. The management approach for each site depends on which register it is listed under, its ownership and the type of heritage asset under management.

Under the EPBC Act, any site on the World, National and Commonwealth heritage lists owned or leased by the Australian Government is required to have a management plan that outlines how the heritage values of the site will be protected. Where the Australian Government does not have ownership, the owners (e.g. state or territory governments or private owners) can enter into agreements to develop and implement a management plan. Joint management plans can be developed for sites that extend across multiple tenures.

Sites listed on the state and territory heritage registers can be government owned or privately owned. Government-owned sites are managed by relevant state or territory government

Table 6.43: Area of forested land on sites included in the Non-	n-Indigenous Heritage Sites of Australia dataset
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	Area ('000 hectares)									
Forest type	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Australia	
Acacia	0	1	0	23	0	2	6	0	34	
Callitris	0	2	0	0	2	0	19	0	22	
Casuarina	0	68	0	30	3	0	1	0	102	
Eucalypt	112	1,936	754	659	315	475	960	165	5,381	
Eucalypt mallee open	0	9	0	0	3	0	0	0	12	
Eucalypt mallee woodland	0	16	0	0	308	0	0	40	365	
Eucalypt low closed	0	0	1	0	0	0	3	0	5	
Eucalypt low open	0	12	41	17	0	43	21	1	136	
Eucalypt low woodland	7	37	74	16	1	33	3	39	210	
Eucalypt medium closed	0	0	2	9	0	0	8	0	20	
Eucalypt medium open	82	1,087	276	304	0	88	554	2	2,394	
Eucalypt medium woodland	23	568	360	273	3	142	257	81	1,707	
Eucalypt tall closed	0	1	0	0	0	0	9	0	10	
Eucalypt tall open	0	205	0	40	0	133	102	2	482	
Eucalypt tall woodland	0	1	0	0	0	36	3	0	40	
Mangrove	0	1	15	84	0	0	0	2	103	
Melaleuca	0	2	93	60	0	9	4	1	168	
Other	3	77	46	101	0	29	18	20	292	
Rainforest	0	139	50	691	0	289	0	0	1,169	
Plantation hardwood	0	0	0	0	0	6	0	0	7	
Plantation softwood	4	0	0	0	0	0	0	0	5	
Plantation mixed and unknown	0	0	0	0	0	0	0	0	1	
Total	119	2,225	959	1,648	321	814	1,009	190	7,285	

Note: Totals may not tally due to rounding.

Source: Australian Bureau of Agricultural and Resource Economics and Sciences, National Forest Inventory.

agencies, and many have heritage management plans in place (e.g. conservation reserve management plans and state forest codes of practice). Private owners of heritage sites are required to submit development application plans to the relevant state agency or local government before any alteration of the site (including removal of trees), outlining how the heritage values will be preserved and maintained. Initiatives at local, state and territory, and national levels provide opportunities for funding for heritage conservation works.



Visitor facilities in forest above Mammoth Cave, a limestone cave containing ancient megafauna fossils, south-west Western Australia.







Nourlangie Rock, Kakadu National Park, Northern Territory.

Indicator 6.4c

The extent to which Indigenous values are protected, maintained and enhanced through Indigenous participation in forest management

Rationale

This indicator measures the extent to which Indigenous people participate in forest management. Active participation in forest management reflects the relationship between people and the land, and the integration of Indigenous peoples values with forest management practice, policy and decision making.

Key points

- Indigenous values can be divided into three broad but not mutually exclusive categories: heritage, contemporary and aspirational. Effective Indigenous participation can occur through a variety of direct or consultative mechanisms, but it is difficult to measure the exact scale of Indigenous participation through these mechanisms at the national scale.
- The degree of management control and influence that Indigenous people have over forests varies, depending on the type of land management arrangements in place and whether the land is Indigenous owned and managed, Indigenous managed, Indigenous co-managed or covered by Other special rights.
- Approximately 4.4 million hectares of forest are on Indigenous-owned lands where the legislated management intent is conservation. The tenure classifications for these lands are private, leasehold or other Crown land.

Indigenous people value forests for a range of cultural, social and economic reasons. This indicator discusses the relationship between the participation of Indigenous people in forest management and the protection, maintenance and enhancement of the values associated with forests.

In the past, the forest sector has dealt with Indigenous issues mostly in terms of archaeological cultural heritage sites, placing less emphasis on the values associated with a spiritual attachment to the land. However, the forest sector's understanding of Indigenous forest values has changed significantly in recent years. In part, this is due to contemporary civil movements for social justice and land rights. In addition, larger numbers of Indigenous people are now employed in government agencies responsible for nature conservation and commercial wood production, and Indigenous people have a greater presence on natural resource management committees and in other foreststakeholder forums.

Indigenous values

Indigenous values can be divided into three broad but not mutually exclusive categories: heritage, contemporary and aspirational.

Heritage

Heritage values are associated with Indigenous history and are important for connecting people with the landscape. Features with heritage value include the following.

 Archaeological sites—these provide tangible evidence of prior Indigenous presence. All jurisdictions protect archaeological sites through Indigenous heritage protection laws.

- Natural landscape features associated with Dreaming and creation stories—information about these features is often held by individuals and passed on orally, and may also be contained in historical records.
- Places associated with Indigenous history and culture these places might not contain physical evidence of such associations. They can include places of teaching, resource collection and work. Most of this information is only available orally.
- Secret and sacred places—information on these places is held by particular knowledge holders and is released on a discriminatory basis according to customary laws. Most of this information is only available orally.

Contemporary

Indigenous people also value forests for contemporary reasons, including the following:

- Landscapes of reconciliation and empowerment—for example, native forest harvesting on the sacred mountains of Mumbulla and Gulaga (south-east New South Wales) was halted as a result of Indigenous protests in 1979 and 1990, respectively.
- Places where Indigenous beliefs and customs can be integrated with modern living—for example, customary knowledge can be applied in economic development to produce wood products for the arts and crafts industry.
- Economic independence—both planted and native forests may be valued by Indigenous people for their ability to contribute to economic independence.

Aspirational

Forests may also have aspirational value for Indigenous people. Most native forests are under public ownership, under which native title rights and interests may prevail; they can therefore potentially contribute to intergenerational equity. Native forests are valued as areas in which Indigenous people can gain greater autonomy and economic returns through a range of mechanisms, including ownership and management of country.

Indigenous participation

Effective participation and consultation are essential for the protection, maintenance and enhancement of Indigenous forest values. Participation and consultation can occur through a variety of mechanisms, including:

- forest ownership and management
- joint management of national parks and conservation reserves
- consultation by public forest management agencies
- direct employment in the forest sector
- community employment schemes
- cooperative research programs
- partnerships with government and industry.

It is difficult to measure the exact scale of Indigenous participation through these mechanisms at the national scale. Indicator 6.4a presents information on the areas of forest that are owned, managed or co-managed by Indigenous people or where other special rights allow Indigenous people to participate in forest management. Indigenous people have legislated rights over 41.9 million hectares of forest in Australia.

The degree of management control and influence that Indigenous people have over the forests on these lands varies, depending on the relevant Australian, state or territory legislation that applies in each case. The degree of management control that Indigenous people have over each of the land management types included in the dataset is described below; currency of the data for each sub-category is given in Table 6.39 (Indicator 6.4a).

Indigenous owned and managed lands

A total of 13.5 million hectares of forested land was Indigenous owned and managed as at 2011 (Indicator 6.4a), in the following sub-categories.

Indigenous Protected Areas

Indigenous Protected Areas (IPAs) are areas of land that are legally owned and managed by Indigenous people for the protection of biodiversity and cultural heritage values.

IPAs are established through voluntary agreements between the Australian Government and Indigenous land owners. All IPAs have management plans that are developed by the landowners when they apply for the IPA to be declared. These plans incorporate culturally significant traditional land-management practices with other land-management practices to protect the significant values of the area. On-ground implementation of the management plans is undertaken by the Indigenous landowners. Funding is available from the Australian Government for the Indigenous owners to develop, implement and monitor the effectiveness of the management plans (DEWHA 2009b).

Although a number of existing IPAs are located in nonforested regions in the arid centre of Australia, several are located in the wetter, forest-dominated regions of the north and east coasts. Approximately 2.4 million hectares of forest are located in IPAs. Eucalypt medium woodland forest and Eucalypt medium open forest make up 65% of all forests in this land category, and Rainforests make up 5%. Case study 6.7 describes how Indigenous values are protected, maintained and enhanced through the management of forests in the Kaanju Ngaachi Wenlock and Pascoe Rivers IPA on Cape York in Queensland.

Aboriginal Lands Trust lands, Northern Territory

Northern Territory Aboriginal Lands Trust lands have been granted or claimed under the *Land Rights Act 1976* (Northern Territory). The legal title of the land is held by an Aboriginal Lands Trust, which is made up of Indigenous people who hold the title for the benefit of all of the traditional landowners. The lands are inalienable freehold, which means that they cannot be acquired, sold, mortgaged or disposed of in any way (Central Land Council 2007).

The traditional landowners are the key decision makers for their land. As the owner, the Aboriginal Lands Trust can approve the use of the lands for Indigenous housing, Indigenous business activities and other community purposes. However, before any activities take place, the appropriate Aboriginal land council (Central, Northern, Anindilyakwa or Tiwi) provides advice and consults with the traditional landowners to ensure that they understand and agree with the proposal. Once agreement has been reached, the land council provides directions to the Aboriginal Lands Trust to carry out the proposal (Central Land Council 2007).

There are 9.1 million hectares of forest located across all Northern Territory Aboriginal Lands Trust lands. Eucalypt medium woodland forest and Eucalypt medium open forest make up 77% of all forests in this land category.

Indigenous Land Corporation–owned and Indigenous Land Corporation– granted lands

The Indigenous Land Corporation (ILC) was established in 1995 as an independent statutory authority of the Australian Government. The purpose of the ILC, as defined in the Commonwealth *Aboriginal and Torres Strait Islander Act 2005*, is to help Aboriginal persons and Torres Strait Islanders acquire and manage land to achieve economic, environmental, social and cultural benefits (ILC 2012).

Further information on the Land Acquisition and Land Management Programs of the ILC can be found in its National Indigenous Land Strategy.¹⁴⁵

There are 1.2 million hectares of forest located across all ILC-owned and ILC-granted lands across Australia. Eucalypt medium woodland forests make up 66% of all forests in this land category.

ILC Indigenous estate

In 2003, the ILC funded the production of a dataset that was a snapshot of the extent of the Indigenous estate in Australia. It included all lands that were identified as being owned, managed or leased by Indigenous corporations, communities, trusts or agencies at the time of data collection.

This dataset has been used as a surrogate for Aboriginal Lands Trust and Aboriginal land council lands in a number of states and territories for which other data could not be collected within the required timeframe for use in this report. The dataset was used in SOFR 2008 to report on the area of forest that was owned and managed by Indigenous people, and therefore it provides a suitable baseline for use in SOFR 2013. There are some known errors in this dataset.

There are 15.0 million hectares of forest located on the 2003 ILC Indigenous estate. Eucalypt medium woodland forest and Eucalypt medium open forest make up 71% of all forests in this land category.

Deed of Grant in Trust, Queensland

Deed of Grant in Trust (DOGIT) lands are former reserves and missions that have been granted by the Queensland Government to Indigenous groups for the benefit of Indigenous inhabitants or for Indigenous purposes. The grants were made under the *Queensland Community Services (Torres Strait) Act 1984* and *Community Services (Aborigines) Act 1984* (DERM 2008).

Each trust area is owned by the Indigenous community and is managed as a local government area. Incorporated Aboriginal councils, which elect representatives every three years, manage the community's affairs. The councils are able to make by-laws and appoint community police, and are responsible for maintaining housing, infrastructure, the Community Development Employment Program, licences, and hunting and camping permits. All DOGIT lands are inalienable freehold, which means that they cannot be sold; however, they can be leased (DERM 2008).

There are 864 thousand hectares of forest located on all DOGIT lands. Eucalypt medium woodland forests make up 63% of all forests in this land category, and 'Other native forests' make up 12%.

Indigenous-managed lands

A total of 2.4 million hectares of forested land was Indigenous managed as at 2011 (Indicator 6.4a), in the following sub-categories.

Aboriginal Lands Trust, Western Australia

The Aboriginal Lands Trust (ALT) is a statutory body that was established under the Western Australian *Aboriginal Affairs Planning Authority Act 1972* (AAPA Act). The trust is made up of a board of Indigenous people appointed by the Western Australian Minister for Indigenous Affairs. The ALT, with assistance from the Department of Indigenous Affairs¹⁴⁶, is tasked with managing the ALT lands in a manner that will achieve social, cultural and economic advancement for Indigenous people. Any activities undertaken on ALT lands must be in accordance with the wishes of the local Indigenous community and in line with the ALT's land-use and development policy (DIA 2002).

Lands held by the ALT can be freehold, leasehold or Crown reserve lands that have been acquired through a variety of processes and held in trust for the use and benefit of

¹⁴⁵ www.ilc.gov.au/-/link.aspx?_id=8D4468C409DF44AAA4461918FC <u>CFE67F&_z=z</u>.

¹⁴⁶ From July 2013, the Department of Aboriginal Affairs.

Indigenous people. Freehold lands are owned by the ALT. Leasehold lands are Crown lands with leases granted under the Western Australian *Land Administration Act 1997* (LA Act). Leasehold land remains the property of the Crown and carries certain conditions or requirements relating to the way that it is used. Reserve lands are Crown reserves that have had management orders granted to the ALT to care for, control and manage the land for the use and benefit of Indigenous people, through either the LA Act or the AAPA Act. Lands declared under the AAPA Act have additional protection, which limits access to the lands by the general public and mining companies. Reserves make up the majority of the ALT estate (ALT 2009).

Any lands that are managed by the ALT can be granted to an Indigenous corporation to manage them.

There are 663 thousand hectares of forest located across all ALT lands in Western Australia. Eucalypt medium woodland forests make up 73% of all forests in this land category, and Eucalypt low woodland forests make up 18%.

Indigenous pastoral leases, Western Australia

Indigenous pastoral leases are lands with a pastoral lease granted to Indigenous corporations under the Western Australian LA Act. All pastoral leases that are held by Indigenous corporations are subject to the same rules and regulations that apply to non-Indigenous pastoral leases. The main activity that must be undertaken on these lands is the grazing of animals. Nongrazing activities cannot be undertaken without a permit from the Pastoral Lands Board; this includes clearing native vegetation and establishing plantations.

The Crown maintains ownership of these lands (DIA 2005).

There are 318 thousand hectares of forest located across all Indigenous pastoral leases in Western Australia. Eucalypt low woodland forest and Eucalypt medium woodland forest make up 55% of all forests in this land category, and Acacia forest makes up 42%.

Leased-back nature conservation reserves

The Australian, New South Wales, Northern Territory, Queensland, South Australian and Victorian governments have granted freehold ownership of several nature conservation reserves to Indigenous community groups, land trusts and land councils through Acts of parliament within their jurisdiction. The Indigenous owners have leased the reserves back to the relevant government environmental conservation agency, which in turn delegates the care, control and management of the reserve to a board of management.

