# Criterion 6

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



Use of timber in the construction industry.

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

The 17 indicators in this criterion aim 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, including Aboriginal and Torres Strait Islander communities (referred to in SOFR 2018 as Indigenous communities), 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 grouped into five sub-criteria.

### Production and consumption

The first group of indicators, Indicators 6.1a to 6.1e, focusses on wood and non-wood forest products. As well as providing material used in everyday lives, wood from forests provides employment for workers in harvesting and processing, incomes to landholders and businesses, and revenues to governments. Many Australian non-wood forest products from Australian forests are also harvested and sold commercially, including for emerging export markets, while some industries are based on wild harvesting and hunting. Trends over time in the values and volumes of wood products are covered in Indicator 6.1a, while trends over time in the values and volumes of non-wood forest products are covered in Indicator 6.1b. Together, these indicators provide one assessment of the socio-economic benefits derived from forests.

The range of other services provided by Australia's forests, such as carbon sequestration, soil conservation, protection of catchments for water production, ecotourism, and biodiversity conservation, are the subject matter of Indicator 6.1c. There are markets or other economic mechanisms for capturing the value of some of these services, and for ascribing a monetary value to them. In addition, these services can provide social and environmental benefits to which monetary value cannot be ascribed.

Trends over time in production and consumption, presented in Indicator 6.1d, indicate the capacity of the forest and wood-processing industries, through domestic production and importation, to meet Australian society's demand for wood products, and are a measure of the industry's contribution to the national economy.

Rising global and national demands for forest products, with consequent increased demands on forest resources, have led to 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. These are reported in Indicator 6.1e.

#### Investment

Indicator 6.2a reports data on investment in forest management, that is, expenditure in developing, maintaining and obtaining goods and services from forests, as a measure of the economic commitment to forest utilisation and management.

Both state and territory forest management agencies and private sector entities undertake many activities that constitute forest management. However, differences in the classification of activities, accounting arrangements and reporting timelines, and the commercial-in-confidence nature of some of this information, mean that it is not possible to calculate a national figure for expenditure on forest management. Expenditure on the management of forests in nature conservation reserves is also generally unavailable in a consistent form. Data on establishment of new plantations and re-establishment of harvested plantations are presented as an indication 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. This is reported in Indicator 6.2b across the forestry and wood products industry sector, by subsector.

#### Recreation and tourism

Australia's forests are highly valued for recreation and tourism. Indicators 6.3a and 6.3b assess the area of forest available for recreation and tourism, and the range and use of activities available.

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. This includes most publicly owned forested lands designated as nature conservation reserves or for multiple use, as well as some private forest areas. Some activities are only permitted in some areas to ensure visitor safety, or to protect specific scientific, natural, cultural or water-supply values; difficulties of access may also restrict public use of some areas of forests.

Indicator 6.3b describes the wide range of forest-based recreation and tourism facilities 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. Indicator 6.3b also presents available data on visitor numbers, but this is often not specific to forest areas, and the dispersed nature of forest tourism and recreation means that data on use are limited across jurisdictions and tenures, and difficult to compile nationally.

#### Cultural, social and spiritual needs and values

Forests are highly valued by the community for their wide range of cultural, social and spiritual values. These values are addressed in Indicators 6.4a to 6.4d.

Indicator 6.4a reports the area of forest to which Australia's Indigenous peoples have use and rights, as recognised through formal and informal management regimes. Access, management and ownership are key parts of the relationship of Indigenous people with land. The Indigenous estate can be broadly divided into categories based on the degree of Indigenous ownership, management and other rights over the land.

The extent to which Australia's Indigenous communities participate in forest management reflects their connection with the land, and the integration of Indigenous values into forest management practice, policy and decision-making; this is described in Indicator 6.4c. 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.

Australia's forests include many sites that provide evidence of the interactions between non-Indigenous people and forest landscapes, and the activities that have occurred on the continent since first European settlement. The wide variety of sites, features and structures in forests that are formally managed to protect recorded non-Indigenous cultural values are described in Indicator 6.4b.

Understanding the importance that people place on Australia's forests, as reported in Indicator 6.4d, provides an insight into the level of acceptance and approval by communities of activities related to forest management.



Sawn pine timber, Mount Gambier.

#### Employment and community needs

The final four indicators in Criterion 6, Indicators 6.5a to 6.5d, deal with employment and wage and injury rates in the forestry and wood products sector of the economy, and with the resilience of forest-dependent Indigenous and non-Indigenous communities to changing social and economic conditions.

Employment levels, reported in Indicator 6.5a, are an important measure of the contribution of forests to viable communities and the national economy. A sustainable industry will maintain wage rates, workforce health and worker safety at levels that are comparable with national averages for similar occupations, and these parameters are reported in Indicator 6.5b.

The Australian forestry and wood products sector has changed substantially in recent years. There have been reductions in the areas of native forest available for harvest and consequently in the volume of wood harvested from native forests. An increasing proportion of wood has been harvested from plantations, although plantation expansion has recently ceased and there has been rationalisation of the ownership of existing plantations. Some older processing facilities have been closed or decommissioned, and some new processing facilities developed.

The capacity of Indigenous and non-Indigenous communities to accommodate and adapt to such changes is influenced by the level of their economic dependence on the forestry industries, and by the resources on which they can draw to assist them in responding to change. Community resilience can be measured in different ways, and is sometimes used interchangeably with adaptive capacity, since increasing adaptive capacity will enhance community resilience. The resilience of forestdependent communities to economic and social changes is assessed in Indicator 6.5c for non-Indigenous communities, and in Indicator 6.5d for Indigenous communities.

This icon indicates data, maps or graphics from Australia's State of the Forests Report 2018 that are available for electronic download. Data used in figures and tables in this criterion, together with higher resolution versions of maps, are available via www.doi.org/10.25814/5bda972cd76d9 and www.doi.org/10.25814/5be3bc4321162.

## 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

- The volume of Australia's log harvest in 2015–16 was 30.1 million cubic metres, a 13% increase from 26.5 million cubic metres in 2010–11.
  - Over this five-year period, the volume of logs harvested from native forests declined from 6.5 million cubic metres to 4.1 million cubic metres, a decrease of 37%.
  - In comparison, the volume of logs harvested from commercial hardwood and softwood plantations increased from 20.0 million cubic metres to 26.0 million cubic metres, an increase of 30%.
  - In 2015–16, 86% of the volume of logs harvested in Australia was from commercial plantations.
- The value of logs harvested from native forests and commercial plantations increased by 22% over the reporting period, from \$1.9 billion in 2010–11 to \$2.3 billion in 2015–16<sup>254</sup>.
  - This increase occurred for harvested plantation softwood sawlogs, and for plantation softwood and hardwood export pulplogs, due mostly to the increases in harvest volumes of these log types over the same period.
- The value of production (total industry turnover, or sales and service income) of the wood products industries decreased by 2% between 2010–11 and 2015–16, from \$24.0 billion to \$23.7 billion.
- This indicator presents information on the value and volume of wood and wood products that are directly generated by the forest and wood products industries. Secondary or flow-on economic activity, such as turnover generated through indirect employment, is not examined.

- The total volume of sawnwood production increased by 12% between 2010–11 and 2015–16, from 4.6 million cubic metres to 5.1 million cubic metres. The value of sawnwood production decreased by 7% between 2010–11 and 2014-15, from \$3.8 billion to \$3.5 billion.
- The total volume of wood-based panel production decreased by 2% between 2010–11 and 2015–16, from 1.73 million cubic metres to 1.70 million cubic metres. The value of wood-based panel production decreased by 3% between 2010–11 and 2015–16, from \$1.62 billion to \$1.57 billion.
- The total weight of paper and paperboard production increased by 2% between 2010–11 and 2015–16, from 3.16 million tonnes to 3.22 million tonnes. The value of paper and paperboard production decreased by 4% between 2010–11 and 2015-16, from \$10.9 billion to \$10.5 billion.
- The value added by the forest and wood products industries in 2010–11 was \$8.3 billion, a contribution to Australia's gross domestic product of 0.59%. In 2015–16, the value added was \$8.6 billion, representing a contribution to gross domestic product of 0.52%.

Estimates of value and volume of wood products are subject to various assumptions; the assumptions for volume estimates may be different from the assumptions for value estimates.

<sup>&</sup>lt;sup>254</sup> All dollar figures are unadjusted for inflation.

## Harvested logs

The volume of Australia's log harvest in 2015–16 was 30.1 million cubic metres, a 13% increase from 26.5 million cubic metres in 2010–11 (Figure 6.1). More than half (54%) of the logs harvested in Australia in 2015–16 were softwood, almost entirely from commercial plantations. The remainder were hardwood logs from commercial plantations (33%) and native forests (13%). Native forest softwoods, mostly from New South Wales and Queensland, represent a very small proportion of the total log harvest.

Australia's native forest resource base available for wood production has changed over the reporting period, as explained in Indicator 2.1a. In 2010–11, the native forest log harvest contributed 25% (6.5 million cubic metres) of the total harvested log volume, and this had declined to 14% (4.1 million cubic metres) by 2015–16, a reduction in volume of 37% (Figure 6.1). The lower native forest log harvest was mostly comprised of a decrease in the volume of pulplogs harvested for woodchip export, which declined from 3.3 million cubic metres to 1.3 million cubic metres over the reporting period, a fall of 61%.

The decline in native forest log harvest has occurred at the same time as increases in log harvest from Australia's commercial hardwood plantation estate. The hardwood plantation log harvest increased by 87% from 5.2 million cubic metres in 2010–11 to 9.8 million cubic metres in 2015–16 (Figure 6.1). The largest change came from a higher harvest of hardwood plantation pulplogs for woodchip export, which almost doubled over this reporting period, from 4.8 million cubic metres to 9.3 million cubic metres. Harvests of softwood logs from commercial plantation forests also increased between 2010–11 and 2015–16, from 14.8 million cubic metres to 16.2 million cubic metres.

Overall, the volume of logs harvested from commercial softwood and hardwood plantations increased by 30% from 20.0 million cubic metres in 2010–11 to 26.0 million cubic metres in 2015 16. In 2015–16, a total of 86% of the volume of logs harvested in Australia were harvested from commercial plantations, compared to 75% in 2010–11<sup>255</sup>.

The value (calculated at the mill door) of harvested logs increased by 22% from \$1.9 billion to \$2.3 billion between 2010–11 and 2015–16 (Figure 6.2). This increase occurred for harvested plantation softwood sawlogs, and for plantation softwood and hardwood export pulplogs, due mostly to the increases in harvest volumes of these log types over the same period. The value of logs harvested from commercial plantations increased from \$1.36 billion to \$1.88 billion over this period, while the value of logs harvested from native forests decreased from \$0.50 billion to \$0.39 billion.

In 2015–16, the largest contributors to Australia's total log harvest, for both volume and value, were Victoria and New South Wales (Figures 6.3 and 6.4). Victoria accounted for 8.2 million cubic metres (27%) of total volume and \$599 million (26%) of total value. New South Wales contributed 5.6 million cubic metres (19%) to total volume and \$458 million (20%) to total value.



Figure 6.1: Volume of logs harvested by log type, 2005–06 to 2015–16

Note: Data for native forest logs include the small volume of native forest softwood (cypress pine) sawlogs. Source: ABARES (2017b).

🔊 The data used to create this figure, and a copy of the figure, are available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

6.1a

<sup>&</sup>lt;sup>255</sup> SOFR 2013 reported that 76% of the volume of logs harvested in 2010–11 was from commercial plantations, but this was a rounding error. The correct figure for 2010–11 is 75%.





Notes: Value represents estimated gross value of logs delivered to mill door or wharf gate. Data for native forest logs include the small volume of native forest softwood (cypress pine) sawlogs. Source: ABARES (2017b).

🔕 The data used to create this figure, and a copy of the figure, are available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9



#### Figure 6.3: Volume of logs harvested, by jurisdiction, 2010–11 and 2015–16

Note: Harvest volume data for ACT and NT are zero or not available for 2010-11 and 2015-16. Source: ABARES (2017b).

🔊 The data used to create this figure, and a copy of the figure, are available in Microsoft Excel via <u>www.doi.org/10.25814/5bda972cd76d9</u>

The most substantial changes in log harvest volumes between 2010–11 and 2015–16 were increases in South Australia (54%) and Queensland (43%). Victoria recorded the largest absolute volume increase (1.8 million cubic metres or 28%), while volumes fell in Tasmania (12%) and New South Wales (8%).

The average unit value of logs (the value per cubic metre) differs between states, mainly due to differences in the type and quality of log harvested (such as softwood or hardwood, and pulplog or sawlog) and wood source (such as native forest or commercial plantation).



#### Figure 6.4: Value of logs harvested, by jurisdiction, 2010–11 and 2015–16

Note: Harvest volume data for ACT and NT are zero or not available for 2010-11 and 2015-16. Source: ABARES (2017b).

🔊 The data used to create this figure, and a copy of the figure, are available in Microsoft Excel via <u>www.doi.org/10.25814/5bda972cd76d9</u>

#### Table 6.1: Turnover (sales and service income) in wood products industry, 2010–11 to 2015–16

		2010–11	2011–12	2012–13	2013–14	2014–15	2015–16ª
Total wood products manufacturing	\$ billion	24.0	21.4	20.1	20.0	22.2	23.7
Total manufacturing	\$ billion	389.2	399.2	387.5	377.4	373.7	371.5
Contribution of wood product industries to total manufacturing	%	6.2	5.4	5.2	5.3	5.9	6.4

Note: Turnover (sales and service income) is defined as sales of goods whether or not manufactured by the business, exclusive of goods and services tax.

<sup>a</sup> The 2015-16 turnover data for total wood products manufacturing include an estimated turnover figure for the sawnwood industry.

Source: ABARES (2017b).

🔊 This table, together with other data for Indicator 6.1a, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

## Wood products

Australia's wood products industry includes businesses that manufacture sawnwood, wood-based panels, and paper and paperboard products, each of which is discussed below, as well as other sectors. In addition to these products, there is a growing contribution from businesses that manufacture engineered wood products.

The value of production (total industry turnover, or sales and service income) in wood products manufacturing decreased by 2% between 2010–11 and 2015–16, from \$24.0 billion to \$23.7 billion (Table 6.1). In 2015–16, wood products industries contributed 6.4% of total national turnover of manufacturing, compared to 6.2% in 2010–11. The increased contribution was due to total manufacturing turnover decreasing at a faster rate (4.5% between 2010–11 and 2015–16) than total wood product manufacturing turnover over that period.

#### Sawnwood

The total volume of sawnwood production increased by 12% between 2010–11 and 2015–16, from 4.6 to 5.1 million cubic metres (Figure 6.5). This increase was the result of a rise in softwood sawnwood production, which increased by 16% over the same period, from 3.8 million cubic metres to 4.4 million cubic metres. In comparison, hardwood sawnwood production decreased by 8%, from 730 thousand to 675 thousand cubic metres.

Changes in hardwood and softwood sawnwood production over the reporting period reflect the response of the wood products industry to competitive pressures, expectations of future wood product demand and log supply (Gavran et al. 2014), and resource availability. Over the reporting period, ongoing increase in the area of native forest managed for conservation in Australia has reduced access to native forest for wood production, thereby reducing the amount of hardwood sawlogs from native forests available for the wood products industry.

The commercial hardwood plantation estate, which produced 9.8 million cubic metres of hardwood logs in 2015–16, supplied only 0.2 million cubic metres of sawlog. This was because only

6.1a

#### Figure 6.5: Volume of sawnwood production, 2005–06 to 2015–16



Source: ABARES (2017b).

🔊 The data used to create this figure, and a copy of the figure, are available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

Product type		2010–11	2011–12	2012-13	2013–14	2014–15	2015–16ª
Sawnwood	\$ billion	3.8	3.4	n.a.	n.a.	3.5	n.a.
Wood-based panels	\$ billion	1.62	1.44	1.26	1.33	1.46	1.57
Paper and paperboard products	\$ billion	10.9	9.7	9.9	9.8	10.1	10.5

#### Table 6.2: Turnover (sales and service income) in selected wood products industries, 2010-11 to 2015-16

n.a., data not available

<sup>a</sup> An estimated 2015-16 turnover figure for sawnwood is included in the total wood products manufacturing 2015-16 turnover figure in Table 6.1. Notes: Sawnwood comprises 'log sawmilling' and 'timber resawing and dressing'. Wood-based panels comprises 'veneer and plywood' and 'reconstituted wood product'. Source: ABARES (2017b).

Source: ABARES (2017b).

🦻 This table, together with other data for Indicator 6.1a, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

a small proportion of hardwood plantations are managed for sawlog production, and those are mostly not of harvestable age; and because there are substantial technical and commercial impediments to growing hardwood sawlogs in plantations. The majority of hardwood plantation production is pulplogs for woodchip export; small proportions are used for domestic paper production, wood-based panels and sawlogs.

The value of sawnwood production (sales and service income, or turnover) decreased by 7% between 2010–11 and 2014–15, from \$3.8 billion to \$3.5 billion (Table 6.2). No comparison could be made with 2015–16 as data are unavailable.

#### Wood-based panels

The total volume of wood-based panel production decreased by 2% between 2010–11 and 2015–16, from 1.73 million cubic metres to 1.70 million cubic metres (Figure 6.6). Plywood was the only product that increased in production over the reporting period, by 22% from 140 thousand cubic metres to 171 thousand cubic metres. Both particleboard and medium-density fibreboard production declined, by 3% and 5%, respectively. The value of Australia's wood-based panel production decreased by 3% between 2010–11 and 2015–16, from \$1.62 billion to \$1.57 billion (Table 6.2).

#### Paper and paperboard products

The total weight of paper and paperboard production increased by 2% between 2010–11 and 2015–16, from 3.16 million tonnes to 3.22 million tonnes (Figure 6.7).

Paper and paperboard products in Australia in 2015–16 comprised newsprint, printing and writing paper, household and sanitary products, and packaging and industrial products. Of these products, the weight of printing and writing paper produced increased the most, by 50% from 342 thousand tonnes in 2010–11 to 513 thousand tonnes in 2015–16. By comparison, newsprint production decreased by 27% over the reporting period, from 439 thousand tonnes to 319 thousand tonnes (Figure 6.7).

The value of Australia's paper and paperboard production decreased by 4% between 2010–11 and 2015–16, from \$10.9 billion to \$10.5 billion (Table 6.2).



#### Figure 6.6: Volume of wood-based panel production, 2005–06 to 2015–16

Source: ABARES (2017b).

The data used to create this figure, together with other data for Indicator 6.1a, are available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9





Source: ABARES (2017b).

The data used to create this figure, together with other data for Indicator 6.1a, are available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

6.1a

## Contribution of the forestry and wood products industries

The value added by the Australian forestry and wood products industries<sup>256</sup>, referred to as 'industry value added'<sup>257</sup>, was \$8.3 billion in 2010–11 and contributed 0.59% of Australia's gross domestic product (GDP) in that year (Table 6.3). By 2012–13, industry value added had decreased to \$7.0 billion, and the contribution to GDP had decreased to 0.46%, driven largely by a downturn in the domestic housing market and softening in wood products exports, both of which are important drivers of economic growth in Australia's forestry and wood products industries. By 2015–16, and following a recovery in domestic dwelling construction and wood products exports, industry value added increased to \$8.6 billion. The contribution to GDP increased, but only to 0.52%, as national GDP grew faster than industry value added between 2010–11 and 2015–16 (Table 6.3).



Hardwood sawmill, Eden, NSW.

#### Table 6.3: Forestry and wood products industries value added, 2010–11 to 2015–16

	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
Forestry and wood products manufacturing (\$ billion)	8.29	7.35	7.01	7.71	7.91	8.60
National GDP (\$ billion)	1,410	1,492	1,528	1,590	1,617	1,655
Proportion of national GDP (%)	0.59	0.49	0.46	0.49	0.49	0.52

Source: ABARES (2017b).

🔊 This table, together with other data for Indicator 6.1a, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

<sup>&</sup>lt;sup>256</sup> These industries are defined according to the Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006. The forestry industry is equivalent to Division A, Subdivision 3 – forestry and logging. The wood products industry consists of Division C, Subdivision 14 – wood product manufacturing; and Division C and Subdivision 15 – pulp, paper and paperboard manufacturing (Trewin and Pink 2006).

<sup>&</sup>lt;sup>257</sup> 'Industry value added' is a measure of economic activity that represents the value added by an industry to its intermediate inputs (that is, the value added to the goods and services other than capital that are inputs to the production process). It is the measure of the contribution by manufacturing to gross domestic product. In the context of SOFR 2018, 'industry value added' omits some downstream parts of the forestry and wood products industries, particularly wholesaling, retailing and valueadding (and thus omits the manufacturing of some commodities).

## Indicator 6.1b

## Values, quantities and use of non-wood forest products

### Rationale

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

## Key points

- Many Australian non-wood forest products (NWFPs) are commercialised, and supply domestic and export markets. However, for most NWFPs there are insufficient data to assess production quantities and value.
- Some NWFP industries are based on products derived from native species, including crocodile eggs, mud crabs, and eucalyptus and tea tree oil. Other NWFP industries are based on products derived from animals that are pests, such as wild pigs and deer. For both these categories of NWFP, only some of the production derives from forest.
- Harvest of game pigs and kangaroos for meat declined between 2011–12 and 2015–16, while harvest of deer and goats for meat was variable over time. Production of crocodile hides decreased slightly over this period.
- Over the period 2011–16, an annual average of 21 thousand tonnes of honey was produced, much of which was produced from forested lands. The volume of honey production declined by 17% during this period, while the gross value of production increased by 39% to \$110 million in 2015–16.
- In 2011, the gross annual value of production of NWFPs regarded as having high forest dependence was \$198 million. A more recent estimate of the gross value of production for these products was not available. However, between 2011 and 2016 the gross annual value of production increased for tea tree, and for honey and beeswax, and varied or decreased for some other products.

Non-wood forest products (NWFPs) are products of biological origin other than wood that are derived from forests. In some countries, people in rural communities depend on NWFPs for everyday necessities and for subsistence income. In Australia, many NWFPs have been commercialised and are traded both domestically and internationally (Bird 2010; Hansda 2009). This indicator provides an overview of selected commercialised NWFPs; there are insufficient data to examine the full range of NWFPs. Some tree-based industries are not discussed in this indicator because they are regarded as horticulture, rather than forest-based industries. Some other forest species (e.g. flowering shrubs) that have been fully commercialised outside forests are also not discussed, because none of their production derives from forest.

Information about the sustainability of harvest of NWFPs is presented in Indicator 2.1d.

## Classification of non-wood forest products

Not all products reviewed in this indicator are fully forestdependent, because the plants and animals on which the sector is based exist both within forests and outside forests. For these products, data on the proportion obtained from forests are generally not available. Lack of data is 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 6.4 features products considered to have high forest dependence or to be derived from forest-based animal and plant stocks. A portion of the harvest of feral buffalo (*Bubalus bubalus*) also derives from forests (Foster 2014), but this industry is not reported here.

The estimated gross value of production of products with a high forest dependence was reported as \$126 million in 2006–7, and \$198 million in 2011–12 (MIG and NFISC 2013). These figures do not include forest-related production in the goat, kangaroo and wallaby industries. A more recent

Table 6.4: Estimated gross value o	f production (\$'000) of selected non-wood	forest products, 2011-12 to 2015-16
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Sector	2011–12	2012–13	2013–14	2014–15	2015–16
Crocodile products	51,859	-	-	-	28,100
Mud crabs <sup>b</sup>	22,900	21,400	21,300	19,000	15,900
Deer	1,688ª	1,818	2,148	2,177	2,245
Game pigs	9,456ª	1,719	1,490	3,124	5,757
Eucalyptus oil	1,260	-	-	-	-
Tea-tree oil	12,132	-	-	-	28,582
Native bush foods	17,915	-	-	-	-
Sandalwood	14,740	-	-	-	-
Honey and beeswax	79,376ª	88,374	88,037	100,553	110,241

-, not available

<sup>a</sup> Figures for 2011–12 differ slightly from those in SOFR 2013 due to updated production and or price data.

<sup>b</sup> Queensland only.

Note: Gross value of production (GVP) 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, or 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: MIG and NFISC (2013); Foster (2014); DAF (2017); ABARES (2018).

🔊 This table, together with other data for Indicator 6.1b, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

estimate of the gross value of production for products with a high forest dependence was not available, however current data (Table 6.4) show an increase in the gross annual value of production of some products (including tea tree oil, and honey and beeswax) between 2011 and 2016, while some other products decreased in total value.

## Crocodiles

The crocodile farming industry depends on the commercial harvesting of eggs from the wild, incubating these eggs, and raising hatchlings, a process known as ranching (CFANT 2015). Crocodile hatchlings are used primarily to raise crocodiles for skin products and meat. Most crocodile farms raise saltwater crocodiles (*Crocodylus porosus*), although a few farms also raise freshwater crocodiles (*C. johnstoni*). The harvesting of wild eggs is often from mangrove forests and forested wetlands (including melaleuca forest), so crocodile eggs are considered a non-wood forest product. Some hatchlings and juveniles are also harvested from the wild.

Production of live crocodile eggs from farms and harvest from the wild in the Northern Territory totalled an average of around 75,000 eggs per year between 2011 and 2016, about twice the level of the previous SOFR reporting period. Most of the eggs were harvested from the wild (Table 6.5). To help prevent over-harvesting, the Northern Territory Government regulates the harvest of wild crocodile eggs by requiring and managing permits for harvest. The management program for the saltwater crocodile (*C. porosus*) in the Northern Territory for 2016–2020 allows an increased harvest ceiling of 90,000 viable eggs per year, representing a potential 40% increase in egg harvest<sup>258</sup>.

Crocodile hide production has increased substantially over the long term, but dipped during the five-year reporting period (Table 6.6). Around 80% of production is exported. The major use for Australian crocodile skins is the manufacture of



Crocodile products (considered non-wood forest products because eggs harvested from wetland forests are used to raise crocodiles).

high-quality leather goods. Some pieces of crocodile leather are also exported. Australian crocodile meat production and exports from 2011–12 to 2015–16 are shown in Table 6.7. Other parts of the crocodile (such as teeth, skulls and feet) are used as components in accessories, jewellery, medicine, and the production of oils.

<sup>&</sup>lt;sup>258</sup> The Northern Territory crocodile farming industry strategic plan 2015–21 (CFANT 2015) states a harvest ceiling of 100,000 (live) eggs, while the Wildlife Trade Management Plan for the Saltwater Crocodile (Crocodylus porosus) in the Northern Territory of Australia, 2016–2020 (DLRM 2015) specifies 90,000 viable eggs. Modelling indicates that a harvest of 120,000 eggs from the wild would equate to 100,000 live eggs (the harvest unit used in previous management programs) or 90,000 viable eggs (the harvest unit used in the Wildlife Trade Management Plan for the Saltwater Crocodile (Crocodylus porosus) in the Northern Territory of Australia, 2016–2020) (DLRM 2015). Modelling also indicates that this harvest ceiling is less than 50% of the total number of eggs laid each year and, because survival in the wild from egg to later age classes is less than 25%, the egg harvest mostly represents displaced rather than additional mortality (DLRM 2015).

Table 6.5: Crocodile egg harvest from the wild for commercial use, Northern Te	erritory, 2011–12 to 2015–16
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Period	2011–12	2012–13	2013–14	2014–15	2015–16
Harvest ceiling	60,000	60,000	70,000	70,000	70,000
Eggs permitted	52,500	58,500	60,750	68,000	70,000
Eggs harvested	42,171	47,610	51,238	50,022	47,194

Source: Saalfeld and Fukuda (2017) and previous saltwater crocodile monitoring reports at <u>denr.nt.gov.au/land-resource-management/saltwater-crocodile-monitoring</u>.

🔊 This table, together with other data for Indicator 6.1b, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

#### Table 6.6: Australian crocodile hide production and exports, 2011–12 to 2015–16

Product statistic	Metric	2011–12	2012–13	2013–14	2014–15	2015–16
Production	Number of hides (saltwater and freshwater)	48,532	-	-	-	41,852
Exports	Number of hides (saltwater and freshwater)	36,560	59,518	52,461	37,524	35,111
Exports	Value of hides (\$ million)	14.7	28.4	25.2	23.6	22.2

-, not available

Source: MIG and NFISC (2013); ABS (2017d); Northern Territory Department of Primary Industry Fisheries; Queensland Department of Environment and Heritage Protection.

🔊 This table, together with other data for Indicator 6.1b, is available in Microsoft Excel via <u>www.doi.org/10.25814/5bda972cd76d9</u>

#### Table 6.7: Australian crocodile meat production and exports, 2011–12 to 2015–16

Product statistic	Metric	2011–12	2012–13	2013–14	2014–15	2015–16
Production	Tonnes	243.0	-	-	-	132.3
Exports	Tonnes	25.9	29.3	24.0	17.1	26.4
Exports	\$ '000	321	369	259	182	317

-, not available

Source: ABS (2017d); ABARES (2018).

🔊 This table, together with other data for Indicator 6.1b, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

## Deer

Wild (feral) deer are common and widespread in parts of Queensland, South Australia, Tasmania and Victoria, and their numbers are increasing in New South Wales; they are less common in the Northern Territory and Western Australia (Davis et al. 2016; NSW DPI<sup>259</sup>). Six species have established wild populations, including fallow deer (*Dama dama*), red deer (*Cervus elaphus*) and sambar (*Rusa unicolor*). Wild deer are a pest species in forests, and are commonly hunted both for recreation and as a method of pest management. Wild and farmed deer are sold for meat through licenced abattoirs and producers. The main products from deer farming are venison and velvet antler.

Table 6.8 shows the amount of venison production and exports, as well as the number of deer hides exported. These data include venison from commercial deer farms.

Velvet antlers are widely used in traditional Asian medicines. Production and exports from 2011–12 to 2015–16 are shown in Table 6.9. Most velvet antler production is exported.

## Goats

In some parts of Australia, wild (feral) goats (*Capra hircus*) are a pest species. Feral goats are common and widespread particularly in rangeland areas and to some extent in forested areas throughout Australia, except for the Northern Territory. Wild-caught goats contribute to Australia's domestic meat production and export of live goats, however the proportion taken from forest areas is unknown.

Table 6.10 shows the amount and gross value of production, meat export, and live goats exported. Data in Table 6.10 include goats and goat meat from commercial goat farms.

The Australian goat industry is heavily export-oriented, unlike other goat-producing countries. Since 2009 Australia has been the largest exporter of goat meat, and in 2015 accounted for 51% of world exports despite producing less than 1% of the world's goat meat. Australia's live goat export has accounted for around 15% of world trade since 2010 (ABARES 2017a).

The slaughter of goats increased from 1 million in 2000–01 to around 2.6 million in 2013–14, but has been relatively stable since 2013–14. In 2015–16, there were 2.2 million goats slaughtered. This expansion in slaughter has been driven by export demand, particularly from the United States. Goat consumption in Australia is limited to small niche markets. The gross value of goat production increased from \$43.6 million in 2007–08 to \$181 million in 2015–16.

<sup>259</sup> www.dpi.nsw.gov.au/biosecurity/vertebrate-pests/pest-animalsin-nsw/wild-deer/wild-deer; www.pestsmart.org.au/wp-content/ uploads/2010/03/West2008\_3.pdf

Table 6.8: Venison productio	on and exports, and exports of	f deer hides, 2011–12 to 2015–16
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Product statistic	Metric	2011–12	2012–13	2013–14	2014–05	2015–16
Venison production	tonnesª	224	243	326	286	265
Venison exports	tonnesª	160	170	230	200	185
Deer hide exports	number	2422	-	-	-	-

-, not available

<sup>a</sup> Venison production and exports are reported as hot carcass weight.

Note: Export figures for 2011–12 differ from those in SOFR 2013 due to updated levies data.

Source: ABS (2011); Department of Agriculture and Water Resources (Levies section).

🔊 This table, together with other data for Indicator 6.1b, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

#### Table 6.9: Velvet antler production and exports, 2011–12 to 2015–16

Product statistic	Metric	2011–12	2012–13	2013–14	2014–15	2015–16
Production	kg	13,287	12,325	10,405	11,434	12,127
Exports	kg	12,092	8,157	4,582	9,760	11,356
Proportion exported	%	91	66	44	85	94

Note: Production figures for 2011-12 differ slightly from those in SOFR 2013 due to updated levies data.

Source: Department of Agriculture and Water Resources (Levies section).

🔊 This table, together with other data for Indicator 6.1b, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

#### Table 6.10: Australian goat production, export and value, 2011–12 to 2015–16

Product statistic	Metric	2011–12	2012–13	2013–14	2014–15	2015–16
Production	'000 tonnes	28.7	36.2	40.4	39.0	34.3
Gross value of production	\$million	81.4	78.2	105.5	153.8	181.0
Meat export	'000 tonnes	34.4	38.3	36.5	29.6	29.9
Meat export	\$million	113.6	145.8	198.9	258.2	226.0
Live goat exports	'000	71.9	61.3	81.2	91.0	80.7
Live goat exports	\$million	9.7	7.2	9.9	9.6	10.3

Source: ABS (2017d); Meat and Livestock Australia unpublished data 2017; ABARES.

🔊 This table, together with other data for Indicator 6.1b, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

#### Table 6.11: Number of game pigs killed, and game pig meat production and exports, 2011–12 to 2015–16

Product statistic	Metric	2011–12	2012–13	2013–14	2014–15	2015–16
Animals killed	Number	119,100	23,500	21,000	41,900	63,800
Meat production	Tonnes	1,488	294	262	523	798
Meat export	Tonnes	1,468	274	242	503	778

Note: Figures for 2011-12 differ from those in SOFR 2013 due to updated or revised levies data. Source: Department of Agriculture and Water Resources (Levies section); ABARES.

🔊 This table, together with other data for Indicator 6.1b, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

## Game pigs

The game pig industry is based on the harvest of feral pigs (*Sus scrofa*), primarily in forests in northern and eastern Australia, where they are more prevalent. Game pigs are hunted for their meat, as a recreational activity and as a pest management practice.

The number of reported game pig kills, and game pig meat production and exports, declined substantially from 2011–12 to 2015–16 (Table 6.11). Almost all the production was exported.

## Kangaroos and wallabies

Kangaroos and wallabies are harvested from the wild by shooters under a quota system administered by the state, territory and Australian governments, based on the principles of sustainability (see Indicator 2.1d). An industry has developed over the past 40 years from this harvest, producing meat for human consumption, pet food and skins.

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 harvested commercially in Tasmania. All these species dwell both in forests and non-forests, and are common and not endangered. Other kangaroo and wallaby species are protected from commercial harvesting.

Harvest of kangaroos occurred at a similar level over the 2011–2016 period, but has declined over the past 10 years. The total commercial harvest of kangaroos was 1.7 million in 2015–16, with a gross value of \$42.8 million (Table 6.12); these figures are respectively 42% and 27% less than figures reported in 2006–07. The major factor in these reductions was the loss of the Russian Federation market in 2009-10. The total value of exports of kangaroo products (meat and skins) fell from \$99 million in 2006–07 to \$36 million in 2010–11, before recovering to \$54 million in 2013–14. Export destinations for kangaroo meat in 2015–16 included Belgium (28% of total exports), Papua New Guinea (19%), Germany (18%), Netherlands (11%) and France (7%). Kangaroo skins are the largest component of the kangaroo export industry by value, with exports totalling \$32 million in 2015–16, around two-thirds of total kangaroo product exports. The proportion of production and value from kangaroos derived from forests (animals living or sheltering in forests) is unknown.

In Tasmania, 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 products from Tasmania ceased after 2007–08. The Tasmanian Government allows harvesting of wallabies for the domestic market, provided the harvesting is within sustainable levels indicated in the management plan. Data on production of wallaby meat in Tasmania over the past few years have not been published. In 2010–11, production of wallaby meat was around 19 tonnes and the gross value of wallaby production was \$170,000.

## 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).

Activity	Product statistic	Metric	2011–12	2012–13	2013–14	2014–15	2015–16
Harvest	Quotaª	'000 animals	5,408	6,224	8,441	7,834	7,071
	Actual	'000 animals	1,800	1,767	1,841	1,664	1,727
	Gross value of production	\$'000	36,815	34,487	37,081	33,656	42,837
Meat production	Human consumption	tonnes	14,229	13,382	14,449	12,943	13,273
	Pet food	tonnes	3,824	3,779	4,095	3,475	3,898
	Total	tonnes	18,053	17,651	18,545	16,418	17,171
Exports	Meat	tonnes	4,534	3,570	4,663	3,951	3,427
	Meat	\$million	20.7	15.6	21.8	19.0	18.8
	Hides, skins, leather	'000 pieces	1,807	1,840	2,232	2,228	1,693
	Hides, skins, leather	Śmillion	24.2	25.8	32.3	32.8	32.3

#### Table 6.12: Kangaroo products: production, export and value, Australia, 2011–12 to 2015–16

<sup>a</sup> Quota figures are for calendar year. For example, quota in 2011–12 refers to quota for 2012. Data include sustainable quotas and special quotas. Note: Figures in 2011–12 differ from those in SOFR 2013 due to updated production and or price data, and/or ABARES methodologies.

Source: ABARES using data from the ABS (2017d); Australian Government Department of Sustainability, Environment, Water, Population and Communities<sup>260</sup>; Department of Agriculture and Water Resources (Levies section).

🔊 This table, together with other data for Indicator 6.1b, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

#### Table 6.13: Australian honey production, export and value, 2011–12 to 2015–16

Activity	Product statistic	Metric	2011–12	2012-13	2013–14	2014–15	2015–16
Production	Amount	Tonnes	21,989	23,585	22,167	18,166	18,211
	Gross value of production	\$million	79.4	88.4	88.0	100.6	110.2
Exports	Honey	Tonnes	4,879	4,641	4,373	4,178	4,479
	Beeswax	Tonnes	207	358	358	268	266

Note: Production figure for 2011–12 differs from SOFR 2013 due to updated data from industry. Source: ABS (2017d); ABARES.

🔊 This table, together with other data for Indicator 6.1b, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

260 www.environment.gov.au/system/files/pages/ee20f301-6c6c-44e4aa24-62a32d412de5/files/kangaroo-statistics-states-2018.pdf; www. environment.gov.au/biodiversity/wildlife-trade/natives Over the period 2011–16, an annual average of 20.8 thousand tonnes of honey was produced, much of which was produced from forested lands. Honey production declined by 17% during this period, while the gross value of production increased by 39% and the amount of exports declined by 8% (Table 6.13). Honey production in Australia varies considerably between years due to variably dry seasonal conditions.

## Eucalyptus oil

Eucalyptus oil is an essential oil that is extracted from the leaves of several species of the genus *Eucalyptus*. It has a wide range of commercial applications and may be found in perfumes, pharmaceutical products, and as a food additive and industrial chemical. Other Australian essential oils include sandalwood, tea-tree and boronia oils, from species of the genera *Santalum*, *Melaleuca* and *Boronia*, respectively.

Eucalyptus oil is harvested from plantations and from native forest under permit. Most Australian eucalyptus oil is produced from blue mallee (*Eucalyptus polybractea*), with smaller quantities obtained from narrow-leaved peppermint (*E. radiata* subsp. *radiata*) and oil mallee (*E. kochii*)<sup>261</sup>. Plantations of *E. polybractea* have been established for eucalyptus oil production in New South Wales, and some plantations of this species have been converted to oil production in Western Australia. The use of mechanical harvesting for *E. polybractea*, and improved distillation equipment, has greatly reduced the cost of production<sup>262</sup>.

Eucalyptus oil is sold in domestic markets, and is both imported and exported. In 2011–12, eucalyptus oil production was estimated at 120 tonnes, with exports (including re-exports) estimated to be 149 tonnes (MIG and NFISC 2013). In some areas, the millennium drought running from 2000 to 2010 had a significant impact on eucalyptus oil production levels and operations. A national industry estimate for the 2011–2016 reporting period was not available, however some eucalyptus oil producers reported a 50% increase in production during this period. Production increased between 2011 and 2016 as plantations matured and as the farm gate price and seasons improved.

Other potential products from eucalyptus oil, such as jet fuel or other biomaterials, have been tested in Australia for proofof-concept but are not currently commercial (e.g. Mendham et al. 2015). There is strong competition from overseas production, and new product development is occurring in Australia<sup>263</sup>.

- 262 www.eucalyptusoil.com/australian-oil-production/future-production/ future-production\_
- <sup>263</sup> www.agrifutures.com.au/farm-diversity/eucalypts-oil/

<sup>264</sup> ATTIA (Australian Tea Tree Industry Association) (2010). Tea tree uses, ATTIA, Casino. <u>www.teatree.org.au/teatree\_uses.php</u>

## Tea-tree oil

Australian tea-tree oil from narrow-leaved paperbark (*Melaleuca alternifolia*; also called narrow-leaved tea-tree) is harvested principally from plantations in northern New South Wales and Queensland, and there is also a small harvest from natural stands on flood plains. Tea-tree oil has a wide range of uses that relate mainly to its antiseptic, anti-inflammatory and other healing properties. It is used in topical treatments to treat fungal, bacterial and viral infections, bruises and skin allergies, and also has industrial applications in solvents and disinfectants (RIRDC 2007b).

Table 6.14 presents data on production and exports of Australian tea-tree oil in 2011–12 and 2015–16. Approximately 85% of tea-tree oil production in Australia is exported for use in the cosmetics and pharmaceuticals industry. The remaining oil is used domestically as pure oil or as an ingredient in products such as soaps, shampoo and other personal products<sup>264</sup>. The estimated gross value of tea-tree oil production increased from 2012 (\$12 million) to 2016 (\$28 million) over the five-year period, reflecting improved market conditions, with increases in production (Table 6.14) and in average prices (from \$32/kg to \$46/kg).

## Sandalwood products

Australia's current sandalwood production comes primarily from harvesting native sandalwood (*Santalum spicatum*) in Western Australia. Harvesting of native sandalwood in Western Australia is based on an allowable cut as specified in the *Sandalwood (Limitation of Removal of Sandalwood) Order (No. 2) 2015.* Indicators 2.1c and 2.1d discuss the sustainability of sandalwood production in Australia. The area from which native *S. spicatum* is available for harvest in Western Australia is spread across 14 million hectares (FPC 2017).

Around 160 tonnes of wild-grown, native northern sandalwood (*S. lanceolatum*) was harvested in Queensland in 2015–16, the smallest harvest since 2012–13. An average of 240 tonnes per year of this species was harvested in Queensland over the SOFR 2018 reporting period.



Debarked sandalwood, Kalgoorlie, Western Australia

<sup>&</sup>lt;sup>261</sup> eopaa.com.au/essential-oil-industry-australia/

#### Table 6.14: Tea-tree oil production and exports, Australia, 2011–12 and 2015–16

Product statistic	Metric	2011–12	2015–16
Production	Tonnes	400	783
Exports	Tonnes	373	688

Source: ABS (2017d); ABARES.

🔊 This table, together with other data for Indicator 6.1b, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

#### Table 6.15: Sandalwood plantation area (hectares), by tree ownership, Australia, as at June 2017

Tree ownership	Santalum spicatum	Santalum album	Total
Publicª	5,900	0	5,900
Private	12,000	14,100	26,100
Total	17,900	14,100	32,000

<sup>a</sup> Includes joint (public and private) tree ownership.

Source: ABARES.

🔊 This table, together with other data for Indicator 6.1b, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

#### Table 6.16: Sandalwood production, Australia, 2011–12 to 2015–16

Product statistic	Metric	2011–12	2012–13	2013–14	2014–15	2015–16
Wood production	tonnes	5,200	5,300	4,700	4,300	4,600
Harvested for domestic production	tonnes	3,200	3,300	3,100	2,900	3,200
Exported	tonnes	2,000	2,000	1,600	1,500	1,300
Oil production	kg	n.d.	1,100	1,300	1,600	2,600
Oil exported	kg	n.d.	900	1,100	500	2,100

n.d., no data

Note: Totals may not tally due to rounding.

Source: ABARES.

🔊 This table, together with other data for Indicator 6.1b, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

In 2015–16, there were 32,000 hectares of sandalwood plantations in Australia, located in the Northern Territory, Queensland and Western Australia (Table 6.15). This estate comprised approximately 17,900 hectares (56%) of *S. spicatum* and 14,100 hectares (44%) of Indian sandalwood (*S. album*), and these plantations are reported in the 'Other forest' category in Indicator 1.1a. Around 18% (5,900 hectares) of the sandalwood plantation estate consisted of public tree ownership and 82% (26,100 hectares) of private tree ownership in 2015–16. The first commercial harvest of *S. album* was completed in June 2014 (TFS 2014).

Table 6.16 presents the estimated annual sandalwood production in Australia for wood and oil for the period 2011–12 to 2015–16. Total wood production in Australia averaged 4,800 tonnes per year between 2011–12 and 2015–16. An average of 3,100 tonnes (65%) was harvested for domestic use and the balance was exported. An average of 1,700 kilograms of sandalwood oil was produced each year in Australia between 2012–13 and 2015–16, and the yearly production of oil has increased substantially over this period. The majority of oil produced in Australia (an average of 1,200 kilograms per year; 70% of total production) was exported.

## Other essential oils

Other native species from forests are also used to produce small commercial quantities of essential oils, including lemon myrtle (*Backhousia citriodora*), boronia (*Boronia* spp.), fragronia (*Agonia fragrans*) and honey myrtle (*Melaleuca teretifolia*). The oils can be of high value, and are used in small quantities in cosmetics or food products. Cypress oil is being harvested commercially in the Northern Territory from plantations of the cypress pine *Callitris columellaris* var. *intratropica* planted in the 1960s and 1970s.

