Criterion 7

Legal, institutional and economic framework for forest conservation and sustainable management



Plantation and native forest, Queensland.

Criterion 7 Legal, institutional and economic framework for forest conservation and sustainable management

The five indicators in this criterion report on the extent to which the legal, institutional and economic frameworks in Australia support sustainable forest management, specifically the conservation, maintenance or enhancement of the forest attributes described in Criteria 1-6. The indicators also report on the extent to which these frameworks support the capacity to monitor change and to conduct and apply research and development to forest management.

Effective legal, institutional and economic frameworks are critical for sustainable forest management. The legal framework presented in Indicator 7.1a defines and allocates legal and regulatory responsibilities, describes provision for public participation, and outlines the protection of conservation values in forests. Indicator 7.1b describes the institutions that provide mechanisms for policy-making and decision-making, and for the engagement of the wider community in continuous improvement of forest management. National economic policies on investment, taxation and trade that influence the level of investment in forest conservation, in forest growing, and in the wood-processing industries are addressed in Indicator 7.1c. Indicator 7.1d describes Australia's forest measurement and monitoring programs, and how these programs provide the basis for planning to support sustainable forest management. The extent to which relevant and up-to-date information about forest condition is available to forest managers provides a measure of the capacity for continuous improvement of forest management. Reporting on the capacity to measure change provides forest managers with the opportunity to revise and prioritise data collection so that future measurement and monitoring are more relevant and informative.

Lastly, Indicator 7.1e assesses Australia's capacity to conduct and apply forest research and development. A scientific understanding of the characteristics and functions of forest ecosystems is needed to underpin their sustainable management. Research and development provide the basis for biological and wood inventories, forest health surveillance, improvements in operational forest management and silviculture, and effective forest monitoring. Research and development also underpin the expert advice required to inform decision-making and policy development. Changes in the institutional capacity for forest research and development, and the magnitude of investment in this, can indicate changes in research investment priorities and delivery mechanisms.

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 are available via www.doi.org/10.25814/5bda99c8d76da.

Indicator 7.1a

Extent to which the legal framework supports the conservation and sustainable management of forests

Rationale

This indicator outlines the support that the legal system gives to the sustainable management of forests. A legal system that ensures transparency and public participation in policy and decision-making processes supports the continuous improvements in sustainable forest management.

Key points

- All states and territories and the Australian Government have legislation that supports the conservation and sustainable management of Australia's forests.
- Australia's public native forests, including those held in nature conservation reserves and those available for wood production, are governed and managed under state or territory regulatory frameworks and management plans.
 - Many of these frameworks and plans are prescribed in legislation.
 - Management of forests on private land is also regulated under various Acts.
 - As at 2016, 43 million hectares (32% of Australia's forests) were covered by management plans relating to their conservation and sustainable management. Management plans are in place for 19 million hectares of forest in the National Reserve System (57% of the area of forest in the National Reserve System).
- Codes of forest practice vary in their legal status and coverage, but generally provide specific operational guidance for sustainable forest management practices in public and private forests available for wood production, including in commercial plantations.
 - In Tasmania, there is a code of practice for the management of nature conservation reserves, including forested nature conservation reserves.

This indicator provides an overview of the support that the legal framework provides for the conservation and sustainable management of Australia's forests. An effective framework of legislation and legal mechanisms ensures transparency in land ownership, management planning and operational implementation, and enables public participation and the inclusion of Indigenous perspectives (perspectives of Aboriginal and Torres Strait Islander peoples) in policy development and decision-making processes. An effective regulatory framework also promotes continuous improvement in the sustainable management of forests across tenures. Public participation, including Indigenous participation, is covered in more detail at Indicator 7.1b.

Legal framework for forest management

In Australia, primary responsibility for land management, including forest management, lies at the state and territory level. At the national level, the Australian Government also has certain powers and responsibilities.

All states and territories have Acts, and dependent Regulations, that are designed to ensure the conservation and sustainable management of forests. Some of this legislation is administered jointly by, and requires coordination between, state or territory and local governments, statutory authorities and regional management authorities. State and territory legislative provisions cover planning and review, public participation, and the regulation of forest management activities in multiple-use public forests, public nature conservation reserves and, to a lesser extent, private and leasehold forests. In most states and territories there is also a legislative requirement to apply best practice standards to forest management activities, in multiple-use public forests, nature conservation reserves, and private and leasehold forests.

Table 7.1 lists key legislation at the national and state and territory levels relating to the conservation and sustainable management of Australia's forests, active during the SOFR 2018 reporting period 2011–16.