The Indigenous owners of the reserves hold a majority of seats on the boards of management. Other stakeholders on the boards can include representatives of government agencies, conservation groups, local councils and other local landholders. The boards of management develop a management plan, which they implement and monitor using funds paid by the government agency as part of the lease agreement.

Leased-back nature conservation reserves have been classified in this report as Indigenous-managed lands because, although they are legally owned by Indigenous groups, these groups do not have sole management control over the land—control is often shared with non-Indigenous government and community representatives.

There are 2.0 million hectares of forest located across all leased-back nature reserves in Australia. Eucalypt medium woodland forest and Eucalypt medium open forest make up 65% of all forests in this land category; Melaleuca forest makes up 10%; and Rainforest makes up 9%.

Approximately 4.4 million hectares of forest are on Indigenous-owned lands where the legislated management intent is conservation. This includes the area of forest in Indigenous Protected Areas and leased-back nature conservation reserves. The formal land tenure classifications (see Indicator 1.1a) for these lands are private, leasehold or other Crown land.

Indigenous co-managed lands

A total of 5.4 million hectares of forested land had Indigenous co-management arrangements in place as at 2011 (Indicator 6.4a), in the following sub-categories.

Nature conservation reserve memoranda of understanding

Nature conservation agencies in all jurisdictions have negotiated memoranda of understanding (MOUs) with local Indigenous communities for the joint management of a number of nature conservation reserves. Under these MOUs, the Indigenous community may be involved in the development and implementation of reserve management plans to protect sites of Indigenous cultural significance.

The Crown maintains ownership and management control of these lands.

There are 3.6 million hectares of forest across Australia in nature reserves with co-management MOUs in place. Eucalypt medium woodland forest and Eucalypt medium open forest make up 65% of all forests in this land category, and Rainforest makes up 10%.

World Heritage Areas

Several of Australia's World Heritage-listed areas have Indigenous advisory committees that provide advice to the World Heritage Area management committee on the management of sites of Indigenous cultural significance.

World Heritage Areas can be owned by the Crown or by private parties and can exist on any land tenure type. Only areas that are owned by the Crown, or have co-management agreements with private landowners in place, have capacity for Indigenous co-management.

There are 4.3 million hectares of forest located across all co-managed World Heritage-listed areas across Australia. Eucalypt medium woodland forest and Eucalypt medium open forest make up 48% of all forests in this land category, and Rainforest make up 27%.

Lands with other special rights

Other special rights had been granted over a total of 20.6 million hectares of forested land as at 2011 (Indicator 6.4a), in the following sub-categories.

Native title determinations

Native title is the recognition, in Australian law, that some Indigenous people have rights to, and interests in, their land that come from their traditional laws and customs. Native title rights can include the right to live in, access and collect resources from an area, along with the right to visit and protect sites of cultural significance.

In some cases, native title includes the right to possess and occupy an area to the exclusion of all others. This includes the right to control access to, and use of, the area concerned. However, this right can only be recognised over certain areas, such as unallocated or vacant Crown land and some areas already held by, or for, Indigenous Australians (NNTT 2009). Native title does not always grant legal title of an area to an Indigenous community group, but it does give the right to participate in decisions on how the land or waters are used by other people. Native title rights may co-exist with other rights not involving native title; however, in the event of conflict, the native title rights must give way to the non–native title rights (NNTT 2009).

There are 7.8 million hectares of forest across Australia located across all lands with native title determinations that have not been counted under any of the other Indigenous land ownership and management categories. Eucalypt medium woodland forest and Eucalypt medium open forest make up 57% of all forests in this land category; Eucalypt mallee woodland forest makes up 8%; and Eucalypt low woodland forest makes up 8%.

Case study 6.7: Kaanju Ngaachi Wenlock and Pascoe Rivers Indigenous Protected Area

The Kaanju Ngaachi Wenlock and Pascoe Rivers Indigenous Protected Area (IPA) is Australia's 25th IPA. It stretches across nearly 2,000 square kilometres of wet tropical forest and sand-ridge country between Lockhart River, Coen and Weipa on Cape York, Queensland. Like all of Australia's IPAs, it protects some of the nation's rare and fragile environments for the benefit of all Australians.

The IPA is managed by the Chuulangun Aboriginal Corporation and is a place of significant social, cultural, spiritual, historical and economic value for its traditional owners. Kaanju refers to 'upland' and Ngaachi to 'homelands' (traditional country).

Kaanju Ngaachi's forests are among the most diverse and unspoiled in the world and contain plant species that date back to the time of Gondwanaland. Through the vegetation along its rivers, the IPA provides an important habitat link between the closed forests on either side of Cape York.

The rivers that border the IPA contain many freshwater fish species. The IPA protects a wide range of animals, including nationally endangered southern cassowaries, fish eagles, yellow-faced whip snakes and quolls. Saltwater crocodiles can be found in the lower Pascoe River where salt water meets fresh water, and freshwater crocodiles live in the lagoons and tributaries of the upper Pascoe and Wenlock rivers.

A team of rangers helps look after the IPA, controlling weeds, maintaining traditional fire regimes, and fencing sensitive areas to exclude feral animals. Much of their work is funded by the Australian Government under the Caring for our Country initiative, through the Indigenous Protected Areas and Working on Country elements. Support also comes from the Queensland Government through the Wild Rangers program, and from Bush Heritage Australia, delivered by the Chuulangun Aboriginal Corporation.

Chuulangun also has a cooperation agreement with The Wilderness Society, which supports an environmental protection and homelands development agenda for Kaanju homelands and the IPA.

The declaration of Kaanju Ngaachi Wenlock and Pascoe Rivers IPA in June 2008 was made under International Union for Conservation of Nature (IUCN) Category V—Protected Area (Landscape/Seascape).

Like all IPAs, Kaanju Ngaachi is part of Australia's National Reserve System, a nationwide network of reserves especially set up to protect examples of Australia's unique landscapes, plants and animals for current and future generations.

For more information about the Kaanju Ngaachi Wenlock and Pascoe Rivers IPA and the activities of the Chuulangun Aboriginal Corporation, visit <u>www.kaanjungaachi.com.au</u>.

Source: Adapted from www.environment.gov.au/indigenous/ipa/pubs/kaanju-factsheet.pdf.

Indigenous land use agreements

The Commonwealth *Native Title Act 1993* allows for Indigenous land use agreements to be made between Indigenous people who hold or may hold native title and other interested parties (e.g. private companies or government agencies) about how land and waters in an area covered by the agreement will be used and managed. Indigenous land use agreements can be made as part of a native title determination, or separately from a native title claim.

Indigenous land use agreements do not equate to ownership of land. They deal with the use of land, and can cover a range of issues that may or may not relate to forests. For example, an Indigenous land use agreement may cover one or more of access to land for exploration or mining, change in land use, access to pastoral leases, terms and conditions of claim settlements, or joint management arrangements in relation to conservation areas. They can include assurances about protection of cultural heritage and the environment, employment and training opportunities, and communication between parties.

There are 21.0 million hectares of forest across Australia located across all lands with Indigenous land use agreements that have not been counted under any of the other Indigenous land ownership and management categories. Eucalypt medium woodland forest and Eucalypt medium open forest make up 56% by area of all forests in this land category, and Melaleuca forest makes up 11%.



Woodland forest on the south boundary of the Mission Aboriginal Area, New South Wales.



Tiwi forestry workers measuring native forest logs, Melville Island, Northern Territory.

Case study 6.8: Indigenous community engagement with Forests NSW¹⁴⁷

Forests NSW works with Indigenous people to protect cultural heritage and empower people through participation in management programs and processes.

In the Forests NSW Central Region, a memorandum of understanding between Forests NSW and the Anaiwan elders led to Forests NSW funding improvements to forest sites.

In 2010–11, a co-management agreement was signed between Forests NSW Southern Region and the Ulladulla Local Aboriginal Land Council (LALC) relating to an area of state forest that contains significant art sites. The agreement opens the way for use of the area in an LALC ecotourism venture.

Forests NSW Southern Region also signed an agreement with the Eden LALC on a *Land & Sea Country Plan.* This will see the LALC develop a group of rangers for Forests NSW, the National Parks and Wildlife Service, the shire council, Landcare groups, and the Southern Rivers Catchment Management Authority. The intention is for these land management agencies to give a number of Indigenous people fulltime work, such as weed clearing along rivers and beaches, hazard reduction burning for Forests NSW and the National Parks and Wildlife Service, and other works for Landcare and the council.

In another project, Eden LALC is working with Forests NSW and the National Parks and Wildlife Service on developing a walking track, known as the Bundian Way, that connects the coast at Eden to the high country around Mount Kosciuszko. The track is based on the travel route used by Indigenous people to connect the high country to the coast for trade; the route also allowed coastal people to travel to the high country to feast on bogong moths. It is hoped that this will bring tourists from around the country and the world to walk the track and visit LALC-owned areas along the route, providing tourism work and money to the local Indigenous and non-Indigenous people. The route was mapped in 2010-11, and work will continue on camping areas, signage and safety management systems in 2011–12.

Further information on Indigenous engagement and employment in Forests NSW can be found in the *Forests NSW Annual Report 2010–11* (Forests NSW 2011).

¹⁴⁷ From January 2013, the Forestry Corporation of NSW.

SOFR 2008 reported a general lack of data for this indicator. In the period covered by SOFR 2013, however, considerable

new data were generated by surveys of attitudes towards forest management (both native and plantation), wood products, and the potential role of forests and wood in climate change mitigation. The results provide insights into the knowledge and attitudes of the community and how these are changing over time.

Australia's forests are recognised as one of Australia's greatest

that they provide. Over the past 35 years, societal values and

attitudes towards the natural environment and the industries

to people provides an insight into communities' acceptance

and approval of activities relating to forest management.

natural assets and are highly valued for the wide range of environmental and socio-economic benefits and services

that affect it have changed (see Lacey et al. 2012 for an example). Understanding the importance of Australia's forests

Attitudes towards wood and forests

A series of nine national market research surveys conducted for Forest and Wood Products Australia¹⁴⁸ in the period 2008-12149 explored the views of people towards forest-related environmental issues and the role of wood. People aged 18 years and over, living in Australia, were surveyed, with a sample size of greater than or equal to 1,000 per survey.

Indicator 6.4d

The importance of forests to people

This indicator measures the range of attitudinal values that communities and individuals place on their forests. The importance of forests to society is exemplified through the value that people place on biodiversity, clean air and water, social equity or simply the knowledge that Australia's forests exist.

Key points

- Several surveys conducted between 2006 and 2012 have provided considerable insight into the attitudes of Australians to a range of forest-related issues.
- More than 40% of the respondents to an Australiawide series of surveys agreed that Australia's native forests were being managed sustainably. The proportion of respondents who agreed that 'we should not be cutting down any trees for wood products' decreased between 2009 and 2012, and the proportion of respondents who agreed that 'we should use more wood because it is more environmentally friendly than alternative materials' increased.
- The level of understanding about the role of forests in carbon storage is high and increasing. In 2012, more than 90% of respondents to the same series of Australia-wide surveys agreed that trees absorb carbon dioxide, and 71% (up from 52% in 2008) agreed that 'carbon is stored in wood, even after the tree is harvested'.
- In south-west Western Australia and Tasmania, views are polarised on the acceptability of eucalypt plantations for pulp and paper, and pine plantations for timber.
- About 80% of respondents to a survey in south and central rural New South Wales indicated that they would consider planting trees for carbon sequestration, and nearly 70% indicated that being paid for carbon sequestration would increase the likelihood that they would plant trees for purposes such as reducing land degradation and providing shelter for stock.

¹⁴⁸ Forest and Wood Products Australia (FWPA) is a not-for-profit company that provides national integrated research and development services to the Australian forest and wood products industry (www.fwpa.com.au).

 $^{^{\}rm 149}\,$ The most recent two surveys were in May 2012 and July 2012, outside the nominal reporting period for this report, but these data are included here because of their timeliness. Where practical, data for May 2011 (the most recent survey inside the nominal reporting period) are also provided.

In these surveys, almost 80% of people agreed with the statement 'cutting down trees is okay, as long as we replace them with new ones' (Figure 6.36). Over the same period, a smaller majority (56-60%) indicated that 'cutting down trees is bad for the environment'. However, only a small proportion (9–13%) agreed that we should import more wood from overseas rather than cut down trees in Australia. More than 40% of respondents agreed that Australia's native forests were being managed sustainably. The number of respondents who agreed with the statement 'we should not be cutting down any trees for wood products' declined from 41% in 2009 to 35% in 2012. Over the same period, the proportion of respondents who agreed that 'we should use more wood because it is more environmentally friendly than alternative materials' increased from 51% to 60%. The surveyed population therefore held a wide range of views about forests and wood.

Survey respondents perceived wood to be substantially more environmentally friendly than other common building materials (e.g. aluminium, plastic, concrete, steel and brick) (Figure 6.37). The surveys also indicated that the perception of wood as an environmentally friendly material increased substantially between 2008 and 2012.

The surveys found that fewer women than men agreed with the statements 'Australia's native forests are managed sustainably' and 'cutting down trees is okay, as long as we replace them with new ones' (Figure 6.38). More women than men agreed with the statements 'we should not be cutting down any trees for wood products in Australia' and 'cutting trees down is bad for the environment'.

Figure 6.36: Proportion of people agreeing with statements relating to tree harvesting, native forest management and plantations, May 2009, May 2011 and May 2012



Sample sizes ≥ 1,000.

Total sample reliability = $95\% \pm 3\%$.

Source: FWPA (2013).

Figure 6.37: Perceptions of materials as environmentally friendly, October 2008, May 2011 and May 2012



Notes:

The histogram shows the percentage of respondents who associated the term 'environmentally friendly' with a given material. Sample sizes \geq 1,000.

Total sample reliability = $95\% \pm 3\%$. Source: FWPA (2013).
Figure 6.38: Proportion of females and males agreeing with statements related to tree harvesting, native forest management and plantations, May 2012



Notes:

'Agreeing' means a response of 'agree totally', 'agree strongly' or 'agree slightly'. Sample sizes \geq 1,000, comprising at least 500 females and 500 males. Total sample reliability = 95% ± 3%.

Source: FWPA (2013).





Notes:

Participants were asked to respond 'true' or 'false' to each statement. Sample sizes \geq 1,000.

Total sample reliability = $95\% \pm 3\%$.

Source: FWPA (2013).

Forests, carbon and climate change

Public responses to statements on the role of forests and wood products in climate change were also assessed in the Forest and Wood Products Australia surveys. The level of understanding about the role of forests in carbon storage was generally high: in surveys conducted in 2008 and 2012, 94% of people thought that the statement 'trees absorb carbon dioxide from the atmosphere' was true (Figure 6.39). The level of understanding about the role of wood in carbon storage was somewhat lower, but increased over time. In 2008, 52% of people thought that the statement 'Carbon that is stored in wood stays there even when the tree has been harvested' was true, whereas 71% per cent of respondents thought that it was true in 2012 (Figure 6.39). Awareness of the role of wood in carbon storage increased between May 2011 and May 2012. This may have been the result of advertising campaigns held in February–April 2012 via television and the internet, which delivered the messages 'wood stores carbon for life' and 'wood—naturally better', or a range of other advertising campaigns.