Boronia oil is a fragrant oil produced from the flowers of a perennial shrub endemic to Australia (usually *Boronia megastigma*). The oil is extracted using a solvent process and is further refined into either a waxy solid (a 'concrete') or a liquid (an 'absolute').

Boronia oil is used in perfumery and as food flavouring (Foster 2014). Traditionally, boronia oil has been produced from flowers picked in the wild, but most boronia oil is now produced from plantations using selected plant clones and mechanical harvesting.

## Other non-wood forest product-based industries

Australia produces a range of other non-wood products that are at least partly forest-dependent. These include wildflowers, other native plants, herbs, spices, nuts, and fruits as native bush foods.

Two fisheries, mud crab (*Scylla* spp.) and white banana prawn (*Fenneropenaeus merguiensis*), have a direct link to forests. Adult mud crabs and nursery stock of these two fisheries dwell in mangrove forests. Commercial mud crab fisheries are managed by Northern Territory and Queensland fishery agencies, with Queensland reporting production and gross value of production (Table 6.17).

#### Table 6.17: Mud crab production, Queensland, 2005 to 2016

Year	Total catch (tonnes)	Gross value of production (\$ million)
2005	969	15.5
2006	955	15.3
2007	931	14.9
2008	1,007	16.1
2009	1,044	16.7
2010	1,240	19.8
2011	1,439	23.0
2012	1,429	22.9
2013	1,340	21.4
2014	1,329	21.3
2015	1,189	19.0
2016	994	15.9

Source: DAF (2017b).

This table, together with other data for Indicator 6.1b, is available in Microsoft Excel via <u>www.doi.org/10.25814/5bda972cd76d9</u>

The native (bush) food industry spans a wide variety of Australian species, including anise myrtle, Australian finger lime, bush tomato, Davidson's plum, desert limes, Kakadu plum, lemon aspen, lemon myrtle, muntries, mountain or native pepper, quandong, wattle seed and riberry (Clarke 2012; see list of scientific names below). Many of these originate from forests. Information on the cultivation, production, health uses and plant improvement was reviewed in Sultanbawa and Sultanbawa (2016). The native food industry had an estimated value of approximately \$17 million in 2011 (MIG and NFISC 2013), but limited information is available about production levels and value for individual species or the sector as a whole.

<sup>266</sup> ibid

Currently 13 native foods, mostly forest species, are certified by Food Standards Australia New Zealand and available within the Australian and international markets (PwC's Indigenous Consulting 2017):

- Lemon myrtle: Backhousia citriodora (leaf and oil)
- Mountain or native pepper: *Tasmannia lanceolata* (leaf and berry)
- Bush tomato or desert raisin: Solanum centrale
- Anise myrtle: Backhousia anisata (leaf and oil)
- Finger limes: Citrus australasica
- Kakadu plum: Terminalia ferdinandiana
- Desert limes: Citrus glauca
- Quandong: Santalum acuminatum
- Muntries: Kunzea pomifera
- Wattleseed: Acacia victoriae
- Riberry: Syzygium leuhmanii
- Davidson's plum: Davidsonia spp.
- Lemon aspen: Acronychia acidula.

Some native foods are wild-harvested, such as Kakadu plum and mountain pepper (pepperberry), but many bush foods are grown on farms. A recent survey of the native food industry found that it is supply-constrained, with opportunities for growth (PwC's Indigenous Consulting 2017).

Lemon myrtle is one of the most cultivated and commercially mature species in the native food industry, with an estimated annual production in 2012 of between 575 and 1,100 tonnes (RIRDC 2014b) and an estimated farm gate value of \$15 million dollars<sup>265</sup>. This compares with an estimated 5-15 tonnes of annual production for most other native food crops. Lemon myrtle is a medium-sized native tree with the leaves used for flavouring, essential oil and cosmetic ingredients. Estimated annual production of lemon myrtle oil in 2012 was between three and eight tonnes, with a farm gate value of \$500,000. About 90% of lemon myrtle leaf and oil produced in Australia is exported to the European Union and the United States of America<sup>266</sup>. Originally harvested on a small scale from Australian rainforest, the majority of commercial lemon myrtle is now grown on farms in Oueensland and the north coast of New South Wales.

Myrtle rust (*Puccinia psidii*), which was first found in Australia in 2010, severely damages new growth of species in the Myrtaceae family, and threatens lemon myrtle production. Growers of native bush foods may seek a permit to use specified fungicides for the treatment of myrtle rust on riberry, anise myrtle and lemon myrtle. Plantations of lemon myrtle established in Malaysia and China are not yet in full production but are expected to provide strong price competition for Australian product in the future<sup>267</sup>.

An emerging product is Kakadu plum (*Terminalia ferdinandiana*), which has increasing interest in Australia and internationally because of the fruit's very high vitamin C content, and other properties. Case study 6.1 describes the emerging Kakadu plum industry.

<sup>&</sup>lt;sup>265</sup> Agrifutures Australia, accessed 9 November 2017. Lemon Myrtle (24.05.2017) www.agrifutures.com.au/farm-diversity/lemon-myrtle/

<sup>&</sup>lt;sup>267</sup> ibid

### Case study 6.1: Commercial harvest of Kakadu plum

Kakadu plum (*Terminalia ferdinandiana*) is a tree of small to medium size (3–8 metres) found in woodland forest and other vegetation types across northern Australia. This includes large areas of Aboriginal owned and managed lands in the Kimberley region of Western Australia and the top end of the Northern Territory. Kakadu plum is also known as bush plum, billygoat plum, gubinge (Kimberley), mimarral (Wadeye) and murunga (Arnhem land) (RIRDC 2014a; Gorman et al. 2016).

Kakadu plum has mainly been used as an ingredient in jams, sauces and juices. However, it is increasingly being dried and ground into a powder for use in dietary supplements and health foods. The fruit is sold in fresh, powdered or frozen puree form.

The fruit has extremely high concentrations of vitamin C (Brand et al. 1982; Williams et al. 2014) relative to other fruits. Kakadu plum fruit and leaf also have extremely high levels of phenolic compounds, such as ellagic and gallic acid, which give a high antioxidant capacity (Konczak et al. 2010, 2014). The phenolic-rich fruit extract has recently been found to have pronounced anti-inflammatory, anti-microbial and chemopreventative properties (Tan et al. 2011; Mohanty and Cock 2012), further supporting the many traditional uses of Kakadu plum as a medicine (Konczak et al. 2010).

The properties of Kakadu plum give it commercial application as a food (for its flavour and health benefits); as a preservative (for its antimicrobial properties<sup>268</sup>); in the cosmetic sector (skin creams and beauty products); as a food supplement; and in medical applications.

Commercial harvest of Kakadu plum commenced in the late 1990s. Most production in the Northern Territory and Western Australia comes from wild harvest, which occurs mainly on Aboriginal land and Crown land and requires government permits. Permits issued by the Northern Territory government ranged from 5,000 kg in 2012 to 10,000 kg in 2014 and 2015<sup>269</sup>. There is also a plantation of Kakadu plum in the Northern Territory and a number of small plantations in Western Australia, mostly on Aboriginal land (Gorman et al. 2016).

- 268 www.abc.net.au/news/rural/2013-09-19/kakadu-plums-improvingprawns/4968046; www.abc.net.au/news/rural/2015-10-06/kakaduplum-added-to-meals-to-improve-shelf-life-and-nutrition/6810928
- <sup>269</sup> Wildlife harvest permit data from Northern Territory Department of Environment and Natural Resources. The actual amount collected is likely to be less than the permitted amount.
- 270 www.abc.net.au/news/rural/2016-04-28/kakadu-plum-harvestunderway-in-wadeye-nt/7359856
- 271 www.news.uwa.edu.au/201312046334/research/vitamin-c-richnative-fruit-ripe-cash-crop-study; thewest.com.au/news/kimberley/ global-plans-for-native-kimberley-super-fruit-ng-ya-129637



Kakadu plum fruit.

The Wadeye Aboriginal community, which is 600 kilometres southwest of Darwin, has been harvesting wild Kakadu plum on a commercial basis for over a decade. In recent years, hundreds of community members have participated in the harvest and fruit collected has been handled by the Palngun Wurnangat Association, an Aboriginal-owned women's group. This has returned tens of thousands of dollars to the community. Fruit is also collected in other areas in the Northern Territory and by Aboriginal groups near Broome, Western Australia.

Following recent, increased awareness of the fruit's properties, demand is steadily increasing and the market is currently undersupplied. Current production is estimated to average 15–17 tonnes per annum (RIRDC 2014a). When processed into dried powder form, Kakadu plums are selling for up to \$600 per kilogram<sup>270</sup>.

Use of regional cooperatives which feed into supply hubs could facilitate consistency of volume and quality of fruit, and alternative production systems, such as horticulture, enrichment planting, or managing native stocks could help to increase yields (Gorman et al. 2016; Julian Gorman, Charles Darwin University, pers. comm.).

Enrichment planting of a native stand is being trialled in the Kimberley (Lee and Courtenay 2016), and research on Kakadu plum domestication for commercial orchards has also commenced<sup>271</sup>.



Australian forest species are included in some health food products.

## 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

- Australia's forests provide wood and non-wood forest products and a range of ecosystem services, such as carbon sequestration, soil conservation, catchment protection, recreation, and biodiversity conservation. Markets currently exist for only some of these services.
- Few data are available on the value of most forest-based services. The notable exceptions are the provision of wood, the value of which is reported in national accounts and by some forest managers; and the provision of water, which can be valued using data from irrigation agriculture and domestic water suppliers.
  - In 2015–16, the value of standing native forest timber in Australia was \$1.8 billion, while the gross value of log production from native forests was \$388 million.
  - In 2015–16, the value of standing plantation timber was \$10.2 billion, while the gross value of log production from plantations was \$1.9 billion.
  - The two asset values were calculated using different methodologies, so cannot be summed or compared with each other.

Forest ecosystem services are services provided by forest ecosystems without human input. They can be classified into several categories:

- supporting services (e.g. providing habitats for flora and fauna, formation of soil, cycling of nutrients, storage of carbon)
- provisioning services (e.g. provision of wood in growing trees, clean water in streams and rivers, genetic resources for utilisation)
- regulating services (e.g. regulation of water flows)
- cultural services (e.g. provision of recreation, ecotourism, amenity, aesthetic and heritage values).

Many of these services become tangible benefits with human input (e.g. when water is collected or wood harvested). Attempts to place monetary values on ecosystem services over many years have led to the development of the System of Integrated Environmental and Economic Accounts framework (SEEA), which was adopted by the United Nations Statistical Commission in 2012 and is now used by the Australian Bureau of Statistics (ABS) and other Australian government agencies (ABS 2017a).

The SEEA is based on internationally agreed concepts, definitions, classifications and accounting rules. It enables information to be organised into integrated and coherent accounts that can be used for a range of purposes, including national reporting and decision-making. The value of SEEA accounts to the user remains dependent on the accuracy and credibility of the data imported into the accounts, and on the method selected for valuing each environmental service. Other methods, such as 'Vegetation Assets, States and Transitions' (Thackway and Lesslie 2008)<sup>272</sup> and 'Accounting for Nature' (Wentworth Group of Concerned Scientists 2017) seek to monitor trends over time in the condition of natural assets by using scales and relative measurements, rather than monetary values. Methods involving 'Natural Capital' seek to monitor changes in ecosystem assets that underpin ecosystem services (ABS 2017a).

<sup>272</sup> The 'Vegetation Assets, States and Transitions' approach is described Case study 7.4 of SOFR 2013, pp.381–2.

These various methods are reviewed in the *Valuing Victoria's Parks* report prepared in 2015 by Parks Victoria and the Department of Environment, Land, Water and Planning, 2015<sup>273</sup>. This report also presents calculated values for ecosystem services provided by Victoria's parks and reserves, many of which are forested. These ecosystem services included tourism, water supply, mitigation of flood and storm-water damage, honey production and pollination services; parks and reserves also provide a number of other social values for which an economic value cannot readily be calculated, such as amenity, cultural connections, heritage conservation, carbon storage, and protection of species habitats and genetic diversity.

Valuation of water from forested catchments is discussed in Case study 6.2.

## Timber assets

The ABS reports the value of Australia's 'standing timber assets', that is, wood that can potentially be harvested from forests, in Australia's environmental-economic accounts. These are shown in Figure 6.8 (see also Table 7.10). The standing timber assets underpin the ecosystem service of provision of wood for harvesting.

From 2005–06 to 2015–16, the value of standing native forest timber in Australia decreased from \$2.1 billion to \$1.8 billion (14%). This is consistent with the decline in the area of publicly owned native forests outside conservation reserves over that period (Indicator 2.1a). Over the same period, the value of standing plantation timber increased from \$7.9 billion to \$10.2 billion (29%). This is consistent with increases in the plantation area and average plantation age over this period (Indicator 2.1b). These two figures were calculated by different methodologies (the value of native forest timber is the net present value of the potential future stream of income to the owner of all native forests outside conservation reserves, whereas the value of standing plantation timber is the insurance value), so cannot be summed or compared with each other.

For the year 2015–16, the gross value of log production from native forests was \$0.39 billion, a decrease of 36% from the value in 2005–06 (ABARES 2017c). The gross value of log production from plantations for 2015–16 was \$1.9 billion, an increase of 77% over the value for 2005–06 (ABARES 2017c). Details of the value of log production are provided in Indicator 6.1a.

Some forest management businesses owned by state governments publish data on the value of timber in the native forests and plantations under their management (Table 6.18). Together, these businesses manage a little less than half of the public native forests managed for timber production, and around 20% of Australia's plantations. These figures cannot be compared readily with those in Figure 6.8 because they are for a mix of assets and because different valuation methods, product values and discount rates have been used.



#### Figure 6.8: Value of standing timber in Australia, 2005–06 to 2015–16

Note: The value of standing plantation timber is the insurance value. The value of standing native forest timber is the value for all publicly owned native forests outside conservation reserves plus the value for private native forests, all of which are assumed to be potentially available for timber production. The native forest values are derived from the net present value of the potential future stream of stumpage income.

Source: ABS (2017a).

The data used to create this figure, together with other data for Indicator 6.1c, are available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

6.1c

<sup>&</sup>lt;sup>273</sup> Until January 2015, the Department of Environment and Primary Industries: see <u>parkweb.vic.gov.au/about-us/valuing-victorias-parks</u>

Table 6.18:	Value of	standina	timber	under	state	forest	manaaem	ent. 20	015–16
								· · · /	

Business entity	Coverage	Timber value (\$ million)ª
Forest Products Commission (Western Australia)	Native forests, softwood plantations, sandalwood	310
Forestry Corporation of NSW	Native forests, hardwood plantations, softwood plantations	877
Forestry Tasmania	Native forests, hardwood plantations, softwood plantations	184
ForestrySA	Softwood plantations, Mount Lofty Ranges and Mid-North South Australia	46
VicForests	The portion of multiple-use public forests covered at the reporting time by the VicForests Allocation Order	49

<sup>a</sup> Valuations are in accordance with Accounting Standard AASB 141 and are based on deemed fair value less sale costs.

Sources: FPC (2016); FCNSW (2016a); Forestry Tasmania<sup>274</sup> (2016a); ForestrySA (2016); VicForests (2016a).

🔊 This table, together with other data for Indicator 6.1c, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

## Payment for ecosystem services

Traditionally, many ecosystem 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.

The value of wood harvested for wood-based industries is considered in Indicator 6.1a, and the value of non-wood forest products is considered in Indicator 6.1b. Storage and sequestration of carbon is addressed in Indicators 5.1a and 7.1c. Water and soil values are addressed in Indicators 4.1a–e.

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 using market-based mechanisms. These include programs that offer information support, positive branding or the opportunity for formal protection of private 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 to program providers that participants are meeting their biodiversity conservation obligations. An example is the NSW Biodiversity Banking and Offsets Scheme<sup>275</sup>.

The aesthetic quality of forests can be viewed as an amenity service that benefits the ecotourism sector. As well as providing enjoyment to participants, ecotourism generates economic benefits for the local and regional communities that provide tourist services, and supports complementary sectors such as accommodation, transport, restaurants and resorts (see Indicator 6.3b). Tourist visits to forested national and state parks in the national reserve system, and forests in other tenures such as state forests (multiple-use public forests), indicate the value of forests for ecotourism (see Indicator 6.3b).

The Carbon Farming Initiative, part of the Emissions Reduction Fund, is a voluntary carbon offsets scheme developed by the Australian Government that provides economic rewards to farmers and landholders who take steps to reduce greenhouse gas emissions. Farmers and landholders can choose whether or not to be involved. Under the initiative, they may be able to earn carbon credits from activities including reforestation (see Indicator 5.1).

<sup>&</sup>lt;sup>274</sup> From July 2017, Sustainable Timbers Tasmania.

<sup>&</sup>lt;sup>275</sup> www.environment.nsw.gov.au/biobanking/

#### Case study 6.2: Valuation of water from forested catchments

Forest vegetation is intimately connected to the hydrological cycle on forest land, and forest management actions affect hydrological flows. The common finding of many studies around the world is that timber harvesting leads to a temporary decrease in water loss from a site by transpiration, because the amount of vegetation canopy is reduced, and hence leads to a temporary increase in stream flow. Regrowth forests of one Australian species – *Eucalyptus regnans* (mountain ash) – are known to use more water than older forests of this species; this has also been taken to be the case for other species, but in many cases has not been documented. 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 can be determined, but the value of water in the landscape cannot. 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.
- In times of above-average rainfall, there is usually adequate or excess water provided by existing infrastructure, and additional water thus has a low value.

- Water released or absorbed as a consequence of forest management activities is geographically dispersed, and changes are often only detectable under certain conditions.
- The results of an Amazon Basin study (Rodriguez et al. 2010) suggest that 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 tradeoff between water quality and water quantity – that is, these catchments produce clean and sustained stream flow, but produce a lower volume of water than catchments with 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 the long time periods for a return (increased water) on investment in forest management. Most successful valuations consider a range of interest rates but base their decisions essentially on public-good criteria – the function of valuation is to provide insight on these criteria.



Thomson Dam, Gippsland, Victoria.

Continued

6.1c

The value of water transpired by growing regrowth forest has been argued to exceed the value of the wood extracted from mature forest (see Bren 2009). This argument has four problems. First, the relationship between water yield and forest age is known well for only one species (mountain ash, see above). For many forest types, reducing the forest density by partial harvesting or thinning enhances water yield (Bren 2015): this is a situation in which harvesting increases water values. Second, water is valuable but values are intangible in the absence of a water market. Third, predictions of the impacts on value of future relative shortage or excess are heavily dependent on the interest rate adopted. Fourth, complete removal of forest and replacement with vegetation such as grass or bracken could maximise water yields (indeed, this argument was used historically to justify forest clearing) but would have a negative impact on other values such as biodiversity, amenity or carbon storage

Water produced from some forested catchments may be valued by comparison with prices paid in irrigated agriculture or for domestic water supply. The spot price in irrigated agriculture can fluctuate 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 storage and with enough gravitational energy to flow to the purchaser (see Bren 2009). City users of river or dam water often pay a much higher price than irrigators, reflecting the higher delivery and treatment costs, and this can further complicate the valuation of water and can lead to the existence of two parallel market prices for the same water (for example, water from the Thomson River Dam, Victoria, is used for irrigation in Gippsland and for domestic consumption in Melbourne).

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 that have constructed large pipelines to remote areas, have commissioned desalination plants, or have accessed deep groundwater. In these cases, there is a large energy component in the cost of water delivered, and the marginal value of the water can be very high, such as \$5–10,000 per megalitre. The high costs of provision of water through these mechanisms highlights the relative cheapness of water from forested catchments, where the major cost is simply the collection and distribution of the water.

Source: Leon Bren

# 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

- Total consumption of sawnwood in Australia increased by 12% between 2010–11 and 2015–16, from 5.1 million cubic metres to 5.6 million cubic metres.
  - Consumption of hardwood sawnwood decreased from 0.75 million cubic metres to 0.69 million cubic metres over this period.
  - Consumption of softwood sawnwood increased from 4.3 million cubic metres to 5.0 million cubic metres over this period.
- Between 2010–11 and 2015–16, Australia's consumption of wood-based panels increased by 5% to 2.1 million cubic metres, while total consumption of paper and paperboard fell by 8% to 3.7 million cubic metres.
- Australia's trade in wood products experienced strong growth over the past decade, with the sum of imports and exports (total merchandise trade) exceeding \$8 billion for the first time in 2015–16. Australia continues to be a net importer of wood and wood products.
  - Between 2010–11 and 2015–16, the total value of wood product imports increased from \$4.4 billion to \$5.5 billion, driven mainly by higher imports of miscellaneous forest products and wood-based panels.
  - The total value of wood product exports increased from \$2.5 billion to \$3.1 billion over this period, primarily due to higher exports of roundwood, woodchips, and paper and paperboard.

- Residential use of firewood declined by 12% between the period 2006–07 to 2010–11 and the period 2011–12 to 2015–16, whereas industrial use of fuelwood increased by 19% between these periods.
  - In the period 2011–12 to 2015–16, industrial fuelwood was used to generate an annual average of 40 petajoules of energy.
- 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.
  - Beekeeping is one of the largest non-wood forest product industries, with an average of 20.8 thousand tonnes of honey produced annually over the period 2011–12 to 2015–16, much of which is produced from forested lands.

This indicator reports on the production, consumption and trade of wood and wood products, and non-wood products, by product category. Categories of wood and wood products are sawnwood, wood-based panels, and paper and paperboard. Because of the relatively small volumes of nonwood forest products and their highly dispersed nature, there is a relative lack of information about their trade; aspects of non-wood forest products are mostly reported in Indicators 2.1d and 6.1b.

Consumption (domestic consumption) is calculated as domestic production plus imports minus exports. The production figures used in this indicator are those reported in Indicators 6.1a and 6.1b and generally are from ABARES (2017c).

## Sawnwood

Australia's total consumption of sawnwood, comprising softwood sawnwood and hardwood sawnwood, increased by 12% between 2010–11 and 2015–16, from 5.1 million cubic metres to 5.6 million cubic metres.

Softwood sawnwood is commonly used in housing construction for structural framing, and has other applications including furniture, decking and flooring. Consumption of softwood sawnwood increased by 15% between 2010–11 and 2015–16, from 4.3 million cubic metres to 5.0 million cubic metres (Figure 6.9). The increase in consumption occurred in parallel with increases in imports and domestic production (by 3% and 16%, respectively). Exports of softwood sawnwood decreased by 6% over this period.

Due to its widespread use in the construction and building industry, one of the key factors influencing consumption of softwood sawnwood is domestic residential dwelling commencements (ABARES 2017b). The total number of dwelling commencements, consisting of housing and other residential building commencements, increased by 43% between 2010–11 and 2015–16 (Figure 6.10). This increase was driven mostly by an increase of 87% in commencements of other residential buildings (including units, house conversions and multi-dwelling residences such as high-rise apartment blocks), while housing commencements increased by 15%.

Hardwood sawnwood is generally used where strength is important and for decorative purposes, such as for flooring, decking, cladding, joinery and furniture. Consumption of hardwood sawnwood decreased by 7% between 2010–11 and 2015–16, from 0.75 million cubic metres to 0.69 million cubic metres (Figure 6.11). The decrease in consumption corresponded with a decrease over the same period of domestic production and of imports (by 8% and 31%, respectively).

Exports of hardwood sawnwood also decreased, by 39%.



#### Figure 6.9: Softwood sawnwood consumption, production and trade, 2005–06 to 2015–16

Notes: Consumption is calculated as production plus imports minus exports. All categories include roughsawn and dressed sawnwood. Source: ABARES (2017c).

The data used to create this figure, together with other data for Indicator 6.1d, are available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9





Note: 'Other residential buildings' include units, house conversions and multi-dwelling residences such as high-rise apartment blocks. Source: ABARES (2017c).

The data used to create this figure, together with other data for Indicator 6.1d, are available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9





Notes: Consumption is calculated as production plus imports minus exports. All categories include roughsawn and dressed sawnwood. Source: ABARES (2017c).

The data used to create this figure, together with other data for Indicator 6.1d, are available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

## Wood-based panels

The wood-based panels category includes manufactured wood products such as medium-density fibreboard, plywood and particleboard that have various applications, including flooring, joinery (e.g. kitchen benches and cupboards), furniture and housing construction.

In 2015–16, Australia produced 1.7 million cubic metres of wood-based panels, a 2% decrease from 2010–11 (Figures 6.12 and 6.13). This production total includes 0.95 million cubic metres of particleboard (56% of total wood-based

panel production), 0.57 million cubic metres of mediumdensity fibreboard (34%), and 0.17 million cubic metres of plywood (10%).

Consumption of wood-based panels grew by 5% between 2010–11 and 2015–16, from 2.0 million cubic metres to 2.1 million cubic metres (Figure 6.13). The increase in consumption occurred in parallel to a change in imports, which increased by 31% over the same period, from 407 thousand cubic metres to 535 thousand cubic metres. Domestic production and exports of wood-based panels both decreased (by 2% and 1%, respectively).





Source: ABARES (2017c).

The data used to create this figure, together with other data for Indicator 6.1d, are available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9





Note: Consumption is calculated as production plus imports minus exports. Source: ABARES (2017c).

The data used to create this figure, together with other data for Indicator 6.1d, are available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

## Paper and paperboard

The paper and paperboard category of wood products includes newsprint, printing and writing paper, household and sanitary paper, and packaging and industrial paper.

In 2015–16, Australia produced 2.2 million tonnes of packaging and industrial paper, accounting for 68% of total paper and paperboard production (Figure 6.14). Domestic production of printing and writing paper, and newsprint, totalled 0.51 million tonnes (16%) and 0.32 million tonnes

(10%) respectively. Household and sanitary paper was the smallest component of paper and paperboard production, contributing 215 thousand tonnes (7%).

In 2015–16, combining these four categories of paper and paperboard, Australia produced 3.2 million tonnes of paper and paperboard products, a 2% increase from 2010–11 (Figures 6.14 and 6.15). Consumption of paper products declined by 8% over the same period, from 4.0 million tonnes to 3.7 million tonnes, while imports decreased by 15% and exports increased 10%.

Figure 6.14: Production of paper and paperboard, 2005–06 to 2015–16



Source: ABARES (2017c).

The data used to create this figure, together with other data for Indicator 6.1d, are available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9





Note: Consumption is calculated as production plus imports minus exports. Source: ABARES (2017c).

The data used to create this figure, together with other data for Indicator 6.1d, are available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9 6.1d

## Trade performance

Over the past decade, Australia's trade in wood products has grown strongly. In 2015–16, the value of both imports and exports reached record levels, and total merchandise trade (the sum of imports and exports) was \$8.5 billion (exceeding \$8 billion for the first time).

Australia is a net importer of wood and wood products. Between 2010–11 and 2015–16, the total value of imported wood products increased from \$4.4 billion to \$5.5 billion (Figure 6.16). Most of this increase was driven by higher imports of miscellaneous forest products and wood-based panels (Table 6.19). In 2015–16, paper and paperboard imports accounted for the largest proportion by value of Australia's imported wood products, at 41% (\$2.2 billion), down from 50% in 2010–11.

The value of wood and wood product exports also increased over the reporting period, from \$2.5 billion to \$3.1 billion (Figure 6.16).This increase was due primarily to growth in exports of roundwood, woodchips, and paper and paperboard (Table 6.20). Australia's largest-value exported wood product in 2015–16 was woodchips, accounting for 36% (\$1.1 billion) of total export value, the same proportion as in 2010–11.





Source: ABARES (2017c).

The data used to create this figure, together with other data for Indicator 6.1d, are available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9



Softwood sawlogs for export, Eden, NSW.

#### Table 6.19: Forest product imports, 2010–11 and 2015–16

	Import value (\$ million)		Proportion of total forest product imports by value (%)		
Product type	2010–11	2015–16	2010–11	2015–16	
Roundwood					
Total	0.6	1.7	0.01	0.03	
Sawnwood					
Softwood roughsawn	134.6	111.9	3.0	2.0	
Softwood dressed	247.7	360.5	5.6	6.6	
Hardwood roughsawn	40.1	55.1	0.9	1.0	
Hardwood dressed	50.3	27.7	1.1	0.5	
Total	472.8	555.2	10.7	10.2	
Miscellaneous forest products					
Total	706.5	1,303.7	15.9	23.8	
Wood-based panels					
Veneer	20.9	23.6	0.5	0.4	
Plywood	170.3	300.2	3.8	5.5	
Particleboard	20.9	41.0	0.5	0.7	
Hardboard	39.7	69.2	0.9	1.3	
Medium-density fibreboard	34.5	51.3	0.8	0.9	
Softboard and other fibreboards	3.0	4.0	0.1	0.1	
Total	289.3	489.3	6.5	8.9	
Paper and paperboard					
Newsprint	175.7	43.6	4.0	0.8	
Printing and writing	1,347.4	1,036.4	30.4	19.0	
Household and sanitary	185.2	305.3	4.2	5.6	
Packaging and industrial	515.0	845.0	11.6	15.5	
Total	2,223.2	2,230.4	50.2	40.8	
Paper manufactures					
Total	556.6	661.9	12.6	12.1	
Recovered paper					
Total	0.4	0.3	0.01	0.005	
Pulp					
Total	180.3	221.8	4.1	4.1	
Woodchips					
Total	1.8	3.9	0.04	0.1	
Grand total	4,431.5	5,468.2	100.0	100.0	

Note: Totals may not tally due to rounding.

Source: ABARES (2017c).

🦻 This table, together with other data for Indicator 6.1d, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

6.1d

#### Table 6.20: Forest product exports, 2010–11 and 2015–16

Product type2010-112015-162010-112015-16RounwoodSortwood sawnwood1976438.043.0Sortwood sawnwood71.775.02.92.4Hardwood sawnwood43.22.8.11.7.02.9Total41.22.8.11.7.02.9Total6.131.50.0.21.0.0Total2.931.20.1.01.0.0Total5.79.0.62.1.01.0.0Total5.79.0.62.4.03.6.0Total5.79.0.62.4.03.6.0Wood-based panels5.79.0.62.4.03.6.0Porteleboord2.42.30.1.00.1.0Porteleboord2.43.0.10.0.10.0.1Porteleboord3.42.7.00.0.10.0.1Softboard and other fineboards0.61.0.23.0.10.0.1Softboard and other fineboards3.64.0.23.0.10.0.1Softboard and other fineboards3.6.13.0.30.0.10.0.1Softboard and other fineboards3.6.13.0.32.2.32.2.3Portand paperboard3.1.33.3.43.0.32.2.32.2.3Newsprint13.33.3.43.0.33.2.32.2.3Portalg and mixtrint5.7.76.8.13.0.32.2.3Portalg and mixtrint5.7.76.8.13.0.32.2.3Portalg and mixtrint5.7.76.8.13.0.3		Export value (\$ million)		Proportion of product exports	total forest s by value <mark>(%)</mark>
RendwordTotal19.00.8.00.8.0Softword somword71.775.02.9.00.4.0Hardword somword43.22.8.11.7.00.9.0Total10.00.4.00.0.00.4.0Total10.00.0.00.0.00.0.0Backgrout Softword Soft	Product type	2010–11	2015–16	2010–11	2015–16
Total1976438.08.014.350730.030.030.0Bordwood sawnwood71.770.070.070.0Total10.3047.220.3170.0Total10.3047.070.070.0Bucalpotei forest products90.070.070.0Total70.070.070.070.0Total61.031.50.0.270.0Total61.070.070.070.070.0Other50.770.9070.070.070.0Potodosanta70.070.070.070.070.0Potodosanta70.070.070.070.070.0Potodosanta70.070.070.070.070.0Potodosanta70.070.070.070.070.0Potodosanta70.070.070.070.070.0Potodosanta70.070.070.070.070.0Potodosanta70.070.070.070.070.0Potodosanta70.070.070.070.070.0Potodosanta70.070.070.070.070.0Potodosanta70.070.070.070.070.0Potodosanta70.070.070.070.070.0Potodosanta70.070.070.070.070.0Potodosanta70.070.070.070.070.0Potod	Roundwood				
SartwoodSartwood71.775.02.96.4Bardwood sownood71.775.02.97.1Bardwood sownood43.210.010.03.1Total10.010.010.03.10.0Macellaneous forest products2.93.1.20.110.0Tota rea cii2.93.1.20.110.0Total5.010.02.010.010.0Other5.070.902.43.010.0Total5.710.02.00.010.0Porteschometor2.42.10.010.0Porteschometor2.42.10.010.0Porteschometor2.42.00.010.0Porteschometor2.42.00.010.0Porteboard2.42.00.010.0Porteboard2.42.00.010.0Porteboard2.42.00.010.0Porteboard2.42.00.010.0Porteboard2.42.00.010.0Porteboard2.83.610.010.0Porteboard3.810.010.010.0Porteboard3.410.010.010.0Porteboard3.410.010.010.0Porteboard3.410.010.010.0Porteboard3.410.010.010.0Porteboard3.410.010.010.0 <td>Total</td> <td>197.6</td> <td>438.0</td> <td>8.0</td> <td>14.3</td>	Total	197.6	438.0	8.0	14.3
Softwood sawnwood17.775.02.92.4Hardwood sawnwood43.228.11.70.9Total10.943.228.11.70.9Bicsellaneous forest products1.150.20.10Eucolyp toil6.13.150.21.01.0Total50.746.92.11.51.0Total50.7109.62.43.63.6Wood-based panels7.14.20.10.1Pywood1.74.20.10.10.1Pywood1.74.20.10.10.1Particleboard2.42.30.10.10.1Hardboard2.17.00.10.10.1Particleboard3.947.91.60.90.1Softboard and other fibreboards0.61.10.030.04Total3.36.54.00.10.1Pare and poperboard3.33.30.51.11.1Printing and writing8.412.83.64.22.32.3Packaging and industriol51.763.12.2.32.32.32.32.32.32.32.32.32.33.40.51.53.53.53.53.53.53.53.53.53.53.53.53.53.53.53.53.53.53.53.53.53.53.53.63.5 </td <td>Sawnwood</td> <td></td> <td></td> <td></td> <td></td>	Sawnwood				
Hardwood sownwood43.228.11.70.9Total114.9103.04.73.4Miscellaneous forest productsEucalypt oil6.131.50.21.0Can tee oil2.931.20.11.0Other50.746.92.11.5Total59.7109.62.43.6Wondessed panels91.20.10.1Phywood1.74.20.10.1Particleboard2.42.30.10.1Hardboard2.17.00.10.2Porticleboard3.42.7.90.10.2Softboard and other fibreboard0.61.10.030.04Total3.9.42.7.91.60.9Softboard and other fibreboard0.61.10.030.04Total3.9.42.7.91.60.9Softboard and other fibreboards0.61.10.030.04Total3.9.42.7.91.60.9Softboard and sonitary94.05.2.23.81.7Packaging and industrial55.7685.12.3.22.2.3Total24.0024.83.0.32.9.3Recovered paper1.3.33.4.41.0.32.9.3Total24.0024.83.0.32.9.3Recovered paper1.11.0.53.5.83.5.8Charl2.4.93.0.41.0.53.5.8Recovered pa	Softwood sawnwood	71.7	75.0	2.9	2.4
Total114.9103.04.73.4Miscalianeous forest productsEucolypt oil6.131.50.20.10Teate oil2.931.20.10.10Other50.746.92.110.0Total50.740.92.13.6Modesse panes52.124.12.10.8Plywood1.74.20.10.1Particleboard2.42.30.10.1Particleboard2.42.30.10.1Hordboard2.42.30.10.1Briddboard3.42.70.10.1Hordboard3.42.70.10.1Softboard other fibreboards0.61.10.0Softboard and other fibreboards0.83.66.54.0Pare and paperboard3.80.51.1Pinting and writing8.8126.53.64.2Rockolging and industriol9.403.232.32.3Rotal7.1488.11.2.53.64.2Rotading and industriol9.403.2.32.32.3Rotading and industriol9.402.4.69.83.63.6Rotading and industriol9.4.02.4.69.83.63.6Rotading and industriol9.4.03.5.73.63.63.6Rotading and industriol2.4.02.4.69.83.63.6Rotading and industriol2.4.0	Hardwood sawnwood	43.2	28.1	1.7	0.9
Miscellaneous forest productsEucolypt oil6.131.50.01.0Text ree oil2.931.20.11.0Other50.746.92.13.0Total50.746.92.43.6Wood-based paneis102.10.0Phywood1.74.20.10.1Particleboard2.42.30.10.1Hardboard2.42.30.10.1Britcleboard2.42.30.10.1Hardboard2.17.00.10.2Softboard ond other fibreboards39.42.7916.8Softboard ond other fibreboards0.8336.54.0Parand paperboard9.8336.54.02.1Newsprint13.333.40.51.1Pinting and writing88.4128.53.64.2Roakoging and industrial51.768.312.32.3Rotard paper1.33.40.51.53.6Rotard paper1.33.40.53.63.2Rotard paper1.33.340.53.23.83.2Rotard paper1.33.40.53.63.23.6Rotard paper1.33.40.53.63.23.6Rotard paper1.33.49.53.63.63.6Rotard paper1.41.03.03.63.63.6Rotard paper <td< td=""><td>Total</td><td>114.9</td><td>103.0</td><td>4.7</td><td>3.4</td></td<>	Total	114.9	103.0	4.7	3.4
Eucalypt oil6.131.50.210To tree oil2.931.20.110Other50.746.92.11.5Total59.7109.62.43.6Wood-based panels2.12.10.1Princeboard2.12.412.10.1Particeboard2.42.30.10.1Particeboard2.42.30.10.1Particeboard3.942.7.91.60.9Softboard and other fibreboard3.942.7.91.60.9Softboard and other fibreboards0.61.10.030.04Total9.8.366.54.02.22.2Pager and paperboard3.33.340.51.1Printing ond writing13.33.340.51.1Printing ond writing55.768.12.2.32.2.3Pockoging and industrial55.768.32.2.32.2.3Recovered paper74.489.83.0.32.9.3Recovered paper74.489.83.0.32.9.3Rodothips74.489.83.0.32.9.3Total24.0024.869.78.1Rodothips74.48.93.63.6.5Rodothips74.78.93.6.53.6.5Rodothips74.48.93.6.53.6.5Rodothips74.78.841.05.5	Miscellaneous forest products				
Tea tree oil2.931.20.110Other50746.92.11.5Total50746.92.11.5Total59.7109.62.43.6Woneers52.124.10.10.1Particleboard2.42.30.10.1Hardboard2.42.30.10.1Particleboard3.942.7.91.60.9Softboard and other fibreboards0.61.10.030.04Total98.366.54.02.2Particleboard3.340.51.1Total98.336.54.02.2Packaging and industrial13.33.340.51.1Printing and writing88.4128.53.64.2Packaging and industrial551.7683.12.2.322.3Total240.024.69.78.1Wootchips1.11.05.23.63.5Total24.024.69.78.1Modelips551.7683.12.2.32.2.3Total24.024.69.78.1Wootchips1.03.03.03.0Total18.41.05.53.63.5Total24.01.05.75.13.5Total24.01.05.75.13.5Total24.01.05.75.13.5Total24.01.05.75.13.5To	Eucalypt oil	6.1	31.5	0.2	1.0
Other50.746.92.11.5Total59.7109.62.43.6Wood-based panelsVeneers52.124.12.10.8Plywood1.74.20.10.1Particleboard2.42.30.10.1Hardboard2.17.20.10.1Hardboard2.17.20.10.1Hardboard2.17.00.10.2Medium-density fibreboard39.47.91.60.04Softboard and bibre fibreboards0.61.00.040.04Total98.366.54.02.2Paper and paperboard13.333.40.51.1Printing and writing88.4128.53.64.2Household and sanitory94.053.23.81.7Packaging and industrial551.7683.122.322.3Total240.0248.59.78.1Modelips1.133.340.51.1Printing and writing88.4128.53.631.2Packaging and industrial551.7683.12.2.32.2.3Total240.0248.59.78.1Packaging and industrial51.7683.13.0.32.2.3Packaging and industrial2.12.13.13.41.0Packaging and industrial2.12.13.13.41.1Packaging and industrial2.1 <th< td=""><td>Tea tree oil</td><td>2.9</td><td>31.2</td><td>0.1</td><td>1.0</td></th<>	Tea tree oil	2.9	31.2	0.1	1.0
Total59.7109.62.43.6Wood-based panels52.124.12.10.8Plywood7.74.20.10.1Porticleboard2.42.30.10.1Particleboard2.42.30.10.1Hardboard2.47.00.10.2Softboard and other fibreboards0.61.10.030.04Total98.366.54.02.2Per and paper board0.61.10.030.04Printing and writing13.33.340.51.1Pixelogi and industrial31.33.340.51.1Pockoging and industrial51.768.32.2.322.3Total74.076.33.63.63.6Pockoging and industrial51.768.12.2.322.3Total74.076.33.63.63.6Rosered paper1.11.053.63.63.6Total24.0024.0024.03.63.63.6Rosered paper1.11.053.63.63.63.6Total24.0024.0024.03.63.63.6Rosered paper1.11.053.63.63.6Total24.024.024.03.63.63.6Rosered paper1.11.053.63.63.6Total24.024.024.03.633.63.6 <td>Other</td> <td>50.7</td> <td>46.9</td> <td>2.1</td> <td>1.5</td>	Other	50.7	46.9	2.1	1.5
Wood-based panels     Veneers   52.1   24.1   2.1   0.8     Plywood   1.7   4.2   0.1   0.1     Particleboard   2.4   2.3   0.1   0.1     Hardboard   2.4   2.3   0.1   0.1     Hardboard   2.1   7.0   0.1   0.2     Medium-density fibreboard   39.4   2.79   1.6   0.9     Softboard and other fibreboards   0.6   1.1   0.03   0.04     Total   98.3   66.5   4.0   2.2     Paper and paper board   0.6   1.1   0.03   0.04     Total   98.3   66.5   4.0   2.2     Paper and paper board   98.3   66.5   4.0   2.6     Paper and paper board   13.3   33.4   0.5   1.1     Printing and writing   88.4   128.5   3.6   4.2     Packaging and industrial   51.7   683.1   22.3   22.3     Total   240.0	Total	59.7	109.6	2.4	3.6
Veneers   52.1   24.1   2.1   0.8     Plywood   1.7   4.2   0.1   0.1     Particleboard   2.4   2.3   0.1   0.1     Hardboard   2.1   7.0   0.1   0.2     Medium-density fibreboard   39.4   27.9   1.6   0.9     Softboard and other fibreboards   0.6   1.1   0.03   0.04     Total   98.3   66.5   4.0   2.2     Paper and paperboard   98.3   66.5   4.0   2.1     Newsprint   13.3   33.4   0.5   1.1     Printing and writing   88.4   128.5   3.6   4.2     Household and sanitary   94.0   53.2   3.8   1.7     Packaging and industrial   551.7   683.1   22.3   22.3     Recovered paper   101   747.4   898.1   30.3   29.3     Modothips   240.0   248.6   9.7   8.1     Voodechips   101   101.7	Wood-based panels				
Plywod 1.7 4.2 0.1 0.1   Particleboard 2.4 2.3 0.1 0.1   Hardboard 2.1 7.0 0.1 0.2   Medium-density fibreboard 39.4 27.9 1.6 0.9   Softboard and other fibreboards 0.6 1.1 0.03 0.04   Total 98.3 66.5 4.0 2.2   Paper and poperboard 98.3 66.5 4.0 2.2   Paper and poperboard 13.3 33.4 0.5 1.1   Printing and writing 88.4 128.5 3.6 4.2   Household and sanitary 94.0 53.2 3.8 1.7   Packaging and industrial 551.7 683.1 22.3 22.3   Total 747.4 898.1 30.3 29.3   Recovered paper 747.4 898.1 30.3 29.3   Voodchips 101 240.0 248.6 9.7 8.1   Total 240.0 248.6 9.7 8.1 3.5   Dotal 884.4	Veneers	52.1	24.1	2.1	0.8
Particleboard 2.4 2.3 0.1 0.1   Hardboard 2.1 7.0 0.1 0.2   Medium-density fibreboard 39.4 27.9 1.6 0.9   Softboard and other fibreboards 0.6 1.1 0.03 0.04   Total 98.3 66.5 4.0 2.2   Paper and paperboard 98.3 66.5 4.0 2.2   Newsprint 13.3 33.4 0.5 1.1   Printing and writing 88.4 128.5 3.6 4.2   Household and sanitary 94.0 53.2 3.8 1.7   Packaging and industrial 551.7 683.1 2.3 22.3   Total 747.4 898.1 30.3 29.3   Recovered paper 70.0 248.6 9.7 8.1   Woodchips 70.1 884.4 1,095.8 35.8 35.8   Other 70.0 103.7 5.1 3.4   Grand total 2,468.7 3,063.3 10.0 100.0	Plywood	1.7	4.2	0.1	0.1
Hardboard 2.1 7.0 0.1 0.2   Medium-density fibreboard 39.4 27.9 1.6 0.9   Softboard and other fibreboards 0.6 1.1 0.03 0.04   Total 98.3 66.5 4.0 2.2   Paper and paperboard 13.3 33.4 0.5 1.1   Newsprint 13.3 33.4 0.5 1.1   Printing and writing 88.4 128.5 3.6 4.2   Household and sanitary 94.0 53.2 3.8 1.7   Packaging and industrial 551.7 683.1 22.3 22.3   Total 747.4 898.1 30.3 29.3   Recovered paper 101 240.0 248.6 9.7 8.1   Woodchips 101 240.0 248.6 9.7 8.1   Total 884.4 1,095.8 35.8 35.8   Other 126.2 103.7 5.1 3.4   Grand total 2,468.7 3,063.3 10.0 100.0	Particleboard	2.4	2.3	0.1	0.1
Medium-density fibreboards   39.4   27.9   1.6   0.9     Softboard and other fibreboards   0.6   1.1   0.03   0.04     Total   98.3   66.5   4.0   2.2     Paper and paperboard   33.4   0.5   1.1     Newsprint   13.3   33.4   0.5   1.1     Printing and writing   88.4   128.5   3.6   4.2     Household and sanitary   94.0   53.2   3.8   1.7     Packaging and industrial   551.7   683.1   22.3   22.3     Total   747.4   898.1   30.3   29.3     Recovered paper   747.4   898.1   30.3   29.3     Total   240.0   248.6   9.7   8.1     Woodchips   7   51.7   51.7   51.7   51.7   51.7   51.7   51.7   51.7   51.7   51.7   51.7   51.7   51.7   51.7   51.7   51.7   51.7   51.7   51.7   51.7   51.7	Hardboard	2.1	7.0	0.1	0.2
Softboard and other fibreboards   0.6   1.1   0.03   0.04     Total   98.3   66.5   4.0   2.2     Paper and paperboard   13.3   33.4   0.5   1.1     Newsprint   13.3   33.4   0.5   1.1     Printing and writing   88.4   128.5   3.6   4.2     Household and sanitary   94.0   53.2   3.8   1.7     Packaging and industrial   551.7   683.1   22.3   22.3     Total   747.4   898.1   30.3   29.3     Mocodchips   30.3   29.3   30.3   29.3     Total   240.0   248.6   9.7   8.1     Woodchips   35.8   35.8   35.8   35.8     Other   3126.2   103.7   5.1   3.4     Total   126.2   103.7   5.1   3.4     Other   31.6   34.9   30.0   30.0     Grand total   2,468.7 <th3,063.3< th="">   100.0   100</th3,063.3<>	Medium-density fibreboard	39.4	27.9	1.6	0.9
Total 98.3 66.5 4.0 2.2   Paper and paperboard 13.3 33.4 0.5 1.1   Newsprint 13.3 33.4 0.5 1.1   Printing and writing 88.4 128.5 3.6 4.2   Household and sanitary 94.0 53.2 3.8 1.7   Packaging and industrial 551.7 683.1 22.3 22.3   Total 747.4 898.1 30.3 29.3   Recovered paper 240.0 248.6 9.7 8.1   Modchips 1 100.1 884.4 1,095.8 35.8 35.8   Other 126.2 103.7 5.1 3.4 3.4   Total 126.2 103.7 5.1 3.4	Softboard and other fibreboards	0.6	1.1	0.03	0.04
Paper and paperboard   Newsprint 13.3 33.4 0.5 1.1   Printing and writing 88.4 128.5 3.6 4.2   Household and sanitary 94.0 53.2 3.8 1.7   Packaging and industrial 551.7 683.1 22.3 22.3   Total 747.4 898.1 30.3 29.3   Recovered paper 747.4 898.1 30.3 29.3   Total 240.0 248.6 9.7 8.1   Woodchips 101 240.0 248.6 9.7 8.1   Total 240.0 248.6 9.7 8.1 3.5.8 35.8   Other 101 1.095.8 35.8 35.8 35.8   Other 126.2 103.7 5.1 3.4   Grand total 2,468.7 3,063.3 100.0 100.0	Total	98.3	66.5	4.0	2.2
Newsprint 13.3 33.4 0.5 1.1   Printing and writing 88.4 128.5 3.6 4.2   Household and sanitary 94.0 53.2 3.8 1.7   Packaging and industrial 551.7 683.1 22.3 22.3   Total 747.4 898.1 30.3 29.3   Recovered paper 747.4 898.1 30.3 29.3   Total 240.0 248.6 9.7 8.1   Woodchips 100.0 100.0 35.8 35.8   Other 126.2 103.7 5.1 3.4   Grand total 2,468.7 3,063.3 100.0 100.0	Paper and paperboard				
Printing and writing 88.4 128.5 3.6 4.2   Household and sanitary 94.0 53.2 3.8 1.7   Packaging and industrial 551.7 683.1 22.3 22.3   Total 747.4 898.1 30.3 29.3   Recovered paper 747.4 898.1 30.3 29.3   Total 240.0 248.6 9.7 8.1   Woodchips 7 7.8 3.5.8 35.8   Other 126.2 103.7 5.1 3.4   Grand total 2,468.7 3,063.3 100.0 100.0	Newsprint	13.3	33.4	0.5	1.1
Household and sanitary 94.0 53.2 3.8 1.7   Packaging and industrial 551.7 683.1 22.3 22.3   Total 747.4 898.1 30.3 29.3   Recovered paper 240.0 248.6 9.7 8.1   Voodchips 7 747.4 898.1 30.3 29.3   Total 240.0 248.6 9.7 8.1   Woodchips 5 5 5 5   Total 884.4 1,095.8 35.8 35.8   Other 5 5 5 3.4   Total 126.2 103.7 5.1 3.4   Grand total 2,468.7 3,063.3 100.0 100.0	Printing and writing	88.4	128.5	3.6	4.2
Packaging and industrial 551.7 683.1 22.3 22.3   Total 747.4 898.1 30.3 29.3   Recovered paper 240.0 248.6 9.7 8.1   Woodchips 7total 1,095.8 35.8 35.8   Other Total 126.2 103.7 5.1 3.4   Grand total 2,468.7 3,063.3 100.0 100.0	Household and sanitary	94.0	53.2	3.8	1.7
Total   747.4   898.1   30.3   29.3     Recovered paper   747.4   898.1   30.3   29.3     Total   240.0   248.6   9.7   8.1     Woodchips   Total   1,095.8   35.8   35.8     Other   Total   126.2   103.7   5.1   3.4     Grand total   2,468.7   3,063.3   100.0   100.0	Packaging and industrial	551.7	683.1	22.3	22.3
Recovered paper     Total   240.0   248.6   9.7   8.1     Woodchips   500   500   500   500     Total   884.4   1,095.8   35.8   35.8     Other   500   500   500   500     Total   126.2   103.7   5.1   3.4     Grand total   2,468.7   3,063.3   100.0   100.0	Total	747.4	898.1	30.3	29.3
Total   240.0   248.6   9.7   8.1     Woodchips   5000000000000000000000000000000000000	Recovered paper				
Woodchips   S884.4   1,095.8   35.8   35.8     Other   126.2   103.7   5.1   3.4     Grand total   2,468.7   3,063.3   100.0   100.0	Total	240.0	248.6	9.7	8.1
Total   884.4   1,095.8   35.8   35.8     Other   70tal   126.2   103.7   5.1   3.4     Grand total   2,468.7   3,063.3   100.0   100.0	Woodchips				
Other   126.2   103.7   5.1   3.4     Grand total   2,468.7   3,063.3   100.0   100.0	Total	884.4	1,095.8	35.8	35.8
Total   126.2   103.7   5.1   3.4     Grand total   2,468.7   3,063.3   100.0   100.0	Other				
Grand total 2,468.7 3,063.3 100.0 100.0	Total	126.2	103.7	5.1	3.4
	Grand total	2,468.7	3,063.3	100.0	100.0