Nearly three-quarters of survey respondents (74%) in May 2012 believed that climate change is occurring and being contributed to by human activities (Figure 6.40), and more than 70% 'would like to know more about what I can do to reduce carbon dioxide and other greenhouse gases'. An increasing proportion of respondents over time thought that 'using more wood would be a help in tackling climate change'.



Figure 6.40: Proportion of people agreeing with various statements relating to climate change, May 2011 and May 2012

Notes:

80

For the first three statements, 'agreeing' means a response of 'strongly agree' or 'agree'; for the fourth statement, 'agreeing' means a response of 'agree totally', 'agree strongly' or 'agree slightly'. Sample sizes \geq 1,000.

Total sample reliability = $95\% \pm 3\%$.

Source: FWPA (2013).

Public acceptability of plantation forestry

Understanding people's attitudes about plantation forests contributes to an understanding of the importance of forests to people. A survey of residents of Tasmania and south-west Western Australia (minimum sample size of 1,729) was undertaken between June and August 2008 to measure, among other things, the acceptability of eucalypt and pine plantations relative to other land uses (Williams 2009, Williams 2011).

On average, pine plantations and eucalypt plantations for timber and pulp production were viewed less positively than traditional agricultural land uses such as cropping and grazing, and less positively than 'green' land uses such as revegetation and wind farms, but more positively than rural residential development (Figure 6.41).

Both positive and negative views were expressed about plantations, especially with respect to eucalypt plantations for pulp and paper (Figure 6.41B). This polarisation was strongest in Tasmania, where there was both support for and strong aversion to pine plantations grown for timber production, and eucalypt plantations grown for pulp and paper. Conflict in the views of Western Australian respondents was less pronounced. Many respondents in Western Australia believed that plantations improved profit and management options for landholders, but fewer believed that plantations would lead to social benefits such as growth in regional populations and employment, community involvement and business for local traders.

Overall, plantations were viewed by respondents as having a mix of physical outcomes. For example, many believed that plantations would help protect soils from erosion, but many also considered plantations to have negative impacts on water availability (Williams 2009).

A follow-up survey conducted in 2011 (Williams 2012; minimum sample size of 1,094) found no significant change in attitudes between 2008 and 2011 among residents of south-west Western Australia with regard to acceptance of pine plantations grown for timber production, eucalypt plantations grown for timber, or eucalypt plantations grown for paper and pulp. However, residents in Tasmania had, over this period, become significantly more accepting of pine plantations grown for timber, eucalypt plantations grown for timber, and eucalypt plantations grown for pulp and paper (Figure 6.42). Nevertheless, the data again suggest conflicting views among residents of Tasmania with regard to both eucalypt plantations grown for timber: 12–15% of respondents expressed strong aversion to these forms of plantations, and 21–22% indicated strong support.



Recreational hikers in forest, Walhalla, Victoria



Figure 6.41: Acceptability of various land uses to residents in Tasmania and south-west Western Australia, 2008

Notes:

Distribution of acceptability ratings of (A) Traditional agricultural land uses, (B) Plantation land uses, (C) Native vegetation and wind farms as land uses, and (D) Rural residential development, as land uses. Acceptability is rated from 1 to 7, with a rating of 1 being 'Not acceptable' and a rating of 7 being 'Very acceptable'. The histograms show the proportion of respondents with each acceptability rating. Combined data from respondents in Tasmania and south-west Western Australia. Sample sizes \geq 1,000.

Source: Adapted from Williams (2009). See also Williams (2011).



Yellow-tailed black-cockatoos (Calyptorhynchus funereus) in pine (Pinus radiata) plantation, South Australia.

Figure 6.42: Acceptability of plantations to residents in Tasmania, 2008 and 2011







Notes:

Distribution of acceptability ratings of (A) eucalypt plantations grown for paper and pulp, (B) pine plantations grown for timber, and (C) eucalypt plantations grown for timber. Acceptability is rated from 1 to 7, with a rating of 1 being 'Not acceptable' and a rating of 7 being 'Very acceptable'.

The histograms show the proportion of respondents with each acceptability rating. Sample sizes \geq 1,000.

Source: Adapted from Williams (2012).

Tree planting for carbon sequestration

A survey conducted in July–September 2010 explored landholder perceptions of tree planting for carbon sequestration in south and central rural New South Wales (Schirmer and Bull 2011). Survey areas ranged from high-rainfall, traditional forestry regions, such as Tumut and Tumbarumba, to very low rainfall regions where tree planting is less common, such as Hay and Narrandera. Almost all respondents to the survey had previously engaged in tree planting, most commonly for shelter for animals but also for a wide range of aesthetic and environmental reasons (Figure 6.43).

About 80% of landholders responding to the survey indicated a desire to plant more trees on their properties, and almost 80% said that they preferred to plant species that were native to their local areas. More than 60% said that farmers had a responsibility to manage their lands to provide benefits for the wider community, and more than 70% said that they should be paid to do so.

About 80% of respondents also stated that they would consider planting trees for carbon sequestration in the future (Figure 6.44). Co-benefits were likely to be important in future tree-planting decisions: nearly 70% of respondents stated that being paid for carbon sequestration would increase the likelihood of their planting trees for purposes such as reducing land degradation and providing shade and shelter for stock. The main reasons limiting the uptake of tree planting for carbon sequestration appeared to be a lack of clarity in the rules governing carbon markets, the risk that future governments might change their minds on climate policy, current schemes not offering sufficient financial incentive, and carbon markets being too uncertain. More than 70% of respondents disagreed with the statement 'there is currently clear government legislation providing a good basis for a formal carbon market'. The survey was conducted before the enactment of the Commonwealth Carbon Credits (Carbon Farming Initiative) Act 2011 (see Indicator 7.1a).



Environmental plantings on agricultural land. Large contiguous areas of environmental plantings that meet the definition of forest are recorded in the National Forest Inventory under the 'Other forest' category (Indicator 1.1a).



Figure 6.43: Proportion of landholders who planted trees for a given purpose, 2010

Notes:

The histogram shows the proportion of respondents stating each purpose. Respondents were able to state more than one purpose. Sample size = 345.

Source: Schirmer and Bull (2011).



Figure 6.44: Adoption by landholders of tree planting for carbon sequestration, 2010

Notes:

The histogram show the proportion of respondents giving each response. Respondents could provide only one response. Sample size = 345.

Source: Schirmer and Bull (2011).

Case study 6.9: Native vegetation management on agricultural land

More than 224 million hectares of native vegetation, including native forest as well as shrubland and grassland, occurs on agricultural land (ABS 2011c). Management of this native vegetation by farmers is particularly important for biodiversity protection, carbon sequestration, soil and water quality, and amenity and personal values.

A national telephone survey of farmers run by the Australian Bureau of Agricultural and Resource Economics and Sciences in 2011 (Harris-Adams et al. 2012) found that 85% of farmers were managing their native vegetation for production and/or on-farm environmental benefits (Table 6.44). Benefits include shelter belts, use of native pastures as stockfeed, and habitat for native species. Nearly one-quarter of farmers focused on improving connectivity between their patches of native vegetation and vegetation on neighbouring properties. Farmers were also interested in how their native vegetation fits within the landscape; 30% considered how their native vegetation management contributed to regional or landscape outcomes, including government regional plans.

Table 6.44: Focus of farmers' native vegetation management

Management focus	Proportion of responses (%)
On-farm benefits	85
Connectivity	22
Regional/landscape outcomes	30

Notes:

National results were calculated by weighting data collected from each sample farm.

Figures sum to more than 100% because respondents could choose more than one response.

Source: Harris-Adams et al. (2012).

More farmers were interested in improving the condition or increasing the extent of native vegetation than in clearing native vegetation (Table 6.45). Just over 30% of farmers intended to improve native vegetation condition, and 20% intended to increase the area of native vegetation on their farm; around 12% intended to do both.

Table 6.45: Future management intentions for native vegetation

Future management intentions	Proportion of responses (%)
Clear	10
Increase area	20
Improve condition	31
No change	56

Notes:

National results were calculated by weighting data collected from each sample farm.

Figures sum to more than 100% because respondents could choose more than one response.

Source: Harris-Adams et al. (2012).

Farmers therefore recognise the range of benefits produced by native vegetation on agricultural land and have a central role in managing Australia's native vegetation. Improving the management of native vegetation requires more flexible approaches that recognise its wider benefits.

Indicator 6.5a

Direct and indirect employment in the forest sector

Rationale

This indicator measures the level of direct and indirect employment in the forest sector. Employment is an important measure of the contribution of forests to viable communities and the national economy.

Key points

- Total direct employment in the forest sector was estimated at 73,267 people in 2011, down from 85,254 people in 2006. This decline in total direct employment was largely the result of a 14.3% fall in full-time direct employment in the forest sector between 2006 and 2011, from 69,930 to 59,896 employees.
- Direct employment declined from 2006 to 2011 in the forestry and logging subsector; wood product manufacturing subsector; pulp, paper and converted paper product manufacturing subsector; and timber wholesaling subsector. Direct employment in the forestry support services subsector increased.
- Limited data are available on indirect forest employment because of cross-linkages with other sectors of the economy.
- A study on Tasmania by the Cooperative Research Centre for Forestry used different employment categories, but showed that forest-related employment in Tasmania fell by 46.0% between 2006 and 2011, from 6,409 to 3,460 people. The number of forestrelated businesses in Tasmania also fell over this time.

National data on forest-sector employment presented in this indicator are derived from the Australian Bureau of Statistics, and presented in five categories or subsectors: forestry and logging; wood product manufacturing; pulp, paper and converted paper product manufacturing; forestry support services; and timber wholesaling. The categories are from the 2006 Australian and New Zealand Standard Industrial Classification system (Trewin and Pink 2006). Estimates are for all people aged 15 years or over who worked for at least one hour for pay, profit, commission or payment in kind; employees working for one hour or more without pay in a family business or on a farm; and employers and employees who were on leave, on strike or away from work as a standard work or shift arrangement (ABS 2011d). 'Full-time' means workers who usually worked 35 hours or more in a week; 'part-time' means workers who usually worked fewer than 35 hours per week.

Tasmanian data on forest-sector employment from Schirmer et al. (2011) use different employment categories (Table 6.46).

Employment data for forest-dependent communities (including indirect forest employment) and Indigenous Australians are presented in Indicators 6.5c and 6.5d, respectively.

Direct employment in the forest sector

Total direct employment in the forest sector increased from 79,494 in 2001 to 85,254 in 2006 (Figure 6.45), in line with total national employment—direct forest-sector employment as a proportion of total national employment was 0.96% in both 2001 and 2006.

Total direct employment in the forest sector then fell by 14.0% to 73,267 employees in 2011 (Figure 6.45), and also declined as a proportion of total national employment, from

Figure 6.45: Total national employment in forestry, by employment status, 2001-11



'Total' employment includes people employed full time and part time in forestry and logging; wood product manufacturing; pulp, paper and converted paper product manufacturing; forestry support services; and timber wholesaling. Total employment may be higher than the sum of full-time and part-time employment because total employment includes people who were 'employed, but away from work' but for whom hours worked were not given.

The national total direct employment of 73,267 employees comprised 501 employees in the Australian Capital Territory, 22,247 employees in New South Wales, 244 employees in Northern Territory, 12,845 employees in Queensland, 6,498 employees in South Australia, 3,526 employees in Tasmania, 21,826 employees in Victoria and 5,580 employees in Western Australia.

Estimates of full-time and part-time employment for 2001 are not available.

Source: ABS (2001, 2006, 2012e).

Figure 6.46: Employment in the forestry and logging subsector, 2006-11



Note: 'Total' employment may be higher than the sum of full-time and part-time employment because it includes people who are 'employed, but away from work' where hours worked are not given. Source: ABS (2006, 2012e).



Figure 6.47: Employment in the wood product manufacturing subsector, 2006-11

Note: 'Total' employment may be higher than the sum of full-time and part-time employment because it includes people who are 'employed, but away from work' where hours worked are not given. Source: ABS (2006, 2012e).

0.96% in 2006 to 0.75% in 2011. This decline was primarily the result of a 14.3% decline in total full-time employment, from 69,930 full-time employees in 2006 to 59,896 in 2011. Total part-time employment in the forest sector also fell over the period, but only by 8%, from 11,116 to 10,198 people.

Direct employment in the forestry and logging subsector

The forestry and logging subsector includes the workforce employed in growing trees in both native and plantation forests, and workers employed in logging activities, such as felling trees and cutting logs. It also includes the growing and harvesting of some non-wood forest products.

Total employment in the forestry and logging subsector declined between 2006 and 2011, from 6,872 to 5,399 people (Figure 6.46). The decrease in full-time employment was larger than the decrease in part-time employment. Monthly employment data (not shown) confirm a downward trend from February 2006 to February 2012, with strong seasonal variability (ABS 2012f).

Direct employment in the wood product manufacturing subsector

Wood product manufacturing includes activities relating to log sawmilling, timber dressing, woodchipping, and engineered and secondary wood products.

Employment in the subsector decreased by approximately 12% between 2006 and 2011, from 47,312 to 41,672 people (Figure 6.47). The decline was also evident in monthly employment data for the period February 2006 to February 2012 (not shown), although with seasonal fluctuations (ABS 2012f).

Direct employment in the pulp, paper and converted paper product manufacturing subsector

Employment estimates for the pulp, paper and converted paper product manufacturing subsector include workers engaged in the manufacture of wood pulp, paper and paperboard products.

From 2006 to 2011, employment in this subsector declined by 17.6%, from 23,485 to 19,356 people (Figure 6.48). The decline in full-time employment, from 19,468 to 16,171 people, was larger than the decline in part-time employment. Monthly employment data for the period February 2006 to February 2012 (not shown) showed a similar downward trend, with some seasonal variability (ABS 2012f).

Direct employment in the forestry support services subsector

Forestry support services include silvicultural activities such as planting, pruning, thinning, conservation and plant maintenance. This subsector may overlap with the forestry and logging subsector, which also covers activities relating to forest-growing operations.

Employment in the forestry support services subsector increased by about 5.6% between 2006 and 2011. The number of people employed full time in this subsector remained almost constant, but part-time employment increased from 616 to 755 people (Figure 6.49). Data on intervening years (not shown) show yearly variability and a slight upward trend between 2006 and 2011.

Direct employment in the timber wholesaling subsector

Timber wholesaling includes all wholesaling activities of wood except for firewood. Between 2006 and 2011, employment in the timber wholesaling sector decreased by 15.5%, from 5,534 to 4,674 people (Figure 6.50). There were declines in both full-time and part-time employment.

Indirect forest employment

Indirect employment includes activities that are generated from direct employment in the forest sector. Examples of indirect employment are wholesale and retail trade; legal services; accounting; marketing and business services; motor vehicles; rail, pipeline and other transport services (parts, equipment, maintenance and repairs); electricity, gas and water supply; education; scientific research; technical and computer support; government administration; and media services. Limited data are available on indirect forest employment because of extensive cross-linkages with other sectors of the economy.



Victorian forest officers conducting an audit of harvesting operations.



Figure 6.48: Employment in the pulp, paper and converted paper product manufacturing subsector, 2006-11

Note: 'Total' employment may be higher than the sum of full-time and part-time employment because it includes people who are 'employed, but away from work' where hours worked are not given. Source: ABS (2006, 2012e).



Figure 6.49: Employment in the forestry support services subsector, 2006-11

Note: 'Total' employment may be higher than the sum of full-time and part-time employment because it includes people who are 'employed, but away from work' where hours worked are not given. Source: ABS (2006, 2012e).

6,000 5,000 4,000 3,000 2,000 1,000 2006 2016 2011 Part time

Figure 6.50: Employment in the timber wholesaling subsector, 2006–11

Note: 'Total' employment may be higher than the sum of full-time and part-time employment because it includes people who are 'employed, but away from work' where hours worked are not given. Source: ABS (2006, 2012e).

Tasmanian forest industry employment and trends

Schirmer et al. (2011) report a study on the Tasmanian forest industry by the Cooperative Research Centre for Forestry. The employment categories used this study are summarized in Table 6.46, as they are different from those used in ABS (2006, 2012e).

Table 6.46: Forest-related employment in Tasmania—inclusions and exclusions

Included
Processors of wood up to finished wood products domiciled in Tasmania
Harvest and haulage contractors
Silviculture and road contractors
Nurseries and seed suppliers
Forest and/or plantation growers and managers
Woodcraft sector
Excluded
Processors who use Tasmanian wood but are based outside Tasmania
Firewood cutters and sellers
Researchers focused on forestry
Forest industry groups and regulatory agencies, including industry lobby groups, industry associations and government regulators

Source: Schirmer et al. (2011).

Forest-related employment in Tasmania fell by almost half (46.0%) between 2006 and 2011, from 6,409 to 3,460 employees (Figure 6.51). This was a result of business closures driven by the global financial crisis, appreciation of the Australian dollar and other factors. The estimated number of forest-related businesses operating in Tasmania declined from 510 to 372 between 2006 and 2011 (Figure 6.51). Further declines in employment may occur following the appointment of administrators to Gunns Limited in 2012.

Forest growing and nurseries

The forest-growing and nurseries subsector includes people who are employed in managing native forest and plantations, as well as those who grow and collect seedlings for commercial planting.

In Tasmania, employment in the subsector declined by 43.1% between 2006 and 2011. Employment declined for both forest growers, and nurseries and seed suppliers (Figure 6.52). The fall in employment in the subsector coincided with a sharp decline in plantation establishment in Tasmania (see Indicators 6.2a and 2.1b).

Wood processing

Wood processing includes all businesses involved in the manufacture of primary wood products, including woodchips, sawn timber, and engineered wood products such as veneer. Between 2006 and 2011, employment in the Tasmanian wood-processing industry declined by 46.5%, from 3,034 to 1,622 employees (Figure 6.53). The strong Australian dollar and reduced domestic demand were two drivers of this decline.

Forest contractors

The forest contractors subsector, consisting of people employed in silviculture, harvest and haulage, and roading and earthmoving, experienced a downturn in employment between 2006 and 2011 (Figure 6.54). The number of contractors working in harvest and haulage declined by 41.0% from 1,394 to 823; in silviculture, there was a decline of 76.3% from 668 to 158.



Figure 6.51: Number of people employed in the forest industry, and number of forest-related businesses, Tasmania, 2006–11

Notes:

Categories of forest industry employment are given in Table 6.46. Data for 2007 and 2009 are unavailable.

Source: Schirmer et al. (2011).



Figure 6.52: Employment in the forest-growing and nurseries subsector, Tasmania, 2006–11

Notes:

Includes people employed in both native and plantation estates, but excludes people employed on a contractual basis. Data for 2007 and 2009 are unavailable.

Source: Schirmer et al. (2011).





Note: Data for 2007 and 2009 are unavailable. Source: Schirmer et al. (2011).



Figure 6.54: Employment in forest contracting, Tasmania, 2006–11

Notes:

Data for 2007 and 2009 are unavailable.

Data on employment in roading and earthmoving were unavailable for 2006.

Source: Schirmer et al. (2011).

Indicator 6.5b

Wage rates and injury rates within the forest sector

Rationale

This indicator measures the level of wage and injury rates in the forest sector. A sustainable industry will ensure high levels of workforce health with welfare and wage rates comparable with national averages for other occupations.

Key points

- Total wages and salaries in the wood and wood product industries have been between \$3.8 billion and \$4.2 billion from 2005–06 to 2010–11. Over the period, the average wage (not adjusted for inflation) has been increasing in the forestry and logging subsector, in wood product manufacturing, and in the pulp, paper and converted paper product subsector.
- Average annual wages in the forestry and logging subsector were estimated to be \$34,467 in 2010–11. This is high compared with most other primary sectors, including agriculture and aquaculture, but low compared with the mining sector.
- The average wage in the wood product manufacturing sector was estimated to be \$48,568 in 2010–11, which is lower than in most other manufacturing industries. In comparison, average annual wages in the pulp, paper and converted paper product subsector were estimated to be \$72,381 in 2010–11.
- The number of serious injury claims in both the forestry and logging and the wood and paper product manufacturing subsectors have been declining in recent years. However, the decline in the incidence rate of serious claims is more modest in wood and paper products manufacturing than in the forestry and logging subsector.
- Between 2003–04 and 2009–10, there were 25 reported compensated fatalities in the forestry and logging subsector and 21 compensated fatalities in the wood and paper product manufacturing subsectors.

This indicator compares wage and salary rates in the forestry and logging, wood product manufacturing, and pulp, paper and converted paper product manufacturing subsectors with those of other primary and manufacturing sectors. This indicator also examines death and injury rates in those subsectors.

Wage rates

Estimates of wage rates were derived by dividing the total wages and salaries reported in a sector or industry by the number of full-time and part-time employees in that sector or industry. Wages and salaries include abnormal payments, such as severance, termination, redundancy and bonus payments, and provision expenses for employee entitlements, such as leave. They exclude payments to self-employed labourers such as consultants, contractors and those working on commissions. Withdrawals of equity from a business by proprietors and partners are also excluded.

Total wages and salaries in the wood and wood product industries have ranged from \$3.7 to \$4.2 billion between 2005–06 and 2010–11 (Table 6.47). Some industry sectors showed increases in wages and salaries, and some showed decreases. Businesses classified under 'other wood product manufacturing' constituted the largest component of total wages and salaries (35.7%) in 2010–11. This category includes industries engaged in the manufacture of prefabricated buildings, engineered wood products such as veneer and plywood, wooden structural fittings, and other types of wood products not classified elsewhere, such as ornamental woodworking, picture frames and wood pallets. It excludes timber used in making furniture, such as tables and chairs. The average wage for workers was higher in the forestry and logging subsector than in many other primary sectors in the period 2005-06 to 2010-11 (Table 6.48; employment categories used for the intersectoral comparisons are shown in Box 6.2). Workers in agriculture had the lowest average wage relative to other primary sectors, due partly to the large parttime labour force that is typically recruited during harvesting seasons. The high average annual wage in the mining sector is largely a result of the sector's location in remote areas of Australia—requiring higher wages to attract labour to the industry (Connolly and Orsmond 2011)-and the strong global demand for minerals over the reporting period.

Table 6.49 shows the annual average wage in wood product manufacturing and selected other manufacturing sectors between 2005–06 and 2010–11. The average wage in wood product manufacturing is generally lower than in most other manuacturing sectors. However, the pulp, paper and converted paper product manufacturing subsector was estimated to have an average annual wage of \$72,381 in 2010-11, which was higher than in most other reported sectors except for the petroleum and chemical manufacturing sector.

Table 6.47: Wages and salaries, wood and wood products industries, 2005–06 to 2010–11

			(\$ mill	ion)		
Subsector	2005–06	2006–07	2007–08	2008–09	2009–10	2010–11
Forestry and logging	611	509	500	568	540	517
Wood product manufacturing	1,851	2,082	2,246	2,137	2,224	2,137
Pulp, paper and converted paper product manufacturing	1,294	1,470	1,530	1,468	1,459	1,520
Total	3,756	4,061	4,276	4,173	4,223	4,174

Notes:

Estimates for the timber wholesaling and forestry support services subsectors could not be presented because of aggregation limitations with the source data. Employment categories for 2006-07 to 2010-11 are from the Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006 (Trewin and Pink 2006) (see Box 6.2). Categories for the 2005-06 estimate are from ANZSIC 2003; data were not available for all categories for 2005-06. Source: ABS (2007, 2012b).

Box 6.2: Employment categories used for the intersectoral comparisons

The employment categories used in Tables 6.48 and 6.49 to compare forest-sector wage rates to the wage rates in other sectors use slightly different employment categories from those used in Indicators 6.5a-d.

Agriculture, forestry and fishing support services

For 2006–07 to 2010–11, agriculture, forestry and fishing support services relate to Division A, subdivision 05 under the Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006. This includes silvicultural services, crop spraying, irrigation services and other activities that support agriculture, forestry and fishing.

Forestry and logging

For 2005–06, forestry and logging relates to Division 3 of the ANZSIC 2003 classification. For 2006–07 to 2010–11, forestry and logging relates to Division A, Subdivision 03 in the ANZSIC 2006 classification. This includes activities relating to the harvesting of forest products, both standing trees and non-timber products. It excludes silvicultural activities, which are covered under agriculture, forestry and fishing support services.

Wood product manufacturing

For all periods, this category relates to Division C, Subdivisions 14 and 15 of the ANZSIC 2006 classification. It includes activities relating to sawmilling and timber dressing, the construction of engineered wood products, pulp and paper activities, and other paper products. It excludes activities relating to printing services, such as book-binding services, photocopying, digital printing, and services relating to the reproduction of recorded media.

See Trewin and Pink (2006) for further detail.

Table 6.48: Estimated annual wage, selected primary sectors, 2005–06 to 2010–11

			(\$ per pe	rson)		
Sector	2005–06	2006–07	2007–08	2008–09	2009–10	2010-11
Agriculture	8,800	10,260	10,290	10,531	10,478	10,116
Agriculture, forestry and fishing support services	13,000	17,860	18,604	15,044	16,319	16,940
Aquaculture	-	28,143	25,625	28,286	30,286	30,000
Forestry and logging	23,144	26,789	27,778	28,400	30,000	34,467
Fishing, hunting and trapping	13,000	16,500	20,286	19,857	18,000	16,308
Mining	85,622	101,085	103,813	118,926	115,271	118,882

- = not available

Note: Employment categories for 2006–07 to 2010–11 are from the Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006 (Trewin and Pink 2006); some categories are aggregated. Categories for the 2005–06 estimates are from ANZSIC 2003. Box 6.2 gives more detail of the forestry-related categories. Source: ABS (2007, 2012b).

Table 6.49: Estimated annual wage, selected manufacturing sectors, 2005–06 to 2010–11

			(\$ per pe	rson)		
Sector	2005–06	2006–07	2007–08	2008–09	2009–10	2010–11
Food beverages and tobacco	46,929	43,321	41,632	44,656	46,498	48,685
Metal and non-metal minerals	49,747	54,657	57,694	59,646	59,288	61,951
Petroleum and chemical	58,161	68,365	72,692	77,353	84,340	84,216
Textiles, clothing and footwear	32,184	31,185	32,577	38,021	36,591	34,795
Wood products	43,802	40,824	42,377	43,612	46,333	48,568
Pulp, paper and converted paper product	43,802	61,250	66,522	69,905	69,476	72,381
Other	46,782	51,166	53,917	55,155	54,519	57,270

Note: Employment categories for 2006–07 to 2010–11 are from the Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006 (Trewin and Pink 2006); some categories are aggregated. Categories for the 2005–06 estimates are from ANZSIC 2003. Box 6.2 gives more detail of the forestry-related categories. Source: ABS (2007, 2012b).

Injury rates

Injury and fatality rates in the forest sector reflect occupational health and safety standards, as well as the inherent danger of the sector. The number of serious claims in both forestry and logging and wood and paper product manufacturing declined between 2003–04 and 2009–10 (Table 6.50). The incidence rate of serious claims in the forestry and logging subsector fell from 32.4 per 1000 employees in 2003–04 to 21.4 per 1000 employees in 2009–10. In comparison, the incidence rate of serious claims in the wood and paper product manufacturing industry fell more modestly, from 33.5 per 1000 employees to 32.8 per 1000 employees over the same period.

The number of compensated fatalities in the forestry and logging subsector has also fallen over the same period, with a similar trend in the incidence rate of compensated fatalities (Table 6.50).

Table 6.50: Number of serious claims and	d compensated fatalit	ies, 2003-04 to 2009-10
--	-----------------------	-------------------------

								Total
	2003–04	2004–05	2005–06	2006–07	2007–08	2008–09	2009–10	2003–10
Number of serious claims								
Forestry and logging	375	345	350	290	315	290	270	2,235
Wood and paper products	2,460	2,420	2,190	2,140	2,185	1,905	1,830	15,130
Incidence rate of serious claims (number	per 1000 emp	loyees)						
Forestry and logging	32.4	30.5	32.1	27.3	26.1	23.8	21.4	n.a.
Wood and paper products	33.5	35.4	33.3	31.9	35.4	34.3	32.8	n.a.
Number of compensated fatalities								
Forestry and logging	8	8	5	0	3	1	0	25
Wood and paper products	2	2	0	7	4	5	1	21
Incidence rate of compensated fatalities	(number per 1	000 employe	es)					
Forestry and logging	0.69	0.71	0.46	0.00	0.25	0.08	0.00	n.a.
Wood and paper products	0.03	0.03	0.00	0.10	0.06	0.09	0.02	n.a.

n.a. = not applicable

Notes:

'Wood and paper products' includes wood product manufacturing and pulp, paper and converted paper product manufacturing.

It is not possible to present estimates for timber wholesaling or forestry services because data are not available.

Source: Calculated from data in Safe Work Australia (2010, 2011, 2012).

Indicator 6.5c

Resilience of forest dependent communities to changing social and economic conditions

Rationale

This indicator provides a measure of the extent to which forest dependent communities are able to successfully respond and adapt to change. Resilient forest dependent communities will adapt to changing social and economic conditions, ensuring they remain viable into the future.