Note: Totals may not tally due to rounding.

Source: ABARES (2017c).

🔊 This table, together with other data for Indicator 6.1d, is available in Microsoft Excel via <u>www.doi.org/10.25814/5bda972cd76d9</u>

## Firewood and fuelwood

Firewood is wood used for residential heating, whereas fuelwood is wood or wood products used as industrial fuel or for bioenergy production. Together these are classified as 'wood and wood waste' in national energy statistics (DoEE 2017b). Industrial fuelwood includes wood waste generated during wood processing.

Between 2011–12 and 2015–16, annual average consumption of firewood plus fuelwood in Australia averaged 5.6 million cubic metres per year, a reduction from peak usage of 6.7 million cubic metres per year in 1996–97 to 2000–01 (Figure 6.17). Between the period 2006–07 to 2010–11 and the period 2011–12 to 2015–16, residential use of firewood declined by 12%, whereas industrial use of fuelwood increased by 19%.

Firewood is one of the most commonly utilised wood products, and is collected from plantations, agricultural lands and native forests. Its use is an important segment of the forestry sector, and important to regional communities. Between 1973–74 and 2015–16, residential firewood use averaged 4.3 million cubic metres annually (Figure 6.17). For the SOFR 2013 and SOFR 2018 reporting periods, New South Wales (including the Australian Capital Territory) and Victoria accounted for the majority of residential firewood use. Annual use of industrial fuelwood more than doubled between 1973–74 and 2015–16.

As a proportion of total residential energy use, firewood use decreased from 13.4% to 11.6% between the period 2006–07 to 2010–11 and the period 2011–12 to 2015–16 (Figure 6.18).





Source: DoEE (2017b) and ABARES databases.

The data used to create this figure, together with other data for Indicator 6.1d, are available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9



Figure 6.18: Firewood use as proportion of total residential energy use, 1973–74 to 2015–16

Source: DoEE (2017b) and ABARES databases.

The data used to create this figure, together with other data for Indicator 6.1d, are available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

In 2015–16, wood and wood waste (equivalent to domestic firewood plus industrial fuelwood, including fuelwood used for bioenergy production) provided a total of 94 petajoules (PJ)<sup>276</sup> of renewable energy in Australia (Table 6.21). This was 26% of the total renewable energy consumption, and was greater than the combined contribution of wind power and solar (photovoltaic) power. Average annual growth in wind and solar (photovoltaic) power consumption was larger than average annual growth in wood and wood waste consumption (Table 6.21).

In the period 2011–12 to 2015–16, industrial fuelwood (wood and wood waste used across industries) was used to generate an annual average of 40 PJ of energy (DoEE 2017b). Of this, an annual average of 28 PJ of energy was generated from the manufacturing sector, and of this an annual average of 21 PJ of energy was generated from the wood and wood products and pulp, paper and printing industries (mainly using waste product from manufacturing processes).

Some of the wood and wood waste consumed for energy by industry is used to generate electricity. In 2015–16, wood and wood waste generated 248 gigawatt-hours of electricity, which was 0.7% of the total production of electricity from renewable sources (Table 6.22).

#### Table 6.21: Australian renewable energy consumption by fuel type, 2015–16

		F	Renewable energy consumption, 2015–16		Average annual growth in renewable energy consumption (%)	
Renewable energy source	Fuel type	PJ	Proportion (%)	2014–15 to 2015–16	2005–06 to 2015–16	
Biomass	Wood, wood wasteª	93.3	25.8	3.8	-0.6	
	Bagasse	102.2	28.3	-0.7	-0.9	
	Other waste	2.5	0.7	19.1	n.a.	
	Total biomass	198.1	54.8	1.6	-0.6	
Biofuels	Ethanol	6.2	1.7	-7.4	n.a.	
	Biodiesel	1.2	0.3	-73.4	n.a.	
	Total biofuels	7.5	2.1	-34.4	12.6	
Biogas		17.5	4.8	4.6	8.8	
Hydro		55.1	15.3	13.9	0.6	
Wind		43.9	12.1	6.4	18.7	
Solar photovoltaic		24.6	6.8	23.6	59.1	
Solar hot water		14.9	4.1	0.2	10.6	
Total renewables		361.6	100	4.1	2.6	

PJ, petajoule (10<sup>15</sup> Joules); n.a., not available

<sup>a</sup> Domestic firewood plus industrial fuelwood

Source: Australian Energy Update 2017 (DoEE 2017b)

🦻 This table, together with other data for Indicator 6.1d, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

#### Table 6.22: Australian electricity generation from renewable sources by fuel type, 2015–16

		Electri from re	Electricity generation from renewable sources		Average annual growth in electricity generation from renewable sources (%)	
Renewable energy source	Fuel type	GWh	Proportion (%)	2014–15 to 2015–16	2005–06 to 2015–16	
Bioenergy	Wood, wood waste	248	0.7	n.a.	n.a.	
	Bagasse	1,810	4.7	n.a.	n.a.	
	Municipal, industrial waste	43	0.1	n.a.	n.a.	
	Sulphyte lyes, biofuels	417	1.1	n.a.	n.a.	
	Landfill biogas	1,061	2.8	n.a.	n.a.	
	Sludge biogas	211	0.6	n.a.	n.a.	
	Total bioenergy	3,790	10	5.5	-0.5	
Hydro		15,318	40	13.9	0.6	
Wind		12,199	32	6.4	18.7	
Solar photovoltaic		6,838	18	23.6	59.1	
Geothermal		0	0	-64.1	-8.9	
Total renewables		38,146	100	12.1	6.8	

GWh, gigawatt-hours (10<sup>9</sup> Watt-hours); n.a., not available

Source: Australian Energy Update 2017, April 2018 update (DoEE 2017b).

🔊 This table, together with other data for Indicator 6.1d, is available in Microsoft Excel via <u>www.doi.org/10.25814/5bda972cd76d9</u>

## Non-wood forest products

Non-wood forest products (NWFPs) comprise a wide diversity of products, including tree bark collected for paintings, eucalyptus and sandalwood oil, seeds, bush flowers, native foods, bee products, water, minerals, and animal meat and skins. Several industries based on NWFPs supply domestic and international commercial markets (see Indicator 6.1b).

Beekeeping is one of the largest NWFP industries. An average of 20.8 thousand tonnes of honey was produced annually over the period 2011–12 to 2015–16, and in 2015–16 the estimated gross value of production of honey and other bee products was \$110 million (Table 6.13, Indicator 6.1b). Much of the production comes from forests. Between 2011 and 2016, on average 4.5 thousand tonnes were exported annually (Table 6.13, Indicator 6.1b) and 22.2 thousand tonnes of honey were consumed domestically (ABS 2017d). Imports increased in 2014–15 and 2015–16, mostly due to a significant rise in honey imported from China (ABS 2017d; van Dijk et al. 2016).

Although these are small industries, a significant proportion of crocodile hide, venison, goat and game pig meat, wood and oil from sandalwood, and tea tree and eucalypt oil production is exported (Indicator 6.1b). Most crocodile eggs, sandalwood, tea tree and eucalypt oil are derived from forest; for game meats the proportion derived from forest is unknown. Some native foods and artwork based on non-wood forest products are also exported.

In addition to providing 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 tourism 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.



Structural-grade plywood made in Australia from plantation pine.

6.1d

## Indicator 6.1e

## Degree of recycling of forest products

## Rationale

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

## Key points

- Between 2010–11 and 2015–16, the weight of recycled paper used for domestic paper and paperboard production fell from 1.8 million tonnes to 1.7 million tonnes, and the proportion of paper and paperboard production deriving from recycled paper fell from 56% to 53%. Over this period, the weight of paper waste exported for recycling increased from 1.3 million tonnes to 1.4 million tonnes.
- Australia recycled 60% of the 5.3 million tonnes of paper and cardboard waste generated in 2014–15. Of the weight recycled, Victoria, New South Wales and Queensland together recycled 82%.
- Lower weights of waste timber are recycled or re-used in Australia compared to the weight of paper and cardboard that is recycled, but various government and industry initiatives aim to increase timber recycling and re-use. Of the reporting jurisdictions, Victoria and South Australia recycled the most timber over the years broadly covered by the reporting period.

- <sup>278</sup> Until July 2016, the Department of the Environment.
- <sup>279</sup> 'Paper and cardboard' is defined as comprising liquid paperboard (paperboard with layers of plastic; used for beverage containers), newsprint, magazines and office paper.
- <sup>280</sup> Recovered paper and paperboard refers to paper and paperboard products that have known recycling potential and that have been removed or diverted from solid waste, or that have never been discarded as solid waste, and are intended for sale, use, reuse, or recycling. See www.paperrecyclingcoalition.com/faqs/paper-recycling-terminology/

This indicator measures the extent to which wood-based products such as paper, paperboard and timber are recycled in Australia. Non-wood forest products may also be recycled or re-used (for example, through composting for use in agriculture and floriculture) but the indicator does not assess the extent of such use.

Paper is the major forest product that is recycled in Australia. This indicator presents two main recycling datasets, one from a 2017 ABARES survey of companies and covering paper and paperboard<sup>277</sup>, and the other in 2016 from Blue Environment developed for the Department of Energy and the Environment<sup>278</sup> based on state and territory responses recorded using a national waste dataset reporting tool, and covering paper and cardboard<sup>279</sup>. Both datasets show that the proportions of these materials recycled in Australia have been relatively stable since 2010–11. Differences between the numbers from these two datasets are due to the different types of material included in each, and the methodologies employed.

## Paper and paperboard recycling

Figure 6.19 shows the weight of recovered paper and paperboard<sup>280</sup> that is used for domestic paper and paperboard production, and the proportion of domestic paper and paperboard production that this comprises (ABARES 2017c).

Between 2010–11 and 2015–16, the weight of paper and paperboard produced in Australia increased by 2%, to 3.2 million tonnes. During the same period, the weight of recovered paper and paperboard used to produce paper and paperboard decreased by 4%, from 1.8 million tonnes to 1.7 million tonnes (Figure 6.19). The proportion of paper and paperboard production deriving from recovered paper and paperboard therefore fell between 2010–11 and 2015–16, from 56% to 53%. Since 2002–03, the proportion of paper and paperboard production in Australia that derives from recovered paper and paperboard has fluctuated around the long-term average of 54% (Figure 6.19).

<sup>&</sup>lt;sup>277</sup> 'Paper and paperboard' includes the categories newsprint; coated and uncoated printing and writing paper; household and sanitary paper; and wrapping and packaging paper and board.


## Figure 6.19: Recovered paper and paperboard used for paper and paperboard production, Australia, 2002–03 to 2015–16

Source: ABARES (2017c).

The data used to create this figure, together with other data for Indicator 6.1e, are available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

Figure 6.20: Recovered paper and paperboard exported or used domestically to produce paper and paperboard, Australia, 2002–03 to 2015–16



Note: Total paper and paperboard recovered comprises recycled paper used for domestic paper and paperboard production plus recycled paper exported.

Source: ABARES (2017c).

The data used to create this figure, together with other data for Indicator 6.1e, are available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

The weight of recovered paper and paperboard exports increased from 2002–03 until 2012–13, and since then has been relatively stable (Figure 6.20). Overall, between 2010–11 and 2015–16 the weight of recovered paper and paperboard exports increased by 7%, from 1.3 million tonnes to 1.4 million tonnes. The weight of recovered paper and paperboard imports is much smaller, and decreased between 2002–03 and 2015–16 from 35 thousand tonnes to 1 thousand tonnes. During the same period, the combined weights of recovered paper and paperboard exported and recovered paper and paperboard used to produce paper and paperboard (that is, the total weight of recovered paper and paperboard) increased by 1%, to 3.1 million tonnes (Figure 6.20).

Another dataset that reports on paper and paperboard recovery for the year ended 30 June 2016 is presented in Industry Edge (2017). In that year, Australia's reported total recovery of paper and paperboard fibre was 3.1 million tonnes, of which 1.7 million tonnes was used for domestic production and 1.4 million tonnes was exported.

## Recycling of paper and cardboard waste

Blue Environment (2016) used state and territory government data and an industry survey to report on solid waste generation in Australia, and the fates of numerous waste categories, including paper and cardboard. Figure 6.21 shows the trends over time in the weight of paper and cardboard waste generated, recycled and disposed. In 2014–15, Australia generated 5.3 million tonnes of paper and cardboard waste, of which 3.2 million tonnes (60%) were recycled, and 1.6 million tonnes (30%) were disposed, predominantly to landfill (Figure 6.21). An additional 0.5 million tonnes (9%) were disposed to landfill and then generated methane (landfill gas) that was in turn used to generate energy. The proportion of paper and cardboard waste generated that was recycled in 2014–15 was slightly lower than the proportions reported during the period 2010–11 to 2013–14.

The weight of paper and cardboard waste that is recycled differs between states and territories. These differences are driven by population and therefore consumption levels, by socio-economic factors, by varying waste policies adopted by governments including local governments, and by access to recycling markets (Blue Environment 2016). In 2014–15, Victoria recycled the highest amount of paper and cardboard waste (1.44 million tonnes) in Australia, representing 45% of total national paper and cardboard waste recycling (Table 6.23). Recycling amounts were the next highest in New South Wales (0.71 million tonnes) and Queensland (0.49 million tonnes). Taken together, these

three jurisdictions (which also have the highest populations of Australia's states and territories) recycled 82% by weight of Australia's recycled paper and cardboard waste.

The proportion of paper and cardboard waste recycled in 2014–15 was highest nationally in South Australia (78%), followed by Victoria (72%) and New South Wales (61%); and lowest in the Northern Territory (13%; but see footnotes to Table 6.23).

Indicator 5.1a addresses the contribution of Australia's forest products to the global carbon cycle, including the weight of carbon stored in wood products in use and landfill, and production of energy from biomass.

## Timber recycling and re-use

Waste timber is generated mainly from construction, demolition, commercial and industrial sources, and includes untreated, treated and painted timber, engineered wood products, timber packaging, sawdust, and sawn offcuts. Using waste timber as firewood and fuelwood is not considered to be recycling.

Of the reporting jurisdictions, Victoria and South Australia recycled the largest amounts of waste timber over the years broadly covered by the reporting period (Table 6.24). Over the four years to 2015–16, South Australia recycled 273 thousand tonnes of waste timber (down 3%), and over the three years to 2014–15 Victoria recycled 398 thousand tonnes of waste timber (up 254%). Recycling amounts also increased over time in New South Wales and the Australian Capital Territory (by 63% and 511%, respectively, although from lower base-lines).



Figure 6.21: Paper and cardboard waste generated, recycled and disposed, Australia, 2006–07 to 2014–15

Notes: Totals may not tally due to rounding.

Paper and cardboard comprises liquid paperboard, newsprint and magazines, and office paper, but excludes waste from forestry production activities. Waste disposed that is converted to methane (landfill gas) and used to generate electricity is not shown above, and for this reason the sum of the weight recycled and the weight disposed does not equal the weight of waste generated. The proportion recycled is calculated as the weight of waste recycled divided by the weight of waste generated. Source: Blue Environment Pty Ltd (2016).

The data used to create this figure, together with other data for Indicator 6.1e, are available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

#### Table 6.23: Paper and cardboard waste generated and recycled, by jurisdiction, 2014–15

	ACT	NSW	NT <sup>d</sup>	Qld.	SA	Tas.	Vic.	WA	Australia
Generation ('000 tonnes)ª	76	1,162	39	1,007	300	127	2,000	558	5,269
Recycling ('000 tonnes)	30	706	5e	495	233	69	1,443	245	3,226
Disposal ('000 tonnes)	31	347	29	445	48	44	393	248	1,585
Used for energy recovery ('000 tonnes) <sup>b</sup>	15	109	4	67	20	14	163	65	457
Proportion recycled <sup>c</sup>	39%	61%	13% <sup>e</sup>	49%	78%	54%	72%	44%	61%
Proportion of national paper and cardboard recycled	0.9%	22%	0.2%°	15%	7%	2%	45%	8%	100%

<sup>a</sup> Generation equals 'Recycling' plus 'Disposal' plus 'Used for energy recovery'.

<sup>b</sup> Refers to processes that include capturing methane from landfill gas and converting it to electricity.

<sup>c</sup> 'Recycling' divided by 'Generation'.

<sup>d</sup> These data were obtained via an industry survey and may be under-reported.

<sup>2</sup> The relatively low proportion of paper and cardboard waste recycled in the Northern Territory partly reflects socio-economic factors and a low population density, but also may not fully capture the supply by the Northern Territory of waste paper and cardboard to pulp and paper mills domestically and overseas for reprocessing.

Notes: Totals may not tally due to rounding.

'Paper and cardboard' include liquid paperboard, newsprint, magazines and office paper, and excludes waste from forestry production activities.

Source: Adapted from Blue Environment Pty Ltd (2016).

🔊 This table, together with other data for Indicator 6.1e, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

#### Table 6.24: Weight of waste timber recycled, by jurisdiction, 2010–11 to 2015–16 (tonnes)

Waste timber recycling	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
Australian Capital Territory <sup>a</sup>	n.d.	632	n.d.	n.d.	3,862	n.d.
New South Wales	60,000	n.d.	n.d.	n.d.	98,000	n.d.
South Australia	n.d.	281,000	n.d.	n.d.	n.d.	273,000
Victoria	n.d.	112,381	n.d.	204,000	193,753	n.d.

<sup>a</sup> For the ACT, 'waste timber' measured as timber mulch sold by ACT Recycling Pty Ltd, with data covering the ACT region, including Queanbeyan and Yass (NSW). Sources: Australian Capital Territory, ACT NOWaste and Parks and Conservation Service; New South Wales, unpublished reports conducted on behalf of the NSW Environmental Protection Authority; South Australia, Rawtec (2012, 2017); Victoria, Sustainability Victoria (2012, 2015, 2017a).

🔊 This table, together with other data for Indicator 6.1e, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

Only occasional data are collected on waste timber recycling and re-use in Australia, and estimates of waste timber recycling or re-use vary. For example, in 2009–10 'timber and wood products' was the category of waste with the highest proportion of recycling or re-use nationally, at 91% by weight (ABS 2013a). By comparison, Victoria estimated that 40% of waste timber was recovered for reprocessing in 2013–14 (Sustainability Victoria 2017b). The data show that less waste timber and wood product is recycled or re-used than paper and cardboard, and significant weights of waste timber and wood product are disposed in landfills. This is driven largely by the economics and regulation of recycling and reusing waste timber.

Factors that influence the extent of waste timber recycling and re-use in Australia include the regulatory framework for waste streams, including industry self-regulation. These regulatory factors set minimum standards, frame markets for recycling and re-use, and drive the development and application of new materials derived from waste. Other significant factors influencing timber recycling and re-use include collection, transport, storage and land-filling costs. Particular wood-waste handling challenges include the requirement to separate contaminated and preservativetreated timber (FWPA 2008). Edge Environment (2012) and Blue Environment (2016) summarise waste regulation and legislation across jurisdictions, including landfill levies imposed by most states and territories, and policies and targets to increase recovery rates. Box 6.1 provides examples of initiatives to reduce timber and wood product waste.

Edge Environment (2012) reports that nationally there is lower market demand for recovered timber than other waste from construction and demolition sources, due largely to its low economic value, and the volume of material recovered being relatively small. Waste materials such as metals and masonry that are heavy, are generated in large volumes, and cost more to dispose receive priority attention for recovery and market development in the construction and demolition sector. A reported barrier to growing the recovered timber re-use market is the increasing mechanisation of demolition works, which makes salvage operations more difficult, and increases the potential for damage to high-value timbers.

#### Box 6.1: Initiatives to reduce wood waste

Various initiatives across Australia aim to increase the recovery and re-use of waste timber and wood products that would otherwise be sent to landfill. These initiatives reflect government policies, such as the 2009 National Waste Policy (EPHC 2010), and the potential for high economic returns to industry from the salvage market for reusable timber.

**Timber Recycling fund**: four Victorian businesses received \$500,000 of government funding to increase timber recovery through projects including the manufacture of high-quality biomass pellets and heating briquettes. The projects have the potential to divert up to 27,500 tonnes of timber reported as going to landfill each year in Victoria (Sustainability Victoria 2017b).

**Industry standards**: Forest and Wood Products Australia has developed interim standards that provide recycled timber manufacturers, suppliers and users with the requirements for visually grading recycled hardwood timber intended for use in both structural and decorative applications (FWPA 2017).

**Product stewardship**: The National Timber Product Stewardship Group (NTPSG)<sup>281</sup> is an initiative of the timber and wood products industry to double the recovery of post-consumer timber and wood products to one million tonnes per year by 2017. The Commonwealth *Product Stewardship Act 2011* supports the efforts of the NTPSG and Australian businesses in other sectors by providing the framework to manage effectively the environmental, health and safety impacts of their products.

Localised re-use markets exist for high-quality recycled timber, including for infrastructure timber (power poles and railway sleepers), hardwood flooring, and structural timber (Edge Environment 2012). Tasmania, for example, reports resource recovery of timber products, with tip and salvage shops offering old timber furniture and construction timber for re-use, including items recovered from demolitions or renovations (FPA 2017a). Other products manufactured from recovered timber include engineered wood products, mulch, compost, bedding and other products for animal use, as well as products used to generate energy, including pellets, liquid fuels and dried wood chips. **Recycling centres**: Some regional councils around Australia operate recycling centres that recover and recycle timber waste specifically. The Hazelmere Resource Recovery Park run by the Eastern Metropolitan Regional Council in Western Australia, for example, recovers industrial timber waste and processes it into a reusable woodchip for various markets<sup>282</sup>.

**Timber recyclers and recycling services**: Many businesses across Australia supply recovered waste timber and recycled timber products, many from valuable hardwood. Websites such as Austim<sup>283</sup> are also available to assist in finding wood waste recyclers and information on buying recycled timber and wood products.



Fuel pellets made from softwood processing residues being loaded onto a truck for transport to the port of Bundaberg, Queensland, from where they are exported to European and Asian markets.

- <sup>281</sup> www.timberstewardship.org.au
- 282 www.emrc.org.au/waste-services/resource-recovery-project/hazelmereresource-recovery-park.aspx
- <sup>283</sup> www.austim.com.au/timber-recycling-scheme-directory

# 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

- Australia's state and territory governments undertake many activities that, together, constitute forest management.
  - A range of state government data on forest management investment and expenditure are presented, but the ability to compare these measures is limited by differences in the classification of activities, in accounting arrangements, in reporting timelines, and in reporting for different tenures.
  - It is therefore also not possible to estimate national expenditure on forest management.
- Investment in the establishment of new commercial plantations, as well as re establishment of harvested commercial plantations, is important for future wood availability.
  - The annual rate of establishment of new commercial plantations in Australia declined from 4,200 hectares in 2011–12, to 900 hectares in 2014–15, then increased to 1,600 hectares in 2015–16.
  - During the period 2011–12 to 2014–15, new plantings comprised mostly hardwoods in Victoria, Queensland and the Northern Territory. During the period 2014–15 to 2015–16, new plantings comprised solely softwood plantations in New South Wales and Western Australia.
- The forest and wood products sector accumulated \$4.12 billion of fixed capital in the period 2010–11 to 2015–16, including new plantations, equipment and buildings. Depreciation and amortisation expenses over the same period were \$3.47 billion.
  - Capital formation net of depreciation and amortisation over this period was therefore \$0.65 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 on public forest management, investment in establishment of new plantations and replanting of existing plantations (re-establishment), and investment in harvesting and in manufacturing involving forest products. Information on other forest investment is scarce; in particular, investment by the private sector (for both native forest management and plantation establishment) is either not available or is treated as commercialin-confidence, and is therefore not released publicly.

## Expenditure by state and territory governments

Australia's state and territory governments undertake many activities that, together, constitute forest management. These include management of weeds and pest animals; forest fire management; soil and water management; forest monitoring; forest health surveillance; forest resource inventories; biological surveys; provision of recreational opportunities; and silvicultural, post-harvest and wildlife management practices. However, state and territory agencies 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. Accordingly, the data presented below for various agencies vary widely, depending on the nature of the information available, and are generally not directly comparable between jurisdictions.

The general lack of consistent data on expenditure on forest management, and the absence of data for some tenures (such as many nature conservation reserves), make it difficult to determine the nature of changes in forest management expenditure over the reporting period.

No data were available for the Australian Capital Territory or the Northern Territory for this indicator.

## New South Wales

The Forestry Corporation of NSW (FCNSW)<sup>284</sup> is a state-owned corporation that manages just under 2.2 million hectares of native forests, plantations and other vegetation types in New South Wales (FCNSW 2016d). It undertakes a range of activities aimed at developing, maintaining, and obtaining goods and services from state forests. These activities include:

- harvest supervision and assessment of environmental compliance
- · management of weeds and animal pests
- fire management, including hazard reduction burning and bushfire fighting and prevention
- provision of recreational opportunities.

Table 6.25 shows the total reported expenditure by FCNSW, and the expenditure reported on some of these forest management activities, in the period 2011–12 to 2015–16.

## Queensland

The Department of Agriculture and Fisheries<sup>285</sup> (DAF) is responsible for managing Queensland's land, water and vegetation resources, including forest resources (DAF 2016). Forest Products is a business unit of DAF and under the provisions of the *Forestry Act 1959* (Qld) is responsible for activities related to the supply of native forest timber and other forest products from state forests, timber reserves, other state lands, and forest consent areas. Timber 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 (Business Queensland 2016).

Table 6.26 shows total reported capital expenditure by DAF in native forests, and expenditure in managing native forests, in the period 2011–12 to 2015–16.

## Table 6.25: Expenditure in New South Wales public native and plantation forests by Forestry Corporation of NSW, 2011–12 to 2015–16 (\$ million)

	2011–12	2012–13	2013–14	2014–15	2015–16
Total operating expenses <sup>a</sup>	213.8	196.7	205.0	192.0	206.9
Forest management expenses (selected)					
Harvest management (hardwood forests)					
Supervision and environmental compliance	5.8	6.6	7.4	5.5	5.9
Harvest planning and pre-harvest surveys	5.7	5.5	5.3	4.5	5.0
Other forest management activities					
Firefighting and fire prevention (wildfire)	0.3	1.8	n.r.	n.r.	n.r.
Hazard reduction burning	6.2	8.2	n.r.	n.r.	n.r.
Post-establishment pest management	0.7	0.7	0.4	0.6	0.6
Weed management	0.8	0.7	0.6	0.7	0.7
Animal pest management	0.9	0.7	0.7	0.7	0.9

n.r., not reported

<sup>a</sup> Total operating expenses of FCNSW, not just expenditure on forest management.

Source: FCNSW (2013b, 2014b, 2015, 2016d).

🔊 This table, together with other data for Indicator 6.2a, is available in Microsoft Excel via <u>www.doi.org/10.25814/5bda972cd76d9</u>

## Table 6.26: Expenditure in Queensland native forests by the Department of Agriculture and Fisheries, 2011–12 to 2015–16 (\$ million)

Activity	2011–12	2012–13	2013–14	2014–15	2015–16
Capital expenditure in native forests	n.a.	0.1	0.1	0.0	0.2
Expenditure in managing native forests					
Multiple-use forests	n.a.	10.2	11.9	11.6	12.7
Other tenures <sup>a</sup>	n.a.	2.5	3.0	2.9	3.2

n.a., not available

<sup>a</sup> Other tenures comprise private, leasehold, other Crown land and unresolved.

Source: Department of Agriculture and Fisheries, Queensland.

🔊 This table, together with other data for Indicator 6.2a, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

<sup>285</sup> Until February 2015, the Department of Agriculture, Fisheries and Forestry.

<sup>&</sup>lt;sup>284</sup> Until January 2013, Forests NSW.

## South Australia

In South Australia, ForestrySA is responsible for managing commercial plantations on public land in the Mount Lofty Ranges and Mid-North<sup>286</sup> region, and also manages native forest reserves for conservation and recreation purposes. Table 6.27 shows that, over the reporting period, the total expenditure of ForestrySA (including employee benefits, payments to contractors, depreciation and amortisation) was highest in 2013–14, at \$88.8 million, and fell to \$61.4 million in 2015–16.

On 17 October 2012, the South Australian government sold three forward harvest rotations (up to 105 years) of ForestrySA's Green Triangle plantations to OneFortyOne Plantations Pty Ltd (OFO). Until 30 September 2015, ForestrySA managed the Green Triangle plantations under a plantation management agreement with OFO in return for a management services fee<sup>287</sup>. Income covering management of commercial plantations by ForestrySA over the reporting period, including income from forest management services received by ForestrySA under its agreement with OFO, peaked at \$16.8 million in 2013–14 (Table 6.27).

## 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 valuation and protection of old-growth forests, and monitoring and improvement of natural forest values such as land, biodiversity and water. The Parks and Wildlife Service (a part of DPIPWE) is responsible for managing large areas of forested reserved lands for conservation and recreation, including 412 thousand hectares of 'Future Potential Production Forests' (DPIPWE 2016).

Forestry Tasmania<sup>288</sup>, a government business enterprise (and separate entity from DPIPWE), was responsible for managing public native forests and plantations, recreation and tourism facilities, roads and infrastructure over the reporting period. This included the management of 812 thousand hectares of public production forest that is now classified as 'Permanent Timber Production Zone' land (Forestry Tasmania 2016a). The expenditure by Forestry Tasmania on forest management activities is not separately reported.

Total expenses by Forestry Tasmania for operations, which include expenditure on forest management, research and operational and other activities, were about \$150 million annually over the last three years of the reporting period, with lower values in the previous two years (Table 6.28). As part of this figure, the expenditure by Forestry Tasmania on fire suppression increased from \$0.3 million to \$11.2 million over the reporting period, due largely to the extensive bushfires in Tasmania in 2015–16.

## Table 6.27: Expenditure on South Australia commercial plantation forests by ForestrySA, and management income received, 2011–12 to 2015–16 (\$ million)

	2011–12	2012–13	2013–14	2014–15	2015–16
Total expenditure <sup>a</sup>	77.8	80.3	88.8	82.5	61.4
Income for management services <sup>b</sup>	0.2	10.0	16.8	13.1	3.3

<sup>a</sup> Total expenditure of ForestrySA, not just expenditure on forest management.

<sup>b</sup> Until 30 September 2015, ForestrySA managed silvicultural operations for OneFortyOne Plantations (OFO) in return for a fee. Source: ForestrySA (2012, 2013, 2014, 2015, 2016).

🔊 This table, together with other data for Indicator 6.2a, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

Table 6.28: Total exp	penses for operations	and fire management b	oy Forestry Tasmani	a, 2011–12 to 2015–16 (\$ million)
				, , , ,

Activity	2011–12	2012–13	2013–14	2014–15	2015-16
Total agency operational expenses <sup>a</sup>	134.0	116.9	154.1	148.2	148.0
Fire management (costs of suppression)	0.3	5.1	3.0	0.5	11.2

<sup>a</sup> Values are total expenditure of Forestry Tasmania, not just expenditure on forest management. Source: Forestry Tasmania (2012a, 2013a, 2014a, 2015a, 2016a).

🔊 This table, together with other data for Indicator 6.2a, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

<sup>286</sup> After the SOFR reporting period, ForestrySA withdrew from managing plantations in the Mid North region of South Australia.

<sup>287</sup> After that time, OFO internalised the management of its plantations (Government of South Australia 2015).

<sup>288</sup> From 1 July 2017, Sustainable Timber Tasmania.

6.2a

### Victoria

The agency responsible for managing natural resources, including state forests, in Victoria has changed a number of times during the reporting period. As at June 2016, the Department of Environment, Land, Water and Planning (DELWP)<sup>289</sup> has broad responsibility for Victoria's natural environments (including forest fire management). VicForests is a separate, government-owned business responsible for the harvest, commercial sale and regeneration of harvested coupes from Victoria's state forests. Together with VicForests, DELWP (through Parks Victoria) is responsible for managing Victoria's parks and reserves, and state forests.

Table 6.29 indicates the expenditure on managing Victoria's parks, forests and public land between 2011–12 and 2015–16. Total expenditure, which includes expenditure on non-forested parks or areas of parks, fluctuated during the reporting period, and increased in 2015–16 to \$328 million. Reported expenditure on land and fire management, which also includes expenditure on non-forest areas, similarly fluctuated over the reporting period and increased to \$397 million in 2015–16. Expenditure for various management activities in multiple-use forests, and on forest health monitoring and management in nature conservation reserves, are also given on Table 6.29.

#### Western Australia

Over the SOFR 2018 reporting period, the Department of Environment and Conservation (DEC) and subsequently the Department of Parks and Wildlife (DPaW)<sup>290</sup> were charged with ensuring that Western Australia's plants and animals and the lands (including state forests, conservation parks and nature reserves) and water under the care of these agencies were managed appropriately for tourism, water and wood production. Table 6.30 indicates the annual expenditure from 2011–12 to 2015–16 by these agencies on forest management. Total expenditure by DEC increased to \$56 million in 2012– 13, and by DPaW increased to \$62.7 million in 2014–15.

The Forest Products Commission (FPC) is the statutory authority responsible for the sustainable management and development of Western Australia's forest products industry using native forest, plantation and sandalwood products on land owned or leased by the state. Total expenditure on forest management by FPC, including the sustainable management of timber resources, was about \$73 million annually over the reporting period (Table 6.30).

Activity	2011–12	2012–13	2013–14	2014–15	2015–16
Land and fire management <sup>a</sup>	315.0	383.5	382.3	347.8	396.5
Management of forests and parks <sup>b</sup>	231.8	199.0	199.2	298.9	328.2
Management of multiple-use native forests	38.0	40.3	36.6	40.2	38.1
Commercial production	22.4	24.8	24.9	24.3	26.9
Recreation and tourism	8.2	8.1	5.3	5.8	2.2
Infrastructure construction and maintenance	6.7	5.9	4.8	6.8	6.5
Ecological protection and conservation	n.r.	0.2	0.05	1.2	1.1
Community involvement	n.r.	0.6	0.7	1.2	0.5
Forest health monitoring and management <sup>c</sup>	0.8	0.8	0.8	0.8	0.8
Management of nature conservation reserves					
Forest health monitoring and management <sup>c</sup>	0.8	0.8	0.8	0.8	0.8

#### Table 6.29: Expenditure on public land management categories, Victoria, 2011–12 to 2015–16 (\$ million)

n.r., not reported

<sup>a</sup> Figures for 2014–15 and 2015–16 are the expenditure in grouping 'Fire and emergency management'.

<sup>b</sup> Figure for 2015–16 is expenditure in grouping 'Management of forests, parks and public land'.

<sup>c</sup> 'Forest health monitoring and management' covers health surveillance, management and eradication responses for pests and diseases, and also Vegetation Forest and Monitoring Plots and bushfire monitoring across multiple-use public native forest and nature conservation reserve tenures.

Note: Values may not be comparable across years due to possible changes in these categories arising from agency changes during the reporting period. Source: VicForests; DEPI (2014a); DELWP (2015, 2016).

🔊 This table, together with other data for Indicator 6.2a, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

<sup>&</sup>lt;sup>289</sup> The Department of Environment and Primary Industries from April 2013 to January 2015.

<sup>&</sup>lt;sup>290</sup> From 1 July 2017, the Parks and Wildlife Service, Department of Biodiversity Conservation and Attractions. Before 1 July 2013, DPaW was the Department of Environment and Conservation (DEC).

Table 6.30: Expenditure on fo	rest management, Western Australia,	, 2011–12 to 2015–16 (\$ million)
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Activity	2011–12	2012–13	2013–14	2014–15	2015–16
Forest management (DEC)	53.6	55.9	n.a.	n.a.	n.a.
Forest management (DPaW)ª	n.a.	n.a.	58.2	62.7	8.9
Forest management (FPC)	73.9	74.0	70.9	72.2	73.1

n.a., not applicable

<sup>a</sup> Values for 2013–14 and 2014–15 relate to expenditure by the agency's 'Forest Management Service'. The value for 2015–16 relates only to expenditure by the agency's 'Forest Management Plan Implementation Service' and cannot be compared with previous years.

Note: Changes in operational service areas between 2012–13 (DEC) and 2013–14 (DPaW) means that forest management expenditure between these agencies may not be comparable.

Source: DEC (2012a, 2013a); DPaW (2014, 2015a, 2016b); FPC (2012, 2013, 2014, 2015, 2016).

💋 This table, together with other data for Indicator 6.2a, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

#### Investment in new commercial plantations and plantation re-establishment

Investment in the establishment of new commercial plantations is one form of investment in the production of wood. Australia-wide, the annual rate of establishment of new commercial plantations declined during most of the reporting period, from 4,200 hectares in 2011–12 to 900 hectares in 2014–15; during this period, new plantings comprised mostly hardwoods in Victoria, Queensland and the Northern Territory (Table 6.31). Establishment of new commercial plantations increased in 2015–16, with a total of 1,600 hectares of new plantations established, comprising softwood plantations in New South Wales and Western Australia (Table 6.31). The general downward trend in new commercial plantation establishment over the reporting period is consistent with the decline in new commercial plantations observed towards the end of the previous reporting period (2006–07 to 2010–11).

Table 6.32 shows the annual costs reported across four jurisdictions for commercial plantation establishment and re-establishment during the period 2011–12 and 2015–16. The areas of public and private commercial plantation re-establishment across all Australian jurisdictions during this same period are provided in Indicator 2.1e.

#### Table 6.31: Area of new commercial plantation establishment, 2011–12 to 2015–16 (hectares)

Plantation type and year	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Australia
Hardwood									
2011-12	0	<50	1,600	500	0	100	1,000	400	3,600
2012–13	0	0	1,700	100	0	<50	0	100	2,000
2013-14	0	<50	1,200	100	0	0	0	<50	1,300
2014–15	0	0	400	200	0	0	0	<50	500
2015-16	0	0	0	0	0	0	0	0	0
Total 2011–16	0	<50	4,800	900	0	100	1,000	500	7,400
Softwood									
2011-12	0	300	0	300	0	0	<50	<50	700
2012-13	0	300	0	0	<50	<50	<50	0	300
2013-14	0	200	0	0	0	0	100	<50	300
2014–15	0	100	0	<50	0	0	0	300	400
2015–16	0	1,400	0	0	0	0	0	200	1,600
Total 2011–16	0	2,300	0	300	<50	<50	100	500	3,200
All plantations									
2011-12	0	400	1,600	800	0	100	1,000	400	4,200
2012–13	0	300	1,700	100	<50	<50	<50	100	2,300
2013-14	0	200	1,200	100	0	0	100	<50	1,600
2014–15	0	100	400	200	0	0	0	300	900
2015-16	0	1,400	0	0	0	0	0	200	1,600
Total 2011–16		2,300	4,800	1,200	<50	100	1,100	1,000	10,600

Notes: Figures are areas of new plantations. Areas replanted as plantation following final harvest of a pre-existing plantation (re-establishment) are excluded. Data for Western Australia have been updated with figures from the FPC Annual Report 2016–17 (FPC 2017). Totals may not tally due to rounding. Figures are rounded to the nearest 100 hectares; areas reported as less than 50 hectares (<50) are between 1 and 49 hectares.

Source: National Plantation Inventory; Gavran (2013); Gavran (2015); Downham and Gavran (2017); FPC (2017).

🔊 This table, together with other data for Indicator 6.2a, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

Table 6.32: Cost of commercial plantation area establishment and re-establishment, 2011–12 to 2015–16

Jurisdiction and activity	2011–12	2012–13	2013–14	2014–15	2015–16	Total 2011–16
New South Wales <sup>a</sup>						
Cost of all plantation establishment (\$ million) <sup>b</sup>						
Softwood	12.9	12.6	11.9	15.9	15.3	68.7
Hardwood	1.6	1.3	2.0	0.4	0.8	6.0
Total	14.5	13.9	13.9	16.3	16.1	74.7
Tasmania <sup>c</sup>						
Capital expenditure commitments for plantation establishment and re-establishment <sup>d</sup> (\$ million) <sup>e</sup>	30.0	21.7	17.9	16.4	16.4	_e
Western Australia						
Purchase of investments (new plantations) (\$ million)	4.8	5.2	4.7	5.6	5.9	26.3
South Australia <sup>f</sup>						
Expenditure in plantation forest management (\$ million)						
Establishing new plantations and re-establishing existing plantations	n.r.	n.r.	3.3	2.6	2.1	8.0
Commercial production	n.r.	n.r.	6.2	5.2	4.6	15.9
Infrastructure construction and maintenance	n.r.	n.r.	2.0	1.2	0.6	3.7
Fire management	n.r.	n.r.	1.4	1.8	0.3	3.5

-, no data; n.r., not reported

<sup>a</sup> Plantations managed by FCNSW only, including third-party investor plantings, joint ventures and fee-for-service areas.

<sup>b</sup> Plantation establishment includes the cumulative cost associated with site preparation, planting, post-planting fertilising, and competition control.

<sup>c</sup> Plantations managed by Forestry Tasmania only.

<sup>d</sup> Described in Forestry Tasmania Annual Reports simply as 'establishment'.

<sup>e</sup> Capital expenditure commitments for each year are the sum of two sub-categories ('not longer than one year' and 'between one and five years'), hence cannot be summed into a 5-year total.

<sup>f</sup> Plantations managed by ForestrySA, including (until 30 September 2015) plantations managed for OneFortyOne Plantations Pty Ltd. Due to changes in accounting systems, data are not available for 2011–12 and 2012–13.

Source: FCNSW (2014b, 2015, 2016d); Forestry Tasmania (2012a, 2012b, 2013a, 2013c, 2014a, 2014c, 2015a, 2016a); FPC (2012, 2013, 2014, 2015, 2016). Data for South Australia provided by PIRSA Forestry and ForestrySA.

🔊 This table, together with other data for Indicator 6.2a, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

In the period 2011–12 to 2015–16, the Forestry Corporation of NSW established 2,400 hectares of mostly softwood plantations (Table 6.31). The total cost of plantation establishment and re-establishment for this period was \$74.7 million.

Between 2011–12 and 2014–15, the area of new commercial hardwood plantations in the Northern Territory was 4,800 hectares (Table 6.31), which was the largest area of new plantations for all jurisdictions. No new plantations were established in 2015–16.

In the period 2011–12 to 2014–15, a total of 900 hectares of new hardwood plantations and 300 hectares of new softwood plantations were established in Queensland (Table 6.31). No new plantations were established in 2015–16.

In South Australia, ForestrySA is responsible for managing public plantation forests and have previously managed private plantations for OneFortyOne Plantations Pty Ltd. A very small area of new plantations was established directly by ForestrySA from 2011–12 to 2015–16. Table 6.32 indicates the expenditure by ForestrySA in managing commercial plantations during the period 2013–14 to 2015–16, including (until 30 September 2015) plantations managed for OneFortyOne Plantations Pty Ltd. The total cost of all plantation establishment and re-establishment in this period was \$8.0 million, the total cost of all commercial production activities was \$15.9 million, the total cost of infrastructure construction and maintenance was \$3.7 million, and the total cost of fire management was \$3.5 million.

In Tasmania, Forestry Tasmania manages plantations mostly located in state forest. A relatively small area of new plantations was established in Tasmania in the period 2011–12 to 2012–13, mainly hardwood plantations (Table 6.31). No new plantations were established in the period 2013–14 to 2015–16. Table 6.32 indicates that the capital expenditure commitments by Forestry Tasmania for plantation establishment (including re-establishment) decreased over the period 2011–12 to 2015–16, from \$30 million in 2011–12 to \$16.4 million in 2015–16.

In the period 2011–12 to 2013–14, a total of 1,100 hectares of new plantations (mainly hardwood plantations) were established in Victoria (Table 6.31). No new plantations were established in the period 2014–15 to 2015–16.

In Western Australia, the Forest Products Commission (FPC) is responsible for the harvesting and sale of state-owned wood assets in both plantations and native forests. In the period 2011–12 to 2015–16, a total of 1,000 hectares of new plantations were established in Western Australia, with approximately 500 hectares each of new hardwood and new softwood plantations established during this period (Table 6.31). Table 6.32 indicates that the total cost of the FPC investment in all new plantations in the period 2011–12 to 2015–16 was \$26.3 million.

## Investment in harvesting and manufacturing

The Australian Bureau of Statistics (ABS) has reported investment in the following three subsectors of the Australian forest and wood products sector: forestry and logging; wood product manufacturing; and pulp, paper and converted paper product manufacturing<sup>291</sup> (see also Indicator 6.5b and Box 6.2).

The ABS reports four parameters to measure investment and expenditure in various sectors of the economy. These data are based on random sampling of the industry and so are subject to both sampling and non-sampling errors. Changes in accounting methods adopted by industry, including approaches to asset valuation and depreciation, may also affect the accuracy of values reported. The four parameters are:

- Gross fixed capital formation (GFCF) the total value of fixed-asset acquisitions (such as the establishment of new plantations, purchase of machinery, acquisition of goodwill and intellectual property rights) less any fixed-asset disposals
- Depreciation and amortisation allocation of the cost of an asset over its service life (Fraser and Ormiston 2010), and considered as expenses. The depreciation and amortisation category does not include asset impairment or revaluation in regards to standing timber
- Capital formation net of depreciation and amortisation - GFCF less depreciation and amortisation. Reflects net formation of new productive capacity
- Inventories intermediate goods (such as raw materials, fuels, containers), and goods held for sale or distribution. Reasons for accumulating inventory can range from anticipatory investment to over-investment. Reasons for reducing inventory can range from increased sales to impairments in the value of inventory holdings.

Table 6.33 presents data for investment and expenditure in the forestry and logging, wood product manufacturing, and pulp, paper and converted paper product manufacturing subsectors for the period 2010–11 to 2015–16. Investment

and expenditure in these three forest industry subsectors fluctuated during this period. The three subsectors combined accumulated \$4.12 billion of fixed capital between 2011–12 and 2015–16, including new plantations, equipment and buildings. Depreciation and amortisation expenses over the same period were \$3.47 billion, capital formation net of depreciation and amortisation was \$0.65 billion and the value of inventory holdings decreased by \$47 million.

Across the period 2011–12 to 2015–16, capital formation net of depreciation and amortisation in the forestry and logging subsector was \$420 million (Table 6.33). This reflects gross fixed capital formation of \$1,156 million, and depreciation and amortisation of \$736 million. The only year that net capital formation decreased in the subsector was 2015–16. Unlike many manufacturing sectors, fixed capital formation in this subsector can include acquisitions of natural resource fixed assets, such as plantations, which can appreciate over time as trees grow. The sector also reported an increase in the value of inventory holdings of \$83 million between 2011–12 and 2015–16.

Capital formation net of depreciation and amortisation in the wood product manufacturing subsector was \$429 million across the period 2011–12 to 2015–16, and was positive in all years during this period (Table 6.33). This reflects gross fixed capital formation of \$1,411 million, and depreciation and amortisation of \$982 million. The value of the sector's inventory holdings decreased during the first three years, and increased over the last two years, during this period, remaining largely unchanged overall.

During the period 2011–12 to 2015–16, capital formation net of depreciation and amortisation in the pulp, paper and converted paper product manufacturing subsector was negative \$195 million, the lowest level of the three forest industry subsectors. Depreciation and amortisation (\$1,747 million), which was higher than for the other two forest industry subsectors, exceeded gross fixed capital formation (\$1,552 million). The sector reported decreases in the value of inventory holdings during three of the five reporting years, with a reduction in overall inventory of \$131 million between 2011–12 and 2015–16.

6.2a

<sup>&</sup>lt;sup>291</sup> These three subsectors are based on the Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006 (Trewin and Pink 2006). The 2006 ANZSIC was updated in 2013 (Pink and Welch 2013) with minor revisions but maintaining the scope, concepts and structure of ANZSIC 2006.

Table 6.33: Investment and expenditure in selected Australian forest and wood products subsectors, 2010–11 to 2015–16 (\$ million)

Parameter	2010–11ª	2011–12	2012–13	2013–14	2014–15	2015–16	Total 2011–16
Gross fixed capital formation							
Forestry and logging	192	259	290	192	226	189	1,156
Wood product manufacturing	279	325	309	207	289	281	1,411
Pulp, paper and converted paper product manufacturing	421	389	262	306	275	320	1,552
Total	892	973	861	705	790	790	4,119
Depreciation and amortisation							
Forestry and logging	130	149	184	0	114	289	736
Wood product manufacturing	385	317	222	0	229	214	982
Pulp, paper and converted paper product manufacturing	521	514	455	0	397	381	1,747
Total	1,036	980	861	0	740	884	3,465
Capital formation net of depreciation and amortis	ation						
Forestry and logging	62	110	106	192	112	-100	420
Wood product manufacturing	-106	8	87	207	60	67	429
Pulp, paper and converted paper product manufacturing	-100	-125	-193	306	-122	-61	-195
Total	-144	-7	0	705	50	-94	654
Change in inventory (over previous year/through p	period)						
Forestry and logging	-8	47	12	3	9	12	83
Wood product manufacturing	69	-114	-13	-12	91	49	1
Pulp, paper and converted paper product manufacturing	96	-37	-84	50	5	-65	-131
Total	157	-104	-85	41	105	-4	-47

<sup>a</sup> Revised from SOFR 2013 figures.

Source: ABS (2014, 2017b).

🔊 This table, together with other data for Indicator 6.2a, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

# 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 results in continual improvements to forest management practices.

## Key points

- Australian Bureau of Statistics data show that, from 2007–08 to 2013–14, total expenditure on research and development (R&D) reported by businesses in the forest and wood products sector declined from \$144 million to \$86 million.
  - From 2007–08 to 2015–16, expenditure on R&D reported by businesses in the forestry and logging subsector decreased from \$22.0 million to \$12.9 million.
  - From 2007–08 to 2015–16, expenditure on R&D reported by businesses in the pulp, paper and converted paper product manufacturing subsector varied, with a small overall decrease from \$71.1 million in 2007–08 to \$70.1 million in 2015–16.
  - From 2007–08 to 2013–14 expenditure on R&D reported by businesses in the wood product manufacturing subsector decreased from \$51.3 million to \$20.8 million.
  - Only partial data on R&D expenditure are available from the ABS for some years.
- A separate series of surveys of the forest and forest products sector, using a different definition of the sector from that used by the ABS, showed that R&D expenditure on forestry and forest products decreased from \$87.8 million in 2007–08, to \$48.1 million in 2012–13.
  - Adjusted for inflation, these surveys have shown that expenditure on forestry and forest products R&D has declined by 60.8% between 1981–82 and 2012–13.

- It is not possible to calculate the total expenditure on R&D by businesses, governments, universities and other agencies across the forest and wood products sector.
- A survey of timber industry processing facilities covering softwood and hardwood sawmilling, panel and plywood manufacturing for the period 2012 to 2017 estimated a total capital investment of \$938 million during the period, including but not limited to investment in new technologies and new activities.
  - The majority of these new investments targeted increased productivity, higher recovery and improved grade yield in the sawmilling sectors, and increased productivity and development of new products in the panel and plywood sectors.

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

## Australian Bureau of Statistics survey data

The Australian Bureau of Statistics (ABS) collects data from businesses on their R&D expenditure across three subsectors of the forest and wood products sector: forestry and logging; wood product manufacturing; and pulp, paper and converted paper product manufacturing<sup>292</sup>. The ABS 'Survey of R&D, Businesses' (ABS 2015b, 2017e) is a biennial survey, with the change to the collection frequency from annual to biennial being made after the 2011–12 survey. The most recent data available from the ABS were released in 2017, and include data for the 2015–16 financial year, although data for R&D on wood product manufacturing were not included for that year.

In 2015–16, R&D was defined, for the purposes of ABS data collection, in accordance with the Organisation for Economic Co-operation and Development standard as 'creative and systematic work undertaken in order to increase the stock of knowledge – including knowledge of humankind, culture and society – and to devise new applications of available knowledge' (ABS 2017e). This definition excludes expenditure that expands production capacity using existing technologies, but includes expenditure on basic research ('research') and on ways of applying basic research in practice ('experimental development'). The ABS data also include only expenditure on R&D of \$100,000 or more undertaken

within the sector; R&D on forestry issues undertaken entirely by an entity outside the sector is excluded.

R&D in the forestry and logging subsector can focus on ways to improve forest management, wood production and harvesting of wood products, or on identifying new markets for standing wood (such as a market for reduced carbon emissions). R&D 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. R&D in the pulp, paper and converted paper product manufacturing subsector covers a range of areas, such as improving energy efficiency in the pulping and drying of wood, and the development of new wood-based products. For the SOFR 2018 reporting period, there was no ANZIC06<sup>293</sup> industry subdivision classification that covers research on biofuels and bioenergy.

The total estimated R&D expenditure by businesses in the three forest and wood products subsectors in 2013–14 was \$85.9 million (Table 6.34; data are incomplete for 2009–10, 2010–11 and 2015–16, and unavailable for 2012–13 and 2014–15). This is a decline of \$58.5 million (40.5%) from 2007–08. Adjusted for inflation over the period, this represents a decline of 47.8%. Forest and wood products sector business R&D expenditure declined as a proportion of total business R&D expenditure from a peak of 1.6% in 2005–06<sup>294</sup> to 0.79% in 2008–09, and further to 0.46% in 2013–14 (Table 6.34).

Table 6.34: Business R&D expenditure in the forest and wood products sector, a	nd proportion of total business R&D expenditure,
2007–08 to 2015–16 (\$ million)	

Sub-sector	2007–08	2008-09	2009–10	2010–11	2011–12	2013–14	2015–16
Forestry and logging	22.0	26.0	37.6	33.2	25.8	21.8	12.9
Wood product manufacturing	51.3	57.1	57.5	62.4	38.2	20.8ª	-
Pulp, paper and converted paper product manufacturing	71.1	53.8	-	-	48.3	43.3	70.1
Total research expenditure in the forest and wood products sector	144.4	136.9	-	-	112.3	85.9	-
Total business expenditure on R&D in Australia	15,047	17,291	16,760	18,007	18,321	18,849	16,659
Proportion of R&D expenditure that is forest and wood products sector R&D expenditure (%)	0.96	0.79	-	-	0.61	0.46	-

-, not available.

<sup>a</sup> Values reported by ABS to have a relative standard error of 25–50% and thus to be used with caution.

Notes:

ABS data collection frequency changed from annual to biennial after the 2011-12 survey.

Totals may not tally due to rounding.

Source: ABS (2015b, 2017e).

🔊 This table, together with other data for Indicator 6.2b, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

<sup>292</sup> These subsectors derive from Australia and New Zealand Industry Classification (ANZIC06) industry subdivision classifications; see ABS (2017e).

<sup>293</sup> ibid

<sup>294</sup> Reported in SOFR 2013.

Business R&D expenditure in the forestry and logging subsector declined by 41.4% over the period 2007–08 to 2015–16, from \$22.0 million to \$12.9 million, while business R&D expenditure in the pulp, paper and converted paper product manufacturing subsector decreased by only 1.4% over the same period, from \$71.1 million to \$70.1 million. Business R&D expenditure in the wood product manufacturing subsector decreased by 59.5% over the period 2007–08 to 2013–14, from \$51.3 million to \$20.8 million (Table 6.34).

## Independent survey data

The ABS data are derived from R&D expenditure data reported by business entities. They 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 (2005, 2011, 2012) 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<sup>295</sup>. A less detailed extension of the same survey (Turner and Lambert 2016) estimated expenditure for the 2012–13 financial year.

'Forestry R&D' was defined by Turner and Lambert as 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 'Forestry R&D' and 'Forest products R&D', 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 \$87.8 million, declining to \$48.1 million in 2012–13 (Figure 6.01). The data also show that, although expenditure on forest R&D (unadjusted for inflation) increased in the period 1981–82 to 2007–08, when adjusted for inflation expenditure declined by 60.8% over the period 1981–82 to 2012–13.



#### Figure 6.22: Expenditure on forestry and forest products R&D, 1981–82 to 2012–13

#### Notes:

Expenditure values do not include expenditure for support, administration and surveys. Adjusted values were adjusted for inflation to 2012–13 prices using the consumer price index (ABS 2017c). Sources: Turner and Lambert (2011, 2016).

The data used to create this figure, together with other data for Indicator 6.2b, are available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

<sup>295</sup> Note that the Turner and Lambert surveys refer to 'forest products' and the ABS surveys refer to 'wood products'. Both terms relate to wood, rather than non-wood, forest products.

## National investment in Research, Development and Extension (RD&E)

The Australian Government invests directly in RD&E in the forestry and wood products sector, and also invests through CSIRO and through providing funding to Forest and Wood Products Australia that matches industry funding. The Australian Government also provides grant funding to universities and other research agencies, a proportion of which is expended on research relevant to the forest and wood products sector.

## State and territory investment in RD&E

Investment in forest management and wood product R&D varies between Australia's states and territories, partly based on the scale of production forestry. The values presented here were supplied by state and territory government agencies.

In Queensland, significant state government investment in R&D continued (as highlighted in Case study 6.3), with almost \$2.5 million invested in 2011–12, and over \$3.6 million invested in 2015–16.

In New South Wales, investment by Forestry Corporation of NSW<sup>296</sup> (FCNSW) increased from over \$1.3 million in 2011–12 to about \$1.7 million in 2015–16. About \$850,000 of the 2015–16 investment was funded from NSW Community Service Obligation (CSO) Grants, and the balance funded from FCNSW revenue.

In South Australia, the South East Forestry Partnership Program (SEFPP) was announced by the state government in November 2012 as a \$27 million fund to stimulate investment in new technologies and equipment by new or existing businesses in the forestry industry in the state's South East. In 2015–16, \$6.5 million of this funding was budgeted to provide milestone payments to funded projects from successive rounds of the SEFPP. In addition to the SEFPP, state government funding for Forestry SA activities in research and development was about \$1.1 million in 2011–12, declining to about \$0.75 million due to many of these activities now being undertaken by OneFortyOne Plantations.

In Tasmania, organisations undertaking research included universities, CSIRO, private forestry companies such as Norske Skog and Forico, the Forest Practices Authority, the Tasmania Fire Service, the Department of Primary Industries, Parks, Water and Environment (DPIPWE), Private Forests Tasmania (PFT), Forestry Tasmania<sup>297</sup>, and other government and private agencies. The state government-funded PFT supports private forest owners and managers through research, business development and extension, and education. PFT expenditure for the period 2011–16 was over \$1.2 million.

In Victoria, investment in R&D by VicForests in 2015–16 was approximately \$161,000.

All states and territories that manage public production forests contribute to R&D through a forest grower's levy, which supports the delivery of programs by Forest and Wood Products Australia.

## Areas of R&D investment

Investment in and adoption of new technologies has taken place across a broad range of areas of activity during the SOFR 2018 reporting period. In a report prepared for the national-level Forest and Wood Products Research, Development and Extension Forum (FWP RD&E Forum), Duff and Kile (2014) estimated the distribution of R&D effort across each of the headline national priorities developed by the FWP RD&E Forum (Table 6.35). Estimates of effort were based on the number of full-time equivalent research scientists in each field, as reported by the 12 largest research provider organisations contributing to forest and wood products RD&E effort in Australia.

Examples of applied research and development focused on industry innovation during the SOFR 2018 reporting period include:

• continued development of commercially valuable genotypes including improved genetics for existing and potential commercial species

Area of activity	Proportion of effort
More volume and value from the existing and expanding estate	43%
Supply chain optimisation and manufacturing productivity	12%
Know, grow and diversify the market	11%
Resource risk management and biosecurity	22%
Environmental and social sustainability	11%

Source: Adapted from Duff and Kile (2014). Note: Totals may not tally due to rounding.

🔊 This table, together with other data for Indicator 6.2b, is available in Microsoft Excel via <u>www.doi.org/10.25814/5bda972cd76d9</u>

<sup>&</sup>lt;sup>296</sup> Until January 2013, Forests NSW.

 $<sup>^{297}\,</sup>$  From July 2017, Sustainable Timber Tasmania.

#### Case study 6.3: Queensland Government research investment and capacity

The Queensland Government has maintained a strong forest and timber research capability, and invests around \$4 million per annum to deliver industry priorities. A further \$5 million per annum is invested by collaborators including Commonwealth bodies, universities and private industry.

Strategic investment in forest and timber industry research, development and extension is guided by the Queensland forest and timber industry research, development and extension framework, which was developed in conjunction with industry in 2014. In addition, the Queensland Government, through the Department of Agriculture and Fisheries<sup>298</sup> (DAF), has initiated the Centre for Future Timber Structures with the University of Queensland. This Centre has expanded the

- development of integrated genotype-by-environment-bymanagement regimes adapted to future growing conditions or new environments and that minimise losses from pests and diseases
- increasing the value recovery from the available forest resources from native and planted forests (e.g. veneer recovery and use, design of engineered wood products, and a range of exploratory studies on biomass utilisation, bioenergy and bio-refinery applications)
- improving the efficiency and reducing the costs of harvesting and transport operations
- development of models to predict and assess impacts of key risks, including changing incidence of pests, and climate change and attendant risks of increased fire incidence, changing rainfall patterns and drought
- contingency and response plans for exotic pest introductions.

## Adoption of new technologies

A voluntary survey of selected wood-processing facilities to establish the total level of capital investment in the timber industry processing sectors was conducted by Zed and Zed (2017), covering the period 2012 to 2017. The four sectors identified were softwood sawmilling, hardwood sawmilling, panel manufacturing, and plywood manufacturing. Survey responses covered 52% of the softwood sawmilling industry, 40% of the hardwood sawmilling industry, 58% of the panels industry and 42% of the plywood industry. A total of \$473 million was invested by the survey respondents over the five-year period. This was extrapolated by Zed and Zed (2017) to an estimated total investment of \$938 million by all four sectors over that period. research effort into use of timber in mid-rise construction with major industry partners such as Arup, LendLease and Hyne, establishing the Australian Research Council Industrial Transformational Research Hub.

The Queensland Government delivers its research through a multidisciplinary forest and timber research group, Forestry and Biosciences RD&E, in DAF. This group concentrates its research investment on the priority areas of managing and improving forest productivity, forest health, and developing new forest products and processing systems.

The research is delivered through collaborative networks with universities and other institutes in Queensland, interstate and overseas, as well as with industry partners to achieve positive outcomes across the industry value chain.

The survey respondents provided information on the key technologies in which they invested and the benefits they sought to achieve from the investment. Capital items included major replacements or upgrades to current plant, as well as investment in new technologies and activities. The survey identified in detail the investment in new technology and the derived benefits.

In the sawmilling sectors, there was a focus on investment in scanning and optimisation technologies to support the drive for higher recovery, increased productivity and increased grade yield. These technology gains have been incorporated in most of the new equipment installed over the past five years (Zed and Zed 2017).

In the panel manufacturing sector, most new technology investments focused on improvements in manufacturing lines, to increase productivity and reduce costs. There was also investment in remanufacturing technologies to develop new product lines.

In the plywood sector, new technologies were adopted to derive a range of benefits, including access to new products and markets, meeting new design standards, reducing labour costs, and improvements to production efficiency.

Examples of recent innovations adopted in forest inventory and wood harvesting are presented in Case study 6.4 and Case study 6.5, respectively.



Sawn Hydrowood-harvested black heart sassafras

#### Case study 6.4: Recent innovations for forest inventory and data capture

In the past, most features within forests, such as tree heights and the location of streams and roads, were mapped using a combination of aerial photographic interpretation and ground-based surveys. However, most of Australia's state and territory forest managers have now turned to airborne and ground-based scanning technology to replace traditional methods of forest mapping in native forests and plantations. These new approaches include 'light detection and ranging' (LiDAR) and digital aerial photogrammetric (AP) sensors mounted on a variety of platforms.

LiDAR equipment can be mounted on light aircraft and, increasingly, on small unmanned aerial vehicles (UAVs) flown over forests. The LiDAR equipment emits highrepetition, short-duration pulses of light directed at the forest, measures the time to the return reflection, and calculates target distance and bearing. Mounting LiDAR sensors on UAVs ('drones') has proven to be a reliable and relatively low-cost alternative to the use of light aircraft, with advantages including significantly reduced capital and operating costs, greater deployability, and potentially higher resolution due to lower operating altitudes (Goodbody et al. 2017).

As a direct sampling tool, LiDAR can capture a range of terrain and forest attributes more rapidly, objectively and cost-effectively than ground-based survey techniques. LiDAR can accurately determine features such as drainage lines, roads and slopes that can be combined into digital elevation maps, and can measure tree and forest heights. Direct applications of LiDAR include determining forest canopy height and cover, forest stand density and basal area, forest growth stage, forest and vegetation classification, vertical and horizontal forest structure, forest fuel characteristics and regeneration success.

Over the last two decades, LiDAR has developed from a research tool to a fully operational assessment tool, and the technique now contributes to many areas of forest management, including forest mapping, topographic mapping, catchment management, reserve planning and mapping, carbon accounting, wood resource assessment, harvest planning, forest health and fuel-load assessment, and monitoring of mechanical harvesting operations and illegal logging activities.

More recently, studies have shown that 3D point clouds derived from digital aerial photogrammetric (AP) data (with one or more cameras on a moving aircraft) can provide a comparable level of accuracy to LiDAR-based approaches. New digital airborne camera systems, advanced image matching algorithms, and increased computing capabilities are available. Acquisition costs of AP data range from one-third to one-half of those of LiDAR (White et al. 2016). Recent trials in radiata pine (*Pinus radiata*) plantations in Tasmania have shown that reliable estimates of recoverable volume, determined compared to data on actual volumes recovered by harvesting machines as a reference, can be obtained using both LiDAR and AP data (Caccamo et al. 2018).



LAStools (lasview) screenshot of 3D point cloud representing trees in 18 research plots. Source: University of South Australia and Forestry SA.

## Case study 6.5: Hydrowood – taking underwater harvesting from an idea to commercialisation

Worldwide, there are an estimated 300 million trees submerged in dams constructed from the 1950s to 1970s for hydro-electric schemes and water storage. This includes the dams used to generate hydro-electric power in Tasmania, with large amounts of forest resource submerged within these dammed lakes and rivers.

When plans were first approved to dam the Pieman River in western Tasmania in 1971, logging was resumed in the area, but only a small portion of the relatively inaccessible forest in the dam's footprint had been logged by the time the area was flooded in 1986. The now flooded area of temperate rainforest includes sought-after specialty timbers such as blackwood (*Acacia melanoxylon*), celerytop pine (*Phyllocladus aspleniifolius*), Tasmanian myrtle (*Nothofagus cunninghamii*), Huon pine (*Lagarostrobos franklinii*) and sassafras (*Atherosperma moschatum*). These timbers are now being extracted by Hydrowood for commercial use.

Hydrowood is one of the world's first underwater forestry operations, and required significant innovation in harvesting technologies, timber processing and marketing. The operation started in November 2015 and now runs seven days every week. The operation employs specialised sonar that enables the location of individual trees and the identification of species, and a specially developed, waterproof harvesting head and boom attached to machinery mounted on a barge. It recovers approximately one load of wood per day from underwater. The wood is sold to customers as a certified product, and chain-ofcustody certification enables the harvest story to be passed along with each log. When processed, the salvaged timber has unique properties that drive high-end timber sales, with particular features unique to wood submerged for long periods of time.



Hydrowood purpose-built, waterproof harvesting head and boom attached to an excavator mounted on a barge.

6.2b

# 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 forests for recreation and tourism.

## Key points

- Most forests in nature conservation reserves and multiple-use public native forests in Australia are available to the general public for recreation or tourism purposes. The total areas of native forest in these tenures are 21.7 million hectares and 9.8 million hectares, respectively. Some public land in other tenure categories may be similarly available.
- Substantial private forest areas are available for recreation and tourism, usually under commercial arrangements. Kakadu National Park in the Northern Territory is an example of reserved forest on private land tenure that is available for recreation and tourism.
- Some forests that are usually available for public recreation and tourism may be closed temporarily, mainly to ensure public safety. This may occur during adverse weather conditions or bushfire, or during times when certain forest management activities are occurring, such as wood harvesting or prescribed fire.
- Public forest areas may also be closed permanently to recreation and tourism if these activities are likely to compromise, or are not compatible with, the objectives of management for these forest areas, especially preservation and scientific reference areas.

## Forests on public land

Most publicly owned forested lands designated for multiple use or nature conservation are available for general recreation and tourism activities. Other tenure categories of public land may also be available. Nationally, 31.5 million hectares of native forest are available for general tourism and recreation across the nature conservation reserves and multiple-use public forest estates (see Table 1.7, Indicator 1.1a), comprising 21.7 million hectares in nature conservation reserve and 9.8 million hectares in multiple-use public forest. Recreation and tourism activities include bushwalking, biking, camping, canoeing, eco-tourism ventures, hiking, hunting, picking berries and fungi, picnicking and horse-riding (see Indicator 6.3b).

Although various outdoor recreation and tourism activities may be undertaken in most public forests, access for some activities, such as hunting, and to some areas is restricted to protect specific scientific, natural, cultural or water supply values (see Case study 7.1). 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, nature conservation areas where preservation is a core objective,



Mt Erica road, near Erica, Victoria; forest roads constructed for management purposes are generally available for public recreation.

some water catchment areas, significant Indigenous cultural heritage sites, and defence training areas.

Forests that are usually 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 controlled events (e.g. car rallies). 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. Forest management plans typically specify the types of visitor and community activities that are permissible and outline the general conditions of use that apply. In forests not subject to forest management plans, the policies of the responsible forest management agency usually indicate the types of recreation and tourism that may take place, and the conditions of use.

The Australian Capital Territory has nearly 16 thousand hectares of multiple-use forest, with 98% of this area available for recreation and tourism. The 2% not available for recreation and tourism consists of the area of pine plantation leased and managed by the Department of Defence. All of the ACT's nature conservation reserves are available for recreation and tourism.

In New South Wales, the Forestry Corporation of NSW<sup>299</sup> manages over 2.1 million hectares of multiple-use forest. Of that area, over 300 thousand hectares of forest is managed for nature conservation purposes and is also available for recreation and tourism. Most areas in nature conservation reserves in New South Wales are also available for recreation and tourism.

In the Northern Territory, most areas in nature conservation reserves are available for recreation and tourism. There are no multiple-use forests in the NT.

In Queensland's public forests, over 3 million hectares of multiple-use forest (in State forests and timber reserves) are available for recreation and tourism. Most areas in nature conservation reserves, including national parks, conservation reserves, resource reserves and forest reserves, are available for recreation and tourism. Areas excluded from recreation and tourism in Queensland include scientific areas of national parks, freehold land, leasehold land, and unallocated state land or other tenures managed by Queensland Parks and Wildlife Service, and land for conservation purposes that are managed by other parties or trusts.

In South Australia, ForestrySA manages approximately 43,500 hectares of multiple-use forest and forest in nature conservation reserves. These forests are all available for recreation and tourism. Most areas in the nature conservation reserve estate are also available for recreation and tourism.

In Tasmania, over 700 thousand hectares of multiple-use forest and over 350 thousand hectares of other publicly managed forest land is available for recreation and tourism. The majority of forested land managed under Tasmania's *National Parks and Reserves Management Act 2002* is also available for recreation and tourism. In Tasmania, recreation and tourism are statutory management objectives for most

<sup>299</sup> Until January 2013, Forests NSW.

reserve classes 'to encourage tourism, recreational use and enjoyment consistent with the conservation of the reserve's natural and cultural values'.

Victoria has over 3 million hectares of multiple-use forest, with 99% of this area available for recreation and tourism. Most areas in nature conservation reserves are also available for recreation and tourism.

In Western Australia, over 600 thousand hectares of multipleuse forest and over 750 thousand hectares of forest in nature conservation reserves are available for recreation and tourism within the area covered by the South West Western Australia Regional Forest Agreement.

## Forests on private and leasehold land

Public access for recreation and tourism to forests on private land is generally restricted or not permitted, although little information is available about actual permitted uses. If access is required, it would be on application to the private landowner or manager for permission to undertake particular activities, unless specific commercial arrangements are advertised (e.g. a wildlife park). The same applies for forests on leasehold land, most of which is privately managed under long-term pastoral leases that grant the lessee rights of custody of the land — these leases impart a level of responsibility for the management of the land.

Of the 88.8 million hectares of forest on private and leasehold land (Indicator 1.1a), around 11.5 million hectares (13%) is in the National Reserve System (Indicator 1.1c). The Northern Territory contains more than 5.6 million hectares of reserved private or leasehold land, including reserved Indigenous land, and Queensland has more than 4.3 million hectares. Much of that land is available for recreation and tourism, including Kakadu National Park, which is an example of private land leased to the Australian Government for management of its nature conservation values under national park tenure.

In Tasmania, for two private land reserve types (private sanctuaries and private nature reserves) with a combined area of forest of about 14 thousand hectares, public access is at the discretion of the owner.



Bushwalkers, Casuarina Coastal Reserve, Northern Territory.

6.3a

# 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 recreation and tourism activities can be undertaken on forested land in Australia. There is considerable and increasing demand for recreation and tourism in public forested areas, including national parks, state forests and pine plantations.
- Tourism Australia data indicate that an annual average of 4.2 million people visited major forested tourism regions for bushwalking in the period 2011–12 to 2015–16, with 10% of these visitors identifying as international visitors. The proportion of international visitors to major forested tourism regions is especially high in northern Australia.
- This indicator also presents data on recreational facilities and visitor activities in public forests in the Australian Capital Territory, New South Wales, Queensland, South Australia, Tasmania and Victoria over the period 2011–12 and 2015–16
  - The increasing number of recreation and tourism facilities in public forests indicates considerable ongoing investment in providing for forest recreation and tourism.

This indicator reports the use of forests for a range of recreation and tourism activities, and the numbers of recreation and tourism facilities available for public use. Some facilities, such as walking or riding tracks, picnic sites and campgrounds, are provided solely for recreation or tourism activities. Other facilities, such as roads and vehicular tracks, are provided for a range of forest management purposes but are also available for use for recreation and tourism activities. In each state and territory, public forest management aims to provide a range of opportunities for recreational pursuits (such as walking, running, cycling, driving, climbing, fishing, camping, canoeing, and water sports) consistent with demand, resources, environmental concerns and management intent, as well as facilities appropriate for each forest setting.

## 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. Greater restrictions on recreation and tourism activities are usually imposed in nature conservation reserves, because nature conservation is the higher management priority. Restrictions in nature conservation reserves typically include limits to the number of camping sites and access for trail-bike and horse riding; hunting and use of dogs is usually discouraged or not permitted in national parks. Many commercial plantations are also available for recreation and tourism activities.

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 some facilities in national parks, are accessed via an entrance gate with an entrance fee, and fees can be charged for overnight camping, with registration required to access popular camping sites and multi-day hiking trails. A proportion of these fees generally goes towards the ongoing maintenance of facilities and park management. Organised events and eco-tourism activities in state forests and national parks are administered by permit (or licence) systems, and there is typically an associated fee.

In 2015–16, Forestry Corporation of NSW<sup>300</sup> (FCNSW) as a State-owned corporation, spent \$3.7 million on recreation and tourism services from an annual Community Services Obligation grant of \$16 million from the NSW Government,

<sup>&</sup>lt;sup>300</sup> Until January 2013, Forests NSW.

the grant recognising that a comparable privately owned commercial forestry business would not be expected to provide those services. FCNSW also spends additional funds on the management of recreation and tourism sites in multiple-use public forests.

### Numbers of visitors

Visitor numbers in some public forests (mainly national parks and other reserves) are monitored regularly by a mixture of counts, estimates by management agency staff, and on-site surveys. Count data are based on entry fees, traffic counters and camping permits, and are relatively accurate ways to monitor use.

Use of unmonitored forests is difficult to measure because there can be many entry points, and visitors are widely dispersed. Use can also vary according to the day of the week and the season, and increases greatly during school holidays. Sites that are well signposted and promoted are visited more frequently than lesser known sites, where use depends more on local knowledge and personal experience. Because of the free access to state forests, and the many entrance points, data on use are generally not collected. However, data are collected for some locations, such as Cumberland State Forest in Sydney's north-west, which attracts more than 100,000 visitors per year.

#### National

Tourism Australia undertakes questionnaire-based surveys asking Australians and visitors to Australia about their trips and activities. The numbers of bushwalkers identified in these surveys are summarised in Table 6.36 for selected Tourism Australia National Landscapes regions for which forests are a likely component of their attraction as bushwalking destinations. The Tourism Australia data indicate that an annual average of 4.2 million visitors visit the major forested tourism regions for bushwalking, with 10% of these visitors identifying as international visitors.

The Greater Blue Mountains was the most popular destination for bushwalkers, perhaps because they are close to Sydney. Tasmania was the most popular for overnight visits, but the Australian Alps and south-west Western Australia received only slightly fewer overnight visitors. The proportion of international visitors is especially high in northern Australia.

#### States and territories

In the Australian Capital Territory, Namadgi National Park is the largest and mostly frequently visited nature conservation reserve, with camping and bushwalking the main forms of recreation in the park. There is difficulty in reporting recreational visitation in the park is due to the size, remoteness, area of use available to visitors, and the park's position on a through road, with many vehicles passing through but not stopping to visit the park.

The ACT's pine plantations are also extensively used and managed for recreational activities including walking, jogging, horse riding, cycling, camping, picnicking, fishing, musical events and car rallies. Visitor use in the plantation estate is now equal to the number of visitors to the ACT nature conservation reserves due to their close proximity to Canberra, the substantial high quality road and trail infrastructure, and the investment made in forest management.

Some of the recreation facilities available in public forests in the ACT are shown in Table 6.37. Usage of these facilities each year during the SOFR 2018 reporting period was estimated at about 4000 to 5000 people cycling, over 100,000 people walking or running, 14,000 to 18,000 people attending events, and over 200,000 people picnicking and playing.

#### Table 6.36: Bushwalking visitors to major forested tourism regions

	Annual average numbers of bushwalkers ('000)° 2011–12 to 2015–16			
National Landscape	National visitors, overnight trips	National visitors, day trips	International visitors	Total
Australian Alps, NSW and Victoria	424	199	14	637
Coastal East Gippsland, Victoria	130	n.d.	16	146
Greater Blue Mountains, NSW	350	791	60	1,201
South-west Western Australia	391	116	49	556
Northern NSW and south-east Queensland	196	283	122	601
Tasmania	467	302	93	862
Top End, Northern Territory	62	n.d.	36	98
Wet Tropics, north Queensland	80	n.d.	20	100
Total selected regions	2,100	1,691	410	4,201

n.d., no data reported due to inadequate sample size.

<sup>a</sup> Derived from survey data based on Tourism Australia's National Landscapes.

Source: Tourism Research Australia, Australian Trade and Investment Commission.

🔊 This table, together with other data for Indicator 6.3b, is available in Microsoft Excel via <u>www.doi.org/10.25814/5bda972cd76d9</u>

6.3b

#### Table 6.37: Recreational facilities in public forests in the Australian Capital Territory, 2011–12 and 2015–16

			Number
Activity	Measure	2011–12	2015–16
Riding or walking animals	kilometres of tracks	70	70
Cyclingª	kilometres of tracks	267	267
Driving	kilometres of roads	-	1,433
Walking or running <sup>b</sup>	kilometres of tracks	224	239
Climbing	number of documented sites	2	2
Cultural heritage appreciation	number of managed sites	3	2
Events <sup>c</sup>	number of events	92	128
Camping	number of sites	7	7
Picnicking and playing	number of sites	23	23

-, data not available

<sup>a</sup> For multiple-use forest only; no data available for nature conservation reserves. Includes mountain bike-only tracks (101 km) and motocross tracks (56 km) in pine plantations. The mountain bike tracks are not accessible to motorbikes but mountain bikes can access the motocross tracks. This figure excludes roads and fire trails, but they are also accessible to mountain bikes.

<sup>b</sup> Tracks are specific for walking or running, but most mountain bike tracks and roads are also accessible for walking or running.

<sup>c</sup> Approved events only.

Note: values may include some non-forest sites.

🔊 This table, together with other data for Indicator 6.3b, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

#### Table 6.38: Use of nature conservation reserves for recreation and tourism activities on land managed by New South Wales National Parks and Wildlife Service, 2011–12 and 2015–16

	Number	of visitors (millions)
Activity	2011–12	2015–16
Riding or walking animals	n.d.	0.5
Cycling	1.4	1.9
Driving (includes motorbikes)	0.7	1.4
Walking or running	17.3	23.5
Climbing, caving and canyoning	1.0	1.0
Enjoyment and appreciation of nature	1.0	1.4
Camping (includes roofed accommodation)	1.7	2.9
Picnicking and playing	6.2	6.7
Snow activities	0.7	1.0
Water-based recreation	6.2	9.6

n.d., no data reported due to inadequate sample size.

Source: NSW National Parks and Wildlife Service, Office of Environment and Heritage; derived from commissioned market research, and park visitation data; data are for all nature conservation reserves managed by the NSW National Parks and Wildlife Service and therefore include use of non-forested areas.

🔊 This table, together with other data for Indicator 6.3b, is available in Microsoft Excel via <u>www.doi.org/10.25814/5bda972cd76d9</u>

In New South Wales, the National Parks and Wildlife Service surveys the use of nature conservation reserves for recreation and tourism activities, and collects park visitation data (Table 6.38). Bush-walking and running are the most popular activities, followed by picnicking and water-based activities. The number of visits to nature conservation reserves increased by about 40% over the SOFR 2018 reporting period.

FCNSW estimated that there were 28 million recreational visitors to NSW state forests during 2015–16. FCNSW managed and maintained more than 150 designated visitor sites (FCNSW 2016d), winning tourism awards for developments at five of these sites during the SOFR 2018 reporting period. One of these sites is illustrated in Case study 6.7.

In the Northern Territory, very little land is available for general recreation and tourism outside of nature conservation reserves. Permission is required to visit all private land (Indigenous freehold land and other freehold land, with the exception of Kakadu National Park) and pastoral leasehold land. Permission to visit Indigenous land is provided on request in most instances, but no member of the public is permitted to visit such areas unannounced. Annual visitor numbers to Kakadu National Park and Arnhem Land, which contain extensive forest areas, have increased over the SOFR 2018 reporting period, and average 222,000 between 2015 and 2017, and include international and Australian visitors (Tourism NT 2016, 2017).

#### Case study 6.6: Kowen Forest

Kowen Forest, at the eastern edge of the Australian Capital Territory, comprises 4,700 hectares of pine plantations interspersed with native forest. While being managed for commercial softwood sawlog production, it is also in high demand for recreational activities. Frequent activities include four-wheel drive rallying and driver training, mountain-bike (Figure 6.23) and motor-bike training and racing, mountain-bike orienteering, foot orienteering, rogaining, sled-dog racing, horse riding, camping, and training of military, emergency services and police personnel. These activities add a layer of complexity to management of the plantation for commercial timber production. Community relations issues can arise, for example, when maturing plantation blocks that have been used for bike riding for years become due for clearfelling and re-establishment.

Based on applications for access permits to Kowen Forest and other pine plantations in the ACT, the estimated average number of people participating in these activities in the SOFR 2018 reporting period was 8,600 per year. Considerable numbers of people also undertake activities in Kowen Forest for which permits are not required.

#### Figure 6.23: Mountain bike trail, Kowen Forest



6.3b

#### Case study 6.7: Forest Sky Pier, Orara East State Forest

Forestry Corporation of New South Wales won five awards for forest recreation and tourism facilities during the SOFR 2018 reporting period, including for developing the 21-metre timber and steel 'Forest Sky Pier' at Bruxner Park Flora Reserve in the Orara East State Forest, near Coffs Harbour. Forest Sky Pier is located at Sealey Lookout, one of the best vantage points for viewing the Coffs Harbour's coastline (Figure 6.24). The lookout, the associated network of walking tracks through the forest, and picnic facilities attract more than 150,000 visitors a year.