Key points

- A reduction in the harvest of native forests, lower investment in new plantations, reduced demand for wood products, and the closure of large-scale mills have had significant impacts on Australia's forest and wood products industries and forest-dependent communities over the period from 2006 to 2011.
- In 2011, there were 28 Statistical Local Areas (SLAs) where 4% or more of the working populations were employed in forest and wood products industries (the level used to show medium-to-high relative community dependence on forests). Of these 28 SLAs, only 10 showed a decline in total employment over the period from 2006 to 2011, but 24 showed a decline in employment in the forest and wood products industries over this period. Dependence on forest and wood products industries as a source of primary employment therefore decreased in most regions in the period from 2006 to 2011. Exceptions include Kyogle in the north coast region of New South Wales and Colac in western Victoria.
- Of the SLAs with relatively high employment dependence on forest and wood products industries, several had relatively low rankings in an adaptive capacity index.
- An increased number of people with training qualifications and skills, higher incomes, higher community participation levels and regional industry diversity may contribute in some communities to a higher adaptive capacity and resilience to industry change, through a transition to, and growth of, other industries.

A clear measure of the resilience of communities in adapting to change is not available. In this indicator, information is presented about the characteristics of communities and workers in forest and wood products industries that may affect their capacity to adapt, and that informs our understanding of community resilience.

The concept of resilience in a community in a socio-economic context is conceptualised and measured in different ways, sometimes interchangeably with adaptive capacity (ABARE–BRS 2010). Maguire and Cartwright (2008) clarify that resilience can occur in three different ways: as recovery, as stability and as transformation. The relationship between adaptive capacity and resilience is complementary: increasing adaptive capacity will increase community resilience.

The Australian forest and wood products industries¹⁵⁰ have undergone significant structural changes in recent years, such as a reduced harvest in native forests (Indicator 2.1a), reduced investment in new plantations (Indicator 6.2a), reduced demand for wood products from both domestic and international markets due to global economic conditions (Indicator 6.2a), and decommissioning of several old and uncompetitive processing facilities (Indicator 6.2b).

Such changes can have economic and social implications for forest-dependent communities and workers in the forest and wood products industries. The impacts will depend on factors such as community size, structure, location and history. Some communities adapt to change through transformation and taking opportunities, which enables them to 'bounce back' from stressors, adjust to unknown situations or create a buffer against stressors through continual improvement. For other communities, change may have damaging consequences (Australian Social Inclusion Board 2009). This indicator considers only the dependence of communities on the forest and wood products industries, and not on other forest activities such as tourism or grazing.

¹⁵⁰ Defined here as the Australian and New Zealand Standard Industrial Classification categories of forestry and logging; forestry support services; wood product manufacturing; pulp, paper and converted paper product manufacturing; and timber wholesaling.

The capacity of forest-dependent communities, and workers in forest and wood products industries, to accommodate change is influenced by their level of economic dependence on these industries, and by the level of resources they can draw on to assist their response to change; these resources can be described collectively as 'adaptive capacity'. The resources represented by adaptive capacity can contribute to a community's resilience. Dependence and adaptive capacity are discussed below, and the derivation and application of these terms are discussed in more detail in Schirmer et al (2013).

Dependence on forest and wood products industries

The proportion of people directly employed in an industry can indicate the level of a community's economic dependence on that industry. However, beyond those directly employed in the forest and wood products industries, it is difficult to determine the economic dependence on forests of forest users such as apiarists, graziers, ecotourism operators, training providers and transport contractors, and potentially some personnel involved in forest management. Since these categories are not included in this assessment of forest dependence, forest-related employment is potentially underestimated by the available figures.

Communities are considered to show medium-to-high relative community dependence on forest and wood products industries when employment in the sector is at least 4% of total community employment. Table 6.51 shows the characteristics of the 28 Statistical Local Areas¹⁵¹ (SLAs) that in 2011 had more than 4% employment dependence on the forest and wood products industries and more than 20 workers employed in these industries; these SLAs are also shown in Figure 6.55.

In 2011, there were eight SLAs where 10% or more of the working populations were employed in forest and wood products industries (four in New South Wales, two in South Australia, one in Victoria and one in Western Australia).

Only 10 of the 28 SLAs dependent on forest and wood products industries showed a decline in total employment over the period from 2006 to 2011. However, 24 of these 28 SLAs (all except for two each in New South Wales and Victoria) showed a decline in employment in the forest and wood products industries over this period—in 10 of these 24 SLAs, the decline was more than 20%. This decline may be due to several factors, including the changing nature of the forest and wood products industries.

Of the 28 SLAs, 14 had an increase in employment in forest and wood products industries from 2001 to 2006, while 11 had declines over both consecutive five-year periods to 2011. In Tasmania, several SLAs with more than 4% employment dependence on the forest and wood products industries in 2006 showed a decline to dependence levels below 4% in 2011 (Figure 6.54) and hence do not appear in Table 6.51.

Community adaptive capacity

Community adaptive capacity is affected by the diversity and magnitude of resources available to people in a community. These resources are commonly described in terms of social, human, institutional, physical, natural and economic capital (ABARE-BRS 2010, Wall and Marzall 2006). The assessment of adaptive capacity presented here uses an indicator approach to construct sub-indices from selected Australian Bureau of Statistics (ABS) data from the Census of Population and Housing for forest-dependent SLAs (see Box 6.3). Sub-indices for human capital, social capital and economic diversity are combined to create an overall adaptive capacity index (not incorporating natural or physical capital).¹⁵² Information on the level of dependence of a community on forest and wood products industries, and its adaptive capacity, can help indicate areas where communities adapting to change might require assistance.

Of the SLAs with relatively high employment dependence on forest and wood products industries, several had relatively low rankings in the adaptive capacity index in 2006 (Table 6.51). In particular, Bombala and Tumbarumba in New South Wales, Dorset in Tasmania, and Wattle Range in South Australia depend on these industries for close to, or more than, 10% of employment, but using 2006 data had an adaptive capacity ranking of 'lower'.

Community adaptive capacity is a complex concept, and a single metric cannot capture the full experience of specific communities undergoing rapid change. Using census data reveals only part of the story and, given this limitation, it is important to further validate indicator results with specific information about each community.



Tumut shire in New South Wales, an area with high employment in the forest and wood products industry.

¹⁵¹ A Statistical Local Area (SLA) is one of the base spatial units at which the Australian Bureau of Statistics collects and publishes statistics across Australia (www.abs.gov.au/ausstats/abs@.nsf/0/4BF2827AC128BF62C A256AD4007F680C?opendocument).

¹⁵² For further details, see Stenekes et al. (2012).

Table 6.51: Characteristics of Statistical Local Areas with more than 4% employment dependence on, and more than 20 workers employed in, the forest and wood products industries

SLAª	Number of people employed in forest and wood products industries, 2011	Proportion of workforce employed in forest and wood products industries, 2011 (%)	Change in forest and wood products industries employment, 2001–06 ^b (%)	Change in forest and wood products industries employment, 2006–11° (%)	Change in total employment, 2006–11 (all industries) (%)	Adaptive capacity ranking, 2006ª
New South Wales						
Oberon	394	17.45	8.65	-7.73	-0.66	Middle
Bombala	163	15.22	-0.64*	4.49*	-1.47	Lower
Tumut Shire	717	15.22	1.65	-3.24	4.06	Middle
Tumbarumba	185	13.08	2.56*	-7.50	-5.35	Lower
Clarence Valley—Balance	113	5.30	7.19*	-24.16	5.33	Lower
Clarence Valley—Grafton	412	4.81	27.83	-6.58	4.92	Middle
Kyogle	135	4.03	-46.85	14.41	0.72	Lower
Queensland						
Gympie—Cooloola	412	4.79	-0.48*	-0.24*	17.21	Middle
Gympie—Gympie	320	4.61	-1.10*	-10.86	9.54	Middle
South Australia						
Wattle Range—West	451	12.23	-5.39	-30.62	-2.33	Lower
Mount Gambier	1,239	11.02	-3.51	-17.95	6.66	Middle
Grant	362	9.41	0.63*	-25.05	-2.71	Middle
Wattle Range—East	100	6.43	-20.75	-40.48	-1.95	Lower
Tasmania						
Dorset	227	8.78	-1.50*	-50.54	-6.91	Lower
Derwent Valley—Part B	103	7.93	13.08	-14.88	12.37	Middle
Circular Head	241	6.69	11.45	-17.47	-1.75	Lower
Derwent Valley—Part A	156	6.43	-4.13*	-32.76	4.34	Middle
Central Highlands	41	5.07	6.38*	-18.00*	-2.06	Lower
Launceston—Part C	60	4.51	-16.83	-28.57	5.14	Middle
Victoria						
Alpine—West	200	10.33	-12.20	-22.78	0.36	Middle
Latrobe—Traralgon	749	5.47	8.18	-14.20	14.03	Middle
Wellington—Alberton	119	5.33	25.00	19.00	-0.62	Lower
Colac-Otway—Colac	259	5.22	-7.35	14.10	5.95	Middle
East Gippsland—Orbost	168	5.08	-43.27	-13.40	5.55	Middle
Latrobe—Balance	65	5.00	38.18	-14.47	1.01	Middle
Western Australia						
Nannup	60	10.31	102.94	-13.04*	9.81	Middle
Manjimup	274	6.55	-43.71	-23.46	1.97	Middle
Bridgetown—Greenbushes	98	5.14	3.23*	-38.75	8.72	Middle
Australiae	73,267	0.75	7.2	-14.1	9.7	

SLA = Statistical Local Area

a 2001 and 2006 comparative data are based on 2006 SLA boundaries, and 2011 data are based on 2011 SLA boundaries. There are no significant boundary differences for the SLAs listed.

^{b, c} Percentage change calculated from change in absolute employment numbers between census years. Changes of 10 or fewer individuals are indicated by *.
 ^d Adaptive capacity ranking is only currently available from 2006 census data. 'Lower', 'middle' and 'higher' refer to the adaptive capacity index relative to all SLAs with 20 or more forest-sector workers. The adaptive capacity index combines sub-indices for human capital, social capital and economic diversity.

e Data based on total aggregated SLAs across Australia.

* Indicates changes of 10 or fewer individuals.

Source: ABS (2011e).



Figure 6.55: Employment dependence on forest and wood products industries by Statistical Local Area, 2011

Source: ABS (2011e).



Human capital

Human capital comprises factors that influence the productivity of labour, including education, skills and health. Human capital was calculated using Australian Bureau of Statistics data for age of residents, employment rates, level of education and qualifications, financial position, household structure (such as the proportion of lone-person households) and population mobility.

Social capital

Social capital describes relationships, networks and connections between people, and hence the degree of support people can draw on in the face of challenges. Methods for measuring social capital are less established than those used to measure human capital. The index used here includes two measures of social capital: the percentage of adults undertaking voluntary work, and the percentage of the female workforce in non-routine occupations.

Several other factors can increase social capital, such as business funding, facilitation of community initiatives, and people's attitudes and values, which shape how changes are perceived and decisions are made. These factors cannot be measured using readily available data sources and are not included in the index.

Economic diversity

Economic diversity is the variety of employment sectors in a local economy relative to the Australian economy. High economic diversity provides multiple income streams to a local economy and alternative employment for displaced workers, thereby potentially increasing community resilience to changes in the industry on which they depend.

Worker characteristics

Changes in forest and wood products industries may affect workers at a personal level. An individual's ability to adapt to change is difficult to quantify and can be independent of the broader community's adaptive capacity. Individual adaptive capacity is influenced by many factors; Table 6.52 presents some of the characteristics of workers in forest and wood products industries that could contribute to individual adaptive capacity, using 2006 and 2011 ABS data.

Older employees can find it more challenging than younger people to find alternative employment. In 2011, the median age of forestry workers in most SLAs was 41–47 years, with a small increase in the median age between 2006 and 2011 (Table 6.52). Qualifications and formal skills recognition can increase opportunities for workers. Nationally, 48% of forestry workers had non-school qualifications in 2011, compared with 59% in the total workforce; however, forestry worker education levels have increased in most communities since 2006 (Table 6.52).

Workers on lower incomes and in unskilled occupations may have fewer financial resources to assist them to adapt to change. In many SLAs of high dependence on forest and wood product industries, up to one-third of forest workers were employed in unskilled jobs in 2011, and nationally 8% were low-income earners (Table 6.52). These proportions decreased in the five years to 2011.

Case study 6.10: Potential adaptive capacity and contribution of forestry to the Tumut community

Adaptive capacity can be applied not only to understand a community's ability to 'bounce back' from an impact, but also its ability to take advantage of opportunities. Tumut in southern New South Wales provides a good example of a community that has been able to take advantage of embodied local resources—natural, physical, human and social capital—to attract significant investment in the local forestry sector.

The expansion of forestry in the region since 1991 has contributed to stable economic growth, and to population stability in towns that otherwise would have been likely to experience population decline (Schirmer et al. 2005).

Tumut is ranked 'middle' in terms of its potential adaptive capacity relative to other forest-dependent localities in Australia (Table 6.51). Tumut's degree of adaptive capacity is a result of moderate levels of human capital and economic diversity, and a slightly lower level of social capital than other forest-dependent localities. This indicates that Tumut could be expected to respond reasonably well to 'shocks' affecting the community, and to be able to take advantage of investment opportunities that may derive from other economic, geographic or biophysical factors.

Plantations of radiata pine (*Pinus radiata*) were first established in Tumut Shire in the 1920s, with large-scale processing occurring in the area since the 1950s (Schirmer et al. 2005). In 2000, the consistent quantity and quality of the timber produced in the area (natural capital), the proximity of major road transport infrastructure (Hume Highway) and existing processing infrastructure (physical capital), and the strength of the community and an available skilled workforce (social and human capital) attracted substantial investment by Visy Industries, which selected Tumut from a host of international contenders as the location for its kraft paper mill.

Wood production and associated manufacturing in Tumut have diversified the declining regional economy, and their combined value currently exceeds \$600 million per year. The forest and wood products industries have underpinned significant employment in Tumut, and directly employed 15.2% of the working population in 2011. Although there was a small drop in forest-sector employment from 2006 to 2011 (741 to 717 employees), there was a 4% rise in total employment across all industries (Table 6.51). Flow-on employment has also been generated by, for example, several Tumut-based enterprises that provide engineering and technical services to the Visy paper mill and to forest and wood product industries across New South Wales. Accredited training courses, delivered via the Tumut campus of TAFE NSW, have been established to service the training needs of a range of plantation-sector employees.

The forest and wood products industries have also contributed to the broader Tumut community by supporting community initiatives. For example, Visy Industries has provided funding for local building improvements, and for tree planting and other environmental projects.

Source: ABS (2011e), FWPRDC (2005), Tumut Shire Council (2010), Visy (2011).