#### Figure 6.24: Forest Sky Pier, Orara East State Forest



In Queensland, land managed by Queensland Parks and Wildlife Service (QPWS) includes multiple-use forest and nature conservation reserves. Some recreational activities available on land managed by QPWS are shown in Table 6.39. Activities shown, other than camping, have free access and are not monitored. There were over 1 million overnight campers on land managed by QPWS in 2011–12, rising to over 1.5 million in 2015–16. Hunting activities are not available on Queensland's public lands, they are restricted to private and leasehold lands only.

In South Australia, community use of forest reserves, including native forest reserves, managed by ForestrySA is a high management priority, especially in the Mount Lofty Ranges close to the Adelaide metropolitan area. During the 2015–16 financial year, 152 events were held in the Mount Lofty Ranges forest reserves. These attracted approximately 14,900 people participating in a variety of recreational and or educational activities including school, scout and university programs, motorsport competitions, mountain-biking, horse endurance rides, sled-dog racing, orienteering, defence training, filming and photography. Recorded visitors to all ForestrySA forest reserves for 2015–16 totalled 119,727, excluding regular activities where permits are not allocated (ForestrySA 2016).

The number of facilities provided for recreation in South Australian state forests, including pine plantations, and in parks and reserves managed by ForestrySA, are shown in Table 6.40. These numbers have not changed significantly over the SOFR 2018 reporting period.

In Tasmania, bush-walking, mountain-bike riding, climbing, abseiling, caving, nature observation, photography, swimming and other recreational activities take place in state forests, national parks and other reserves. Hunting is allowed by permit in some areas of state forests and on some reserves (game reserves, conservation areas and regional reserves). Visitor numbers to parks and reserves are monitored

#### Table 6.39: Recreational facilities in public forests in Queensland, 2015–16

Activity	Measure	Value
Cycling	kilometres of tracks	170
Driving	kilometres of roads	33,376
Walking or running	kilometres of tracks	2135
Climbing	number of documented sites	103
Events <sup>a</sup>	number of events	99
Camping	number of sites	460
Picnicking and playing	number of sites	208

Note: Values are for Queensland Parks and Wildlife Service managed lands only, and may include some non-forest sites, though most are in forest settings. <sup>a</sup> Includes 16 commercial and 83 non-commercial events/festivals, for which permits were issued. The non-commercial events occurred primarily on conservation reserves and consisted of military, horse riding club, cycling, motor vehicle, and nature study activities.

🔊 This table, together with other data for Indicator 6.3b, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

#### Table 6.40: Visitor activity and facilities in land managed by ForestrySA, 2015–16

Activity	Measure	Value
Riding or walking animals	Parks available for riding	9
	Parks available for walking dogs	21
	Tracks on land managed by ForestrySA	75%
Cycling	Parks	9
	Cycling tracks on land managed by ForestrySA	All
Walking or running	Tracks in the network managed by ForestrySA	All
Climbing	Sites	4
Cultural heritage appreciation	Sites	4
Events or festivals	Events	163
Hunting	Game reserves	10
Camping	Camping areas	5
	Camp sites	94
Picnicking and playing	Parks and forests	All
Huts, houses	ForestrySA accommodation sites	9

#### Source: ForestrySA.

🔊 This table, together with other data for Indicator 6.3b, is available in Microsoft Excel via <u>www.doi.org/10.25814/5bda972cd76d9</u>

periodically and have increased by an average of 40% over the SOFR 2018 reporting period. Table 6.41 shows visitor numbers to selected forested national parks and reserves in Tasmania.

The Tahune AirWalk, located in state forest in southern Tasmania, continues to be one of the state's leading tourism attractions, receiving 75,000 visitors in 2015–16 (Forestry Tasmania 2016a).

Several major investments in the development of recreation and tourism facilities in forested areas were also completed in Tasmania in the SOFR 2018 reporting period. These include:

- Three Capes walking track, Tasman National Park, opened in late 2015
- Pumphouse Point Lodge, opened at Lake St Clair within the Tasmanian Wilderness World Heritage Area
- Blue Derby mountain-bike trail project, an 80 kilometre network of trails near Derby and within the adjacent Blue Tier Forest Reserve.

In Victoria, in the absence of visitor or use data specific to Victorian forests, the number of facilities provided for recreation activities in state forests can be used as a guide to the demand for various activities on that tenure (Table 6.42). Except for roads promoted as touring routes, the numbers of all facilities increased by an average of 9% in the SOFR 2018 reporting period. Notable increases were in tracks for dog walking and horse riding and in sites promoted for fishing.

In Western Australia, the area covered by the WA *Forest Management Plan 2014–2023* (CCWA 2013) provides important opportunities to meet the growing public demand for outdoor recreation and nature-based tourism in the southwest of WA. Some plantation areas are also important for recreation, with the use of public plantations for recreation being generally promoted. A wide variety of activities are available in the south-west forests of WA, including picnicking, bushwalking, cycling, camping, swimming, fishing and canoeing. There are also two gazetted off-road vehicle areas within pine plantations north of Perth. On occasions, areas covered by the management plan are also used for activities such as organised car rallies and adventure racing.

#### Table 6.41: Visitors to selected parks and reserves, Tasmania

	Number	Number of visitors ('000)	
Location	2010–11	2015–16	
Freycinet	200	272	
Cradle Mountain	162	228	
Mount Field	105	189	
Tasman Arch (Tasman Peninsula)	n.a.	164	
Lake St Clair	75	94	
Narawntapu (Western entrance)	41	46	
Hastings Caves and Thermal Pool	37	46	
Maria Island	8	23	

n.a., not available

Note: The locations listed are a selection of over 800 parks and reserves managed by the Parks and Wildlife Service, Tasmania. The Parks and Wildlife Service monitors a sample of parks and reserves to detect general visitor trends, including forested and non-forested areas. Source: Parks and Wildlife Service, Tasmania, cited in FPA (2012, 2017a).

🦻 This table, together with other data for Indicator 6.3b, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

#### Table 6.42: Visitor activity and facilities in state forests, Victoria, 2011–12 and 2015–16

			Value
Activity	Measure	2011–12	2015–16
Riding or walking animals	kilometres of tracks	40	96
Cycling	kilometres of tracks	320	364
Driving	kilometres of roads <sup>a</sup>	712	620
Walking or running	kilometres of tracks	761	745
Cultural heritage appreciation	number of managed sites	42	58
Events	number of events	152	195
Fishing	number of managed sites <sup>b</sup>	33	54
Camping	number of sites	240	256
Picnicking and playing	number of sites	250	267

<sup>a</sup> Refers to roads promoted as scenic drives, 4WD and trail bike touring routes; this is a small proportion of the total length of roads in state forests that can be used for recreation access. A corrected figure is included for 2011–12.

<sup>b</sup> Sites specifically promoted for fishing.

Source: Department of Environment, Land, Water and Planning, Victoria.

This table, together with other data for Indicator 6.3b, is available in Microsoft Excel via <u>www.doi.org/10.25814/5bda972cd76d9</u>

Recreation and tourism assets in the south-west forests of WA that provide an important basis for some tourism and recreation businesses include the Valley of the Giants and Tree Top Walk, the Bibbulmun Track and Munda Biddi Trail. Visitation to areas covered by the management plan reached 7.1 million visits in 2012–2013, which was 2.3 million visits (48%) more than in 2003–2004 (CCWA 2013).



Forest paths provided for walking, running and bicycle riding. Tuart forest near Bunbury, Western Australia.

# 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

- Australia's Indigenous land estate can be broadly divided into four land ownership and management categories: Indigenous owned and managed, Indigenous managed, Indigenous co-managed and Other special rights.
- In 2016, there were 438 million hectares of land in the Indigenous land estate. Of this, 69.5 million hectares was forested, corresponding to 52% of Australia's total forest area.
  - The Indigenous forest estate comprises 18.0 million hectares of Indigenous owned and managed forest,
     4.9 million hectares of Indigenous managed forest,
     5.7 million hectares of Indigenous co-managed forest, and 40.9 million hectares of forest under Other special rights (including native title determinations and Indigenous Land Use Agreements).
  - The 69.5 million hectares in the Indigenous forest estate as at 2016 represents an increase of 28.5 million hectares over the updated figure for 2011 reported by ABARES<sup>301</sup>. The increase has been driven primarily by an increase in the area of land over which Indigenous people have Other special rights.

- Of the 69.5 million hectares of the Indigenous forest estate, 47.8 million hectares (69%) is in Queensland and the Northern Territory. Since 2011, the largest increases in the area of forest in the Indigenous estate have been in the Northern Territory, Queensland and Western Australia.
- Indigenous heritage sites are widespread across Australia. In 2016, there were an estimated 126 thousand registered Indigenous sites within forest.
  - The total area of forest in Indigenous heritage sites is difficult to estimate, due to the sensitivity and limited availability of spatial data.
  - Data from jurisdictional heritage registers indicate that, excluding the Australian Capital Territory and Victoria, there were 1.8 million hectares of forest in registered Indigenous heritage sites in 2016.

<sup>&</sup>lt;sup>301</sup> The area figure for 2011 reported in SOFR 2013 was updated by ABARES in Dillon et al (2015)

This indicator presents data as at 2016 on the area of land over which Indigenous peoples and communities have ownership, management or rights of use. Only Indigenous community land is included, not land owned or managed by individuals. Detailed descriptions of each land category and its importance to Indigenous peoples, as well as its history and usage, are given in Indicator 6.4c, together with examples of engagement with forest management and use. The term Indigenous is used throughout the SOFR series to encompass all Aboriginal and Torres Strait Islander peoples; where the information provided relates to a particular people, that traditional owner group is named.

### Indigenous land access, management or ownership

For reporting purposes, the information collected on Indigenous land has been grouped into four categories (Dillon et al. 2015):

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, registered Indigenous Land Use Agreements and legislated special cultural use provisions. 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 the use of areas for cultural purposes (e.g. within protected water supply catchment areas), or can provide a legal requirement for consultation with the local Indigenous community before any major development activities take place.

A land parcel may be subject to more than one type of management. For this indicator, land is classified into the highest-ranked Indigenous land ownership and management category that is applicable (Dillon et al. 2015). For example, a land parcel that is subject to a native title determination, but that is also Indigenous owned and managed as a declared Indigenous Protected Area, is reported here as Indigenous owned and managed.

The amount of Indigenous land information accessible through government agencies at the national and state and territory levels is progressively increasing. There has also been a significant increase in the area of land under formal arrangements through which Indigenous people have rights to manage land and to protect their special values. Table 6.43 provides a list of the datasets collected for SOFR 2018; more detailed descriptions of each land category and its importance to Indigenous people, history and usage are given in Indicator 6.4c. As far as possible, data collated for this Indicator were current as at June 2016. The Database of Legal Indigenous Land Interests (held by the Indigenous Land Corporation), from which some data was drawn for SOFR 2013, was not used in SOFR 2018, as additional and up-to-date datasets were obtained from source agencies.

In all jurisdictions, government agencies responsible for the management of nature conservation reserves and other areas can consult informally with Indigenous community groups and representatives as part of normal operations. Consultation with community groups, including Indigenous people, can improve relations between these agencies and local communities, and lead to a range of positive outcomes for agencies, community groups and the environment. Informal arrangements (ad-hoc and non-ongoing consultation) are not included as Indigenous co-management arrangements in the data presented in this indicator.

In 2016, the national Indigenous estate contained 438 million hectares of land, of which 69.5 million hectares was forested (Table 6.44). This is 52% of Australia's total forest area. Of the 69.5 million hectares of forested land in the Indigenous estate, 47.8 million hectares (69%) is in Queensland and the Northern Territory. The proportion of forested land that is in an Indigenous land category varies from 15% in New South Wales, to 79% in the Northern Territory.

The 69.5 million hectares of Indigenous forested land comprises 18.0 million hectares of forested land that is Indigenous owned and managed, 4.9 million hectares of forested land that is Indigenous managed, 5.7 million hectares of forested land that has Indigenous co-management arrangements in place with government agencies, and 40.9 million hectares of forested land over which Other special rights apply (including native title determinations and Indigenous Land Use Agreements). Figure 6.25 shows the geographic distribution of the Indigenous forest estate across Australia.

Data for Indigenous land and forest areas as at 2011 were initially reported in SOFR 2013; subsequently, updated data were published in the *Australia's Indigenous forest estate* (2013) v2.0 spatial dataset and in the Dillon et al. (2015) report that described development of the spatial dataset. Dillon et al. (2015) reported that, as at 2011, there were a total of 306 million hectares of land in Australia's Indigenous estate, of which 41.1 million hectares was forested (13% of Australia's total forest area). The total area of forest reported on Indigenous land has therefore increased by 28.5 million hectares over the period 2011 to 2016.

#### Table 6.43: Datasets compiled on lands over which Indigenous people have use and rights

Title	Year of currency	Source agency* and data availability
Indigenous owned and managed		
Indigenous Protected Areas <sup>302</sup>	2016	DoEE; available at <u>www.environment.gov.au/fed/catalog/main/home.page</u> through Find Environmental Data <sup>303</sup> . See also <u>www.dpmc.gov.au/indigenous-affairs/</u> <u>environment/indigenous-protected-areas-ipas</u>
Indigenous Land Corporation owned and transferred	2016	Indigenous Land Corporation ( <u>www.ilc.gov.au/Home/What-We-Do/Land-Purchased)</u>
NSW Aboriginal Land Council and Local Aboriginal Land Council (LALC) lands	2016	NSW Land and Property Information <sup>a</sup> ( <u>www.nswlrs.com.au/</u> ). Obtained following consultation with NSW Aboriginal Land Council.
Northern Territory Aboriginal Lands Trust lands	2016	Northern Territory Department of Infrastructure, Planning and Logistics <sup>b</sup> ( <u>transport.</u> <u>nt.gov.au/</u> )
Queensland Deed of Grant in Trust	2017	Queensland Department of Natural Resources, Mines and Energy ( <u>dds.information.</u> <u>qld.gov.au/dds/; www.dnrm.qld.gov.au/</u> )
Queensland Aboriginal and Torres Strait Islander land trusts	2017	Queensland Department of Natural Resources, Mines and Energy ( <u>dds.information.</u> <u>qld.gov.au/dds/; www.dnrm.qld.gov.au/</u> )
SA Aboriginal Land Trust and Indigenous community freehold	2016	SA Land Services Group ( <u>www.sa.gov.au/topics/planning-and-property/land-</u> services). Obtained following consultation with SA Aboriginal Land Trust.
Tasmanian Aboriginal Land Trust lands	2016	Aboriginal Land Council of Tasmania ( <u>www.ourcommunity.com.au/directories/</u> listing?id=44088)
Victorian Traditional Owner Settlement agreements	2016	Department of Environment, Land, Water and Planning ( <u>www.propertyandlandtitles.</u> <u>vic.gov.au/</u> )
Victorian Indigenous community freehold (under various Aboriginal Land Acts)	2016	Department of Environment, Land, Water and Planning (obtained from National Native Title Tribunal)
Indigenous managed		
Leased-back nature reserves	2016	State and territory government conservation agencies; DoEE (Collaborative Australian Protected Area Database 2016, available through the Find Environmental Data website <u>www.environment.gov.au/about-us/environmental-information-data/</u> <u>databases-applications</u> ) <sup>304</sup>
Leasehold lands associated with ILUAs	2016	Indigenous Land Use Agreement summaries on National Native Title Tribunal register; internet research (partial dataset only)
South Australia Indigenous community leases	2016	SA Land Services Group ( <u>www.sa.gov.au/topics/planning-and-property/land-</u> services). Obtained following consultation with SA Aboriginal Land Trust.
Western Australian Aboriginal Lands Trust	2016	Western Australia Department of Aboriginal Affairs ( <u>www.daa.wa.gov.au</u> )
Western Australian Indigenous pastoral leases	2016	Western Australia Land Information Authority, trading as Landgate ( <u>www0.landgate.wa.gov.au</u> /)
Indigenous co-managed		
Nature conservation reserve memoranda of understanding or advisory committees	2014-2016	State and territory government conservation agencies; DoEE (Collaborative Australian Protected Area Database 2016, available through the Find Environmental Data website www.environment.gov.au/about-us/environmental-information-data/ databases-applications)
Nature conservation reserves plans of management	Mainly 2013–2016	State and territory government conservation agency websites; DoEE (Collaborative Australian Protected Area Database 2016, available through the Find Environmental Data website www.environment.gov.au/about-us/environmental-information-data/ databases-applications)
World Heritage Area memoranda of understanding or advisory committees	2016	State and territory government conservation agencies; DoEE (Australian World Heritage Areas dataset, available at Find Environmental Data website www.environment.gov.au/about-us/environmental-information-data/databases- applications) <sup>305</sup>
Other special rights		
Native title determinations <sup>306</sup>	2016	National Native Title Tribunal (NNTT) ( <u>www.nntt.gov.au/assistance/Geospatial/</u> Pages/DataDownload.aspx)
Indigenous Land Use Agreements	2016	National Native Title Tribunal (NNTT) ( <u>www.nntt.gov.au/assistance/Geospatial/</u> Pages/DataDownload.aspx)
NSW Aboriginal Areas	2016	NSW Office of Environment and Heritage (Department of Planning and Environment) (datasets.seed.nsw.gov.au/dataset/nsw-national-parks-and-wildlife-service-npws- estate3f9e7)
Western Australia national parks and reserves with customary use provisions (CALM Act 1984, as amended 2012)	2016	Western Australia Department of Parks and Wildlife
Drinking water catchments with legislated Indigenous rights for cultural use	2016	Western Australia Department of Water <sup>c</sup> ( <u>www.dwer.wa.gov.au</u> ); Melbourne Water (Yarra Tributaries Forest Reserve only; <u>www.melbournewater.com.au</u> )

DoEE, Australian Government Department of the Environment and Energy.

\* Agency from which data obtained in 2017, and agency name at that time. Web URLs are current at time of SOFR 2018 publication.

<sup>a</sup> From 1 December 2017, the NSW Land Registry Services.

<sup>b</sup> Established 12 September 2016. Previously the Department of Infrastructure, Planning and Environment.

<sup>c</sup> From 1 July 2017, Department of Water and Environmental Regulation.

Source: ABARES.

6.4a

There are three major drivers for this change in area of forest in the Indigenous estate over the period 2011 to 2016:

- · addition of further land to the Indigenous land estate
- an increase in the reported area of forest in the Northern Territory (see Indicator 1.1a). Of the additional 8.5 million hectares of forest mapped in the Northern Territory, 8.3 million hectares occurs within the Indigenous estate, mostly in the categories 'Other special rights' and 'Indigenous owned and managed'
- improved availability and accessibility of information on Indigenous land from Australian and state and territory government agencies, and incorporation by ABARES of additional types of Indigenous land data (Table 6.43). This has also increased the accuracy of the compiled dataset on the Indigenous estate.

The largest increase in the area of land, and the area of forest, in the Indigenous estate over the period 2011 to 2016 has been in the 'Other special rights' category.

Additional information about the areas of individual Indigenous forest ownership and management categories, and the underpinning datasets, is provided in Indicator 6.4c.

## Indigenous heritage protection

Indigenous cultural heritage comprises objects, sites and places of cultural value to Aboriginal and Torres Strait Islander peoples, including middens, artefacts, painting sites, gathering places, cultural dreaming places, burial sites, and sites of more recent historical significance. Aboriginal objects are items such as stone artefacts, grinding grooves, scarred or carved trees, stone tools and other created objects like baskets and necklaces. The process of learning, remembering, recording and potentially registering cultural heritage is important for maintaining and renewing Indigenous connection to land and culture, and also for non-Indigenous awareness and understanding of Indigenous cultural heritage. Case study 6.15 and Case study 6.16 (Indicator 6.5d) give

- <sup>303</sup> IPA dataset available at www.environment.gov.au/fed/catalog/search/ resource/details.page?uuid=%7BC64658F0-95AD-4209-8D1E-F94BD0A4E827%7D
- <sup>304</sup> CAPAD dataset available at www.environment.gov.au/fed/catalog/ search/resource/details.page?uuid=%7B4448CACD-9DA8-43D1-A48F-48149FD5FCFD%7D
- <sup>305</sup> WHA dataset available at <u>www.environment.gov.au/fed/catalog/search/</u> resource/details.page?uuid=%7B6C54FE6C-2773-47C6-8CBC-<u>4722F29081EF%7D</u>
- <sup>306</sup> A native title determination recognises, under Australian law, the traditional rights and interests to land and waters of Aboriginal and Torres Strait Islander people. Native title can be exclusive or nonexclusive, Exclusive native title determinations allow native title holders to control access to land. Both exclusive and non-exclusive native title are included in the 'Other special rights' category unless the land has been transferred to Indigenous ownership through jurisdictional legislation.
- <sup>307</sup> Amended and re-named as the *Aboriginal Heritage Act 1975* on 16 August 2017.
- <sup>308</sup> Updated to Heritage Act 2017 in March 2017.

examples of Aboriginal cultural heritage assessment and management within forests.

The Commonwealth, state and territory laws that protect Indigenous cultural heritage afford protection to all Indigenous cultural heritage sites, including those situated in forests. The legislation comprises 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)<sup>307</sup>
- Aboriginal Heritage Act 2006 (Victoria) and Aboriginal Heritage Amendment Act 2016 (Victoria)
- Heritage Act 1995 (Victoria)<sup>308</sup>
- Aboriginal Heritage Act 1972 (Western Australia).

All states and territories also have regulations, codes of practice and management prescriptions that govern the management of Indigenous heritage sites, including within forests. These instruments provide a level of protection for Indigenous heritage sites by minimising damage or disturbance to the sites, by imposing penalties for significant impacts, and by requiring prior consultation with the relevant Aboriginal heritage body or council regarding actions that might affect the site. Table 6.45 lists the Indigenous heritage registers and the key organisations responsible for Indigenous heritage protection in each state and territory.

Indigenous heritage sites are widespread across Australia. They can be difficult to find within forest due to the canopy cover and understorey, and limited ground visibility and access. Registration of sites is an ongoing process and new sites are added to registers after they have been found, assessed and verified. The term 'sites' is used to encompass heritage sites, objects and places (Table 6.46).

In 2016, there were 126 thousand registered Indigenous sites (including places and objects) within forest (Table 6.46). There are many more such sites that have not been registered for cultural reasons or due to insufficient resources. Indigenous heritage sites are generally protected irrespective of their registration status.

<sup>&</sup>lt;sup>302</sup> Most but not all Indigenous Protected Areas are on Indigenous freehold land.

Management	Land				Ar	ea ('000 hec	tares)			
category	cover type	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Australia
Indigenous	All	0	342	61,747	6,294	20,070	69	10	35,785	124,317
owned and managed	Forest	0	134	11,490	4,847	253	11	4	1,250	17,989
Indigenous	All	0	207	4,270	3,160	2,893	0	103	16,817	27,450
managed	Forest	0	42	1,726	2,537	16	0	82	503	4,907
Indigenous	All	107	3,066	152	1,529	12,204	1,555	327	3,357	22,297
co-managed	Forest	100	2,274	55	1,006	638	863	255	539	5,731
Other special	All	0	1,247	37,383	75,904	43,916	0	8,138	97,027	263,615
rights	Forest	0	578	5,421	20,707	1,267	0	2,647	10,295	40,916
Total Indigenous	All	107	4,862	103,551	86,887	79,083	1,624	8,579	152,985	437,678
estate	Forest	100	3,029	18,693	29,097	2,175	874	2,988	12,587	69,543
Total forest in j	urisdictiona	142	20,368	23,735	51,830	5,060	3,699	8,222	20,981	134,037
Proportion of to that is forest of Indigenous est	otal forest n the ate	71%	15%	79%	56%	43%	24%	36%	60%	52%

#### Table 6.44: Area of land and forest in the Indigenous estate, by Indigenous land ownership and management categories

<sup>a</sup> From Indicator 1.1a.

Note: Totals may not tally due to rounding.

Source: ABARES.

🔊 This table, together with other data for Indicator 6.4a, is available in Microsoft Excel via <u>www.doi.org/10.25814/5bda972cd76d9</u>

#### Table 6.45: Indigenous heritage registers in each jurisdiction, and requirements for consultation

Jurisdiction	Name of heritage register	Department that hosts the register	Authorised heritage bodies and Aboriginal groups with which consultation is mandated
Commonwealth	Commonwealth Heritage register	DoEE	Australian Heritage Council; Indigenous people with rights and interests to the place or object that is being nominated for the inclusion in the Commonwealth Heritage List
Commonwealth	National Heritage register	DoEE	Australian Heritage Council; Indigenous people with rights and interests to the place or object that is being nominated for the inclusion in the National Heritage List
Commonwealth	World Heritage List	DoEE	Indigenous people with rights and interests to the place or object that is being nominated for the inclusion in the World Heritage List
Australian Capital Territory	ACT Heritage Register	ACT Heritage, Department of Environment and Planning Directorate	ACT Heritage Council; relevant Representative Aboriginal Organisation (RAO)
New South Wales	Aboriginal Heritage Information Management System (AHIMS)	Office of Environment and Heritage	Aboriginal Cultural Heritage Advisory Committee; local Aboriginal groups and Local Aboriginal Land Councils (LALCs)
Northern Territory	Northern Territory Heritage register	Department of Tourism and Culture	Northern Territory Heritage Council; independent Aboriginal Areas Protection Authority
South Australia	Aboriginal Heritage register	Aboriginal Affairs and Reconciliation (AAR), Department of State Development <sup>309</sup>	South Australian Heritage Committee; Recognised Aboriginal Representative Bodies <sup>310</sup> .
Queensland	Aboriginal and Torres Strait Islander Cultural Heritage register and database	Department of Aboriginal and Torres Strait Islander Partnerships (DATSIP)	Cultural Heritage Unit (DATSIP); Specified Aboriginal and Torres Strait Islander Cultural Heritage Bodies <sup>311</sup> .
Tasmania	Tasmanian Aboriginal Heritage register	Aboriginal Heritage Tasmania, Department of Primary Industries, Parks, Water And Environment (DPIPWE)	Tasmanian Aboriginal Heritage Council; Aboriginal Heritage Officer (AHO)
Victoria	Victorian Aboriginal Heritage register	Aboriginal Victoria, Department of Premier and Cabinet	Victorian Aboriginal Heritage Council; Registered Aboriginal Parties (11 covering approximately 60% of Victoria <sup>312</sup> )
Western Australia	Western Australian Aboriginal Heritage register	Department of Planning, Lands and Heritage	Aboriginal Cultural Material Committee, established as an advisory body by the Minister of Aboriginal Affairs

<sup>309</sup> From March 2018, the Department of the Premier and Cabinet.

<sup>310</sup> In South Australia, there are 25 incorporated Aboriginal organisations each representing a traditional owner group.

<sup>311</sup> There are approximately 65 registered cultural heritage bodies in Queensland.

<sup>312</sup> Registered Aboriginal Parties (RAPs) are organisations that hold decision-making responsibilities under the Victorian *Aboriginal Heritage Act 2006* for protecting Aboriginal cultural heritage in a specified geographical area.

6.4a

Table 6.46: Number and area of registered Indigenous he	eritage site	s within fore	est, by juriso	liction							
	ACT	NSW	N	SA	рIQ	Tas.	Vic.	WA	Commonwealth register	National register	Total
Number of sites within forest	845	56,073	5,263	1,635	41,200	7,247	11,921	1,872	ø	17	126,081
Area of sites within forest (hectares) <sup>b</sup>	n.d.	37,548	5,981	192,800	331,300	2,479	n.d.	257,900	905,100	23,900	1,757,008
n.d., no data <sup>a</sup> Total area is a minimum value as area figures for Australian Capita <sup>b</sup> These figures do not include the area of forest in Australia's four W listed for cultural values with the United Nations Educational, Scier	Il Territory an Orld Heritage Intific and Culi	d Victoria were e areas (Kakadu tural Organizati	not available. National Park ion (UNESCO).	, Uluru-Kata Tj Together, thes	juta National Pa e four World He	k, the Willandr itage areas col	a Lakes Regior ntain a total of	i and the Tasm 2.09 million h	anian Wilderness Wo ectares of forest.	rld Heritage Are	a) that are
Notes:											
Sites includes heritage objects, sites, places and landscapes registere coverage (SOFR 2013), unless stated otherwise. Area values are estimbuffer (50 or 100 metres radius) around point data in order to derive a	d in jurisdicti ates only, du area figures (s	onal Indigenou e to varying cor see below); whe	Is heritage reg mpleteness an rre site buffers	listers. Numbe Id types of spa overlap, areas	rs and areas are tial data (point c s were only coun	derived from d Ind polygon) wi ted once.	lata in each jur ithin and betw	sdictional reg een heritage r	ister as at 30 June 201 egisters. Where releva	.6, intersected w nt, each jurisdic	ith 2011 forest tion applied a
ACT: ABARE5 estimated the number of Indigenous heritage sites in th at 12 July 2017. Since this was not a spatial dataset, relevant listings v Territory (Indicator 1.1a). Data on the area of registered Indigenous h	e Australian ( were identifie eritage sites	Capital Territory d based on Abc were not availa	/ using inform priginal heritag ble.	ation in the on ge, and on occı	lline Australian C urrence in locati	apital Territory ons that are su	/ Heritage Regi bstantially fore	ster ( <u>www.env</u> sted accordin	ironment.act.gov.au/h g to the 2016 forest cc	<u>neritage/heritag</u> wer for the Aust	<u>e register</u> ), as alian Capital
NSW: A 50 metre radius buffer was applied to point data by the NSW C	Office of Envii	onment and H	eritage.								
NT: ABARES derived site number and area estimates from an extract c	of the Northe	rn Territory Her	itage register	provided by th	e Northern Terri	tory Departme	nt of Tourism a	nd Culture, as	at 30 June 2016.		
SA: Data provided by the SA Aboriginal Affairs and Reconciliation, Dep	oartment of S	tate Developm	ent; buffer size	e not available	. The data for So	uth Australia re	epresents State	Forest Reserv	es and the Naracoort	e World Heritage	e Area.
Qld: A 100 metre radius buffer was applied to point data by the Queer	nsland Depar	tment of Aborig	ginal and Torre	es Strait Island	er Partnerships.						
Tas.: A 50 metre radius buffer was applied to point data by Aboriginal	Heritage Tas	mania (DPIPWE	:). Tasmanian	data includes t	the Tasmanian V	/orld Heritage /	Area.				

🐼 This table, together with other data for Indicator 6.4a, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9 WA: Heritage data is polygon type; data provided by the Western Australia Department of Planning, Lands and Heritage (DPLH).

Vic.: Data on the area of Indigenous heritage sites were not available

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Figure 6.25: The Indigenous forest estate, by land ownership and management category



Figure 6.26: Forest on non-Indigenous heritage-listed sites



A higher resolution version of this map is available via www.doi.org/10.25814/5be3bc4321162
In Tasmania, a total of 103 additional Aboriginal heritage sites were identified in forested land in the period July 2011– June 2016 (FPA 2017a). Most of these were single stone artefacts or small scatters of artefacts. All sites were recorded on the Conserve Aboriginal database administered by Forestry Tasmania<sup>313</sup>, and records were also sent to Aboriginal Heritage Tasmania for recording on the Aboriginal Heritage Register. Most of these sites were located after forest harvest or during cultivation for plantations, when the mineral soil was visible. The Forest Practices Code (FPA 2015b), established under the *Forest Practices Act 1985*, provides for the assessment, planning, management and protection of Aboriginal heritage within production forests. All new sites have been protected in informal reserves or machinery exclusion zones (FPA 2017a).

The total area of forest coinciding with Indigenous heritage sites is difficult to estimate, due to the sensitivity and limited availability of spatial data, and the constraints to observing heritage sites. 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. SOFR 2013 reported 1.5 million hectares of forest located within sites with Indigenous heritage value on the Register of the National Estate. As this register was closed in 2007, it was not used for SOFR 2018. Instead, data received from jurisdictional heritage registers indicate that, nationally, there were a minimum of 1.76 million hectares of forest within registered Indigenous heritage sites in 2016 (Table 6.45).

This figure is an estimate, because of different types of data across Indigenous heritage registers (Commonwealth, state and territory), the varying methods of estimating area including the different buffer areas around sites applied by jurisdictions, and the unavailability of area data on Indigenous heritage sites for the Australian Capital Territory and Victoria (Table 6.45).

# Case study 6.8: Safeguarding Aboriginal heritage in Western Australian forests

In Western Australia, the *Aboriginal Heritage Act* 1972 was enacted to facilitate the protection and preservation of Aboriginal remains and archaeological sites and objects on all land, including forests, irrespective of land tenure. These sites, places and objects include:

- culturally modified (scarred and carved) trees
- · shell middens and fishing/farming implements
- cultural artefacts, rock paintings and carvings
- stone arrangements and grinding patches/grooves
- skeletal material and burial mounds or sites
- man-made structures.

Where Aboriginal remains and/or archaeological sites or objects are identified, the Department of Aboriginal Affairs develops and implements a heritage management strategy to protect the site so as to minimise or avoid damage to or disturbance of the site. This involves engagement and consultation with appropriate local Aboriginal authorities and communities.

In Western Australia, the Department of Aboriginal Affairs published the *Aboriginal Heritage Due Diligence Guidelines* in 2012, to assist land users and private companies in understanding their obligations under the *Aboriginal Heritage Act 1972*, how their activities could adversely impact Aboriginal heritage sites, and the planning process to mitigate the risk of disturbing/destroying these sites.

Amendments to the Western Australian *Conservation and Land Management Act 1984* in 2012 introduced a new management objective that requires the Department of Biodiversity, Conservation and Attractions (DBCA) to manage national parks and reserves to protect and conserve the value of the lands and waters to the culture and heritage of Aboriginal people, including obligations in regards to sites registered under the *Aboriginal Heritage Act 1972*. These amendments have also provided a statutory framework for joint management arrangements between Aboriginal people and the DBCA.

The Due Diligence Guidelines are available at www.daa.wa.gov.au/globalassets/pdf-files/ddg

6.4a

<sup>313</sup> From July 2017, Sustainable Timber Tasmania.

# 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

- Heritage represents the tangible and intangible connections that people have with the past, through landscapes, landmarks, places, historic buildings, objects, significant events, customs and ceremonies.
  - Heritage registers are maintained at international, national, and state and territory levels, and in this indicator are used to compile a Non-Indigenous Heritage Sites of Australia dataset.
  - Sites listed in the various heritage registers are afforded protection from disturbance under the relevant jurisdictional Acts.
- As at 2016, 11.0 million hectares of forest was on non-Indigenous heritage-listed sites across all jurisdictions.
  - This is an increase of 3.7 million hectares of forest on non-Indigenous heritage-listed sites since 2011, mainly due to the registration of new heritage places.
- Various government departments and private organisations act to identify, conserve, promote and manage heritage values within forests, including through management plans.

Australia's forests include many sites that provide evidence of the interactions between people and forest landscapes, and the activities that have taken place on the continent since European settlement. Heritage includes the sites and objects that contribute to Australia's identity, including landscapes, landmarks, places and historic buildings and contents. Heritage can also represent intangible qualities such as people's feelings or associations with a site, and social, political, national or other cultural significance to a group. Heritage is what we inherit from the past and value enough today to leave for future generations<sup>314</sup>. Heritage can have cultural value at a local, regional, state, national or international scale.

In 1997, the Council of Australian Governments (COAG) agreed that heritage listing and protection should be the responsibility of the level of government best placed to deliver agreed conservation, management and interpretation outcomes. This decision recognised that state and territory governments had passed their own legislation to protect sites that were determined to be significant at the state and territory level. It was agreed that Commonwealth involvement in heritage should focus on places of national significance, including World Heritage properties.

In 2004, the Australian Government created the National Heritage List (NHL) and the Commonwealth Heritage List (CHL) to protect sites with national significance, through amendments to the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)<sup>315</sup>. Australian sites registered on the United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage List (WHL) are also protected under the EPBC Act (see Indicator 1.1c).

Table 6.47 summarises the international, national, and state and territory heritage registers that currently record Australian sites and places of heritage significance. Sites in the heritage registers are afforded protection from disturbance under the relevant jurisdictional Acts. Heritage registers are also compiled at the local government level in some areas of Australia, but are not reported here.

For SOFR 2018, the electronic spatial versions of each of the databases listed in Table 6.47 were obtained from the relevant

<sup>&</sup>lt;sup>314</sup> Heritage Policies (2018) National Trust, <u>www.nationaltrust.org.au/</u> <u>heritage-policies-wa/</u>

<sup>&</sup>lt;sup>315</sup> From March 2018, Department for Environment and Water.

#### Table 6.47: International, national, and state and territory heritage registers for Australia

Heritage register	Jurisdiction	Relevant Australian legislation	Agency responsible at June 2016	Description of register
World Heritage List (WHL)	International. Maintained by UNESCO World Heritage Centre Secretariat	EPBC Act	DoEE	Sites of outstanding universal value that are registered on the UNESCO World Heritage List
National Heritage List (NHL)	Australia	EPBC Act	DoEE	Sites of outstanding heritage value to the Australian nation
Commonwealth Heritage List (CHL)	Australia	EPBC Act	DoEE	Sites of significant heritage value that are owned or controlled by the Australian Government
Australian Capital Territory Heritage Register	Australian Capital Territory	Heritage Act 2004	Environment, Planning 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	Office of Environment and Heritage	Places of heritage significance to the people of New South Wales
Northern Territory Heritage Register	Northern Territory	Heritage Act 2011	Department of Tourism and Culture	Places and objects with heritage significance to the Northern Territory including Aboriginal or Macassan archaeological places.
Queensland Heritage Register	Queensland	Queensland Heritage Act 1992	Department of Environment and Resource Management	Sites and places of cultural heritage significance to Queensland
South Australian Heritage Register	South Australia	Heritage Places Act 1993	Department of Environment, Water and Natural Resources <sup>316</sup>	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 Environment, Land, Water and Planning	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, Lands and Heritage	Places of state cultural heritage significance

DoEE, Department of the Environment and Energy; EPBC Act, Environment Protection and Biodiversity Conservation Act 1999; UNESCO, United Nations Educational, Scientific and Cultural Organization.

<sup>a</sup> Subject to amendment in November 2016 and new Act gazetted in November 2017 (Heritage Act 2017).

Source: ABARES.

agencies, and used as inputs to update the Non-Indigenous Heritage Sites of Australia (NIHSA) dataset. As far as possible, data was current as at June 2016. Sites registered only for Indigenous values were excluded (Indicator 6.4b focuses specifically on non-Indigenous cultural values, whereas Indigenous heritage sites are reported in Indicator 6.4a). The NIHSA dataset was used to report on the area of forest on non-Indigenous heritage-listed sites.

For some non-Indigenous heritage-listed sites, the data only give a central point location rather than a description of an area. A 100 metre buffer was therefore applied to any point data, and the area of non-Indigenous heritage-listed sites reported for some jurisdictions is an estimate.

The datasets used for SOFR 2018 were the same as used for SOFR 2013. In SOFR 2008, the Commonwealth Register of the National Estate (RNE) was used to report the area of heritage sites on forested land that were registered for their historical and natural heritage values.<sup>317</sup>

Sites in the NIHSA dataset cover 28.5 million hectares across all jurisdictions. Of this land area, 11.0 million hectares are forested (Table 6.48; Figure 6.26).

<sup>316</sup> Heritage Places (2018) Australian Government, Department of the Environment and Energy, <u>www.environment.gov.au/heritage/heritageplaces</u>

<sup>317</sup> The Australian Government's Register of the National Estate (RNE) dataset was established in 1975 under the Commonwealth 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. The RNE was closed in 2007, and ceased to be recognised as a statutory listing on 19 February 2012. The five-year transition period allowed jurisdictions to assess places in the RNE for inclusion into other heritage lists by 2012. Many of the places in the RNE are included in other statutory listing such as state heritage listings, the Commonwealth Heritage List (CHL) and the National Heritage List (NHL). See www.environment.gov.au/system/files/resources/45a69069-bdc1-4cdb-b8e8-2b24dfcec951/files/national-estate.pdf

Tenure	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Australia
Leasehold forest	0	10	0	32	302	0	0	669	1,013
Multiple-use public forest	0	38	0	23	0	9	0	2	72
Nature conservation reserve	104	2,120	0	1,059	23	845	996	1,451	6,598
Private land	0	20	1,218	94	3	25	0	265	1,626
Other Crown land	0	6	374	347	0	33	24	824	1,609
Unresolved tenure	0	0	0	45	0	0	0	0	46
Total	104	2,194	1,593	1,600	328	912	1,021	3,212	10,964
Total forest in jurisdiction	142	20,368	23,735	51,830	5,060	3,699	8,222	20,981	134,037
Proportion of total forest that is forest on non-Indigenous heritage-listed sites	73%	11%	7%	3%	6%	25%	12%	15%	8%

Table 6.48: Area of forest on non-Indigenous heritage-listed sites, by tenure and jurisdiction ('000 hectares)

Note: Forest cover from Indicator 1.1a. Totals may not tally due to rounding.

Source: Non-Indigenous Heritage Sites of Australia dataset, National Forest Inventory 2016, ABARES.

🔗 This table, together with other data for Indicator 6.4b, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

The 11.0 million hectares of forest on non-Indigenous heritage-listed sites as at 2016 is an increase of 3.7 million hectares from the area reported as at 2011 in SOFR 2013. This increase in area was primarily due to two large additions to the NIHSA:

- An extension to the Tasmanian Wilderness World Heritage Area was approved by the World Heritage Committee on 24 June 2013, adding more than 170,000 hectares of land. The extension was mainly along the northern and eastern boundaries of the Tasmanian Wilderness World Heritage Area, and incorporated extensive eucalypt forest and other forest, alpine and sub-alpine environments and significant karst and glacial landforms (Commonwealth of Australia 2013b).
- The Western Kimberley region was included on the National Heritage List on 31 August 2011, adding more than 19 million hectares of land to the register (see Case Study 6.9). Of this area added to the register, 2.9 million hectares (15%) is forested.

Registration of additional non-Indigenous heritage-listed sites over the reporting period, including in forest, occurred within most jurisdictions. The small reductions in area of forest on registered heritage-listed sites as at 2016 in the Australian Capital Territory and New South Wales compared with the previous reporting period were associated with changes in reported forest area in these jurisdictions (see Indicator 1.1a).

Of the total area of forest in Australia in June 2016, 8% is on non-Indigenous heritage-listed sites (Table 6.48). The proportion of forest that is on non-Indigenous heritage-listed sites is highest in the Australian Capital Territory (73%) and lowest in Queensland (3%). The largest area of forest on non-Indigenous heritage-listed sites occurs within nature conservation reserves and other Crown lands (Table 6.48), with World Heritage Areas contributing the largest area. Smaller areas are registered on private land, on which there are greater barriers to registration and conservation of sites. The majority of the non-Indigenous heritage-listed forest on private land in the Northern Territory is the Kakadu World Heritage Area, much of which is Indigenous land; Kakadu is listed as a World Heritage Area for both its cultural and natural outstanding universal values.

#### Forest heritage

Many non-Indigenous heritage sites are registered because of their social, economic or historical significance within states and territories, not with the specific objective of protecting and conserving forests. Forests have played an important role in Australia since early European settlement, and forest history is intertwined with European explorers' expeditions, early mining, pastoral expansion, the building of homes and new settlements, war, construction of railways, the establishment of the first forestry reserves, and changing Australian values (Cameron 2001; Powell 1998). The harvesting of wood and the manufacture of timber or wood products were closely linked to the development of the pastoral and agricultural economy. Evidence of early timbergetting and sawmilling activity is quite common in forests (e.g. in cypress forests, Cameron 2001).

Figure 6.28: Hewn timber and iron structures, part of the heritage-listed Weone gold mine, Victoria



Heritage Council Victoria, vhd.heritagecouncil.vic.gov.au/places/866

#### Case study 6.9: West Kimberley National Heritage Place

The West Kimberley National Heritage place, located in far north-western Australia, is significant for its historic, Indigenous, aesthetic and natural value (DoEE 2018c).

The region has a rich and dynamic history of Aboriginal culture, pastoral history and pearling. Indigenous people have occupied the west Kimberley region for at least 40,000 years with a strong history of adaptation and survival, particularly in the past 150 years since European settlement of the region. This region continues to be home to Indigenous groups practising traditional law.

The Kimberley coast was the location of some of the earliest European exploration of the Great Southern Land, including William Dampier's visit in 1688. Its pastoral history, involving both Indigenous and non-Indigenous people, includes the establishment of Fossil Downs Station in 1886 by the MacDonald brothers after a journey of more than 5,600 km droving cattle from Goulburn, NSW. Pearling is significant both for Aboriginal traditional use in rituals, ceremonies and trade, and for the early European and current industry.

The west Kimberley region also has outstanding ecological, geological and aesthetic features, including spectacular gorges and waterfalls, pristine rivers and vine thickets, and a coastline which is one of the most convoluted in Australia (Figure 6.27).

The west Kimberley region is home to a diverse range of flora and fauna, many of which are endemic to this region. These flora and fauna inhabit a range of different forested and non-forested environments, from coastal mangroves and eucalypt woodlands to pockets of rainforests (found scattered as isolated vine thickets), savanna woodlands and grasslands. The forests are of socio-economic and ecological importance, as they provide many resources for both Indigenous and non-Indigenous people.

Some heritage-listed sites show utilisation of timber for early settlements, gold mining and other commercial purposes. For example, the old Weone gold mine site near Myrtleford in Victoria, listed at the state-level for its cultural heritage significance, shows remnants of hewn timber and iron structures demonstrating the rough 'bush building' during these periods (Figures 6.28, 6.29). The Lowden Forest Park near Captains Flat in New South Wales (Case study 6.10) is an example of an early forestry camp.

Many of the larger registered non-Indigenous heritage-listed sites are listed to protect landscapes, which include forests. Examples of these larger heritage sites (and their heritage register category from Table 6.47) are Kakadu National Park in the Northern Territory, the Tasmanian Wilderness World Heritage Area, and the Gondwana Rainforests of Australia in Figure 6.27: The Kimberley coastline, north of Derby, Western Australia



6.4b

Figure 6.29: Water wheel, a key structure used to power huge stamping-battery machines, part of the heritage-listed Weone gold mine, Victoria



Heritage Council Victoria, vhd.heritagecouncil.vic.gov.au/places/866

New South Wales and Queensland (all on the World Heritage List); the Australian Alps National Parks and Reserves, in the Australian Capital Territory, New South Wales and Victoria (all on the National Heritage List); High Conservation Value Old Growth Forests in New South Wales (on the New South Wales State Heritage Register); and the Grampians National Park in Victoria (on the Victorian Heritage Register).

Non-Indigenous heritage-listed sites are located across all tenure types (Table 6.48). The management approach for each site depends on the register under which it is listed, its ownership, and the type of heritage asset under management. Most registered heritage places within forests occur on public land (Table 6.48). For sites on private tenure, landowners work in conjunction with local states and territories to ensure adequate resources and support to manage and preserve the heritage values of the site.

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) are encouraged to develop and implement a management plan; this may include an agreement with the Australian Government for cooperative management. Joint management plans can be developed for sites that extend across multiple tenures. Owners of heritage sites on private land are required to submit development application plans to the relevant state agency or local government authority before undertaking any alteration of the site (including removal of trees), with the plan outlining how the heritage values of the site will be preserved and maintained.

Government-owned sites in forests are managed by relevant state or territory government agencies according to state forest codes of practice or other regulatory instruments, and many also have heritage management plans in place (e.g. conservation reserve management plans). Initiatives at local, state and territory, and national levels provide opportunities for funding for heritage conservation works.

The identification and conservation of heritage within forests can be difficult due to canopy cover, limited access, fire, funding constraints and social attitudes. However, since the late 1990s, awareness of the cultural heritage value of forests has increased (Cameron 2001). In addition to their responsibilities under legislation, various government departments and private organisations encourage research and community education, participation, and use of forest heritage sites. Active involvement by all sectors of the community in the processes of identification, conservation and use of heritage places is integral to good conservation outcomes, community appreciation and compliance.<sup>318</sup>

<sup>&</sup>lt;sup>318</sup> www.nationaltrust.org.au/heritage-policies-wa/

#### Case study 6.10: Forest harvesting heritage in Tallaganda State Forest

Lowden Forest Park, in Tallaganda State Forest in the southern ranges of New South Wales, provides an example of how cultural heritage is managed in NSW State Forests.

Lowden Forest Park began its life as an informal camp in 1937, where timber harvesting contractors would camp in the forest during the week and return home on weekends. The camp was initially known as "Donoghue and Hopkins huts" after the sawmilling company that operated in that location. In 1952, a water wheel, built by William Hopkins and Spencer Hush in Queanbeyan, was brought to Lowden Forest Park to generate electricity for the camp and to recharge batteries from the trucks which transported harvested timber. After some time, as travel to and from the forest became easier, the camp ceased being used. The area was subsequently developed into a visitor area with walking tracks, camping and picnic areas surrounding the remaining heritage objects. Lowden Forest Park was officially opened in 1977 and is currently a popular visitor area.

The Park contains several historical items, including a water wheel (Figure 6.30), a bobtail that was used for pulling logs out of the forest (Figure 6.31), and a boiler that was used to produce steam to run machinery to cut timber (Figure 6.32). The water wheel has been repaired by the Forestry Corporation of New South Wales, including replacing the caulking with hemp (a traditional material) inserted into the wooden parts of the wheel to make them water-tight.

The wood race which delivered water to the wheel was also repaired, and the water wheel is now fully functioning. These historical items show current and future generations how people worked in forests in the past.

Figure 6.31: Bobtail used for pulling logs out of the forest,

Figure 6.30: Historic water wheel under repair, Lowden Forest Park, New South Wales



Brendan Grimson, Forestry Corporation of New South Wales

Source: Forestry Corporation of New South Wales.

Lowden Forest Park, New South Wales



Brendan Grimson, Forestry Corporation of New South Wales

Figure 6.32: Boiler used to power machinery for cutting timber, Lowden Forest Park, New South Wales



Brendan Grimson, Forestry Corporation of New South Wales.

# 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 participation in forest management occurs through a variety of mechanisms, including direct land management, employment, co-management of reserve areas, consultation about cultural heritage, and programs for engagement with forests by urban Indigenous youths.
  - There is ongoing effort to include Indigenous cultural, contemporary and aspirational values in forest management, and ongoing efforts by land management agencies to consult and engage with Indigenous groups. However, it is difficult to measure the level of Indigenous participation at the national scale.
- The degree of management control and influence that Indigenous people have over forest relates to the Indigenous ownership and management category into which the forest is classified (Indigenous owned and managed, Indigenous managed, Indigenous co-managed, or covered by Other special rights).
  - The largest areas of forest in the Indigenous estate occur within Indigenous Land Use Agreement areas, and areas for which there has been a native title determination.
  - Other large areas of forest occur within the Northern Territory Aboriginal Land Trusts, Queensland Aboriginal and Torres Strait Islander land trusts, Indigenous Protected Areas, and owned and leased-back conservation reserves.

- A total of 22.0 million hectares in the Indigenous forest estate (32% of the Indigenous forest estate) are managed for conservation in Australia's National Reserve System.
  - There has been increased Indigenous participation in the development and implementation of management plans for forest reserves, conservation reserves and regional conservation areas across Australia.
- There is ongoing effort by land management agencies to improve Australian community understanding of Indigenous culture and connection with forests through provision of interpretive material. Communication of this information generally occurs by, or in consultation with, local traditional owners.

Indigenous peoples 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. The term Indigenous is used here to encompass all Aboriginal and Torres Strait Islander peoples; where the information provided relates to a particular people, that traditional owner group is named.

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 cultural or spiritual attachment to the land. However, the understanding by the forest sector of Indigenous values has changed significantly in recent years. In part, this is due to contemporary civil movements for social justice and land rights, and the greater community awareness and recognition of Australia's First Peoples. These have led to greater institutional commitment to increasing employment, consultation and inclusion of Indigenous peoples in land management. Larger numbers of Indigenous people are now employed in government agencies responsible for nature conservation or commercial wood production, and Indigenous people have a greater presence on natural resource management committees and in other forest-stakeholder forums. Lastly, there is growing recognition that traditional knowledge can inform forest management, especially in relation to management of forest fire regimes.

## 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:

- archaeological sites, which 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 or may not also be contained in historical records.
- places associated with Indigenous history and culture. These can include places of teaching, resource collection and work, but might not contain physical evidence of such associations. Most of this information is only available orally.
- secret and sacred places, information on which is held by particular knowledge holders and is released only according to customary laws. Most of this information is only available orally.

#### Contemporary

Indigenous people also value forests for contemporary reasons, including:

- landscapes of reconciliation and empowerment.
- 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, with both planted and native forests being valued by Indigenous people for their ability to contribute to economic independence.

#### Aspirational

Forests may also have aspirational value for Indigenous people. Many 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.

### Land management arrangements

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 or influence forest management. Access and rights to use traditional lands for cultural purposes are very important for Indigenous communities, to ensure cultural values are maintained and renewed, to improve recognition and self-worth, and to facilitate knowledge, participation and consultation in land management.

The Indigenous forest estate covers 69.5 million hectares of forest in Australia (Table 6.44, Indicator 6.4a), which is 52% of Australia's total forest area. However, the degree of management control and influence that Indigenous people have over these forest areas varies, depending on the Australian, state or territory legislation that applies in each situation and the policies that are implemented in each jurisdiction.

Commonwealth legislation that provides for Indigenous recognition, access or participation in land management includes the *Native Title Act 1993*, the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and the *Aboriginal and Torres Strait Islander Act 2005*. A native title determination recognises a set of rights and interests over land or waters where Aboriginal and Torres Strait Islander groups have practised, and continue to practise, traditional laws and customs arising from their original ownership under traditional law and custom<sup>319</sup>.

The EPBC Act recognises the role of Indigenous people in the conservation and ecologically sustainable use of Australia's biodiversity, and includes provision for Indigenous advice

<sup>&</sup>lt;sup>319</sup> auroraproject.com.au/what-native-title

on managing Commonwealth reserves<sup>320</sup>. The Indigenous Advisory Committee, established in 2000 under the EPBC Act [section 505A], advises the Minister for the Environment and Energy on environment and heritage programs, policy and consultation strategies, to facilitate better access and engagement for Indigenous peoples.

The Indigenous Land Corporation (ILC) is a corporate Commonwealth entity established in 1995 to assist Aboriginal and Torres Strait Islander people acquire and manage land to achieve economic, environmental, social and cultural benefits. The ILC's primary governing legislation is Part 4A of the Commonwealth *Aboriginal and Torres Strait Islander Act 2005*. The Commonwealth government also has programs that support Indigenous involvement in land and forest management, including Indigenous Protected Areas.

Further, each state and territory has its own legislation and arrangements that give Indigenous peoples involvement with land. Several mechanisms are commonly used:

- land transferred to Traditional Owners through an Aboriginal Land Rights Act or other state or territory legislation
- land purchased by an Indigenous trust or community representative bodies, such as the New South Wales Aboriginal Land Council and individual land councils
- land owned by the government (Crown land) but held in trust for use by particular Indigenous groups, with a requirement for an Indigenous community association, board or corporation to act as advisor or trustee and manager; this arrangement is common in Western Australia and South Australia
- land leased by an Indigenous community for long-term management, such as pastoral lands and land that forms part of Indigenous Land Use Agreements (ILUAs)
- formal joint management agreements, mainly for national parks and reserves, where the land is Indigenous owned and leased back to the government for joint management
- other arrangements where the land is not owned by Indigenous groups, but the whole area, or the cultural heritage aspects within it, are managed in consultation with local Indigenous groups, such as through memoranda of understanding (MOUs), membership on an advisory committee, or Indigenous involvement in development and implementation of a management plan for certain national parks and reserves
- legislation that recognises and allows Indigenous use of the land for traditional, customary purposes, with associated land management plans providing for this use.

Each of the above mechanisms gives some level of Indigenous access and rights to land, and the potential to contribute to land management including the management of forests on that land.

For reporting purposes, the information collected on Indigenous land has been grouped into four ownership and management categories (Dillon et al. 2015): Indigenous owned and managed; Indigenous managed; Indigenous co-managed; and Other special rights. Definitions of these four categories of Indigenous land are provided in Indicator 6.4a, and the degree of management control that Indigenous people have over land in each of these categories is described by category below. Area figures for the four categories sum to give the total area of Indigenous forest (Table 6.44, Indicator 6.4a), because each parcel of Indigenous land identified through one of the underpinning datasets is classified into the highest-ranked of the Indigenous ownership and management categories that apply to it (refer Dillon et al. 2015).

Each of the four categories of land ownership and management includes subcategories that relate to different Indigenous land arrangements; these were identified through inspection of different datasets, and supporting research. The area of forest within each subcategory of Indigenous land is also provided below. Area figures for the subcategories do not sum to the total area of the Indigenous forest estate, because some parcels of land may be subject to more than one type of Indigenous land arrangement or subcategory. For example, part of Kakadu National Park is included in both the 'Indigenous owned and co-managed nature conservation reserves' subcategory and the 'World Heritage Area' subcategory. Similarly, some lands that are classified as Indigenous owned and managed or Indigenous co-managed are subject to a native title determination and an ILUA.

The change in area between 2011 and 2016 reported for each Indigenous land ownership and management category and subcategory is the difference between the figures for 2016 reported in SOFR 2018 and those for 2011 reported in Dillon et al. (2015), which updated those reported for 2011 in SOFR 2013.

Amendments to legislation and policy between 2011 and 2016 have generally increased the capacity for Indigenous community ownership, management or co-management of land (Table 6.49).

# Indigenous owned and managed lands

As at 2016, a total of 18.0 million hectares of forested land was Indigenous owned and managed (Table 6.44, Indicator 6.4a). This is an increase of 4.7 million hectares since 2011. Most Indigenous owned and managed lands are Indigenous freehold tenure under state and territory legislation, including land transferred from the crown to freehold tenure after native title determinations or agreements. An Indigenous Protected Area (IPA) or Indigenous Land Use Agreement (ILUA) can be negotiated after a native title determination for some Indigenous owned and managed land (see below).

<sup>320</sup> www.environment.gov.au/epbc/information-for/indigenousstakeholders

Jurisdiction	Legislation/policy	Comment
Commonwealth	Native Title Act 1993 (as amended 2013)	The Courts and Tribunals Legislation Amendment (Administration) Act 2013 (Commonwealth) amended the Native Title Act 1993 to improve the efficiency of the native title system through institutional reform, including a clearer focus on increasing the rate of land claims resolution <sup>321</sup>
	Aboriginal Land Rights (Northern Territory) Act 1976 (as amended 2013)	Relates to Kakadu lands
NSW	Aboriginal Land Rights Amendment Act 2014	Tighter conditions on sale of <i>Aboriginal Land Rights Amendment Act</i> land; allows Aboriginal Land Agreements; confirms business enterprise potential
	Crown Land Management Act 2016	Allows Local Aboriginal Land Council to manage dedicated Crown land
NT	Aboriginal Land Rights Act (as amended 2015)	Minor changes to township leasing
	Territory Parks and Wildlife Act 2014	Provides for Aboriginal joint management of certain parks and reserves
Qld	Aboriginal and Torres Strait Islander Land (Providing Freehold) Acts 2014	Applies to Deed of Grant in Trust (DOGIT), Aboriginal Land Act 1991 (ALA) and Torres Strait Islander Land Act 1991 (TSILA) land (townships) – allows smaller lots to transition to freehold
	ATSI Land Holding Act 2013	Aligns leasing between Acts
	Nature Conservation and Other Legislation Amendment Act 2016	Re-instated role of Act for conservation of nature while allowing for involvement of Indigenous people in management of protected areas
	Gazettal of Cape York Peninsular Aboriginal Lands (CYPAL) parks	Seventeen Cape York national parks renamed and gazetted as National Park Aboriginal (with some lands added)
SA	Aboriginal Lands Trust Act 2013	Greater autonomy from state for Trust lands
	Wilderness Protection Act 1992 (as amended 2013)	Extended co-management provisions to wilderness protection areas
Tas.	Tasmanian Wilderness World Heritage Area Management Plan (2016)	Potential future joint management
Vic.	Traditional Owner Settlement Act (as amended 2016)	Further provision for grants of aboriginal title under land agreements; streamlined process for authorising traditional owners to access and use natural resources (e.g. right to hunt wildlife and game, fish, and gather flora and forest produce)
	Dja Dja Wurrung agreement 2013, under the Traditional Owner Settlement Act 2010	First comprehensive native title settlement under the Act; formally recognises the Dja Dja Wurrung people as the traditional owners for part of Central Victoria
	Aboriginal Lands Act (as amended 2013)	Extended lease terms for Framlingham and Lake Tyers; revised governance
	Ngootyoong Gunditj Ngootyoong Mara South West Management Plan	New multi-park management plan using a partnership approach between Parks Victoria, the Gunditjmara Traditional Owners, Budj Bim Council and the Department of Environment, Land and Water Protection
WA	Noongar (Koorah, Nitja, Boordahwan) (Past, Present, Future) Recognition Act 2016	Act passed (although South West Native Title Agreement not registered until October 2018)
	Metropolitan Water Supply, Sewerage and Drainage By-laws 1981 and Country Areas Water Supply By-laws 1957 (as amended 2016)	Provision for cultural use of certain areas
	Conservation and Land Management Amendment Act 2015	Greater provision for co-management of conservation reserves
	Regional management plans for conservation areas	Several multi-park management plan using a partnership approach between Department of Parks and Wildlife <sup>322</sup> and the Traditional Owners

<sup>a</sup> This table presents the main legislative changes between 2011 and 2016, and some examples of new management plans.

#### Indigenous Protected Areas

Indigenous Protected Areas (IPAs) are areas of Indigenous owned or managed land (or sea) created when traditional owners enter into a voluntary agreement with the Australian Government to manage the land for conservation, with government support (SVA Consulting 2016a). Currently, the majority of IPAs are Indigenous freehold land, but IPAs

<sup>324</sup> www.environment.gov.au/land/indigenous-protected-areas

are evolving from a management framework based solely on Indigenous land tenure, to one involving multiple tenures coupled with cooperative management arrangements with other stakeholders (PM&C 2015a)<sup>323.</sup> IPAs form part of Australia's National Reserve System<sup>324</sup> (see Indicator 1.1c).

The IPA programme, developed in the mid-1990s, supports Indigenous landowners to use land and sea management as a framework for employment and natural and cultural heritage conservation outcomes (PM&C 2015b). All IPAs have management plans that are developed by the landowners as part of the IPA application process. These plans incorporate culturally significant, traditional land-management practices as well as other land-management practices to protect the significant values of the area. On-ground implementation of the management plans is undertaken by Indigenous landowners.

<sup>&</sup>lt;sup>321</sup> www.ag.gov.au/LegalSystem/NativeTitle/Pages/Pastnativetitlereforms. aspx

<sup>&</sup>lt;sup>322</sup> From July 2017, the Department of Biodiversity, Conservation and Attractions.

<sup>323</sup> www.pmc.gov.au/indigenous-affairs/environment/indigenousprotected-areas-ipas

#### Case study 6.11: Warddeken Indigenous Protected Area

The Warddeken Indigenous Protected Area (IPA) stretches across nearly 1.4 million hectares of gorge, forest and stone country in West Arnhem Land, Northern Territory, and is located next to Kakadu National Park. It serves as a globally significant conservation corridor that links the stony inland escarpment of the Arnhem Land plateau to the coast. The Warddeken IPA was declared in 2009 to conserve the unique environment including endemic plants, threatened and rare species, and important cultural, rock art and archaeological sites. The Warddeken IPA is also part of Australia's National Reserve System<sup>325</sup>.

The land belongs to Nawarddeken, who are the traditional owners from at least 30 clan groups of the Bininj Kunwok language group. Bininj ownership of the area is recognised under the Commonwealth *Aboriginal Land Rights (Northern Territory) Act 1976.* In August 2007, the traditional owners formed Warddeken Land Management to assist the protection and management of country, combining traditional ecological knowledge with modern science. Rangers work on fire management, weed and feral animal control and monitoring threatened species. An important role for rangers is passing on traditional ecological knowledge to younger generations, and the rangers are important community role models.

The Australian Government has provided funds for this work under the Caring for our Country<sup>326</sup> initiative, through the Indigenous Protected Areas and Working on Country elements, with ongoing financial support from Bush Heritage Australia. The Indigenous Land Corporation has also provided assistance (plant and equipment) to the IPA so that Warddeken Rangers can improve road access and maintenance, control erosion, protect culturally important rock art sites, and improve access by community to plateau areas for culturally oriented camps<sup>327</sup>.

The fire management project has been very successful in reducing the impact of late dry-season wildfires on the highly diverse environments of the West Arnhem Land plateau, with the area burnt reduced from 34% annually to less than 7% annually. This has led to significant



Warddekan forest fire management for carbon offsets and healthy country.

Continued

<sup>325</sup> www.environment.gov.au/indigenous/ipa/declared/warddeken.html

- <sup>326</sup> Caring for our Country combined with National Landcare Programme in 2013.
- 327 www.ilc.gov.au/Home/What-We-Do/Project-Profiles/Warddeken-Indigenous-Protected-Area

improvements in protection of endemic, highly firesensitive Anbinik (*Allosyncarpia ternata*) forests, and ongoing protection of the Arnhem Plateau Sandstone Shrubland Complex, a listed threatened ecological community. Outcomes are monitored through 120 reference sites maintained across the IPA. These sites are measured every two years to detect ecological responses to management.

Warddeken Land Management has successfully developed an innovative carbon abatement partnership with industry, and engaged in collaborative scientific research to position itself for entry into any future biodiversity credit scheme. The fire management work has generated substantial revenue as a result of carbon offset sales facilitated through partnerships including the West Arnhem Land Fire Abatement (WALFA) project (see Case Study 5.3) and ALFA (NT) Ltd. The Karrkad-Kanjdji Trust<sup>328</sup> also supports the Warddeken IPA and other IPAs to protect and manage natural and cultural environments by engaging these organisations with the philanthropic sector.

An evaluation of five IPAs and associated ranger programmes found significant positive outcomes for traditional owners (SVA Consulting 2016a). These included engaging Indigenous people in meaningful employment, achieving large-scale conservation outcomes, facilitating reconnection with country, culture and language, and helping to catalyse the development of an Indigenous land and sea based economy.

Sources: Warddeken Land Management; Warddeken Indigenous Protected Areas (IPA) Social Return on Investment Analysis, Department of the Prime Minister and Cabinet (www.pmc.gov.au/resource-centre/ indigenous-affairs/warddeken-ipa-ranger); www.environment.gov.au/ indigenous/ipa/declared/warddeken.html; www.ilc.gov.au/Home/What-We-Do/Project-Profiles/Warddeken-Indigenous-Protected-Area

As of January 2016, IPAs represent 44% of the National Reserve System (DoEE 2016a). Although several large IPAs are located in non-forested regions in the arid lands of Australia<sup>329</sup>, 22 IPAs are located in forested areas of northern and eastern Australia with a mean annual rainfall of 1000 mm or above (ABARES, unpublished).

A total of 4.8 million hectares of forest are located in IPAs.

Case study 6.11 describes how Indigenous values are protected, maintained and enhanced through the management of forests in the Wardekken IPA in West Arnhem Land, Northern Territory.

#### Indigenous Land Corporation-owned and transferred 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.<sup>330</sup>

The ILC has transferred much of its land to management by local traditional owners, who are required to prepare a management plan for the land prior to transfer. The ILC also supports Indigenous peoples through training and assistance to develop management skills and enterprises on the land.

There are 1.5 million hectares of forest located across all ILC-owned and ILC-transferred lands across Australia.

#### Aboriginal Land Council lands, New South Wales

New South Wales Aboriginal Land Council (NSW ALC) lands are lands granted or claimed under the *Aboriginal Land Rights Act 1983* or purchased or leased using the NSW ALC trust fund. The legal title of the land is held by the NSW ALC, which is a statutory body under this Act (NSW ALC 2014).

The NSW ALC mandate includes land acquisition either by land claim or by purchase, and establishment of commercial enterprises and community benefit schemes. It works in conjunction with a network of Local Aboriginal Land Councils (LALCs). The lands granted under the Act are freehold or leased; the freehold lands can generally be sold, leased, mortgaged or disposed of, subject to the land dealing provisions of the Act (NSW ALC 2014). The majority of the land is under the management of the 119 LALCs.

There are 74 thousand hectares of forest located across all NSW ALC lands.

#### Aboriginal Lands Trust lands, Northern Territory

Northern Territory Aboriginal Lands Trust (NT ALT) lands have been granted or claimed under the Northern Territory *Land Rights Act 1976*. 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 NT ALT 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

<sup>328</sup> karrkad-kanjdji.org.au

<sup>329</sup> www.pmc.gov.au/indigenous-affairs/environment/indigenous-landand-sea-management-projects

<sup>330</sup> www.ilc.gov.au/Home/About-Us/Publications/National-Indigenous-Land-Strategy

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 NT ALT to carry out the proposal (Central Land Council 2007).

There are 12.5 million hectares of forest located across all Northern Territory Aboriginal Lands Trust lands.

#### Aboriginal Lands Trust, A<u>n</u>angu Pitjantjatjara Yankunytjatjara and Maralinga Tjarutja lands, South Australia

The South Australian Aboriginal Lands Trust (SA ALT) was originally established by the *Aboriginal Lands Trust Act 1966* to hold, in trust, titles of existing Aboriginal Reserves on behalf of all Aboriginal people in South Australia. Lands held by the SA ALT have been granted or claimed under the Act (Indigenous owned and managed), or are leased (Indigenous managed). The legal title of the land is held by the SA ALT, and the Trust board consists of Aboriginal members appointed by the South Australian Governor. The South Australian government worked with the ALT to review and update the Act and to reform the Trust, to ensure its relevance as an Aboriginal landholding authority into the future, which culminated in the creation of the South Australian *Aboriginal Lands Trust Act 2013*, which came into operation in July 2014<sup>331</sup>.

Under the A<u>n</u>angu Pitjantjatjara Yankunytjatjara Land Rights Act 1981, land was granted to the A<u>n</u>angu Pitjantjatjara Yankunytjatjara (APY) people as inalienable freehold to be managed by the APY body corporate. Any pastoral leases within the area at that time remained in force as if APY had leased the land to the Crown and the Crown had sub-leased it to the lessee, until such time as the lease expired when the land ceased to be leasehold. Under the Maralinga Tjarutja Land Rights Act 1984, lands were handed back to the Maralinga Tjarutja (MT) people in 1985 to be managed by their body corporate.

There are 126 thousand hectares of forest located across all SA ALT lands and 127 thousand hectares of forest on APY and MT lands. Of the total 253 thousand hectares, 251 thousand hectares are Indigenous owned and managed freehold land, and 2 thousand hectares are Indigenous managed leasehold land.

#### 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 community 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 493 thousand hectares of forest located on all DOGIT lands. The decrease since 2011 is due to the transfer of some lands to Queensland Aboriginal and Torres Strait Islander land trusts.

#### Queensland Aboriginal and Torres Strait Islander land trusts

The Queensland *Aboriginal Land Act 1991* and *Torres Strait Islander Land Act 1991* provide for the grant of Indigenous freehold land following a land claim, or the transfer of land. These two Acts are the main mechanisms for Indigenous land to be claimed and transferred in Queensland. Claimable lands are primarily available State land, and include national parks where determined available for claim by the relevant Minister. The transfer rules allow for lesser forms of Indigenous land ownership to be converted to Indigenous freehold, including DOGIT land, Aboriginal reserve land and available Crown land declared to be transferable (Wensing, unpublished)<sup>332</sup>.

In the past, land trusts were established to hold this land for the benefit of Aboriginal and Torres Strait Islander peoples. New land trusts are no longer being established, and land is now granted to corporations registered under the Commonwealth *Corporations (Aboriginal and Torres Strait Islander) Act 2006* or existing land trusts. Existing land trusts continue to function, and are administered under the Queensland *Aboriginal Land Act 1991* or the Queensland *Torres Strait Islander Land Act 1991*. Existing land trusts have the option of establishing a corporation and transferring all land and assets to the corporation<sup>333</sup>.

There are 4.8 million hectares of forest located across Queensland Aboriginal and Torres Strait Island Land Trust lands. This comprises 2.9 million hectares of forest that are Indigenous owned and managed, and 1.8 million hectares of forest that are Indigenous managed and within national parks.

<sup>&</sup>lt;sup>331</sup> www.legislation.sa.gov.au/LZ/C/A/ABORIGINAL%20LANDS%20 TRUST%20ACT%202013.aspx

<sup>&</sup>lt;sup>332</sup> Wensing E (2017). A comparative analysis of the land dealing provisions in the native title and statutory land rights schemes in Australia: Background paper, Unpublished paper, Australian National University, Canberra.

<sup>&</sup>lt;sup>333</sup> www.qld.gov.au/atsi/environment-land-use-native-title/land-trusts

#### Other Indigenous owned lands

There are 98 thousand hectares of forest that are Indigenous owned within other subcategories. This comprises 87 thousand hectares of forest with agreements under the Victorian *Traditional Owner Settlement Act 2010*, two thousand hectares of forest owned through two Aboriginal land Acts relating to Victoria, and 9 thousand hectares of forest owned and managed by the Tasmanian Aboriginal Land Trust.

The Victorian *Aboriginal Land Act 1970* was the first Act in Victoria, and in Australia, to recognise the entitlement of Aboriginal people to land. Under this Act, the deeds for the reserve land at Lake Tyers and Framlingham were transferred to their communities under trusts<sup>334</sup>. The *Aboriginal Land (Lake Condah and Framlingham Forest) Act 1987* was passed by the Commonwealth government at the request of the Victorian Government, under paragraph 51 (xxvi) of the *Australian Constitution*, and gives the traditional owners inalienable title to certain lands in the Lake Condah and Framlingham Forest area. It also gives the corporation of Aboriginal elders which manages the land the right to grant, with or without conditions, rights of access to the land, acquire compensation for land, or refuse mining rights affecting the land<sup>335</sup>.

### Indigenous managed lands

As at 2016, a total of 4.9 million hectares of forested land was Indigenous managed (Table 6.44, Indicator 6.4a). This is an increase of 1.7 million hectares since 2011.

#### 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*. 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 Aboriginal Affairs, 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 land-use and development policy of the ALT (DIA 2005).

The ALT is a significant landholder, with responsibility for approximately 24 million hectares or 10% of Western Australia's land (DAA 2016). Lands held by the ALT can be freehold, leasehold or Crown reserve lands, can have been acquired through a variety of processes, and are held in trust for the use and benefit of Indigenous people. Any lands that are managed by the ALT can be granted to an Indigenous corporation to manage them. There are 834 thousand hectares of forest located across all ALT lands in Western Australia.

#### Indigenous pastoral leases

In Western Australia, Indigenous pastoral leases are lands with a pastoral lease granted to Indigenous corporations under the *Land Administration Act 1997* (Western Australia). 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. Non-grazing 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 377 thousand hectares of forest located across all Indigenous pastoral leases in Western Australia. Some of the 2 thousand hectares of forest on Indigenous leases managed by the South Australian Aboriginal Lands Trust may also be pastoral leases. Pastoral leases are also held by Aboriginal corporations in Northern Territory and Queensland, however data on these were not available.

#### Queensland Aboriginal and Torres Strait Islander land trusts: co-managed conservation reserves

These lands are conservation reserves on lands owned by Queensland Aboriginal and Torres Strait Islander land trusts (see above), and co-managed with the Queensland government. These are in addition to the subcategory of co-managed nature reserves described below.

There 1.7 million hectares of forest on co-managed conservation reserves under Queensland Aboriginal and Torres Strait Islander land trusts.

# Other Indigenous owned and co-managed nature conservation reserves

The Australian, New South Wales, Northern Territory, Queensland, South Australian and Victorian governments have granted freehold ownership of a range of nature conservation reserves to Indigenous community groups, land trusts and land councils through Acts of parliament within the respective jurisdictions. The Indigenous owners have then either signed an agreement with the conservation agency for co-management, or have leased these 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 from the government agency as part of the lease agreement. 6.4c

<sup>334</sup> guides.slv.vic.gov.au/law/acts

<sup>&</sup>lt;sup>335</sup> parlinfo.aph.gov.au/parlInfo/search/display/display.w3p;query=Id%3A %22legislation%2Fbillsdgs%2FNHN10%22

Indigenous owned and co-managed nature conservation reserves are classified as Indigenous managed lands because, although 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 2.8 million hectares of forest located across Indigenous owned and co-managed nature reserves in Australia, in addition to Queensland land trusts (see above). Of this area, Queensland and the Northern Territory have 1.0 and 1.7 million hectares of forest in conservation reserves under this arrangement, respectively. In Victoria, lease-back arrangements include lands within the Dja Dja Wurrung agreement 2013 under the *Traditional Owner Settlement Act* 2010 (Victoria).

## Indigenous co-managed lands

As at 2016, a total of 5.7 million hectares of forested land were Indigenous co-managed, being government-owned land with Indigenous co-management arrangements in place (Table 6.44, Indicator 6.4a). This is an increase of 1.0 million hectares since 2011.

The area of Indigenous co-managed forest increased in most jurisdictions since 2011, and in particular in South Australia, as a result of changes to governance arrangements. The increase of Indigenous co-managed forest in New South Wales is due to the recent addition of reserves and Indigenous agreements to the Indigenous estate, as well as the inclusion of an additional dataset on NSW Aboriginal Areas since SOFR 2013. A decrease in the area of Indigenous co-managed forest in Queensland since 2011 is due to the transfer of some Cape York Peninsular Aboriginal Lands and some IPAs to the Indigenous managed and the Indigenous owned and managed categories, respectively.

# Nature conservation reserve memoranda of understanding

Nature conservation agencies in all jurisdictions except Tasmania 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. Some ILUAs (see below) include comanagement agreements. The Crown in each jurisdiction maintains ownership and management control of these lands.

Co-management arrangements can be associated with formal, legal recognition of Indigenous rights to undertake customary activities on certain lands. For example, Part 4A of the New South Wales *National Parks and Wildlife Act 1974* provides that Traditional Owners or Aboriginal persons with the consent of the relevant board may enter onto and use the lands for gathering traditional foods, hunting or fishing provided this is for domestic purposes, or for ceremonial and cultural purposes to the extent that the entry or use is in accordance with the tradition of the Aboriginal traditional owners. This excludes use of protected (threatened) species and species subject to any legislation applying to the land or to a park or site plan of management. Similarly, in Western Australia, Aboriginal native title holders may undertake certain customary activities on section 8AA land and some 8A land under the *Conservation and Land Management Act 1984* (Western Australia), that is, lands over which there is an agreement for joint management by the Department of Parks and Wildlife<sup>336</sup> and native title holders.

The combined area of forest within government-owned co-managed nature conservation reserves with MOUs and advisory structures (see below) is 3.0 million hectares.

# Advisory structures: government-owned co-managed conservation reserves

Formal consultation arrangements with Indigenous communities can occur where conservation reserves are government-owned, through co-management boards, advisory committees, or consultation mechanisms specified in reserve management plans. Land on which informal or ad-hoc consultation with stakeholders, including Indigenous groups, is undertaken as part of forest operations has not been included in the Indigenous estate.

Reserve management plans are required under legislation, and many New South Wales and Queensland national parks and nature reserves specify ongoing Indigenous consultation in these management plans. In 2004, South Australia amended legislation to share responsibility for the management of national parks and conservation parks with Aboriginal groups through either a co-management board or co-management advisory committee. Further legislation amendments were made in 2013 to extend co-management to areas protected as wilderness. Several regional agreements have been made in recent years under this arrangement. In Western Australia and Victoria, a number of agreements have been made with Traditional Owners that include co-management arrangements for certain forest, public and nature reserves. Several regional, multi-reserve management plans have also been developed with Indigenous consultation and co-management arrangements (see Table 6.49).

In New South Wales, Aboriginal Areas are Crown land reserved under the *National Parks and Wildlife Act 1974* (New South Wales) to protect and conserve areas significant to Aboriginal culture and to allow use by Aboriginal people for cultural purposes. Management of the Aboriginal Area may include providing opportunities for Aboriginal people to access Country, and to maintain, renew or develop cultural practices and associations. Most Aboriginal Areas are categorised as comanaged because they have a MOU or ILUA, or because there is a Plan of Management or Statement of Management Intent which specifies joint management or ongoing consultation with traditional owners. The total area of forest within Aboriginal Areas is 23 thousand hectares, the majority of

<sup>&</sup>lt;sup>336</sup> From July 2017, the Department of Biodiversity, Conservation and Attractions.

which is categorised as Indigenous co-managed. A small area of Aboriginal Areas is categorised as 'Other special rights'.

There are currently no formal joint management arrangements in place for Tasmanian national parks, however there are Aboriginal representatives on the National Parks & Wildlife Advisory Council which advises the Director of National Parks and Wildlife and the relevant Minister on management issues relating to Tasmania's national parks and reserves. Because the arrangements are not specified for individual reserves, Tasmanian parks have not been included in the Indigenous co-managed category. While currently an advisory arrangement, the 2016 Management Plan for the Tasmanian Wilderness World Heritage Area outlines a joint management proposal.

#### World Heritage Areas

World Heritage Areas are Matters of National Significance under the EPBC Act. Australia's World Heritage-listed areas have Indigenous representatives on 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; however, only areas that are owned by the Crown, or have co-management agreements with private landowners in place, have the capacity for Indigenous co-management.

Some World Heritage Areas overlap with other land management arrangements. For example, about half of the area of Kakadu National Park, which is also a World Heritage Area, is owned by Indigenous peoples. The Kakadu Board of Management, which has an Aboriginal majority representing traditional owners of land in the park, determines management policy and is responsible, along with the Parks Australia director, for preparing a management plan for the park. The management plan is the main policy document for the park, addressing long-term strategic goals and guiding day-to-day operations.

The Wet Tropics Regional Agreement (2005) was the first agreement of its kind in Australia, and provides for the cooperative management of the Wet Tropics of Queensland World Heritage Area by the 18 Rainforest Aboriginal peoples associated with the area, and the Australian and Queensland Governments<sup>337</sup>. Three IPAs overlap the Wet Tropics World Heritage Area: Mandingalbay Yidinji IPA, Girringun IPA, and Eastern Kuku Yalanji IPA<sup>338</sup>.

There are 4.7 million hectares of forest in the Indigenous estate across all World Heritage areas. This comprises 0.3 million hectares that are Indigenous owned and managed (IPAs within the Wet Tropics), 1.2 million hectares that are Indigenous managed, and 3.2 million hectares that are Indigenous co-managed. The forest in the Indigenous managed category comprises Kakadu lands that are both Indigenous owned and World Heritage (1.2 million hectares) and a small area (approximately 100 hectares) in Ulu<u>r</u>u-Kata-Tju<u>t</u>a National Park. Both of these parks are Indigenous owned and are leased-back to the Commonwealth government for co-management.

## Other special rights

As at 2016, Indigenous peoples have been granted 'Other special rights' over a total of 40.9 million hectares of forest (Table 6.44, Indicator 6.4a). This is an increase of 21.1 million hectares since 2011. Part of this increase is due to the increase in the reported area of forest in the Northern Territory (Indicator 1.1a), and part is due to the inclusion of additional datasets on areas of forest with 'Other special rights', but there has also been an increase in the actual forest area in this category due to recent native title determinations and ILUAs.

#### Native title determinations

Native title is the recognition, under Australian law, that some Indigenous people have rights to and interests in land that derive from 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. However, this right only exists over certain areas or tenures, 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 is used by other people. Native title rights may co-exist with other rights not involving native title; in the event of conflict, the native title rights give way to the non-native title rights (NNTT 2009).

As at 2016, there are 28.0 million hectares of forest with native title determinations. Of this area, 22.7 million hectares are not included in any other Indigenous land ownership and management category.

#### Indigenous Land Use Agreements

The Commonwealth *Native Title Act 1993* allows for Indigenous Land Use Agreements (ILUAs) 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 in an area covered by the agreement will be used and managed. ILUAs can be made as part of a native title determination, or separately.

ILUAs do not equate to ownership of land. The agreements deal with the use of land, and can cover a range of issues that may or may not relate to forests. For example, an ILUA may cover one or more forms of access to land for 6.4c

<sup>&</sup>lt;sup>337</sup> www.environment.gov.au/heritage/about/world/managementaustralias-world-heritage-listed/managing-world-heritage-australia/ indigenous-world-heritage

<sup>&</sup>lt;sup>338</sup> www.wettropics.gov.au/caring-for-country-1

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. The agreements can include assurances about protection of cultural heritage and the environment, employment and training opportunities, and communication between parties.

Often, national parks and reserves within the land covered by an ILUA are subject to co-management arrangements (see above). For example, the Githabul ILUA in northern New South Wales establishes a joint management arrangement for the eleven parks in the ILUA area, including the Tooloom Falls (Bandahngan) Aboriginal Area created in 2009. The ILUA has resulted in the ongoing employment of Githabul people in the care and maintenance of these parks.

As at 2016, there are 33.2 million hectares of forest under ILUAs. Of this area, 25.9 million hectares are not included in any other Indigenous land ownership and management category.

#### Other areas with customary practice rights (Aboriginal Areas and some drinking water supply catchments)

In addition to Indigenous land ownership, management and co-management, native title or ILUAs, there are certain other situations where Indigenous rights to undertake customary (traditional) activities are formally recognised within an Act or regulations. This can include the right to visit and protect sites of cultural significance, and to undertake ceremonial and cultural practices at Aboriginal registered sites. The type of customary activities permitted may be specified, to ensure the intent of the overarching legislation, such as water protection or biodiversity conservation, is maintained. Datasets relating to such land were not incorporated in the Indigenous land dataset compiled for 2011 by Dillon et al. (2015), but are included in the 'Other special rights' category for SOFR 2018.

In the Yarra Tributaries Forest Reserve, Victoria, and in some protected water supply catchments in south-west Western Australia, formal provision has been made for Indigenous groups to undertake certain customary activities. As part of negotiations for the Noongar South West Native Title Settlement, the Western Australian *Metropolitan Water Supply, Sewerage and Drainage By-laws 1981* and *Country Areas Water Supply By-laws 1957* were amended in June 2016 to specify those Noongar customary activities that are permitted, and to clarify the locations and activities that are not permitted due to risks to drinking water quality.

Amendments to the Western Australian *Conservation and Land Management Act 1984* have also recognised the rights of Aboriginal people to undertake traditional practices on conservation reserves that are traditional lands. Under the 2012 amendments, activities are considered to be done for an Aboriginal customary purpose if they involve traditional practices to do with making and eating food, making and using medicine, practising artistic, ceremonial or other cultural activities, and doing other things involved with any of the above, including using natural resources such as ochre, stones and soil for ceremonies. No activity is considered customary if it is done for financial gain or reward<sup>339</sup>. There are 5.9 million hectares of forest in this subcategory 'Other special rights'. Of this, 5.2 million hectares are Western Australian conservation reserves with legislated provisions for Aboriginal cultural use.

# Indigenous participation in forest management

Indigenous participation in forest management occurs through a variety of mechanisms, including:

- forest ownership and management
- joint management of national parks and conservation reserves
- Indigenous Land Use Agreements
- native title rights
- consultation by public forest management agencies
- direct employment in the forest sector
- community employment schemes
- cooperative research programs
- · partnerships with government and industry
- · consultation about cultural heritage within forests
- programs for urban Indigenous youths' engagement with forests.

It is difficult to measure the level of Indigenous participation through the above mechanisms at the national scale. However, there is a diverse range of activities that demonstrate Indigenous participation in forest use and management. Indigenous people provide critical knowledge that contributes to the protection and maintenance of forest values independent of any legal right to land. Engagement derives from the concern of Indigenous peoples and communities to protect forest heritage and culturally sensitive sites, and from involvement in decisionmaking about matters relevant to the forest.

Forest ownership involves direct management responsibility by Indigenous people and communities. This provides opportunities for integrating traditional and contemporary forest management practices, forming land management partnerships, employing Indigenous people, and renewing and continuing cultural practices. Pastoral leases and some ILUAs also give direct Indigenous management responsibility for forests on those lands. In limited instances, Indigenous owned and managed land is used for commercial forestry (see Case Study 6.13), which provides local resources and employment and direct Indigenous involvement in forest management.

There are 22.0 million hectares of forest across all Indigenous lands that are included in the National Reserve System (determined through intersection of the Indigenous forest estate spatial dataset with the Collaborative Australian Protected

<sup>339</sup> www.dpaw.wa.gov.au/parks/aboriginal-involvement/92-customaryactivities

Areas Database 2016), where conservation is the legislated management intent (see Indicator 1.1c). This represents 32% of the forest area in the Indigenous estate, and 16% of all Australian forest. A total of 90% of the area of Indigenous managed forest and 95% of the area of Indigenous co-managed forest are in the National Reserve System, as are 28% of the area of Indigenous owned and managed forest, and 17% of the area of Indigenous forest with 'Other special rights'.

A recent study (Renwick et al. 2017) highlighted the role of Indigenous peoples in contributing to conservation of Australia's biodiversity. Renwick et al. (2017) used an older dataset of Indigenous lands to report that three-quarters of Australia's 272 terrestrial or freshwater vertebrate species listed as threatened under national legislation have projected ranges that overlap Indigenous lands; this figure includes forest and non-forest areas, as well as species that are not forestdwelling. Hotspots where the ranges of multiple threatened species overlap with Indigenous lands occur predominantly in coastal areas and in northern Australia (see also Figure 1.23, Indicator 1.2b).

Indigenous owned and co-managed lands include lease-back arrangements such as Kakadu National Park, and reserves designated under the Queensland *Nature Conservation Act 1992* as Cape York Peninsular Aboriginal Lands<sup>340</sup>. The management arrangements between the Bininj/Mungguy people and the Director of National Parks with regard to Kakadu National Park are an example of an innovative cooperative management arrangement (DoEE 2016b). Protected area and land management authorities regularly visit the park, as do groups of Indigenous people interested in joint management from within Australia and overseas, and the model of joint management used in Kakadu and Ulu<u>r</u>u-Kata-Tju<u>t</u>a National Parks has been a blueprint for joint management more broadly.

Agreements may be developed to co-manage a park for nature conservation purposes whether or not native title has been formally determined. In Victoria, the *Traditional Owner Settlement Act 2010* provides a number of mechanisms for consultation and participation of traditional owners in managing natural resources, continuing cultural practices and achieving land management agreements, either through a native title settlement or other arrangements.