Table 6.52: Forestry worker characteristics in Statistical Local Areas with more than 4% employment dependence on, and more than 20 workers employed in, the forest and wood products industries, 2006 and 2011

SLAª	Median a	ige (years)	Work non quali	ers with -school fication⁵	Unski	lled workers ^c	Low	r-income arners ^d
	2011	2006	2011 (%)	2006–11 (% change)	2011 (%)	2006–11 (% change)	2011 (%)	2006–11 (% change)
New South Wales								
Oberon	41	39	39.3	5.1	23.4	-0.8	2.5	-0.7
Bombala	41	38	30.1	7.0	28.2	-8.3	1.8	-3.9
Tumut Shire	44	41	47.6	5.2	20.2	-5.0	5.0	-1.9
Tumbarumba	41	37.5	49.7	11.7	22.2	-11.8	1.6	-2.9
Clarence Valley—Balance	45	44	34.5	2.3	38.1	1.8	10.6	1.9
Clarence Valley—Grafton	42	39	30.6	1.3	35.4	0.3	8.3	0.8
Kyogle	45	44	38.5	6.3	43.7	3.9	11.1	5.2
Queensland								
Gympie—Cooloola	46	44	40.0	2.8	28.6	-6.0	4.9	-3.4
Gympie—Gympie	43	42	42.2	3.2	23.8	-3.8	5.3	-3.9
South Australia								
Wattle Range—West	45	43	37.7	4.3	25.3	-1.2	2.9	-1.9
Mount Gambier	43	40	44.2	7.3	20.1	-6.3	3.3	-1.7
Grant	44	41	47.8	2.7	18.5	-4.3	6.1	0.7
Wattle Range—East	45	41	24.0	0.2	31.0	-9.5	3.0	-2.4
Tasmania								
Dorset	39.5	37	42.7	6.6	29.1	-6.9	7.0	-2.3
Derwent Valley—Part B	40	41	39.8	10.1	30.1	2.0	10.7	1.6
Circular Head	42	40	20.7	0.9	38.2	-1.6	6.2	-6.1
Derwent Valley—Part A	47	42	39.1	5.1	19.9	-3.0	3.2	-2.0
Central Highlands	34	33	29.3	17.3	22.0	-14.0	7.3	-10.7
Launceston—Part C	44	39	28.3	-3.8	28.3	10.5	8.3	1.2
Victoria								
Alpine—West	47	42	38.0	1.7	35.0	-4.0	4.0	-0.6
Latrobe—Traralgon	46	44	56.2	6.0	21.2	-3.4	2.0	-0.7
Wellington—Alberton	40	39	29.4	-7.6	44.5	-4.5	10.9	-10.1
Colac-Otway—Colac	36	41	33.2	1.0	28.6	-8.9	4.6	-2.9
East Gippsland—Orbost	43	42.5	39.9	7.9	33.3	2.4	7.7	-1.0
Latrobe—Balance	47	41	60.0	0.8	23.1	15.2	4.6	-0.6
Western Australia								
Nannup	52	44.5	31.7	11.4	65.0	7.0	11.7	-2.8
Manjimup	47	44	32.1	3.1	32.5	-9.4	5.8	-0.9
Bridgetown—Greenbushes	47	44	28.6	7.9	46.9	3.2	8.2	0.0
Australia—forest workerse	42	40	48.6	5.4	15.9	-2.1	8.0	-3.3
Australia—all workers ^f	40	40	58.9	6.0	9.4	-1.0	15.9	-5.0

SLA = Statistical Local Area

Comparative data are based on 2006 SLA boundaries. There are some minor differences with 2011 SLA boundaries, but no significant differences for the SLAs listed.
 Workers holding a qualification at the level of certificate, diploma or advanced diploma, bachelor degree, graduate certificate or graduate diploma,

or postgraduate degree.

• Workers who identified their occupation as 'labourer'.

^d Workers whose median weekly income was less than \$400.

e Whole-of-workforce comparison figures (forest and wood products industries) for all SLAs in Australia.

^f Whole-of-workforce comparison figures, all industries.

Source: ABS (2006, 2011e).

Indicator 6.5d

Resilience of forest dependent Indigenous communities and forestry workers to changing social and economic conditions

Rationale

This indicator provides a measure of the extent to which forest dependent Indigenous communities are able to respond and adapt to change successfully. Resilient forest dependent Indigenous communities will adapt to changing social and economic conditions, ensuring they prosper into the future.

Key points

- Access to native forests enables Indigenous people to practise and maintain cultural values, leading to an improved sense of well-being, and personal and community resilience. However, measuring Indigenous cultural dependence on forests or economic dependence on forest-based activities is difficult.
- The financial and educational resources developed through engagement with commercial forest management activities can help build the capacity of Indigenous peoples to manage change and increase broader community resilience. In 2011, the forest and wood products industries directly employed 1,110 Indigenous people nationally. In a number of regions across Australia, more than 1% of the Indigenous workforce was employed in the forest and wood products industries.
- The proportion of Indigenous workers who had non-school qualifications or had completed secondary school increased between 2006 and 2011. There were a total of 169 completions of ForestWorks vocational courses by Indigenous students in 2011.
- Successful Indigenous forest-sector projects can deliver both social and economic benefits, strengthening the resilience of Indigenous communities in the face of social and economic change.

In the same way as Indicator 6.5c, this indicator examines community resilience by considering community capacity and resources to adapt to changes. Although no single measure for resilience is possible, the information presented here informs an understanding of resilience—it includes community adaptive capacity, dependence on forests and the characteristics of Indigenous workers.

Indigenous communities include both Aboriginal and Torres Strait Islander communities. 'Indigenous forestry' can be defined as the range of forest and forest-related activities that deliver social and economic benefits to Indigenous people (Feary 2007). Many Indigenous people place strong cultural significance on native forests (Feary 2008); Indigenous forestry can therefore have different dimensions from that of the mainstream forest sector. The various ways in which Indigenous people and their communities use forest resources, and the range of social, cultural and economic benefits they may gain through this use, can increase personal and community resilience in times of social and economic change.

Oral histories suggest that the timber industry was a major employer of Indigenous people in the mid-20th century in New South Wales, Queensland and Victoria, with a decline in Indigenous employment later in the century. Over the reporting period, there has been an increase in opportunities for Indigenous communities to use or maintain their use of native forests and participate in the forest sector. This increase is the result of the recognition of native title, land rights legislation and other processes (Indicators 6.4a and 6.4c; see also Pollack 2001). Currently, 15.9 million hectares of forest are Indigenous owned and managed or Indigenous managed (refer to Indicator 6.4a).

Forest dependence

Dependence of Indigenous communities on native forests has social, cultural and economic aspects that vary in intensity depending on the local context, and the connections and values of each Indigenous community. Many Indigenous communities have cultural dependence on forests; especially where the forest is part of the country for which a particular community has customary responsibility, access to native forests enables Indigenous communities to engage in cultural activities, contributing to improved health and wellbeing (Ganesharajah 2009).

Measuring cultural dependence is complex and not readily done using census data. In addition, census data do not capture aspects of resilience that relate to the Indigenous cultural context, such as traditional skills and knowledge, kinship networks and other aspects of Indigenous culture. The area of land managed under the Indigenous estate is a measure that can suggest opportunities for strengthening both cultural connectedness and economic benefits (see Indicators 6.4a and 6.4c).

Indigenous economic dependence on forest-based activities is also difficult to quantify because of a lack of data on Indigenous involvement in the forest sector. The number of people directly employed in forest and wood products industries¹⁵³ is used here as an indicator of the economic dependence of Indigenous communities on these industries. Indigenous communities are geographically defined using ABS Indigenous Regions (Figure 6.56); data on the level of involvement of different Indigenous Regions in the forest and wood products industries are shown in Table 6.53. Nationally consistent data on the economic benefits from employment in tourism, ecotourism, conservation (including national parks) or other non-commercial forest management were unavailable.



Figure 6.56: Indigenous Regions and level of Indigenous workforce employment in forest and wood products industries, 2011

Note: Numbered and listed regions are regions with more than 0.4% of their Indigenous workforce employed in the forest and wood products industries. Source: ABS (2011e).

			, III 11 III 11 III 11 III 1				ai ce ci i piojea		המ הומתרוש ווומת	JUIC3, 2011
Indigenous Region ^a	Commun	ity characteristics—	-employment depend	ence	Charact	eristics of Indigend and wood product	ous workers in for s industries	est	Land te	inure
	Number of Indigenous people employed in forest and wood products industries	Proportion of Indigenous workforce employed in forest and wood products industries (%)	Change in Change in number employed, 2006–111 (%)	Indigenous people in population (%)	Median age (years)	Secondary school qualification ^c (%)	Non-school qualification (%)	Unskilled workers (labourers) (%)	Indigenous-owned or managed land ('000 hectares) ^d	Forest on Indigenous-owned or managed land ('000 hectares) ^d
New South Wales										
South-Eastern NSW	37	1.38	-0.48	3.5	41	11.1	44.7	34.2	28	27
North-Eastern NSW	42	1.13	-0.34	8.8	27	26.7	17.1	43.9	21	14
Riverina-Orange	51	1.08	-0.28	4.6	27	25.0	46.0	44.2	47	14
NSW Central and North Coast	128	0.96	-0.24	3.8	35	31.7	25.6	41.6	28	22
Sydney-Wollongong	113	0.71	-0.03	1.3	29	28.4	41.0	25.6	m	m
Dubbo	17	0.64	-0.22	13.7	16	35.7	33.3	17.6	m	2
Northern Territory										
Jabiru-Tiwi	36	1.67	1.33	78.9	25	27.6	38.5	7.9	7,754	4,435
Queensland										
Toowoomba-Roma	46	1.27	-0.19	4.8	41	22.7	27.3	54.2	239	97
Rockhampton	43	0.88	-0.86	4.5	31	23.4	27.7	62.5	51	24
Brisbane	111	0.68	-0.30	1.9	35	35.8	28.0	32.1	1	0
Cairns-Atherton	23	0.47	-0.29	11.3	55	50.0	30.4	16.7	603	489
South Australia										
Port Augusta	26	1.67	1.67	9.3	29	21.4	23.1	25.0	11,771	6
Adelaide	55	1.07	-0.32	1.5	36	19.0	23.3	33.9	20	4
Tasmania										
Tasmania	146	2.36	-0.96	4.1	36	8.6	32.1	41.4	61	80
Victoria										
Victoria excluding Melbourne	59	1.23	-0.51	1.5	36	23.7	31.5	29.3	65	40
Melbourne	46	0.77	-0.46	0.5	34	31.3	31.1	20.8	0	0
Western Australia										
South-Western WA	16	0.71	-0.79	3.0	19	26.3	31.6	33.3	25	8
South Hedland	10	0.47	0.47	14.2	30 ^e	0.0	0.0	0.0	8,567	2
Australia ^f , 2011	1,110	0.79		2.68	33	25.0	30.2	33.2	135,149	16,455
Australia ^f , 2006	1,073	0.93	I	2.29	33	21.5	26.4	39.5	101,6579	20,8679
Australia ^f , 2001	985	1.03	I	2.28	I	I	I	1	1	I

Table 6.53: Characteristics of Indiaenous communities and workers. in Indiaenous Reajons with more than 0.4% of the Indiaenous workforce employed in forest and wood products industries. 2011

– = not available

- Indigenous Regions are geographical units used by the Australian Bureau of Statistics in place of the Aboriginal and Torres Strait Islander Commission regions that were used for reporting before the 2006 census. They are based on Indigenous Coordination Centre (ICC) regions and Torres Strait Regional Authority areas; 39 Indigenous Regions cover the whole of Australia. Indigenous Regions are aggregated from one or more Indigenous Areas, which in turn are aggregated from one or more Indigenous Locations (which generally represent small Aboriginal and Torres Strait Islander communities with a minimum population of 90 Aboriginal and Torres Strait Islander usual residents). Indigenous Regions are grouped by state and then listed in order of the percentage of the Indigenous workforce employed in the forest sector. Regions with fewer than 10 forest sector workers are not included because of data unreliability due to ABS randomisation.
- ^b Difference in percentage employed from 2006 to 2011.
- ^c Secondary school qualification is defined as Year 12 or equivalent as highest year of school completed.
- ^d Includes indigenous-owned land and Indigenous-managed land as described in Indicators 6.4a and 6.4c. Indigenous co-managed land and land with other special rights have not been included because they are less suitable for the forest and wood products industry, due to restrictions on resource extraction based on tenure type or land ownership.
- Median age calculated from fewer than 10 workers.
- ^f Totals cover the whole of Australia, not just the Indigenous Regions listed.
- 9 Figures as presented in Table 96 of SOFR 2008. These were calculated using the Indigenous Land Corporation's Indigenous Estate dataset and the SOFR 2008 forest extent.

Source: Australian Bureau of Agricultural and Resource Economics and Sciences, Australian Bureau of Statistics.



Yellow box (Eucalyptus melliodora) and Blakely's red gum (Eucalyptus blakelyi) woodland forest, New South Wales.

In 2011, the forest and wood products industries directly employed 1,110 Indigenous people nationally—0.79% of the Indigenous workforce. The highest level of Indigenous employment in the forest and wood products industries (measured as the percentage of the Indigenous workforce employed in these industries) was in the Indigenous Region of Tasmania, followed by the Indigenous Regions of Port Augusta in South Australia, Jabiru–Tiwi in the Northern Territory and South-Eastern New South Wales.

Although absolute numbers of Indigenous people employed in the forest and wood products industries have increased nationally since 2001, the proportion of Indigenous employment in forest and wood products industries decreased nationally over this period and in most of the listed Indigenous Regions (Table 6.53); exceptions include Port Augusta (South Australia) and Jabiru–Tiwi (Northern Territory), which had zero or very low employment in these industries in 2006. The decrease in proportion employed may be due to a combination of factors, such as changes in the forest and wood products sector as a whole, more efficient technology requiring less employment per unit of production, the availability of alternative sources of income for Indigenous communities, and possible impacts of the global financial crisis on employment and training opportunities for Indigenous communities.

Of Indigenous people directly employed in the forest and wood products industries in 2011, nationally 67% were employed in wood, pulp and paper product manufacturing, 10% were employed in forestry and logging, and 18% were employed in forestry support services (ABS 2011d). Compared with 2006, in 2011 a greater proportion of Indigenous employment in forest and wood products industries was in support services, and a lower proportion was in manufacturing.

Community and worker resilience

Resilience refers to the capacity of communities and individuals to 'bounce back' from stressors and to cope with unknown situations (Australian Social Inclusion Board 2009). It varies spatially and over time (Maguire and Cartwright 2008) and can be shaped by a range of cultural, social and economic factors.

The cultural use of native forests allows Indigenous people to connect with ancestral landscapes through traditional activities such as hunting and gathering, and social ceremonies. Native forests are places where new generations of Indigenous people can learn about values and maintain cultural identity. This can strengthen mental health and personal wellbeing (Feary 2008) and so improve individual resilience.

Business opportunities that draw on traditional activities can deliver both cultural and economic outcomes. For example, collection of bush food and the creation of traditional artefacts for tourist markets can enable Indigenous communities to generate income while maintaining customary activities and values. Generally, the most resilient Indigenous communities are those in which economic development incorporates customary laws and values (SOFR 2008). Ownership of native forests can enable Indigenous communities to establish forest-based enterprises, provide training and employment (see Case study 6.11), pursue economic independence on country, maintain social connections and fulfil cultural obligations to care for country. This may be particularly important in remote communities with limited access to other commercial industries. Moreover, the skills and work experience gained in Indigenous forestbased enterprises can assist Indigenous people to obtain employment in other forest-sector enterprises and in other industries (although Indigenous people often face significant barriers in obtaining employment—see Case study 6.12). Some Indigenous-owned and Indigenous-run business models do not revolve around maximum financial gain (e.g. Nanum Tawap, described in SOFR 2008 and Feary 2008) and have other prime objectives of addressing social and family obligations.