Cooperative management is one outcome from the Native Title settlement process with the Gunditjmara Traditional Owners<sup>341.</sup> The Ngootyoong Gunditj Ngootyoong Mara South West Management Plan is a new type of multi-park management plan, developed using a unique partnership approach between Parks Victoria, the Gunditjmara Traditional Owners, Budj Bim Council and the Department of Environment, Land, Water and Planning (DELWP). The plan was released in May 2014, and covers nine parks managed or co-managed by Parks Victoria, Cobboboonee Forest Park managed by DELWP, 132 reserves and a regional park managed by Parks Victoria, and six properties owned by the Gunditjmara community including three IPAs. The plan integrates the knowledge of the Gunditjmara traditional owners into park management.

On government-owned conservation reserves, many management plans or statements prepared during the period from 2011 to 2016 specify arrangements for Indigenous co-management. Ongoing consultation on cultural heritage and culturally significant sites is common to these agreements. Indigenous advice can influence other park management. For example the Management Statement for Amamoor National Park, Queensland includes an aim of encouraging traditional owners to identify and document values, sites, artefacts and places of cultural heritage significance so that management strategies and decisions relating to fire regimes, access and track maintenance minimise potential threats to these values<sup>342</sup>. Apart from cultural heritage sites, more comprehensive co-management agreements can include Indigenous input into park management, tourism and visitation, and employment as guides or as rangers who undertake weed and feral animal control, biodiversity monitoring, fire management (see Case study 6.11) and other work. For example, the Murrumbung Rangers use cultural burning practices to manage vegetation in Namadgi National Park, ACT.

Other mechanisms for participation by Indigenous peoples in forest management include engagement with natural resource management and forest management agencies, Indigenous forestry, biosecurity surveillance, tourism, and participation in forest-related programs. NSW National Parks and Wildlife Service supports the Aboriginal educational program 'Connecting to Culture Sydney'. It immerses urban Aboriginal youth into Aboriginal culture within NSW national parks close to Sydney. Participants take part in camping trips, ongoing fieldwork on Country, recording and preserving Aboriginal sites, and discovering Australian native plants and traditional practices<sup>343</sup>.

Most state and territory departments responsible for commercial forest management have policies, programs and guidelines to facilitate Indigenous employment in forestry (see also Indicator 6.5d) and the engagement of Indigenous peoples with forests. Parks Victoria has an active program for the employment of Indigenous people in land under its management. Forestry Corporation of New South Wales (FCNSW)<sup>344</sup> have supported Indigenous trainees while they complete forestry qualifications (FCNSW 2016a). Case Study 6.12 provides further information on the involvement of FCNSW with Indigenous groups.

Finally, Indigenous tourism provides opportunities for employment and renewing connection to country for Indigenous guides and participants, as well as offering visitors an insight into the culture of the local Indigenous

<sup>&</sup>lt;sup>340</sup> www.npsr.qld.gov.au/managing/joint\_management\_of\_cape\_york\_ peninsula\_national\_parks.html

<sup>&</sup>lt;sup>341</sup> Source: Parks Victoria Annual Report 2014–15 (<u>parkweb.vic.gov.au/about-us/publications-list/annual-reports</u>); Victorian National Parks Association (2015) Exploring Victoria's national parks. Victorian National Parks Association (<u>vnpa.org.au/publications/exploring-victorias-national-parks/</u>)

<sup>342</sup> www.npsr.qld.gov.au/managing/plans-strategies/statements/pdf/ amamoor.pdf

<sup>343</sup> www.nationalparks.nsw.gov.au/conservation-programs/connecting-toculture-sydney\_\_\_\_\_\_

<sup>&</sup>lt;sup>344</sup> Until January 2013, Forests NSW.

people. Mossman Gorge, located in the Daintree National Park, Queensland, is owned by the local Indigenous group Kuku Yalanji who manage interpretative dreamtime walking tours, which give visitors the opportunity to experience the beauty of the rainforest and learn about traditional bush foods (Mossman Gorge Centre 2017). The Kuku Yalanji aim to minimise the impact of tourism on the park, including through a low emissions bus which takes tourists to designated areas (Langton 2018).

The Bundian Way is the first Indigenous walking trail to be listed on the New South Wales State Heritage Register, and honours the Koori people who used this trail extensively to commute from Targangal (Kosciuszko) to Bilgalera (Fisheries Beach) on the south coast of New South Wales (Blay and Eden Local Aboriginal Land Council 2011) (Figure 6.33). The first stage of the Bundian Way was opened to the public in March 2016; visitors can experience self-guided tours from Eden's Cocora Beach to Quarantine Bay.

The Gumgali Track (Case study 6.14) is also providing opportunities for Aboriginal-initiated tourism, and for involvement in NSW public-use forest management. Other examples of Indigenous tourism are given in Langton (2018). Figure 6.33: Workers clear and widen a section of the Bundian Way, the first Aboriginal pathway to be listed on the New South Wales State Heritage Register



# Case study 6.12: Forestry Corporation of New South Wales engagement with the Aboriginal community

The Forestry Corporation of New South Wales (FCNSW) aims to protect, nurture and manage Aboriginal cultural heritage and significant sites while creating sustainable partnerships with the Aboriginal community. A team of Aboriginal Partnership Liaison Officers (the FCNSW Aboriginal Partnerships Team) works with Aboriginal communities throughout NSW to find, protect and manage Aboriginal cultural sites on State Forest prior to road works, and prior to forest harvesting and regeneration. The team engages Aboriginal organisations (mostly Local Aboriginal Land Councils) to help with site surveys and to contribute to management of sites and areas of significance. As at June 2016, the area under FCNSW management included six gazetted Aboriginal Places, 3,453 protected Aboriginal sites, and 1,140 hectares managed for Aboriginal cultural heritage. The number of sites is increasing over time, and FCNSW aims to manage cultural heritage on all lands for which they have responsibility.

The FCNSW Aboriginal Partnerships Team develops partnerships or arrangements with Aboriginal organisations to provide access to areas of significance, traditional resources and materials, land for teaching and camping, culture camps, and bark for traditional canoe making. For example, the Anaiwan Aboriginal Traditional Owners use and manage a former forestry depot for cultural teaching and camping. Joint management partnerships in place or under development include with the Darkinjung Local Aboriginal Land Council (LALC) for the joint management of Warre Warren Aboriginal Place in McPherson State Forest inland of the Central NSW Coast, and with the Githabul Rangers for management of Toonumbar State Forest near Kyogle.

FCNSW also encourages projects undertaken by 'green teams' within Aboriginal organisations and Local Aboriginal Land Councils. FCNSW has supported and worked with other Indigenous groups, including the Durrunda Wajaarr Green Team, the Coffs Harbour and District LALC, the Eden Local Aboriginal Land Council, and Keepa Keepa Incorporated, an affiliation of the Awabakal Land Council. FCNSW also participates in community projects which assist Aboriginal people, such as through the provision of salvage timber as firewood for Biripi Aged Care.

FCNSW also provides land-based permits for Aboriginal groups to manage specific areas of land, or for community enterprise development, with the aim, in partnership with Aboriginal people and organisations, of building Aboriginal enterprises that manage significant areas of forest with a focus on sustainability, profitability and strong partnerships.

#### Case study 6.13: Indigenous forestry

Indigenous communities own large areas of contiguous forest in northern Australia, whereas the areas of Indigenous owned forest in southern Australia are relatively small and widely dispersed. Much of the land owned and managed by Indigenous communities is managed for conservation and cultural purposes, but some forested areas are available for harvesting and other uses, depending on wood harvest rights and the agreement of traditional owners.

In southern Australia, a small number of Indigenous businesses cut and supply firewood to their local area, and other communities are scoping the feasibility of a mix of enterprises on Indigenous forest lands. The Indigenous Land Corporation owns small areas of existing plantations (*Pinus radiata*, *Eucalyptus globulus* and sandalwood) on properties acquired for agricultural purposes.



Gumatj men employed at the local Gunyangara timber mill in Arnhem Land.

In the Northern Territory, Tiwi Islanders have long been involved in commercial plantation forestry of brown salwood (*Acacia mangium*) for pulp wood production.

In remote areas of Australia, obtaining timber from regional centres can be extremely expensive, and softwood from *Pinus* species, although reasonably readily available, is not resistant to termites that commonly occur in northern Australia. Harvesting local native forests can provide local employment in Indigenous communities, and be a source of more durable timbers for housing construction, replacing timber imported from elsewhere.

The Yolgnu-Gumatj people of East Arnhem Land harvest trees near Nhulunbuy from mining lease areas about to be cleared of forest for mining, and have a small factory producing furniture and roof trusses. The main species is Darwin stringybark (E. tetradonta), which is a class 1 hardwood, good for construction, decking and outdoor furniture. The Wadaye community of West Arnhem Land has two sawmills used for cutting timber to build furniture. In north Queensland, the Aurukun community are negotiating to develop forestry salvage operations associated with mining on the western side of Cape York. In Queensland, the Cape York Timber mill has a harvest contract with Yintjingga Aboriginal Corporation to harvest on their lands, and to pay royalties to the Lama Lama community. The main species harvested is Darwin stringybark, with in addition some Melville Island bloodwood (Corymbia nesophila) and Cooktown ironwood (*Erythrophleum chlorostachys*).

#### Case study 6.14: Gumgali Track

The Gumgali walking track, located north of Coffs Harbour, New South Wales, is based on the travel route used for tens of thousands of years by the local Aboriginal people to connect Orara Valley and the coast. The traditional owners of the land are the Gumbaynggirr people. The walking track follows the ridge line to Korora lookout, passing through the eucalypt forest of the Bruxner Flora Reserve, part of the Orara East State Forest.

Gumgali track arose from a partnership between Forestry Corporation of New South Wales, Interpretative Design Company, the Coffs Harbour and District Local Aboriginal Land Council, and the Coffs Harbour Elders Group (Gumbaynggirr) who gave their permission for the re-telling of the dreaming story Gumgali. This story tells how Gumgali, the black goanna, burrowed through the escarpment beneath Korora lookout to emerge in the sea off Macauleys Headland.

The Gumgali track retells the story of Gumgali through interactive wooden sculptures, mural artwork, interpretative signage (Figure 6.34) and sound. Sculptures were crafted from locally grown brushbox (*Lophostemon confertus*), tallowwood (*Eucalyptus microcorys*) and ironbark (*E. paniculata*) by a local sculptor with the assistance of a local Gumbaynggirr woman. An audio post near the lookout tells the story of Gumgali in Gumbaynggirr language and English. In partnership with the Bularri Muurlay Nyanggan Aboriginal Corporation, Gumbaynggirr have introduced cultural shows utilising Gumgali track.

Tourism allows Aboriginal communities to revitalise language and culture, creates and drives an economy, and promotes respect and appreciation for culture. Gumgali track provides ongoing opportunities for traditional owners to share language and culture with the local community and tourists, as well as providing employment and income, and highlighting the importance of managing and caring for forests (O'Brien and Rogers 2017). Since the opening of the project in 2016, Gumgali track has won a range of awards from the National Association for Interpretation, Interpretation Australia, and the NSW Tourism Industry.

Source: FCNSW (2016c); www.forestrycorporation.com.au/about/releases/ aboriginal-interpretive-walk.



Figure 6.34: Main entrance sign to Gumgali track, manufactured from locally sourced hardwoods, Orara East State Forest, New South Wales

# Indicator 6.4d

### The importance of forests to people

#### Rationale

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

- Surveys conducted between 2008 and 2017 on behalf of Forest and Wood Products Australia indicate the attitudes of Australians to a range of forest-related issues.
  - Averaged across the surveys, just under half of the respondents agreed that Australia's native forests are being managed sustainably.
  - A majority of respondents considered that wood is more environmentally friendly than alternative materials, and a large majority of respondents preferred the use of Australian trees rather than overseas trees to make wood products.
  - A majority of respondents also believed that harvesting trees is acceptable so long as the trees are replaced.
  - The level of understanding of basic facts about the role of forests and wood in carbon sequestration and storage increased markedly across the 16 surveys.

Australia's forests are recognised as one of Australia's greatest natural assets and are highly valued for the wide range of environmental and socio-economic benefits and services that they provide. Societal values and attitudes towards the natural environment and the activities that affect it change over time. This indicator monitors those attitudes in regards to community acceptance and approval of activities relating to forest management.

# Attitudes towards wood and forests

Sixteen surveys conducted since 2008 for Forest and Wood Products Australia<sup>345</sup> provide insights into the knowledge and attitudes of the community and how these attitudes are changing. In each survey, a sample of approximately one thousand people was asked whether they agreed with a range of statements. The samples were selected with quotas placed on age, gender and location according to census data, to ensure that the samples were representative of the Australian population.

Averaged across the 16 surveys, a little under half of the respondents (44%) agreed that Australia's native forests are being managed sustainably (Figure 6.35). This proportion varied between 39% and 48% over the series of surveys, but with no apparent trend over time.

An average of 56% of respondents agreed that we should use more wood because it is more environmentally friendly than alternative materials (Figure 6.35). This proportion increased from a low of 46% in March 2010 to a high of 71% in July 2017. However, over all 16 surveys, an average of only 14% of respondents considered that Australia should import more wood from overseas rather than cut down Australian trees; individual survey results for this question ranged from 9% to 18% with a slight trend upwards over time (Figure 6.35).

A consistent proportion of people (average of 58%, with a range of 50% to 65% between surveys) agreed that cutting

<sup>&</sup>lt;sup>345</sup> Forest and Wood Products Australia Limited (FWPA) is a notfor-profit company that provides national, integrated research and development services to the Australian forest and wood products industry (www.fwpa.com.au/).



### Figure 6.35: Proportion of people agreeing with statements relating to tree harvesting, native forest management and wood

Notes:

'Agreeing' means the total of responses 'agree totally', 'agree strongly' or 'agree slightly'. Sample sizes are approximately 1,000. Response reliability ±3%.

Source: Forest and Wood Products Australia.

The data used to create this figure, together with other data for Indicator 6.4d, are available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

trees down is bad for the environment. However, a larger proportion of people (average of 76%, with a range of 68% to 82% between surveys) agreed that cutting down trees is acceptable as long as we replace them (Figure 6.35). This suggests that people are prepared to accept some perceived immediate environmental impact of harvesting trees when balanced against the lower long-term impacts and the environmental benefits of being able to use wood.

Respondents were also asked to respond to survey statements relating to carbon and wood (Figure 6.36). These statements are relevant to the ongoing public debate about the enhanced greenhouse effect and global warming, and the role of forests and wood products in the global carbon cycle. All the survey statements are correct, yet in initial surveys the level of agreement with three statements ('Carbon is stored in wood', 'Carbon that is stored in wood stays there even when the tree has been harvested' and 'Wood products in the home store carbon') were well below 100%. In subsequent years, the level of agreement with these statements rapidly increased, showing improving levels of understanding. A substantial majority of respondents now understand that carbon is stored in wood products. Despite that, an average of only 35% of people believed that using more wood would help tackle climate change, with that figure not increasing significantly over time (Figure 6.35).

Five surveys undertaken by the FWPA from 2015 to 2017 asked people whether they considered that various materials used in buildings and for other purposes are 'environmentally friendly'. The average results of the five surveys (Figure 6.37) show that many more respondents (an average of 74% over the five surveys) think wood is environmentally friendly, compared to an average of 13% for the other materials in the survey.



#### Figure 6.36: Proportion of people agreeing with statements on trees and wood

Notes:

Participants were asked to respond 'true' or 'false' to each statement. Sample sizes are approximately 1,000. Response reliability ±3%. Source: Forest and Wood Products Australia.

The data used to create this figure, together with other data for Indicator 6.4d, are available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9





Notes:

The histogram shows the average proportion of respondents who associated the term 'environmentally friendly' with a given material. Five surveys were conducted from 2015 to 2017. Sample sizes are approximately 1,000. Source: Forest and Wood Products Australia.

The data used to create this figure, together with other data for Indicator 6.4d, are available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

6.4d

# 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 national direct employment in the forest sector was estimated at 51,983 persons in 2016, down by 24% from 68,596 persons in 2011. Forest sector employment decreased in all jurisdictions except the Northern Territory during these years.
  - The decline in total direct employment reflected a 24% fall in full-time direct employment, from 56,087 to 42,733 employees, and a 23% fall in part-time direct employment, from 9,508 to 7,301 persons.
  - The total employment figures include a small number of persons employed but away from work.
  - Between 2011 and 2016, national direct employment increased in the forestry and logging subsector and the forestry support services subsector, but decreased in the larger wood product manufacturing and pulp, paper and converted paper product manufacturing subsectors.
- The key drivers for the reduction in total national direct employment in the forestry sector were consolidation of processing into larger facilities with higher labour efficiencies, and restructuring of the sector.
  - These drivers applied to direct employment in both the wood product manufacturing subsector and the pulp, paper and converted paper product manufacturing subsector.

- A study on the South West Slopes and Central Tablelands regions in New South Wales reported that, in 2016, the softwood plantation industry in these regions generated 2,769 direct jobs and 4,633 indirect jobs in these regions, and a further 1,225 indirect jobs elsewhere in New South Wales. This gave a total of 8,627 jobs generated from the softwood plantation industry in these two regions.
  - Similar studies report on indirect employment generated in 2017 by the forest sector in various Australian states and regions.
  - The estimation of indirect jobs by these studies uses multipliers to account for jobs induced by production and consumption effects, as well as broader employment categories, and thus the data are only indicative.

National data on forest sector employment presented in this indicator are derived from the Australian Bureau of Statistics (ABS) Census of Population and Housing, and are presented in four categories or subsectors: forestry and logging; forestry support services; wood product manufacturing; and pulp, paper and converted paper product manufacturing<sup>346</sup>. Employment in other subsectors, such as forest-based tourism, or management of forested national parks and reserves, is not captured here. Employment data are for all persons 15 years of age and over who, during the reference period: worked for at least one hour a week for pay, profit, commission or payment in kind; worked for one hour or more without pay in a family business or on a farm; or were employees who had a job but were not at work (ABS 2013b, 2016b). 'Full-time' refers to persons who usually worked 35 hours or more in a week; 'parttime' refers to persons who usually worked less than 35 hours in a week; and 'away from work' refers to persons who were employed but away from work and for whom hours worked were not reported.

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 decreased between 2011 and 2016, both in the number of employees (from 68,596 to 51,983 persons, a 24% decrease) (Table 6.50, Figure 6.34) and as a proportion of total national employment (from 0.68% to 0.49%). This decline included a 24% fall in total full-time employment, from 56,087 persons in 2011 to 42,733 persons in 2016. Total part-time employment in the forest sector also fell during this period, by 23%, from 9,508 to 7,301 persons.

The key drivers for the reduction in total forestry sector employment were consolidation of processing into larger facilities with higher labour efficiencies, and restructuring of the sector. These drivers applied to both the wood product manufacturing subsector and the pulp, paper and converted paper product manufacturing subsector (Table 6.50; Schirmer 2018). Increased harvesting of plantation logs occurred (ABARES 2018), but does not necessarily create more processing activity if products are exported with minimal processing.

#### Table 6.50: Employment in forestry subsectors, 2006 to 2016

	Number of persons employed				
	Forestry and logging	Forestry support services	Wood product manufacturing	Pulp, paper and converted paper product manufacturing	Total forestry sectorª
2006					
Full time	5,364	1,299	39,310	19,469	65,437
Part time	1,054	614	5,864	2,720	10,260
Away from work	458	139	2,138	1,292	4,021
Total	6,871	2,050	47,310	23,479	79,720
2011					
Full time	4,219	1,293	34,403	16,170	56,087
Part time	810	753	5,694	2,258	9,508
Away from work	372	116	1,575	934	2,996
Total	5,399	2,168	41,670	19,364	68,596
2016					
Full time	4,769	1,783	24,348	11,839	42,733
Part time	903	1,044	3,766	1,586	7,301
Away from work	355	127	922	540	1,946
Total	6,027	2,957	29,035	13,962	51,983

<sup>a</sup> Total national employment in the forestry sector includes a very small number of persons employed in external territories of Australia. Notes: Total employment includes people employed in the sum of the following sectors: forestry and logging; forestry support services; wood product manufacturing; and pulp, paper and converted paper product manufacturing.

Total employment may be different from the sum of the three individual employment categories because the ABS randomly adjusts some small values published in the Census of Population and Housing to avoid release of confidential data.

'Away from work' refers to persons who were employed but away from work and for whom hours worked were not given.

Source: ABS (2006, 2011, 2016b).

🔊 The data used to create this figure, together with other data for Indicator 6.5a, are available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

6.5a

**CRITERION 6** 

<sup>&</sup>lt;sup>346</sup> These categories are from the Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006 (Trewin and Pink 2006).



#### Figure 6.38: Total national employment in forest sector, by employment status, 2006 to 2016

Notes: Total employment includes persons employed full-time and part-time in the following sectors combined: forestry and logging; forestry support services; wood product manufacturing; and pulp, paper and converted paper product manufacturing. Total employment is higher than the sum of full-time and part-time employment because total employment also includes a relatively small number of persons employed but away from work (and did not state their number of hours worked). Table 6.50 shows the number of persons employed but away from work in 2006, 2011 and 2016. Source: ABS (2006, 2011, 2016b).

The data used to create this figure, together with other data for Indicator 6.5a, are available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9



Figure 6.39: Total employment in the forest sector, by jurisdiction, 2006 to 2016

Notes: Total employment includes persons employed full-time and part-time in the following sectors combined: forestry and logging; forestry support services; wood product manufacturing; and pulp, paper and converted paper product manufacturing.

Total employment is higher than the sum of full-time and part-time employment because total employment also includes a relatively small number of persons employed but away from work (and did not state their number of hours worked). Table 6.48 shows the number of persons employed but away from work in 2006, 2011 and 2016.

Source: ABS (2006, 2011, 2016b).

The data used to create this figure, together with other data for Indicator 6.5a, are available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9 The number of persons directly employed in the forest sector decreased in all states and the Australian Capital Territory between 2011 and 2016 (Figure 6.39). The jurisdictions with the highest decreases in employment were Victoria (by 5,062 persons, down 25%), New South Wales (by 4,686 persons, down 22%) and Queensland (by 3,270 persons, down 28%). Proportional decreases in forest sector employment in the jurisdictions ranged between 17% (in South Australia) and 29% (in Western Australia and Tasmania). The Northern Territory was the only jurisdiction where employment increased over this period (from 241 to 278 persons, up 15%).

# Direct employment in the forestry and logging subsector

The forestry and logging subsector includes businesses that grow and log timber in native and plantation forests. It also includes businesses that grow and harvest some non wood forest products.

Total employment in this subsector increased between 2011 and 2016, both in the number of employees (from 5,399 to 6,027 persons, a 12% increase) (Table 6.50) and as a proportion of total forest sector employment (from 8% to 12%). The number of persons employed both full-time and part-time increased during these years.

# Direct employment in the forestry support services subsector

The forestry support services subsector includes businesses that provide silvicultural support services to forestry, such as planting, pruning and thinning trees, forest reafforestation, forest plantation conservation or maintenance; and that operate forestry planting stock nurseries.

Total employment in the subsector increased between 2011 and 2016, both in the number of employees (from 2,168 to 2,957 persons, a 36% increase) (Table 6.50) and as a proportion of total forest sector employment (from 3% to 6%). The number of persons employed both full-time and part-time increased during these years.

# Direct employment in the wood product manufacturing subsector

The wood product manufacturing subsector includes businesses that manufacture rough-sawn timber and boards, woodchips, engineered wood products; and that re-saw or dress timber, timber boards and mouldings.

Total employment in the wood product manufacturing subsector decreased between 2011 and 2016, both in the number of employees (from 41,670 to 29,035 persons, a 30% decrease) (Table 6.50) and as a proportion of total forest sector employment (from 61% to 56%). The number of persons employed both full-time and part-time decreased during these years. The number of persons employed in this subsector fell by the most of any forest industry sub-sector, more than double the decrease in the pulp, paper and converted paper product manufacturing subsector. The key drivers for the reduction in employment in the wood product manufacturing subsector were consolidation of processing into larger facilities with higher labour efficiencies, and restructuring of the subsector. More than half of the overall decrease in persons employed in this subsector between 2011 and 2016 can be attributed to a reduction in persons employed in businesses engaged mainly in manufacturing wooden structural fittings and components, such as finger-jointing, roof trusses, door and window frames.

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

The pulp, paper and converted paper product manufacturing subsector includes businesses that manufacture wood pulp; manufacture pulp from used paper, paper or paperboard; and manufacture paperboard containers and other paper-based products.

Total employment in the subsector decreased between 2011 and 2016, both in the number of employees (from 19,364 persons to 13,962 persons, a 28% decrease) (Table 6.50) and as a proportion of total forest sector employment (from 28% to 27%). The number of persons employed both full-time and part-time decreased during these years.

The key drivers for the reduction in employment in the pulp, paper and converted paper product manufacturing subsector were consolidation of processing into larger facilities with higher labour efficiencies, and restructuring of the subsector. More than half of the overall decrease in persons employed in this subsector between 2011 and 2016 can be attributed to a decrease in persons employed in businesses engaged mainly in manufacturing corrugated paperboard containers, sheeting or solid paperboard containers, and paper stationary.

## Indirect forest employment

Indirect employment includes activities that are generated from direct employment in the forest sector. Examples 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.

A study by Schirmer et al. (2018a) estimated employment generated directly and indirectly by the commercial softwood plantation industry in the South West Slopes and Central Tablelands regions of New South Wales in 2016. These two regions together represent around a quarter of Australia's commercial softwood plantation estate (Downham and Gavran 2018).

Employment data are derived from a survey of forest industry businesses operating in the two regions, the ABS 2016 Census of Population and Housing, and economic modelling. 6.5a



Nangarin Timbers sawmill, Maryborough, Queensland, which closed in 2016 as part of the decline in sawmilling employment during the reporting period.

The direct employment categories used in the study are different from those used by the ABS. Direct employment includes employment generated up to the point of sale of primary processed products from softwood plantations, as well as by the wholesaling of these products. Indirect employment includes jobs generated as a result of the economic activity of the softwood plantation industry, and the estimation of indirect jobs uses multipliers to calculate jobs generated by production-induced and consumption-induced impacts<sup>347</sup>, and thus the data are only indicative.

In the South West Slopes region in 2016, the softwood plantation industry generated 1,917 direct jobs and 3,458 indirect jobs, a total of 5,375 jobs. In the Central Tablelands region in 2016, the softwood plantation industry generated 852 direct jobs and 1,175 indirect jobs, a total of 2,027 jobs. The majority of direct jobs in both regions (66% in the South West Slopes and 73% in the Central Tablelands) were generated in the processing and wholesaling of wood and paper products. The study also found that an additional 1,225 indirect jobs were generated elsewhere in New South Wales as a result of the softwood plantation industry in the South West Slopes and Central Tablelands regions. These jobs were generated from the demand for supplies and inputs (such as fuel and mechanical servicing), and from the spending of salaries and wages by industry workers. A total of 8,627 jobs were therefore generated in 2016 in New South Wales from the softwood plantation industry in the South West Slopes and Central Tablelands regions.

Studies using a similar methodology have also estimated employment generated directly and indirectly in 2017 by the forest industry in Queensland (Schirmer et al. 2018b), in Victoria (excluding the Green Triangle region<sup>348</sup>; Schirmer et al. 2018c), in Western Australia (Schirmer et al. 2017a) and the Green Triangle region (Schirmer et al. 2017b).

<sup>&</sup>lt;sup>347</sup> Production-induced impacts are generated by businesses outside the forest industry that supply forest industry businesses. Consumptioninduced impacts are generated when workers involved in the forest industry, and in businesses that supply the forest industry, spend their wages on goods and services (Schirmer et al. 2018a).

<sup>&</sup>lt;sup>348</sup> A region that includes softwood and hardwood plantations in south-west Victoria and south-east South Australia.

# 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 forest sector varied between \$4.0 and \$4.3 billion between 2010–11 and 2015–16, driven mostly by changes in average wages in the pulp, paper and converted paper products subsector.
  - In 2015–16, the average annual wage in the forestry and logging subsector was \$41,538. This is high compared with most other primary sectors, including agriculture, but low relative to the mining sector.
  - In 2015–16, the average annual wage in the wood product manufacturing subsector was \$53,233. This is lower than in most other manufacturing sectors or subsectors.
  - In 2015–16, the average annual wages in the pulp, paper and converted paper product subsector was \$94,125. This is at the upper end of wages across manufacturing sectors and subsectors.
- Between 2010–11 and 2014–15, the number of serious injury claims rose by 5% in the forestry and logging subsector (from 137 to 144), and fell by 25% in the wood and paper product manufacturing subsector (from 1,826 to 1,371).
  - Over this period, the incidence of serious injury claims per thousand employees also rose in the forestry and logging subsector, and fell in the wood and paper product manufacturing subsector.
  - From 2010–11 to 2014–15, there were four reported compensated fatalities in the forestry and logging subsector, and nine reported compensated fatalities in the wood and paper product manufacturing subsector.
  - A 2016 study on forestry work accidents in five industry partners of the Australian Forest Operations Research Alliance during the period 2004 to 2014 found that the total number of work accidents was 470, with the majority occurring in harvesting, transport and roading (176 accidents) and forest management (142 accidents).

National data on forest sector wage and salary rates presented in this indicator are derived from the Australian Bureau of Statistics, and are presented for three industry subsectors: forestry and logging; wood product manufacturing; and pulp, paper and converted paper product manufacturing. Estimates for the forestry support services subsector are not presented because of aggregation limitations within the source data. This indicator also presents data derived from Safe Work Australia on injury and death rates in the forestry and logging subsector and the wood and paper product manufacturing subsector (which combines the wood product manufacturing subsector and the pulp, paper and converted paper product manufacturing subsector).

### Wage rates

Estimates of wage rates were derived by dividing the total wages and salaries reported in a subsector by the number of full-time and part-time employees in that subsector. 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 forest sector varied between \$4.0 and \$4.3 billion between 2010–11 and 2015–16 (Figure 6.40). Over this period, wages and salaries increased by 4% in the forestry and logging subsector and by 6% in the wood product manufacturing subsector, and fell by 1% in the pulp, paper and converted paper product manufacturing subsector by 1%.

In 2015–16, the wood product manufacturing subsector constituted the largest component (53%) of total forest sector wages and salaries, while the pulp, paper and converted paper product manufacturing subsector comprised 35%, and the forestry and logging subsector 12%.

The estimated average annual wage for workers in the forestry and logging subsector increased from \$34,467 to

\$41,538 (a 21% increase) between 2010–11 and 2015–16, and was higher than in most other agriculture, forestry and fishing sectors during this period (Figure 6.41; employment categories used for the inter-sectoral comparisons are shown in Box 6.2). By contrast, the estimated annual average wage in the mining industry increased from \$117,893 to \$154,043, by a higher proportion (31%) and from a much higher base.

Workers in agriculture had the lowest average wage relative to other primary sectors, due partly to the large part-time labour force that is typically recruited during harvesting seasons. The high average annual wage in the mining sector is due largely to the sector's location in remote areas of Australia – requiring higher wages to attract labour to the industry (Connolly and Orsmond 2011).

Figure 6.42 shows the estimated annual average wage in selected product manufacturing subsectors between 2006–07 and 2015–16. The estimated average annual wage in the wood product manufacturing subsector increased from \$49,023 to \$53,233 (by 9%) between 2010–11 and 2015–16, but was generally lower than in most other product manufacturing subsectors during this period. By contrast, the estimated annual average wage in the pulp, paper and converted paper product manufacturing subsector increased from \$72,476 to \$94,125 (by 30%) between 2010–11 and 2015–16, and in 2015–16 was the highest of all other reported subsectors.



#### Figure 6.40: Wages and salaries, forest sector, 2006–07 to 2015–16

Notes: Estimates for the forestry support services subsector are not presented because of aggregation limitations within the source data. Employment categories are from the Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006 (Trewin and Pink 2006) (see Box 6.2). Source: ABS (2017b).

🔊 The data used to create this figure, together with other data for Indicator 6.5b, are available in Microsoft Excel via <u>www.doi.org/10.25814/5bda972cd76d9</u>





Notes: Employment categories are from the Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006 (Trewin and Pink 2006); some categories are aggregated. Box 6.2 gives more detail of the forest sector-related categories. Source: ABS (2017b).

🦻 The data used to create this figure, together with other data for Indicator 6.5b, are available in Microsoft Excel via <u>www.doi.org/10.25814/5bda972cd76d9</u>



#### Figure 6.42: Estimated annual wage, per person, selected product manufacturing sectors, 2006–07 to 2015–16

Notes: Employment categories are from the Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006 (Trewin and Pink 2006); some categories are aggregated. Box 6.2 gives more detail of the forest sector-related categories. Source: ABS (2017b).

🔊 The data used to create this figure, together with other data for Indicator 6.5b, are available in Microsoft Excel via <u>www.doi.org/10.25814/5bda972cd76d9</u>

#### Box 6.2: Forest-related employment categories used for the inter-sectoral comparisons

The following employment categories used in Figures 6.41 and 6.42 are slightly different to the employment categories used elsewhere in Indicators 6.5a-d.

#### Agriculture, forestry and fishing support services

This category refers to Division A, Subdivision 05 of the Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006. It includes businesses that provide silvicultural support services to forestry, shearing services for livestock, and other agricultural and fishing support services, and businesses that operate forestry nurseries.

#### Forestry and logging

This category refers to Division A, Subdivision 03, of ANZSIC 2006. It includes businesses that mainly grow and log timber in native or plantation forests, or timber tracts; cut and/or roughly hew logs into products such as railway sleepers or posts; cut trees and scrubs for firewood; and gather forest products such as mushrooms and resin from forest environments.

#### Wood product manufacturing

This category refers to Division C, Subdivision 14, of ANZSIC 2006. It includes businesses that manufacture rough-sawn timber and boards; woodchips; prefabricated buildings; structural fittings and components (such as roof trusses and doors); veneers and plywood; wood boards and sheets from reconstituted wood fibres; laminated timber and non-timber materials; and businesses that re-saw or dress timber, timber boards and mouldings. It excludes businesses that manufacture timber used in furniture-making.

## Pulp, paper and converted paper product manufacturing

This category refers to Division C, Subdivision 15, of ANZSIC 2006. It includes businesses that manufacture: wood pulp, pulp from used paper, paper or paperboard; paperboard containers; paper bags; paper stationery products; and sanitary paper-based products.

Businesses are classified according to their predominant activity, and can include government-owned and controlled entities such as government agencies.

The 2006 ANZSIC (Trewin and Pink 2006), was updated in 2013 (Pink and Welch 2013) with minor revisions but maintaining the scope, concepts and structure of the 2006 ANZSIC.

### Injury rates

Injury and fatality rates in the forest sector reflect occupational health and safety standards, as well as the inherent danger of the forest sector.

Between 2010–11<sup>349</sup> and 2014–15, the number of serious injury claims rose in the forestry and logging subsector from 137 to 144 (a 5% increase) and fell in the wood and paper product manufacturing subsector from 1,826 to 1,371 (a 25% decrease) (Figure 6.43). Over the same period, the incidence of serious injury claims per 1,000 employees in the forestry and logging subsector increased marginally from 30.1 to 30.7, but decreased in the wood and paper product manufacturing subsector from 33.1 to 27.3.

Between 2010–11 and 2014–15, there were four reported compensated fatalities in the forestry and logging subsector and nine in the wood and paper product manufacturing subsector (Figure 6.44). During the same period, the average incidence of compensated fatalities per 1,000 employees was 0.13 in the forestry and logging subsector, and 0.04 in the wood and paper product manufacturing subsector.

A study by Ghaffariyan (2016) reported on the frequency, type and root causes of work accidents that occurred within different forestry activities of five industry partners of the Australian Forest Operations Research Alliance during the period 2004 to 2014. The study found 470 work accidents during this 11-year period. The majority of accidents occurred in operational activities, such as harvesting, transport and roading (176 accidents), and forest management (142 accidents) (Table 6.51). Firefighting activities accounted for 38 accidents and 114 accidents occurred in other, unspecified forestry activities.

The main reported root causes of accidents were individual errors such as lack of personal protective equipment, operator error, poor body position, and application of poor techniques. Back and shoulder injuries were the most common. The study suggests that workers aged between 50 and 59 years have had a higher accident rate while workers older than 65 years had the lowest accident rate, although 51% of the incident reports did not record worker age.

<sup>&</sup>lt;sup>349</sup> SOFR 2013 reports injury and fatality rates to 2009–10.



Figure 6.43: Serious injury claims, number and incidence per 1,000 employees, 2003–04 to 2014–15

Notes: Data from 2003–04 to 2009–10 cannot be compared with data from 2010–11 to 2014–15 due to changes between those periods in both industry classification (i.e. differences between the 1993 and 2006 Australian and New Zealand Standard Industrial Classifications) and data collection. Wood and paper products includes wood product manufacturing and pulp, paper and converted paper product manufacturing.

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

🔊 The data used to create this figure, together with other data for Indicator 6.5b, are available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9



#### Figure 6.44: Compensated fatalities, number and incidence per 1,000 employees, 2003–04 to 2014–15

Notes: Data from 2003–04 to 2009–10 cannot be compared with data from 2010–11 to 2014–15 due to changes between those periods in both industry classification (i.e. differences between the 1993 and 2006 Australian and New Zealand Standard Industrial Classifications) and data collection. Wood and paper products includes wood product manufacturing and pulp, paper and converted paper product manufacturing.

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

🦻 The data used to create this figure, together with other data for Indicator 6.5b, are available in Microsoft Excel via <u>www.doi.org/10.25814/5bda972cd76d9</u>

Table 6.51: Work accidents by forestry activity, for five industry partners of the Australian Forest Operations Research Alliance, 2004–2014

Activity	Number of accidents	Proportion (%)
Forest management <sup>a</sup>	142	30
Operations <sup>b</sup>	176	37
Firefighting	38	8
Others	114	24
Total	470	100

<sup>a</sup> Includes activities such as silviculture, planting, nursery, planning, assessment, establishment and fertilisation.

<sup>b</sup> Includes harvesting, transport and roading.

Note: Totals may not tally due to rounding.

Source: Ghaffariyan (2016).

🔊 This table, together with other data for Indicator 6.5b, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9
# 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

- In 2016, there were 30 Local Government Areas (LGAs) rated as dependent on forest and wood products industries through having 2% or more of their working population and more than 20 workers employed in these industries. Five of these LGAs (two in New South Wales, three in South Australia) had 8% or more of their workforce employed in the forest and wood products industries.
  - Employment in forest and wood products industries declined in 21 of these 30 LGAs over the period 2011–16. With the exception of LGAs in Victoria, these declines were greater than the declines observed in total employment within each LGA.
  - Large proportional increases in forest and wood products industries employment were in LGAs in south-west Victoria (Glenelg) and northern Tasmania (George Town).
- Levels of community adaptive capacity (as represented by a combination of economic diversity, community wellbeing, and capital resources) varied considerably across the 30 LGAs rated as dependent on forest and wood products industries.
  - Levels of economic diversity varied considerably across these 30 LGAs, both between and within jurisdictions.
  - Three LGAs in Western Australia (Nannup, Manjimup and Bridgetown–Greenbushes) and two LGAs in Victoria (Alpine and Wangaratta) had higher scores for both community wellbeing and capital resources indices.
  - Three LGAs in Tasmania (Central Highlands, Dorset and Waratah/Wynyard) had lower scores for both community wellbeing and capital resources indices.
  - Bellingen (New South Wales) had a high score across all three indices of community adaptive capacity.

- In 2016, the median age of forest and wood products sector workers was from 40 to 50 years in 22 of the 30 LGAs dependent on forest and wood products industries.
  - There was a small increase in the median age of workers in the forest and wood products sector nationally between 2011 and 2016.
  - In eight LGAs dependent on forest and wood products industries, four of which were in Tasmania, the median age of workers in this sector was lower in 2016 than in 2011.
- Nationally, 54% of workers in the forest and wood products sector had non-school qualifications in 2016, compared with 65% in the total workforce. In 25 of the 30 LGAs dependent on forest and wood products industries, the proportion of workers in the forest and wood products sector with qualifications increased between 2011 and 2016.
- Nationally, 28% of households containing workers in the forest and wood products sector had weekly incomes below \$800. This is slightly lower than the proportion for total workforce households.
  - The proportion of households with weekly incomes below \$800 fell by more in the forest and wood products sector over the five years to 2016, than in the broader workforce.
- Communities with significant employment in Australia's forest and wood products industries thus continue to be exposed to structural changes in the sector, as well as to other influences on the local community. Changes in employment patterns, or changes in the level of employment dependence on a specific industry, can pose challenges for communities.

In a socio-economic context, the concept of resilience of a community 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 thus complimentary: increasing adaptive capacity will increase community resilience.

Recent industry trends that may affect communities dependent on the forest and wood products sector in Australia include changing patterns of harvesting native forests and plantations, consolidation in the sawmilling industry, and stronger export demands for processed wood products and resultant investment. The economic and social implications of these trends for such communities will depend on factors such as community size, structure, location and history. Some communities adapt to change through transformation and pursuing 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 long-term consequences (Australian Social Inclusion Board 2009).

In this indicator, a range of information is presented about the characteristics of communities and workers in the forest and wood products industries<sup>350</sup> that may affect their capacity to prevent, withstand, or mitigate threats resulting from changes in the industry upon which they depend. This information informs our understanding of resilience of forest-dependent communities to changing social and economic conditions.

The resilience of communities dependent on the forest and wood products sector is conceptualised in this indicator through:

- the degree of community dependence on forest and wood products industries
- community adaptive capacity, represented by a combination of:
  - economic diversity of industries that provide employment within the community
  - community wellbeing, depicting residents' confidence and perceptions about wellbeing and liveability in their community
  - the degree of social, human, financial, institutional, physical and natural capital resources available in the community.

Higher levels of economic diversity, community wellbeing, and capital resources can indicate greater adaptive capacity and resilience to industry change.

Selected characteristics that can contribute to the resilience to change at the level of individual workers are also presented.

## 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. This indicator presents data on those directly employed in the forest and wood products industries. However, it is difficult to determine the economic dependence on forests resulting from other forest users such as apiarists, graziers, and ecotourism operators, and thus these activities are not considered in this indicator. Other business activities connected with forest and wood products industries, such as input suppliers, training providers, transport contractors and timber wholesale businesses, are also not considered.

Communities are considered to be dependent on the forest and wood products industries when direct employment in the sector is at least 2% of total workforce employment, and the community contains more than 20 workers employed in these industries. The threshold employment proportion has been reduced from the value of 4% used in SOFR 2013 so as to detect changes in more communities.

Table 6.52 shows the characteristics of the 30 Local Government Areas<sup>351</sup> (LGAs) that were dependent on the forest and wood products industries, as well as changes since 2001. In 2016, there were five LGAs where 8% or more of the workforce were employed in forest and wood products industries (Snowy Valleys and Oberon in New South Wales, and Mount Gambier, Wattle Range and Grant in South Australia). SOFR 2013 presented economic dependence for Statistical Local Areas, which are different geographic units to the LGAs reported here.

Figure 6.45 shows the location of the LGAs that were dependent on the forest and wood products industries, together with the locations of National Plantation Inventory (NPI) regions. The NPI regions indicate major regions of the commercial plantation estate, and can also indicate major centres of employment in the wider forestry sector.

In 2016, nationally 83% of workers in the forest and wood products sector were employed in the combined wood product manufacturing industry and pulp, paper and converted paper product manufacturing industry, 12% were employed in forestry and logging industry, and another 6% in the forestry support services industry (ABS 2016b). National forestry sector employment levels are also reported in Indicator 6.5a.

While total employment rose nationally from 2011 to 2016, total employment declined in 25 of the 30 LGAs dependent on forest and wood products industries. In 21 of these 30 LGAs, employment in forest and wood products industries also declined over this period. The decline in forest and wood products industries employment was more than 20% in eight LGAs, with the largest proportional reductions in LGAs in Tasmania. In four LGAs in Victoria employment in forest and wood products industries increased from 2011 to 2016, although total employment declined. Large proportional increases in forest and wood products industries employment occurred in south-west Victoria (Glenelg) and northern Tasmania (George Town).

<sup>&</sup>lt;sup>350</sup> Forest and wood products industries are defined here using the Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006 categories: forestry and logging; forestry support services; wood product manufacturing; and pulp, paper and converted paper product manufacturing. The forest and wood products sector is defined as the sum of these four categories.

<sup>&</sup>lt;sup>351</sup> Local Government Areas (LGAs) are a suitable, small-scale geographic unit for reporting meaningful social data for the forest sector for a range of stakeholders including local governments (ABARES 2014). Nationally, there are 545 LGAs.

	Number of	Proportion of workforce employed in	Change in forest c e	ind wood products i employment (%) <sup>a</sup>	ıdustries	Change in total employment (all industries) <mark>(%)</mark>		Adaptive capacity (2016)	
Local Government Area	people employed in forest and wood products industries, 2016	Torest and wood products industries, 2016 (%)	2001–06	2006–11	2011–16	2011-16	Economic diversity index <sup>b</sup>	Community wellbeing index <sup>c</sup>	Capital resources index <sup>d</sup>
New South Wales									
Snowy Valleys	903	15.84	-2.3	-4.3	1.7	-7.0	0.44	0.72	0.55
Oberon	320	15.24	8.7	-9.2	-16.9	-7.0	0.47	0.75	0.60
Kyogle	92	2.99	-46.6	14.4	-31.9	-8.1	0.45	0.72	0.57
Clarence Valley	400	2.37	15.6	-12.1	-29.5	-3.0	0.88	0.72	0.57
Bellingen	67	2.06	-31.4	1.0*	-8.5*	1.3	0.85	0.80	0.57
Northern Territory									
West Arnhem	27	2.04	-100.0*	I	-12.9*	-36.1	0.46	0.70	0.53
Queensland									
Gympie	627	3.76	-0.1*	-10.4	-14.0	-1.5	0.81	0.71	0.54
South Australia									
Mount Gambier	1143	10.18	-3.3	-20.1	-6.5	-0.1	0.86	0.72	0.53
Wattle Range	456	9.40	-8.7	-33.1	-16.9	-7.4	0.35	0.80	0.54
Grant	333	8.91	-0.7*	-15.9	-8.5	-2.9	0.37	0.80	0.54
Tasmania									
Dorset	173	7.09	2.3*	-51.9	-20.3	-5.6	0.30	0.67	0.51
Derwent Valley	212	5.77	0.6*	-28.3	-15.5	-1.4	0.85	0.73	0.55
George Town	96	4.64	-25.9	7.9*	41.2	-12.3	0.72	0.69	0.53
Circular Head	144	4.18	14.9	-17.9	-38.5	-4.2	0.30	0.78	0.54
Central Highlands	27	3.43	-14.0*	-22.4	-28.9	-2.6	0.19	0.66	0.49
Huon Valley	141	2.30	-5.9	14.1	-40.0	1.2	0.61	0.73	0.55
Waratah/Wynyard	112	2.19	*4.0	-59.3	19.1	-8.1	0.77	0.68	0.51
Victoria									
Alpine	239	4.53	-20.6	-20.7	-2.4*	0.8	0.76	0.85	0.60
Latrobe	1189	4.19	11.0	-14.6	-4.9	-4.0	0.75	0.62	0.54
Colac-Otway	378	4.14	4.6	8.8	2.4*	-1.8	0.63	0.79	0.58
Benalla	178	3.29	-29.9	2.1*	-8.2	-8.2	0.77	0.72	0.58
Wellington	443	2.58	43.7	3.9	9.9	-1.9	0.64	0.74	0.56
Glenelg	190	2.40	-10.4	-55.8	52.0	-7.7	0.58	0.73	0.55
Wangaratta	253	2.09	6.6-	-9.1	9.5	-2.1	0.83	0.83	0.63

Table 6.52: Characteristics of Local Government Areas dependent on forest and wood products industries

Continued

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	Number of	Proportion of workforce employed in	Change in forest	and wood products i employment (%) <sup>a</sup>	ndustries	Change in total employment (all industries) (%)		Adaptive capacity (2016)	
Local Government Area	people employed in forest and wood products industries, 2016	forest and wood products industries, 2016 (%)	2001-06	2006–11	2011-16	2011-16	Economic diversity index <sup>b</sup>	Community wellbeing index <sup>c</sup>	Capital resources index <sup>d</sup>
Western Australia									
Nannup	38	7.25	110.3	-11.5*	-29.6	-10.0	0.44	0.83	0.61
Manjimup	274	6.85	-43.9	-22.7	0.4*	-4.4	0.39	0.83	0.61
Bridgetown-Greenbushes	58	3.14	-7.0*	-30.1	-37.6	-3.1	0.53	0.83	0.61
Donnybrook-Balingup	66	2.75	13.4	-23.7	-7.0*	0.2	0.48	0.76	0.57
Dardanup	135	2.18	36.8	-17.5	2.3*	3.6	0.78	0.76	0.57
Wyndham-East Kimberley	66	2.15	106.3	127.3	-12.0*	-14.9	0.73	0.71	0.56
Australia <sup>e,f</sup>	51,983	0.51	-3.4	-14.0	-24.2	3.9	1.0	0.75	0.55
-, not calculated as previous value zero									

\* Change of 10 or fewer individuals.

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<sup>a</sup> 2001, 2006 and 2011 data have been adjusted to align with 2016 LGA boundaries.

<sup>b</sup> The economic diversity index is calculated from ABS census data and measures the variety of employment sectors in an LGA on a scale between 0.0 and 1.0, with a score of 1.0 indicating the same diversity as the Australian economy (high diversity). Economic diversity index cannot be aggregated above LGA scale.

c Community wellbeing index scores from 2016 Regional Wellbeing Survey datasets rescaled to between 0.0 (relatively low wellbeing) and 1.0 (relatively high wellbeing)

<sup>d</sup> Capital resources index constructed by ABARES from 2016 Regional Wellbeing Survey data by averaging the scores under financial capital, human capital, institutional capital, physical capital and natural capital, for each LGA or region including the LGA (see Table 6.53). A score of 0.0 indicates relatively low capital and a score of 1.0 indicates relatively high capital.

All LGAs in Australia, not just those dependent on forest and wood products industries.

f Employment changes for 2001–06 and 2006–11 differ to those reported in SOFR 2013 because of a change in industry classification for the forest sector.

Notes: Local Government Areas (LGAs) are considered to be dependent on the forest and wood products industries when direct employment in the sector is at least 2% of total workforce employment, and the community contains more than 20 workers employed in these industries. The Australian Capital Territory is not listed because employment in forest and wood products industries is below 2% of total workforce employment (there are no LGAs within the ACT).

Source: ABARES calculations based on ABS (2016b), ABS Customised reports on census data for 2004, 2011 and 2016, and 2016 Regional Wellbeing Survey data tables (www.canberra.edu.au/research/faculty-research-centres/ceraph/ regional-wellbeing/survey-results/2016-survey-results/2016-results-by-rda-and-lga).

🐼 This table, together with other data for Indicator 6.5c, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

Continues



Figure 6.45: Local Government Areas, by proportion of the total workforce employed in forest and wood products industries, 2016

Note: map shows all National Plantation Inventory regions and LGAs with 2% or more of the total workforce employed in forest and wood products industries, regardless of the number of individual workers in these industries in the LGA. Two mapped LGAs (Menzies in Western Australia, and Belyuen in Darwin, Northern Territory) have 20 or less workers in these industries.

Source: ABS (2016b).

🔊 A higher resolution version of this map, together with other data and maps for Indicator 6.5c, is available via <u>www.doi.org/10.25814/5be3bc4321162</u>

## Community resilience

Community resilience is difficult to measure quantitatively, but measures of community adaptive capacity can be used as a proxy for community resilience. Three quantitative indices are used to represent the degree of adaptive capacity within a community: economic diversity, community wellbeing, and capital resources (see Box 6.3). The indices use employment data from the 2016 Australian Bureau of Statistics Census of Population and Housing (ABS CPH), and community wellbeing and capital resources data from the 2016 Regional Wellbeing Survey.

Communities are likely to be more resilient, adaptive (to change) and healthy if they have a strong economy, good access to services and infrastructure, positive social inclusion, strong institutions and governance, and positive leadership (Kais and Islam 2016; Schirmer et al. 2016). The diversity of employment sectors in a local economy is a useful indicator of the potential in a community to respond to change in one specific sector (see Box 6.3). If the forest and wood products sector sits alongside a diversity of other economic activities, this can provide communities with a more even and secure

growth trajectory (Ministry for Primary Industries 2015). Economic diversity is a common component in, and one of the most influential parts of, adaptive capacity metrics that combine population information to compare communities (Productivity Commission 2017; Stenekes et al. 2012).

Resilient communities have sufficient assets and resources to facilitate their coping capacity in the short and long term (Kais and Islam 2016). Having access to the types of resources that support and positively influence wellbeing, resilience and adaptive capacity, is commonly called 'capital' – financial, human, social, physical, natural and institutional (Schirmer et al. 2016). These types of capital describe the resources that people and communities can draw on, use and transform, to achieve positive wellbeing outcomes, and hence these types of capital can also be referred to as 'determinants of wellbeing' (Schirmer et al. 2016).

Some determinants of wellbeing are more difficult to measure with census data, and surveys can provide another perspective of the experiences of residents of their local context. Good levels of the above resources can, in turn, lead residents to have a more positive view of wellbeing in their community, and its 'liveability' (Schirmer et al. 2016). A subjective index of

#### Box 6.3: Indicating resilience - community adaptive capacity

#### **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. An Economic Diversity Index (Hachmann Index; for details see Stenekes et al. 2012) utilises data from the 2016 ABS CPH to generate scores that show diversity of employment across sectors within a location relative to that for Australia. Areas that are more economically diverse, where people are employed across more industries, are likely to be in a better position to respond to change than are less diverse areas.

#### **Community Wellbeing Index**

Community wellbeing is measured in the annual Regional Wellbeing Survey, conducted by the Centre for Research and Action in Public Health, University of Canberra, ACT. The Community Wellbeing Index is a combination of responses to five survey questions asked of residents of rural and regional Australia about liveability, in terms of how attached and positive they feel about their community and how it supports their quality of life. These questions include how well they think their local community copes with challenges, and their confidence in the future of their community. The index provides a collective measure of community wellbeing that can be compared across other areas (Schirmer et al. 2016).

#### **Capital Resources Index**

This is a composite index of the capital resources to which residents in a community have access and can draw upon to respond to change and achieve positive wellbeing outcomes. The index combines sub-components of the Regional Wellbeing Survey that measure residents' views on income and living costs (financial capital); personal health, psychological distress, and community leadership (human capital); equity and inclusion (institutional capital); volunteering rates and belonging (social capital); access to education, professional and telecommunications services (physical capital); and environmental health (natural capital). The detailed composition of these subcomponents is shown in Table 6.53.

#### Table 6.53: Components and measures of capital resources index

Capital resources index	
sub component	Measures
Financial	Household financial wellbeing; financial distress*; community economic wellbeing
Human	General health; self-efficacy; psychological distress*; community leadership and collaboration
Institutional	Having a say; equity and inclusion
Social	Spending time with friends and family; getting involved; regularly volunteer; sense of belonging
Physical	Access to health, education, aged care and child care; Access to transport; Access to food and retail shops; Access to financial and professional services; Access to telecommunications; Crime and safety; Landscape and aesthetics
Natural	Perceived environmental health

\* The negative of the score for psychological distress was used in the sum of scores.

Questions used to score each measure are given in www.canberra.edu.au/research/faculty-research-centres/ceraph/regional-wellbeing/survey-results/2016-survey-results/2016-results-by-rda-and-lga

community wellbeing can be used to report on the confidence of residents in a community's resilience and its future, to help understand adaptive capacity (see Box 6.3).

Of the 30 LGAs dependent on forest and wood products industries, several LGAs (Central Highlands, Dorset and Waratah/Wynyard in Tasmania, and Latrobe in Victoria) had relatively low community wellbeing scores in 2016, while other LGAs (Nannup, Manjimup and Bridgetown– Greenbushes in Western Australia, and Wangaratta and Alpine in Victoria) had higher wellbeing scores (Table 6.52). This reflects that wider influences affect wellbeing, and that wellbeing is not linked solely to employment in one sector.

The level of capital resources perceived by residents at community scale appears relatively low in several LGAs in Tasmania, in Mount Gambier (South Australia), and West Arnhem (Northern Territory). This compares with higher levels of perceived capital resources in Wangaratta and Alpine (central Victoria), Nannup, Manjimup and Bridgetown– Greenbushes (south-west Western Australia), and Oberon (New South Wales).

Across the three measures combined in this indicator to depict community adaptive capacity (Box 6.3), the LGAs of Central Highlands, Dorset and Waratah/Wynyard (Tasmania) had the lowest scores, while Wangaratta and Alpine (Victoria) and Bellingen (New South Wales) had the highest scores (Table 6.52).

## Box 6.4: Individual forest industry workers – resilience

Factors that influence the individual resilience of workers can include their age, level of education and qualifications, skills and financial position.

Older workers may face greater difficulty in adapting to change. They may find it more difficult to find alternative employment, and lack the mobility to take advantage of opportunities in other geographic locations.

Measures of educational attainment and ability to meet living costs have been positively correlated with subjective wellbeing measures of life satisfaction and health in surveys of forest and wood products workers (Binks et al. 2014). A worker's skill set will also influence their ability to secure alternative employment; unskilled workers may find fewer opportunities for employment.

Equivalised household income (income to enable comparison between households of differing size and composition) is an indicator of financial position that enables comparision between different sized households. It is likely to be a better indicator of the overall ability of workers to meet living costs than individual income.

## 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 situation in the broader community. Table 6.54 presents selected characteristics of individual workers in forest and wood products industries that could contribute to their ability to adapt to change, using ABS CPH data (see Box 6.4).

In 2016, the median age of forest and wood products sector workers was from 40 to 50 years in 22 of the 30 LGAs dependent on forest and wood products industries (Table 6.54). There was a small increase in their median age nationally between 2011 and 2016. In eight LGAs dependent on forest and wood products industries, four of which were in Tasmania, the median age of forest and wood products sector workers was lower in 2016 than in 2011 (Table 6.54).

Qualifications and formal skills recognition can increase opportunities for workers. Nationally, 54% of forestry workers had non-school qualifications in 2016, compared with 65% in the total workforce. However, in 25 of the 30 LGAs dependent on forest and wood products industries, the proportion of forestry workers with qualifications increased between 2011 and 2016 (Table 6.54).

Workers with lower household incomes and in unskilled occupations may have fewer financial resources to assist them to meet living costs or adapt to change. Nationally, the proportion of forest sector worker households with weekly incomes below \$800 was slightly lower (28%) than in total workforce households. The proportion fell by more in the forest sector over the five years to 2016, than in the broader workforce (Table 6.54). In 2016, the West Arnhem LGA (Northern Territory) had the highest proportion of forest sector households with relatively low household incomes. In many LGAs of high dependence on forest and wood products industries, more than 20% of workers in this sector were employed in unskilled jobs in 2016; the proportion nationally was similar in 2016 to 2011.

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Table 6.54: Forestry worker characteristics in Local Government Areas dependent on forest and wood products industries, 2011 and 2016

	Median ag (years)	ge	Worker non-school qu	s with ualification⁵	Unsk work	illed ærs <sup>c</sup>	Weekly h income	ousehold <\$800ª
Local Government Areaª,b	2016	2011	2016 (%)	Change 2011–16 (%)	2016 (%)	Change 2011–16 (%)	2016 (%)	Change 2011–16 (%)
New South Wales								
Snowy Valleys	44	42	53.9	5.1	18.2	-2.2	21.0	-16.3
Oberon	42	40	48.8	8.5	20.3	-5.2	26.4	-12.8
Kyogle	49	45	48.9	10.4	39.1	-3.0	62.5	-4.5
Clarence Valley	44	41	39.3	6.3	31.6	-4.5	48.5	-15.0
Bellingen	49	48	32.0	2.7	40.6	9.5	50.0	-11.0
Northern Territory								
West Arnhem	29	-	22.2	2.9	0.0	0.0	100.0	0.0
Queensland								
Gympie	45	44	49.4	7.9	28.7	0.8	31.9	-12.6
South Australia								
Mount Gambier	43	42	47.3	2.9	20.5	0.1	24.3	-14.4
Wattle Range	48	45	39.7	4.4	19.8	-6.3	17.6	-12.4
Grant	47	45	47.7	2.1	19.6	-0.1	26.0	-11.0
Tasmania								
Dorset	40	41	39.9	-1.1	24.9	-2.8	41.7	-16.5
Derwent Valley	46	45	43.4	4.0	18.8	-4.0	23.4	-12.5
George Town	37	33	31.3	-7.0	27.1	2.1	38.8	-14.1
Circular Head	34	42	34.0	12.7	27.3	-12.7	44.3	-15.9
Central Highlands	44	48	14.8	-16.8	37.0	12.7	53.3	-4.7
Huon Valley	45	41	36.2	3.0	25.2	-17.6	48.2	-13.8
Waratah/Wynyard	41	49	42.0	-5.9	24.3	-0.1	36.5	-15.5
Victoria								
Alpine	46	47	47.7	6.1	20.7	-11.9	35.1	-13.4
Latrobe	46	45	58.6	5.1	22.0	-0.4	14.2	-10.9
Colac-Otway	41	37	47.1	10.8	25.0	-4.4	31.1	-23.4
Benalla	40	39	43.3	5.1	18.4	-0.1	38.3	-16.9
Wellington	38	41	45.1	9.7	33.2	-6.7	32.4	-16.6
Glenelg	36	49	46.8	16.4	20.3	-9.8	28.0	-26.6
Wangaratta	45	39	49.4	-1.7	20.8	3.0	36.1	-13.6
Western Australia								
Nannup	62	54	23.7	-11.5	47.4	-11.9	31.6	-34.3
Manjimup	50	46	35.0	2.1	29.3	-3.8	27.5	-18.5
Bridgetown-Greenbushes	52	49	22.4	-7.7	26.7	-14.2	27.1	-25.5
Donnybrook-Balingup	56	52	51.5	13.5	9.1	-17.4	14.0	-27.3
Dardanup	47	45	43.7	5.1	13.4	-3.6	20.9	-12.7
Wyndham-East Kimberley	48	50	59.1	11.1	15.2	-6.2	6.3	-11.7
Australia (forest workers) <sup>e</sup>	43	41	54.3	4.9	16.8	0.5	28.5	-12.7
Australia (all workers) <sup>f</sup>	40	40	65.3	6.4	9.4	0.0	29.9	-7.7

-, insufficient data

 $^{\rm a}$   $\,$  Based on 2016 LGA boundaries. Data for 2011 have been adjusted to align with 2016 LGA boundaries.

<sup>b</sup> Proportion of workers holding a qualification at the level of certificate, diploma or advanced diploma, bachelor's degree, graduate certificate, graduate diploma or postgraduate degree.

<sup>c</sup> Proportion of workers who identified their occupation as 'labourer'.

<sup>d</sup> Proportion of forest and wood products sector worker households with equivalised household income below \$800 per week. Equivalised household income is household income data adjusted by the ABS to enable comparison between households of differing size and composition. \$800 is used as the closest comparison point to the median Household Equivalised Weekly Income for Australia of \$877 in 2016, and \$790 in 2011.

<sup>e</sup> All LGAs in Australia, not just those dependent on forest and wood products industries.

<sup>f</sup> All LGAs in Australia, not just those dependent on forest and wood products industries, and all industries (whole-of-workforce), not just forest and wood product industries.

Notes: Local Government Areas (LGAs) are considered to be dependent on the forest and wood products industries when direct employment in the sector is at least 2% of total workforce employment, and the community contains more than 20 workers employed in these industries. The Australian Capital Territory is not listed because employment in forest and wood products industries is below 2% of total workforce employment (there are no LGAs within the ACT). Source: ABARES calculations based on ABS (2016b) and ABS Customised reports on census data for 2011 and 2016.

🔊 This table, together with other data for Indicator 6.5c, is available in Microsoft Excel via 🛛 www.doi.org/10.25814/5bda972cd76d9

# Indicator 6.5d

## Resilience of forest dependent Indigenous communities 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

- Australia's Indigenous peoples have a deep connection to their ancestral landscapes, which forms a core part of their sense of wellbeing. Access to native forests enables Indigenous people to maintain or re-connect with cultural values, strengthening their connection with their community, the land and their past. This strengthens personal and community resilience.
- Forest-related employment that draws on traditional activities and knowledge delivers cultural and economic benefits. Key examples include the Indigenous ranger program that is part of the Australian Government's Working on Country initiative, and the legislative requirement for land developers to carry out cultural heritage assessments, including on land involving forests or forestry activities.
  - An estimated 337 Indigenous people are employed in conservation or park operation roles nationally in areas with forested conservation reserves.
- Participation of Indigenous workers in the forest and wood products industries can be used as an indicator of economic dependence on forests. Employment connected with forests can support livelihoods through income, skills development, and a connection with forests through services and advice, which can contribute positively to resilience.

- In 2016, the forest and wood products industries directly employed 1,099 Indigenous people nationally.
- In seven Indigenous Locations across Australia, more than 10% of the Indigenous workforce was employed in the forest and wood products industries.
- Of Indigenous people directly employed in the forest and wood products industries nationally in 2016, 61% were employed in the wood product manufacturing and the pulp, paper and converted product manufacturing industries, 26% were employed in the forestry support services industry, and 13% were employed in the forestry and logging industry.

Indigenous people and communities in Australia include both Aboriginal people and communities and Torres Strait Islander people and communities.

Many Indigenous people place strong cultural significance on native forests, including activities that occur on forested land. This strengthens their cultural identity, and their connection with the land and their past (Feary 2007). Cultural dependence on forests is particularly strong when the forest involves country for which a particular Indigenous community has customary responsibility (Ganesharajah 2009). Relatedness to kin and country is embedded in complex sets of obligations that are laid out by Indigenous law and customs. The land and the associated environment therefore underpin practices that are laden with meaning and that facilitate social interactions relating to personhood, body, property, knowledge, economy and ecology (Kerins and Green 2018). The deep connection of Indigenous peoples to their ancestral landscapes therefore stands central to their wellbeing, and revolves around cultural, physical, social, spiritual and emotional elements (Kingsley et al. 2013).

Indigenous people may therefore define resilience differently than commonly occurs through the lens of a more western worldview. The latter often has at its core sustaining livelihoods through employment opportunities and incomegenerating activities. Instead, Indigenous communities may place high value on cultural resilience, which encompasses the capacity of a particular cultural system to absorb disturbance and re-arrange under change in order to maintain key components of the structure and identity of the particular cultural system (Healy 2006; Kerins and Green 2018). Maintaining livelihoods for Indigenous people thus often includes both tangible economic activities and intangible social and cultural dimensions (Kerins and Green 2018).

The land area managed under the Indigenous estate represents a measure of the opportunities for strengthening both cultural and economic benefits (see Indicators 6.4a and 6.4c). Over the reporting period, the opportunities for Indigenous communities to use native forests have increased as a result of increased formal recognition of native title, land rights legislation and other processes (Indicators 6.4a and 6.4c). A total of 22.9 million hectares of forest are classified as 'Indigenous owned and managed' or 'Indigenous managed', and 5.7 million hectares of forest are classified as 'Indigenous co-managed' (Indicator 6.4a). A further 40.9 million hectares of forested land is classified as 'Other special rights', which includes native title determinations and Indigenous land use agreements. Successful native title claims can contribute considerably to the social and economic wellbeing of Indigenous communities, as these claims confer land access and usage rights. However, the value that Indigenous people place on the different benefits they may derive from forests may vary depending on the local context, and the connections and values of each community.

As described in Indicator 6.5c, no single measure for resilience is possible, and measuring cultural and social aspects is complex. Publicly available data, such as census data, do not provide a national picture of the cultural aspects of resilience, so this indicator also draws on insights gained from interviews with experts, literature and case studies. This indicator is structured along a spectrum of cultural and economic dependence that supports the resilience of Indigenous communities:

- cultural dependence on forest-based activities
- · economic dependence on cultural forest-based activities
- economic dependence on forest and wood products industries.

## Cultural dependence of Indigenous communities on forest-based activities

The cultural use of native forests allows Indigenous people to connect with ancestral landscapes through activities such as hunting and gathering, use of fire (see Case Study 6.15), collecting materials for arts and tool-making, sharing stories and social ceremonies, and collecting bush food. Native forests are places where new generations of Indigenous people can learn traditional knowledge about country and its values, thereby contributing to the cultural resilience of their communities. This has been shown to strengthen Indigenous mental health and personal wellbeing (Feary 2008).

## Economic dependence of Indigenous communities on cultural forest-based activities

Generally, the most resilient Indigenous communities are those in which economic development incorporates customary laws and values. Culture-based employment provides not only income but also benefits related to health, education, social function and wellbeing. These are particularly important in remote communities with limited access to other commercial industries (Garnett et al. 2016). Some forest-related Indigenous business models do not revolve around maximum financial gain, but have the prime objective of addressing social and family obligations (Feary 2008).

Cultural-based industries include creative industries, tourism, wildlife operations, and the sale of bush foods (Garnett et al. 2016), several of which involve activities related to native forests. For example, hundreds of Aboriginal women across South Australia and the Northern Territory participate in the harvesting of wattle seed (predominantly from gundabluie, *Acacia victoriae*) during the summer months. Wattle seed is in demand as a flavour enhancer and a cosmetic exfoliator. Wattle seeds have been or are a key part of the diet of many traditional Aboriginal communities (RIRDC 2014c).

However, it is cultural and natural resource management that is currently seen as the most vibrant industry contributing to the economic development of Australia's Indigenous people (Garnett et al. 2016). An estimated 337 Indigenous people are employed in conservation or park operation roles nationally

#### Case study 6.15: Cultural burning

Australia's Indigenous peoples have used fire to manage landscapes for thousands of years. In modern times, the application by Indigenous people of their landscape management skills using fire is called cultural burning. This typically involves small-scale, low intensity burning during the cooler months of the year, when fire is easily controlled (Feary 2018).

Cultural burning engenders individual and community feelings of wellbeing and satisfaction. Being embedded in millennia of traditional cultural activities, it forms a core part of Indigenous cultural identity and pride, including staying connected with the land and with each other. Using fire involves intricate traditional knowledge passed down from generation to generation, and is nested in ancient spirituality, customary laws, traditions and social organisation. Cultural burning facilitates community gatherings and collective activities, allowing for storytelling, advocating values and enacting traditional roles in communities.

The increasing application of cultural burning in Australia has been facilitated by legislative and policy changes that have improved access to land by Indigenous peoples, in combination with targeted programs. Several initiatives exist to introduce and/or maintain cultural burning by partnering with Indigenous communities, most notably the Firesticks initiative, which sets out to 'create social and ecologically resilient landscapes'. In relation to a control program for serrated tussock grass (*Nassella trichotoma*) in New South Wales, Aboriginal people said that "*if you heal country*, *you heal community*" (Feary 2018).

An example related to cultural burning involves Daniel Gomes, a Ranger from the Bandjalang clan for the Minyumai Indigenous Protected Area in the Upper North East region of New South Wales. This area involves mainly uncleared native forest, woodland and wetlands. During his childhood, Daniel heard stories from his late elder Lawrence Wilson about the native plants and animals that used to inhabit the region and his concerns that they might fail to return (SVA Consulting 2016a). He said "When we burned this area, I didn't think the native plants would come back but they did. I couldn't believe it... When I see the changes I feel proud." The significance to Daniel of the native plants returning involved far more than mere ecological benefits. It fostered his sense of self and reconnected him with his ancestry and culture, and reminded him of the resilience of the Bandjalang people (SVA Consulting 2016a).



Rangers from the Bandjalang clan involved in cultural burning near Coffs Harbour, New South Wales.

Table 6.55: Number of Indigenous people employed in conservation operations in Local Government Areas containing forested areas, 2016

Jurisdiction	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Australia
Number of people <sup>a</sup>	0	119	18	122	5	3	22	48	337

<sup>1</sup> Number of Indigenous people employed in Nature Reserves and Conservation Parks Operation in Local Government Areas (LGAs) that have nature conservation reserves containing native forest. LGAs containing forest on nature conservation reserve tenure were determined from the coverage in Indicator 1.1a. For each of these LGAs, the number of individuals who identified themselves as of Aboriginal and/or Torres Strait Islander origin and who were employed in Nature Reserves and Conservation Parks Operation was determined from 2016 ABS census data for Place of Work (ABS 2016b). A proportion of these workers may be employed in conservation roles in non-forest areas. Figures exclude areas of private forest formally managed for conservation purposes.

🔊 This table, together with other data for Indicator 6.5d, is available in Microsoft Excel via 🛛 www.doi.org/10.25814/5bda972cd76d9

#### Case study 6.16: Cultural heritage assessments

A key desire for many Indigenous people is to integrate their financial independence with their socio-cultural obligations to respect and care for the country, including the associated cultural heritage. Cultural heritage assessments make a considerable contribution to fulfilling this desire, including empowering Indigenous communities to have a say in heritage management and protection. Cultural heritage involves the tangible and intangible legacies that have been passed down from generation to generation to a community or society, including places, objects, values and traditions (Feary 2008).

All Australian states and territories have legislation in place to protect Indigenous heritage, including the need for consultation with communities (Feary et al. 2010) (see Indicator 6.4a). This often leads to requirements for companies that carry out activities in forested areas, such as mining or wood harvesting, to fund cultural heritage assessments and subsequent heritage protection. For example, the Forestry Corporation of New South Wales<sup>352</sup>, through its Aboriginal Partnerships Liaison Team, has partnered with various Aboriginal communities across the state to conserve places that have spiritual, historic, scientific or social value. This includes conducting cultural heritage assessments and jointly managing sites as part of commercial forestry operations (FCNSW 2017).

Cultural heritage assessments form an important income source for various Indigenous communities and/or organisations. This can be through shortterm employment opportunities (Feary 2008), which sometimes lead to longer-term roles, such as appointment as heritage assessment officers and associated staff in Indigenous land councils (Feary 2007). Heritage assessments also enable learning opportunities for Indigenous people, either through formal training or by working with archaeologists (Feary 2008).

One cultural heritage assessment technique that has been used in co-management contexts (see Indicator 6.4c) is 'counter-mapping', which involves mapping the cultural relationships that Indigenous communities have with the land (McClean 2013). Mapping country was recently used by the Githabul community, who entered a co-management agreement for Border Ranges National Park in the Upper North East region of New South Wales (part of the Gondwana Rainforests of Australia World Heritage Area), which enabled an authentic representation of the culture of the Githabul community. This included working with elders to map traditional culture, such as stories, sites and language in traditional forms, including juraveels, places where powerful spirits exist and that form an important part of Githabul cosmology and beliefs. In addition, mapping was undertaken of places of everyday cultural significance, such as fishing spots and hunting grounds (McClean 2013). The researcher reflected on this work as follows (McClean 2013, p.96):

"For the Rangers, the mapping process we undertook was an interesting project that they were exploring for its value in their working lives, but one of its most meaningful aspects, from my observation, was that it was linked to the things they do to stay connected to their Country."

<sup>&</sup>lt;sup>352</sup> Until January 2013, Forests NSW.

in LGAs that contain with forested conservation reserves (Table 6.55). These roles, which include ranger positions, provide income and may facilitate cultural connections to forested areas. Indigenous land management programs provide economic, health and wellbeing benefits to their communities (Kinglsey et al. 2013).

An example of economic dependence is the legislative requirement for cultural heritage assessments associated with forest disturbance activities. These assessments provide opportunities to Aboriginal people to earn income and to reconnect with and conserve culturally significant places (see Case Study 6.16). Another example is Australia's Indigenous ranger program (Garnett et al. 2016), as part of the Australian Government's Working on Country program (see Indicator 6.4a), which incorporates customary law and values.

Together with financial security, other benefits to an individual include strengthened self-confidence and selfesteem, better lifestyle choices, improved heath and wellbeing associated with outdoor activity, and being involved in meaningful work. The benefits of being employed extend to both an individual and often also the individual's immediate and extended families. For Indigenous people, broader community benefits include stronger community leadership, positive role models for younger generations, and stronger bonding between elders and younger generations that facilitates the passing on of traditional knowledge (Van Bueren et al. 2015).

## Economic dependence of Indigenous communities on forest and wood products industries

The remainder of this indicator examines the involvement of Indigenous people in forest and wood product industries. Economic dependence on forest-based activities is difficult to quantify because of the diverse ways in which Indigenous people may be engaged in forest-related employment. The number of people directly employed in forest and wood products industries<sup>353</sup> is used here as an indicator of the economic dependence of Indigenous communities on forests, using ABS Indigenous Locations to define communities geographically (Table 6.56, Figure 6.46). Nationally consistent data on the economic benefits from employment in tourism or ecotourism are unavailable. In 2016, the forest and wood products industries directly employed 1,099 Indigenous people nationally (0.64% of the total Indigenous workforce) (Table 6.56). More than 10% of the Indigenous workforce is employed in the forest and wood products industries in the Indigenous Locations of Manmoyi and Bulman-Weemol (Northern Territory), Cape York Wilderness (Queensland), Iga Warta Homeland, Raukkan and Mount Gambier (South Australia), and Manjimup (Western Australia). Many of these Indigenous Locations are small communities with a relatively high proportion of people working in forestry sector support services.

The absolute numbers of Indigenous people employed in the forest and wood products industries have increased nationally since 2006, although the proportion of the total Indigenous workforce employed in these industries decreased nationally since 2006. However, the proportion of the total Australian workforce in these industries decreased to a greater extent, and the dependence of Indigenous communities on these industries increased slightly relative to the entire workforce. In most of the Indigenous Locations with more than 0.8% of the Indigenous workforce employed in forest and wood products industries (Table 6.56), the proportion of employment in these industries increased from 2011 to 2016, although there were decreases in Indigenous Locations in Tasmania. Increases in these proportions may reflect increased opportunities to provide advice and services to commercial forestry operations, while decreases may be due to changes in the forest and wood products sector as a whole (such as more efficient technology), or the availability of employment in other industries.

Of Indigenous people directly employed in the forest and wood products industries nationally in 2016, 61% were employed in the combined wood product manufacturing and the pulp, paper and converted product manufacturing industries. Another 26% were employed in the forestry support services industry, and 13% in the forestry and logging industry (ABS 2016b). As for non-Indigenous employment, the trend is for an increasing proportion of Indigenous employment in the forestry support services industry, and a decreasing proportion in the wood and paper product manufacturing industries. The forestry support services industry made up 6% of Australian employment in the forest and wood products sector workforce in 2016 (Indicator 6.5c).

6.5d

<sup>&</sup>lt;sup>353</sup> Forest and wood products industries are defined using the Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006 categories of forestry and logging; forestry support services; wood product manufacturing; and pulp, paper and converted paper product manufacturing. The forest and wood products sector is defined as the sum of these four categories.

			Community cha employment d	racteristics – lependence		Chara	cteristics of Indigen and wood product	ous workers in fore ts industries	st
Indigenous Location <sup>a</sup>	Proportion of Indigenous people in population	Number of Indigenous people employed in forest and wood products industries <sup>b</sup>	Proportion of Indigenous workforce employed in forest and wood products industries (%)	Change in proportion of Indigenous workforce employed in forest and wood products industries, 2011–16	Proportion of total workforce employed in forest and wood products industries (%)	Median age (years)	Secondary school qualification <sup>c</sup> (%)	Non-school qualification <sup>d</sup>	Unskilled workers (labourers) (%)
New South Wales									
Tumut	4.8	10	9.17	4.09	16.30	I	42.9	I	100.0
Upper Murray	3.0	6	4.11	1.36	2.30	I	33.3	0.0	50.0
Grafton	8.4	14	3.63	-0.80	3.34	I	0.0	25.0	72.7
Bulahdelah	5.2	8	3.57	1.41	1.87	I	0.0	100.0	0.0
Snowy-Monaro	2.3	80	2.88	0.93	1.30	I	0.0	0.0	I
Bathurst	5.8	13	2.35	1.24	1.69	28	33.3	42.9	57.1
Wyong-North-East	5.8	16	1.19	0.39	1.11	I	0.0	23.5	33.3
Wyong-South-West	4.4	11	1.14	1.14	06.0	I	57.1	55.6	0.0
Shoalhaven	4.4	6	1.13	-0.45	0.59	I	0.0	0.0	100.0
Northern Territory									
Manmoyi	100.0	6	64.29	14.29	64.29	I	50.0	50.0	0.0
Bulman-Weemol	96.6	10	18.18	18.18	16.13	I	0.0	I	0.0
Gunbalanya	91.7	14	9.59	9.59	6.60	I	45.5	33.3	0.0
Queensland									
Cape York Wilderness	14.3	80	12.12	5.87	1.77	I	100.0	100.0	0.0
Cooloola	3.5	6	5.59	0.21	4.12	I	100.0	66.7	0.0
Maryborough	5.1	6	4.84	-2.26	4.42	I	0.0	50.0	100.0
South Australia									
Iga Warta Homeland	88.2	11	84.62	84.62	47.83	48	I	40.0	0.0
Raukkan	100.0	8	50.00	20.00	47.06	I	I	100.0	I
Mount Gambier	2.4	20	13.33	4.94	10.17	I	50.0	15.0	41.2
Limestone Coast	1.7	10	4.95	2.27	4.66	33	0.0	33.3	21.4
									Continued

Table 6.56: Characteristics of Indigenous communities and workers in Indigenous Locations with more than 0.8% of the Indigenous workforce employed in forest and wood products industries, 2016

			Community cha employment d	racteristics – ependence		Chara	cteristics of Indigen and wood product	ous workers in fore ts industries	est
Indigenous Locationª	Proportion of Indigenous peopulation (%)	Number of Indigenous people employed in forest and wood products industries <sup>b</sup>	Proportion of Indigenous workforce ewployed in forest and wood products industries (%)	Change in proportion of Indigenous workforce employed in forest and wood products industries, 2011–16 (%)	Proportion of total workforce employed in forest and wood products industries (%)	Median age (years)	Secondary school qualification <sup>c</sup> (%)	Non-school qualificationd	Unskilled workers (labourers)
Tasmania									
Circular Head-King Island	14.5	28	6.11	-3.60	3.41	I	0.0	24.0	25.9
Wynyard	8.2	6	3.69	3.69	2.20	28	0.0	42.9	40.0
Huonville-South Cape	8.8	6	2.08	-2.73	2.27	I	25.0	0.0	57.1
Burnie	7.4	Ø	1.87	1.87	1.22	I	0.0	44.4	44.4
Launceston	3.9	6	1.41	-1.94	1.06	I	0.0	30.8	57.1
Western Australia									
Manjimup	3.6	11	14.10	7.85	6.85	I	100.0	0.0	57.1
Australia 2016°	3.0	1099	0.64	NA	0.51	33	33.1	43.4	28.3
Australia 2011 <sup>e,f</sup>	2.7	1053	0.74	NA	0.70	33	24.3	31.8	33.9
Australia 2006 <sup>e,f</sup>	2.3	066	0.86	NA	06.0	33	21.3	27.6	40.7
data incufficient									

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Indigenous Locations are geographical units used by the Australian Bureau of Statistics that generally represent small Indigenous communities with a minimum population of 90 usual Indigenous residents, and that are designed to allow the production and analysis of statistics relating to Indigenous peoples with a high level of spatial accuracy, while also maintaining the confidentiality of individuals. There are 1,115 Indigenous Locations in Australia. Indigenous Locations in Australia. Indigenous Locations in Australia. Indigenous Locations in Australia. Indigenous us the sector workers are not included in this table because of data unreliability due to ABS randomisation. Indigenous Locations are mapped in Figure 6.46.

Employees are counted under the Indigenous Location that is their place of usual residence. People are not necessarily employed within the geographic area of the Indigenous Location that is their place of residence. م

Secondary school qualification is Year 12 or equivalent as highest year of school completed. U

Certificate, diploma or advanced diploma, bachelor's degree, graduate certificate or graduate diploma, or postgraduate degree. p

Data for whole of Australia.

Australia figures for 2006 and 2011 differ to those reported in SOFR 2013 because of a change in industry classification used to represent the forest sector.

Source: ABARES, based on ABS census data (ABS 2011, 2016b).

🐼 This table, together with other data for Indicator 6.5d, is available in Microsoft Excel via www.doi.org/10.25814/5bda972cd76d9

6.5d



Figure 6.46: Indigenous Locations, by proportion of the Indigenous workforce employed in forest and wood products industries, 2016

Note: Data for Indigenous Locations where more than 0.8% of the total Indigenous workforce are employed in forest and wood products industries are given on Table 6.56.

Source: ABS (2016b).

😡 A higher resolution version of this map is available via <a href="http://www.doi.org/10.25814/5be3bc4321162">www.doi.org/10.25814/5be3bc4321162</a>

#### Characteristics of Indigenous workers

As for the nation generally, there is a strong link between increased education levels, and improved employment and health outcomes, for Indigenous people (Commonwealth of Australia 2018). Employment is associated with improved wellbeing and living standards, and benefits individuals, associated families and broader communities. Factors such as an individual's skills, age, education and financial resources are key influences that support adaptability and positive wellbeing outcomes.

Demographic information about Indigenous people employed in the forest and wood products industries (Table 6.56) can therefore be used to understand an individual's resilience to change in forest and wood product industries. For Indigenous Locations with more than 0.8% of the Indigenous workforce employed in forest and wood products industries in 2016:

• The median age of this workforce across Australia was 33, unchanged from 2011. This compares with a median age of 43 in the Australian forest sector workforce as a whole. In general, younger employees can find it less challenging than older people to find alternative employment and adapt to change.

- In the Indigenous Locations of Wyong-South-West (New South Wales), Manmoyi and Gunbalanya (Northern Territory), Cape York Wilderness and Cooloola (Queensland), the combination of higher rates of secondary school completion and lower proportions of unskilled workers in the forest and wood products industry, compared with other locations and with national figures, may positively influence resilience.
- Workers had the highest levels of non-school qualifications such as certificates and diplomas in Queensland locations, Wyong-South-West and Bulahdelah (New South Wales), Raukkan (South Australia) and Manmoyi (Northern Territory). This could indicate a greater capacity to take opportunities within the forest sector, or potentially other sectors.
- Nationally, Indigenous workers had lower rates of nonschool qualifications (43%) than those in the forest sector workforce as a whole (54%) (see Indicator 6.5c). However, the proportion of Indigenous workers in forest and wood products industries with non-school qualifications, or who had completed secondary school, increased between 2011 and 2016 to a greater extent than for workers in the

forest sector workforce as a whole. 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.

• The proportion of Indigenous workers in unskilled (labourer) occupations fell nationally by 5% from 2011 to 2016, while it increased slightly for the forest sector workforce as a whole (see Indicator 6.5c). Working in higher skilled jobs can increase opportunities and increase financial resources to assist adapting to change

#### Training and skills development

Training in practical skills for the forest and wood products sector, or for broader roles involving forests in the wider forest sector, can increase future employment opportunities and enhance personal resilience. ForestWorks, a not-for-profit skills development organisation, works with Skills Impact, the government-endorsed Skills Service Organisation, to develop and manage skills standards and qualifications under two training packages, the national Forest and Wood Products (FWP) and the Pulp and Paper Industry Manufacturing Industry training packages (ForestWorks 2018). Training is delivered by a range of registered training providers in areas such as forest management, sawmilling and processing, harvesting and haulage, and frame manufacturing.

Enrolments by Indigenous students in government-funded forestry-related training packages declined after 2011, in line with declines for all students in these training packages and in traineeship commencements across all industries. As noted in Indicator 7.1b, declines can be linked to two factors: more focus on less formal in-house approaches to skill development not requiring external payments to service providers; and increased industry preference for fee-for-service short courses and broader training than the technical skills previously delivered by registered training organisations. Other data on total Vocational Education and Training (VET) activities, which are only available since 2014, suggests a rise in Indigenous enrolments since 2014, including for training delivered in the Northern Territory (NCVER 2018).

The number of Indigenous students completing governmentfunded FWP training package awards has fallen since a peak in 2010 and 2011. That was a period when there were high numbers for all students in forestry-related training packages (see Indicator 7.1b). Since 2012, the majority of completions for Indigenous students completing government-funded forestry-related training programs have been in Victoria and New South Wales (Table 6.57). Around 55% of program completions by Indigenous students were at Certificate III level, with the remainder at Certificate II.

The skills and work experience gained in forest-based enterprises or occupations often assist Indigenous people to obtain employment in other sectors. For example, Indigenous ranger programs have contributed to preparing Indigenous people for their subsequent careers (Van Bueren et al. 2015).

Although it is difficult to measure the number of people who obtain employment in other industries as a result of the transferable skills that they obtain by undertaking training courses in the forest sector, the participation of Indigenous people in such training is likely to help build individual and community resilience.

						Comple	tionsª					
Jurisdiction	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017 <sup>b</sup>
ACT	0	0	0	0	0	0	0	0	0	0	0	0
NSW	6	5	0	0	8	6	12	2	6	5	3	5
NT	10	0	0	7	0	0	0	0	0	0	0	4
Qld	5	14	3	0	158	167	33	1	2	0	0	0
SA	0	0	0	4	2	0	0	0	0	0	0	0
Tas.	4	3	2	7	0	0	0	0	0	0	0	0
Vic.	0	0	0	5	5	0	6	6	5	7	3	12
WA	0	0	3	6	0	3	0	0	0	1	0	0
Total	26	18	14	19	169	172	45	11		14	12	19
Indigenous completions as proportion of all completions	7%	8%	5%	6%	32%	35%	9%	4%	3%	4%	4%	9%

#### Table 6.57: Completions of Forest and Wood Products (FWP) training package awards by Indigenous students, 2006 to 2016

<sup>a</sup> Completion of all awards (certificate level I to IV, Diploma or higher).

<sup>b</sup> Figures for 2017 are preliminary.

The FWP training package covers topics including harvesting technologies, forest management innovation, timber processing optimisation, wood machining and timber product development. There were no Indigenous student completions in the Pulp & Paper Manufacturing Industry training package from 2006 to 2017. Figures may differ from those published in SOFR 2013 due to a change in scope of government-funded activity data published by the National Centre for Vocational Education Research.

Source: National Centre for Vocational Education Research, VOCSTATS, VET program completions 2003–2016 database (government-funded training delivered by TAFE, university, other government providers, and private training providers) (<u>www.ncver.edu.au/resources/vocstats.html</u>), extracted 4 July 2018.

🔊 This table, together with other data for Indicator 6.5d, is available in Microsoft Excel via 🛛 www.doi.org/10.25814/5bda972cd76d9

Notes:

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