In 2005, the National Indigenous Forestry Strategy was launched to broker partnerships between Indigenous communities and forest and wood products industries, and to build the capacity of Indigenous people and communities to run forest-based ventures (DAFF 2005). The strategy has funded a range of Indigenous forestry projects across Australia, ranging from the purchase of portable forestry equipment to the engagement of an economic development officer for an Indigenous ecotourism project¹⁵⁴ (Case study 6.11).

Indigenous worker characteristics

Demographic information, together with employment data about Indigenous people employed in the forest and wood products industries (Table 6.53), can be used to indicate resilience to changes in these industries and identify regional differences.¹⁵⁵ Demographic and employment data provide the following information for Indigenous Regions with more than 0.4% of the Indigenous workforce employed in forest and wood products industries in 2011:

- The median age of Indigenous workers employed in forest and wood products industries Australia-wide was 33, unchanged from 2006. Younger employees can find it easier than older people to adapt to change. The regions of Dubbo and South-Western Western Australia had median worker ages substantially lower than the national median age.
- In the Dubbo (New South Wales), Cairns–Atherton (Queensland) and Melbourne (Victoria) regions, the combination of higher rates of secondary school completion and lower proportions of unskilled workers, compared with other regions and national figures, may positively influence resilience.

¹⁵⁴ www.daff.gov.au/forestry/policies/nifs.

¹⁵⁵ www.daff.gov.au/forestry/policies/nifs. Note that Indigenous workers may be living away from home and not necessarily employed in their local communities.

Year	NSW	NT	Qld	SA	Tas.	Vic.	WA	Total enrolments
2007	102	0	143	0	34	84	2	365
2008	155	5	204	0	34	82	13	493
2009	110	10	165	2	22	72	32	413
2010	111	26	336	1	30	85	18	607
2011	105	9	500	0	41	83	9	747

Table 6.54: Indigenous student enrolments in the ForestWorks Forest and Forest Products Training Package

Note: Enrolments do not indicate whether students completed qualifications. However, students commonly aim to complete units of competencies, rather than entire qualifications.

Source: ForestWorks (2012a).

Table 6.55: Completions c	f ForestWorks course	qualifications by	Indigenous students, 2011
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Level	NSW	NT	Qld	SA	Tas.	Vic.	WA	Total completions
Certificate II	3	0	70	0	0	2	0	75
Certificate III	2	0	87	1	2	1	0	93
Certificate IV	0	0	0	0	1	0	0	1
Diploma or higher	0	0	0	0	0	0	0	0
Total			157	1				169

Note: Courses focus on vocational skills in forest growing and management, harvesting, haulage and sawmilling, and processing (for occupations such as tree felling, loading, nursery operation, timber grading and kiln operation).

Source: National Centre for Vocational Education Research (www.ncver.edu.au/).

- Workers in the South-Eastern New South Wales, Riverina– Orange (New South Wales), Sydney–Wollongong (New South Wales) and Jabiru–Tiwi (Northern Territory) regions had the highest levels of non-school qualifications. This could indicate a greater capacity to take opportunities in forestry, or potentially other sectors, although workers in South-Eastern New South Wales also had a low level of secondary school completion.
- Nationally, Indigenous workers had lower rates of nonschool qualifications such as certificates and diplomas (30%) than the forest-sector workforce as a whole (49%—see Indicator 6.5c). However, the proportion of Indigenous workers who had non-school qualifications or had completed secondary school increased between 2006 and 2011. Higher levels of formal education are typically associated with increased rates of employment and tend to indicate a greater capacity to respond to workplace change. However, traditional skills and knowledge, which may also increase resilience, are not measured by these data.
- As for the general forestry workforce, the proportion of Indigenous workers in unskilled (labourer) occupations fell nationally from 2006 to 2011. In the remote and northern Indigenous Regions of Jabiru–Tiwi, South Hedland and Port Augusta, the proportion of Indigenous workers in skilled professional occupations was higher than in capital city and southern regions (ABS 2011d). Forest-sector employment in Jabiru–Tiwi, South Hedland and Port Augusta was concentrated in forestry support services, rather than in manufacturing.

Training and skills development

Training in practical forest-sector skills can increase future employment opportunities and enhance personal resilience. ForestWorks, a not-for-profit provider of learning and skill development in forest and wood products industries, offers a Forest and Forest Products Training Package, which provides training in skills such as tree felling, machine and kiln operation, and timber grading (ForestWorks 2012a). Since 2007, Indigenous enrolments in this training package have risen nationally, with the majority of enrolments being from Queensland (Table 6.54). In 2001, course completions by Indigenous students were mostly at Certificate II and Certificate III levels (Table 6.55).

It is difficult to measure the connection between training and employment—training may not lead to a job in the sector. Similarly, it is difficult to measure the number of people who obtain employment in other industries because of the transferable skills they obtain by undertaking forest-sector training courses. Nevertheless, the availability of such training and training participation by Indigenous people, especially in Queensland, New South Wales and Victoria, is likely to help build individual and community resilience.

Case study 6.11: Indigenous training and enterprise development

In 2008, the Batemans Bay Local Aboriginal Land Council (BBLALC), located on the south coast of New South Wales, established a locally owned and operated timber enterprise project. Major goals were to create training and employment opportunities for Indigenous people, and increase the economic base of the BBLALC. This project gained support through Forests NSW¹⁵⁶ and the Australian Government (under the National Indigenous Forestry Strategy) for feasibility assessments and equipment, and through private organisations for training delivery.

In 2011, as part of the project, 15 local unemployed Indigenous people completed a pre-employment program in competencies based on the Certificate III in Harvesting and Haulage, incorporating training in basic workplace skills, chainsaw use, occupational health and safety, and first aid. The skills obtained in the course are transferable beyond the forest and wood products industries—for example, to the agricultural sector and natural resource management.

The BBLALC intends to create 25 new jobs in the future by expanding firewood operations using mechanical harvesting, and by value-adding through portable mills and bagging operations. The project reflects the integration of Indigenous people's values with forest management practice, policy and decision making, and successful partnerships between the BBLALC, private industry and government.

Source: M MacCallum, Batemans Bay Local Aboriginal Land Council, pers. comm., February 2012.

Case study 6.12: Barriers to Indigenous employment in forestry

Although a national shift has occurred towards more service-based employment for Indigenous and non-Indigenous workers, together with positive signs in terms of worker education levels, participation of Indigenous Australians in the forest sector has decreased slightly in recent years. Barriers to increased Indigenous employment in the sector include the following:

- Traditional recruitment processes that fail to identify effective Indigenous jobseekers. Indigenous people with low levels of literacy may find it difficult to prepare written job applications, and traditional interviews that focus on applicants presenting themselves well can be daunting.
- Balancing responsibilities and Indigenous and non-Indigenous cultures. Some Indigenous people experience strong pressures in balancing their cultural responsibilities as custodians of the land with the practices of commercial forestry.
- A lack of skills and experience. The increasing mechanisation of the forest sector requires acquisition of new skills by forest workers. In many Indigenous communities, particularly in remote areas, locally based training opportunities are lacking, and apprenticeships and traineeships suitable for low entry skill levels are not widely available.
- The future of the industry. Some Indigenous people feel that the forestry industry has a limited future and lacks job security.

Source: DAFF (2004), ForestWorks NSW (2011), Loxton (2007), Loxton et al. (2012), Pearson and Helms (2011).

¹⁵⁶ From January 2013, the Forestry Corporation of NSW.

References—Criterion 6

- ABARE–BRS (Australian Bureau of Agricultural and Resource Economics – Bureau of Rural Sciences) (2010). Indicators of Community Vulnerability and Adaptive Capacity across the Murray–Darling Basin—A Focus on Irrigation in Agriculture, report to the Murray–Darling Basin Authority, ABARE-BRS, Canberra.
- ABARES (Australian Bureau of Agricultural and Resource Economics and Sciences) (2011b). Australian Forest and Wood Products Statistics: March and June Quarters 2011, ABARES, Canberra.
- ——(2012g). Australian Forest and Wood Products Statistics: March and June Quarters 2012, ABARES, Canberra.
- ——(2012h). Australian Forest and Wood Products Statistics: September and December Quarters 2011, ABARES, Canberra.
- ——(2013a). Australian Forest and Wood Products Statistics: September and December Quarters 2012, ABARES, Canberra.
- ——(2013b). Agricultural Commodities: March Quarter 2013, ABARES, Canberra.
- ——(2013c). Australian Forest and Wood Products Statistics: March and June Quarters 2013, ABARES, Canberra.
- ABS (Australian Bureau of Statistics) (2001). 2001 Census, ABS, Canberra.
- ——(2006). 2006 Census of Population and Housing, ABS, Canberra.
- ——(2007). Australian Industry, 2005-06, cat. no. 8155.0, ABS, Canberra.
- ——(2009). Environmental Issues: Waste Management and Transport Use, cat. no. 4602.0.55.002, ABS, Canberra. <u>www.abs.</u> <u>gov.au/AUSSTATS/abs@.nsf/DetailsPage/4602.0.55.002Mar%20</u> <u>2009?OpenDocument</u> (Accessed 23 February 2012)
- ——(2011a). Australian Industry, 2009–10, cat. no. 8155.0, ABS, Canberra.
- ——(2011b). Research and Experimental Development, Businesses, Australia, 2009–10, cat. no. 8104.0, ABS, Canberra.
- ——(2011c). Land Management and Farming in Australia 2009–10, cat. no. 4627.0, ABS, Canberra.
- ——(2011d). Labour Force, Australia, Nov 2011, cat. no. 6202.0, ABS, Canberra. <u>www.abs.gov.au/AUSSTATS/abs@.nsf/</u> <u>allprimarymainfeatures/E026FE49EC537965CA257989000BFB3</u> <u>A?opendocument</u> (Accessed 12 August 2013)
- ——(2011e). Census of Population and Housing, ABS, Canberra.
- ——(2012a). Consumer Price Index, Australia, Jun 2012, cat. no. 6401.0, ABS, Canberra.
- ——(2012b). Australian Industry, 2010–11, cat. no. 8155.0, ABS, Canberra.
- ——(2012c). Year Book Australia, 2012, cat. no. 1301.0, ABS, Canberra.
- ——(2012d). Research and Experimental Development, Businesses, Australia, 2010–11, cat. no. 8104.0, ABS, Canberra.
- ——(2012e). 2012 Census of Population and Housing, ABS, Canberra.
- (2012f). Labour Force, Australia, Detailed, Quarterly, Nov
 2011, cat. no. 6291.0.55.003, ABS, Canberra. www.abs.gov.au/
 AUSSTATS/abs@.nsf/allprimarymainfeatures/E78E95184C9D43E
 FCA2579C100132AB3?opendocument (Accessed 19 Oct 2012)
- ——(2013). International Trade, Australia, cat. no. 5465.0, ABS, Canberra.

- ALT (Aboriginal Lands Trust Western Australia) (2009). Land Use and Development Policy, ALT, Perth. <u>www.dia.wa.gov.au/</u> <u>Documents/Land%20Use%20and%20Development%20</u> <u>Policy%202009.pdf</u> (Accessed 14 June 2013)
- Australia21 (2012). Discussion Paper on Ecosystem Services for the Department of Agriculture, Fisheries and Forestry, final report, Australia21, Canberra.
- Australian Social Inclusion Board (2009). Building Inclusive and Resilient Communities, Australian Government, Canberra. <u>www.</u> <u>socialinclusion.gov.au/publications/building-inclusive-and-</u> resilient-communities (Accessed 12 August 2013)
- Bayne K and Page I (2009). New Applications of Timber in Nontraditional Market Segments: High Rise Residential and Nonresidential (Commercial) Buildings, PRA013-0708, Forest & Wood Products Australia, Melbourne.
- Bren LJ (2009). Native forest management in silvicultural systems and impacts on catchment water yields, Part 2, A critique of the ACF document 'WoodChipping our water', MDBA Publication 132/11, Murray–Darling Basin Authority, Canberra.
- ——, Davey S and Jeyasingham J (2011). Native Forest Management in Silvicultural Systems and Impacts on Catchment Water Yields, part 1, An Analysis of Hydrologic Impacts of Native Forest Management in the Murray–Darling System, Murray–Darling Basin Authority, Canberra.
- Burke B and Townsend P (2011). Forestry—sawnwood. Agricultural Commodities 1:108–113.
- Burns K and Burke B (2012). ABARES National Wood Processing Survey 2010–11, ABARES research report 12.4, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra.
- CCWA (Conservation Commission of Western Australia) (2012a). Draft Forest Management Plan 2014–2023, CCWA, Perth.
- Central Land Council (2007). *The Land Rights Act + Changes Made Simple*, Central Land Council, Alice Springs. <u>www.clc.org.au/</u><u>files/pdf/alra.pdf</u> (Accessed 14 June 2013)
- Connolly E and Orsmond D (2011). The mining industry: from bust to boom. Paper presented to *The Australian Economy in the 2000s* conference, Sydney, 15–16 August 2011.
- CUAD (Clean Up Australia Day) (2011). *Rubbish Report 2011*, Clean Up Australia, Sydney. <u>www.cleanup.org.au/au/RubbishReport2/</u> <u>rubbish-report2010.html</u> (Accessed 17 October 2012)
- DAFF (Australian Government Department of Agriculture, Fisheries and Forestry) (2004). Opportunities and Barriers for Greater Indigenous Involvement in Australia's Forestry Industry: A Scoping Report Addressing Indigenous Involvement in the Forestry and Associated Sectors for the National Indigenous Forestry Strategy Steering Committee, prepared by BDO Consulting (SA) Pty Ltd, DAFF, Canberra. www.daff.gov. au/ data/assets/pdf file/0020/37604/nifs_scoping_report.pdf (Accessed 14 May 2012)
- ——(2005). The National Indigenous Forestry Strategy, DAFF, Canberra. www.daff.gov.au/ data/assets/pdf file/0006/37608/ nifs_strategy.pdf (Accessed 15 August 2012)
- DEC (Western Australian Department of Environment and Conservation) (2007). 2006–07 Annual Report, DEC, Perth.
- ——(2008b). 2007–08 Annual Report, DEC, Perth.
- -----(2009b). 2008-09 Annual Report, DEC, Perth.
- -----(2010b). 2009-10 Annual Report, DEC, Perth.
- ——(2011). 2010–11 Annual Report, DEC, Perth.

- DERM (Queensland Department of Environment and Resource Management) (2008). Leasing Aboriginal Deed of Grant in Trust Land in Local Government Areas—Private Residential Purposes, a Manual for Trustees, DERM, Brisbane.
- ——(2009). South East Queensland Natural Resource Management Plan 2009–2031, DERM, Brisbane.
- DEWHA (Australian Government Department of the Environment, Water, Heritage and the Arts) (2009a). *Ecosystem Services: Key Concepts and Applications*, Occasional paper no. 1, DEWHA, Canberra.
- ——(2009b). The Indigenous Protected Area Program: Background Information and Advice to Applicants, DEWHA, Canberra.
- DIA (Western Australian Department of Indigenous Affairs) (2002). Fact Sheet, DIA, Perth. <u>www.daa.wa.gov.au/Documents/Land/</u> LandFactSheets.pdf (Accessed 14 June 2013)
- ——(2005). Overcoming Indigenous Disadvantage in Western Australia Report 2005, DIA, Perth.
- DSE (Victorian Department of Sustainability and Environment) (2010). Annual Report 2010, DSE, Melbourne.
- ——(2011). Annual Report 2011, DSE, Melbourne.
- EPHC (Environment Protection and Heritage Council) (2010). National Waste Report 2010, EPHC, Canberra.
- FAO (Food and Agriculture Organization of the United Nations) (2013). FAOSTAT database, FAO, Rome, <u>http://faostat3.fao.org/</u> <u>home/index.html</u> (Accessed 15 January 2013)
- Feary S (2007). Forests to forestry: an overview of Indigenous involvement in forest management in Australia. In: *Forestry for Indigenous Peoples: Learning from Experiences with Forest Industries*, Feary S (ed.), papers from Technical Session 130, International Union of Forest Research Organizations (IUFRO) XXII World Congress 2005, Brisbane, 8–13 August 2005, ANU Fenner School of Environment and Society Occasional Paper no. 1, Australian National University, Canberra.
- (2008). Social justice in the forest: Aboriginal engagement with Australia's forest industries. *Transforming Cultures* eJournal 3(1). <u>http://epress.lib.uts.edu.au/journals/index.php/</u><u>TfC/article/view/683</u> (Accessed 27 June 2012)
- Forestry Tasmania (2008). 2008 Annual Report, Forestry Tasmania, Hobart.
- ——(2009a). Appendix 1: 2008–09 Financial Statements, 2008–09 Stewardship Report, Forestry Tasmania, Hobart.
- ——(2009b). Appendix 2: Sustainable Forest Management Data Tables, 2008–09 Stewardship Report, Forestry Tasmania, Hobart.
- ——(2010b). Appendix 1: 2009–10 Financial Statements, 2009–10 Stewardship Report, Forestry Tasmania, Hobart.
- ——(2010c). Appendix 2: Sustainable Forest Management Data Tables, 2009–10 Stewardship Report, Forestry Tasmania, Hobart.
- ——(2011a). Appendix 2: Sustainable Forest Management Data Tables, 2010–11 Stewardship Report, Forestry Tasmania, Hobart.
- ——(2011b). Appendix 1: 2010–11 Financial Statements, 2010–11 Stewardship Report, Forestry Tasmania, Hobart.
- Forests NSW (2009). Forests NSW Annual Report 2008–09: Social, Environmental and Economic Performance, Forests NSW, Sydney.
- ——(2010b). Forests NSW Annual Report 2009-10: Social, Environmental and Economic Performance, Forests NSW, Sydney.

- ——(2011). Forests NSW Annual Report 2010–11: Social, Environmental and Economic Performance, Forests NSW, Sydney.
- ——(2012a). Forests NSW Supplementary Sustainability Indicator Data 2011–12, Forests NSW, Pennant Hills.
- ——(2012b). Forests NSW Annual Report 2011–12: Social, Environmental and Economic Performance, Forests NSW, Sydney.
- ForestWorks (2012a). Forestworks Learning and Skill Development, ForestWorks, Australia. <u>www.forestworks.com.au</u> (Accessed December 2012)
- ForestWorks NSW (2011). Guide to Successfully Employing Indigenous Job Seekers in the Forest and Timber Products Industry, ForestWorks NSW, Sydney.
- Foster M (2009). Emerging Animal and Plant Industries—Their Value to Australia, 2nd edition, RIRDC publication no. 09/004, Rural Industries Research and Development Corporation, Canberra.
- ——(in press). Emerging Industries—Their Value to Australia, Rural Industries Research and Development Corporation, Canberra.
- FPA (Forest Practices Authority) (2012). State of the forests Tasmania 2012, FPA, Hobart.
- FPC (Forest Products Commission) (2007). Forest Products Commission Annual Report 2006–07, FPC, Perth.
- ——(2008). Forest Products Commission Annual Report 2007-08, FPC, Perth.
- ——(2009). Forest Products Commission Annual Report 2008–09, FPC, Perth.
- (2010). Forest Products Commission Annual Report 2009–10, FPC, Perth.
- ——(2011). Forest Products Commission Annual Report 2010–11, FPC, Perth.
- Fraser LM and Ormiston A (2010). Understanding Financial Statements, 9th edition, Pearson, New Jersey.
- FWPA (Forest and Wood Products Australia) (2013). Separating the Wood from the Trees—A Summary of Five Years of Consumer Tracking Research, FWPA, Melbourne.
- FWPRDC (Forest and Wood Products Research and Development Corporation) (2005). Socio-economic Impacts of Plantation Forestry in the South West Slopes of NSW, 1991 to 2004, FWPRDC, Melbourne.
- Ganesharajah C (2009). Indigenous Health and Wellbeing: the Importance of Country, Australian Institute of Aboriginal and Torres Strait Islander Studies, Canberra. <u>www.aiatsis.gov.au/</u> <u>files/ntru/FINALIndigenousHealthandWellbeingTheImportance</u> ofCountry.pdf (Accessed 4 September 2012)
- Hansda R (2009). The Outlook for Non-wood Forest Products in Asia and the Pacific, Working Paper APFSOS II/WP/2009/18, Food and Agriculture Organization of the United Nations, Bangkok.
- Harris-Adams K, Townsend P and Lawson K (2012). Native Vegetation Management on Agricultural Land, ABARES research report 12.10, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra.
- IFA (Institute of Foresters of Australia) (2007). *Recreation in Australian Public Forests*, IFA Forest Policy Statement no. 5.5, IFA, Canberra.
- ILC (Indigenous Land Corporation) (2012). Land Acquisition Program (Socio-Economic Development) 2012 Handbook, ILC, Adelaide.

- Kneebone M (2010). A Study of Existing and Prospective Markets and Marketing Activities for Australian Honey, RIRDC publication no. 10/145, Rural Industries Research and Development Corporation, Canberra.
- Lacey J, Parsons R and Moffat K (2012). Exploring the Concept of a Social Licence to Operate in the Australian Minerals Industry: Results from Interviews with Industry Representatives, EP125553, CSIRO, Brisbane.
- Low K, Townsend P, Mahendrarajah S and Cunningham D (2011). Australia's role in Asia–Pacific forestry. Paper presented at ABARES Outlook 2011 conference, Canberra, 2 March 2011.
- Loxton E (2007). Support and Indigenous employment in the forestry industry. Non-session poster presentation at Australian Institute of Aboriginal and Torres Strait Islander Studies Major Conference, Australian Institute of Aboriginal and Torres Strait Islander Studies, Canberra.
- —, Schirmer J and Kanowski P (2012). Employment of Indigenous Australians in the forestry sector: a case study from northern Queensland. Australian Forestry 75(2):73–81.
 www.forestry.org.au/pdf/pdf-members/afj/AFJ%202012%20 v75/2/03Loxton.pdf (Accessed 26 October 2012)
- Maguire B and Cartwright S (2008). Assessing a Community's Capacity to Manage Change: A Resilience Approach to Social Assessment, Bureau of Rural Sciences, Canberra.
- Maynard S, James D and Davidson A (2010). The development of an ecosystem services framework for South East Queensland. *Environmental Management* 45:881–895.
- ——, James D and Davidson A (2012). An adaptive participatory approach for developing an ecosystem services framework for South East Queensland, Australia. International Journal of Biodiversity Science, Ecosystem Services and Management 7:182–189.
- MEA (Millennium Ecosystem Assessment) (2005). Ecosystems and Human Well-being: Our Human Planet: Summary for Decisionmakers, Island Press, Washington, DC.
- Montreal Process Implementation Group for Australia (2008). Australia's State of the Forests Report 2008, Bureau of Rural Sciences, Canberra.
- NLWRA (National Land & Water Resources Audit) (2008). Assessing Invasive Animals in Australia 2008, Invasive Animals Cooperative Research Centre, NLWRA, Canberra.
- NNTT (National Native Title Tribunal) (2009). *Native Title: An Overview*, NNTT, Perth.
- O'Connor P, Morgan A and Bond A (2008). BushBids: Biodiversity Stewardship in the Eastern Mount Lofty Ranges, South Australian Murray–Darling Basin Natural Resources Management Board.
- Pearson C and Helms K (2011). Indigenous entrepreneurship in timber furniture manufacturing: the Gumaj venture in Northern Australia. *Information Management and Business Review* 2:1-11.
- Petter M, Mooney S, Maynard SM, Davidson A, Cox M and Horosak I (2012). A methodology to map ecosystem functions to support ecosystem services assessments. *Ecology and Society* 18:31.
- Pollack DP (2001). Indigenous Land in Australia: A Quantitative Assessment of Indigenous Landholdings in 2000, Discussion Paper no. 221, Centre for Aboriginal Economic Policy Research, Australian National University, Canberra.
- Pulp and Paper Industry Strategy Group (2010). *Final Report*, Commonwealth of Australia, Canberra.
- QDIP (Queensland Department of Infrastructure and Planning) (2009). South East Queensland Regional Plan 2009–2031, Brisbane.

- RIRDC (Rural Industries Research and Development Corporation) (2007b). The Effectiveness and Safety of Australian Tea Tree Oil, RIRDC, Canberra.
- ——(2008a). Essential Oils and Plant Extracts Five-year R&D Plan: 2008 to 2013, RIRDC publication no. 08/053, Rural Industries Research and Development Corporation, Canberra.
- ——(2008b). Native Foods R&D Priorities and Strategies 2007-2012, publication 08/02, RIRDC, Canberra.
- ——(2010). New and Emerging Industries: National Research, Development and Extension Strategy, RIRDC publication no. 10/159, RIRDC, Canberra.
- Rodriguez D, Tomasella J and Linhare C (2010). Is the forest conversion to pasture affecting the hydrological response of Amazonian catchments? Signals in the Ji-Parana Basin. *Hydrological Processes* 24:1254–1269.
- SAFC (South Australian Forestry Corporation) (2007). ForestrySA Annual Report 2006–07, SAFC, Mount Gambier.
- ——(2008). ForestrySA Annual Report 2007–08, SAFC, Mount Gambier.
- ——(2009). ForestrySA Annual Report 2008–09, SAFC, Mount Gambier.
- ——(2010). ForestrySA Annual Report 2009–10, SAFC, Mount Gambier.
- ——(2011). ForestrySA Annual Report 2010–11, SAFC, Mount Gambier.
- Safe Work Australia (2010). Compendium of Workers' Compensation Statistics Australia 2007–08, Safe Work Australia, Canberra.
- ——(2011). Compendium of Workers' Compensation Statistics Australia 2008–09, Safe Work Australia, Canberra.
- ——(2012). Compendium of Workers' Compensation Statistics Australia 2009–10, Safe Work Australia, Canberra.
- Salvin S, Bourke M and Byrne T (2008). *The New Crop Industries Handbook—Native Foods*, Rural Industries Research and Development Corporation, Canberra.
- Schirmer J and Bull L (2011). *Planting Trees for Carbon* Sequestration: What do Landholders Think?, Technical Report 218, Cooperative Research Centre for Forestry, Hobart
- ——, Binks, B, Kancans R and Stenekes N (2013). Social indicators for Australia's forest and wood products industries—Discussion paper, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra.
- ——, Dunn C, Loxton E and Dare M (2011). Socioeconomic Impacts of Forest Industry Change: A Baseline Study of the Tasmanian Forest Industry, Technical Report 214 (interim report), Cooperative Research Centre for Forestry, Hobart.
- ——, Parsons M, Charalambou C and Gavran M (2005). Socioeconomic Impacts of Plantation Forestry in the South West Slopes Region (NSW), Australian Government, Canberra.
- Shim-Prydon G and Camacho-Barreto H (2007). New Animal Products: New Uses and Markets for By-products and Coproducts of Crocodile, Emu, Goat, Kangaroo and Rabbit, RIRDC publication no. 06/117, Rural Industries Research and Development Corporation, Canberra.
- SOFR 2008—see Montreal Process Implementation Group for Australia (2008).
- Somerville D (2010). Forestry Plantations and Honeybees, RIRDC publication no. 10/076, Rural Industries Research and Development Corporation, Canberra.

- Stenekes N, Reeve I, Kancans R, Stayner R, Randall L and Lawson K (2012). *Revised Indicators of Community Vulnerability and Adaptive Capacity Across the Murray–Darling Basin: A Focus on Irrigation in Agriculture*, report to the Murray–Darling Basin Authority, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra.
- Tourism NSW (2009). Nature Based Tourism to NSW: Year Ended December 2009, information leaflet. <u>http://archive.tourism.</u> <u>nsw.gov.au/Sites/SiteID6/objLib27/Nature-based-tourism-YE-</u> Dec-09.pdf (Accessed 12 August 2013)
- ——(2010). Nature Based Tourism to NSW: Year Ended December 2010, information leaflet. <u>http://archive.tourism.nsw.gov.au/</u> <u>Sites/SiteID6/objLib12/Nature-based-tourism-YE-Dec-10.pdf</u> (Accessed 12 August 2013)
- Trewin D and Pink B (2006). ANZSIC (Australian and New Zealand Standard Industrial Classification 2006), Australian Bureau of Statistics, Canberra.
- Tumut Shire Council (2010). *Tumut Region Business and Investment Profile*, Tumut Shire Council, Tumut.
- Turner J and Lambert M (2011). Expenditure on forestry and forest products research in Australia 2007–2008. *Australian Forestry* 74:149–155.

- Visy (2011). Tumut: A Decade of Sustainability Achievements, Visy, Melbourne. <u>www.visy.com.au/media/47208/tumut_-</u> <u>a decade of sustainability achievements.pdf</u> (Accessed 12 August 2013)
- WA Legislative Council (2012). *Inquiry into the Sandalwood Industry in Western Australia*, Standing Committee on Environment and Public Affairs, interim report, Report 29, Perth.
- Wall E and Marzall K (2006). Adaptive capacity for climate change in Canadian rural communities. *Local Environment* 11:373–397.
- Williams K (2009). Community Attitudes to Plantation Forestry, Technical Report 194, Cooperative Research Centre for Forestry, Hobart.
- ——(2012). Changes in Attitude towards Plantation Forestry (2008– 2011), Tasmania and Southwest Western Australia, unpublished preliminary report, University of Melbourne and Cooperative Research Centre for Forestry.
- Williams KJH (2011) Relative acceptance of traditional and nontraditional rural land uses: Views of residents in two regions, southern Australia. Landscape and Urban Planning 103:55-63.