Table 7.1: Key legislation relating to the conservation and sustainable management of Australia's forests, by jurisdiction, active during the SOFR 2018 reporting period 2011–16

Jurisdiction	Legislation	Purpose
National		
	Environment Protection and Biodiversity Conservation Act 1999	To provide a legal framework to protect and manage, among other things, nationally and internationally important flora, fauna, ecological communities and heritage places – defined in the Act as matters of national environmental significance.
	Regional Forest Agreements Act 2002	To give effect to Commonwealth obligations under Regional Forest Agreements, which are 20-year plans for the conservation and sustainable management of Australia's native forests in the regions in which they apply. The legislation also requires the establishment of a comprehensive and publicly available source of information for national and regional monitoring and reporting in relation to all of Australia's forests, to support decision-making in relation to all of Australia's forests.
	Aboriginal and Torres Strait Islander Heritage Protection Act 1984	To provide for the preservation and protection from injury or desecration of areas and objects in Australia and in Australian waters, being areas and objects that are of particular significance to Aboriginals in accordance with Aboriginal tradition.
	Illegal Logging Prohibition Act 2012	To support the domestic and international trade in legally harvested wood and wood products by giving consumers and businesses greater certainty about the legality of the wood products they purchase.
Australian Ca	pital Territory	
	Nature Conservation Act 2014 (replaced Nature Conservation Act 1980)	To make provision for the protection, conservation, enhancement and management of nature in the ACT, and for the management of reserves.
	Environment Protection Act 1997	To establish an environmental duty of care in relation to water quality and other environmental pressures, and to protect soil and water quality during harvesting through the application of a pollution control licence.
	Public Unleased Land Act 2013	To protect the amenity and natural value of, and to facilitate use of, unleased territory land that the public is entitled to use or is open to, or used by, the public, including nature conservation reserves and wilderness areas.
New South W	ales	
	Forestry Act 2012° (replaced Forestry Act 1916 and Forestry and National Park Estate Act 1998)	To provide for the dedication, management and use of State forests and other Crown- timber land for forestry; to constitute the Forestry Corporation of New South Wales as a statutory State-owned corporation and to specify its objectives and functions; to provide for forest agreements; and to provide for integrated forestry operations approvals for licensing operations in State forests and other Crown-timber lands for a period not exceeding 20 years.
	National Parks and Wildlife Act 1974, as amended ^b	To conserve nature, including threatened species; conserve objects, places and features of cultural value; and foster public appreciation, understanding and enjoyment of nature and cultural heritage and their conservation.
	Environmental Planning and Assessment Act 1979	To encourage the proper management, development and conservation of natural and artificial resources, for the social and economic welfare of the community and a better environment; to promote and co-ordinate the orderly and economic use and development of land; to protect the environment, including the protection and conservation of native animals and plants, including threatened species and ecological communities, and their habitats; ecologically sustainable development; to promote the sharing of the responsibility for environmental planning between the different levels of government in the State, and to provide increased opportunity for public involvement and participation in environmental planning and assessment.
	Native Vegetation Act 2003 ^c	To provide for, encourage and promote the management of native vegetation on a regional basis in the social, economic and environmental interests of the State, and to prevent broad-scale clearing unless it improves or maintains environmental outcomes, protect native vegetation of high conservation value, improve the condition of existing native vegetation, encourage the revegetation of land, and the rehabilitation of land, with appropriate native vegetation, in accordance with the principles of ecologically sustainable development.
	Protection of the Environment Operations Act 1997 ^d	To protect, restore and enhance the quality of the environment in New South Wales, having regard to the need to maintain ecologically sustainable development.
	Plantations and Reafforestation Act 1999	To facilitate the reafforestation of land, and to promote and facilitate development for timber plantations on essentially cleared land, and to codify best practice environmental standards, and provide a streamlined and integrated scheme, for the establishment, management and harvesting of timber and other forest plantations.
Northern Terr	itory	
	Environment Assessment Act 1994	To provide for the assessment of the environmental effects of development proposals and for the protection of the environment.
	Territory Parks and Wildlife Conservation Act 2006	To provide for the establishment and management of parks and reserves (including sanctuaries and joint management parks or reserves), and the study, protection, conservation and sustainable use of wildlife. Also controls commercial harvesting of native vegetation throughout NT, not just in national parks and reserves.
	Pastoral Land Act 1992, as amended ^e	To make provision for the conversion and granting of title to pastoral land and the administration, management and conservation of pastoral land.
	Planning Act 1999	To provide for appropriate and orderly planning and control of the use and development of land. Also establishes the NT Planning Scheme, which specifies performance criteria for the clearing on native vegetation.

Continues

Jurisdiction	Legislation	Purpose
Queensland		
	Forestry Act 1959	To provide for forest reservations; the management, silvicultural treatment and protection of state forests; the sale and disposal of forest products and quarry material, which are the property of the Crown in state forests and timber reserves, and on other lands; and to grant exclusive rights to state plantation forests through a plantation licence.
	Nature Conservation Act 1992	To conserve nature using an integrated and comprehensive conservation strategy for the whole state while allowing for the involvement of indigenous people in the management of protected areas in which they have an interest under Aboriginal tradition or Island custom.
	Vegetation Management Act 1999	To regulate the clearing of vegetation in a way that conserves remnant vegetation, conserves vegetation in declared areas, ensures that clearing does not cause land degradation, prevents the loss of biodiversity, maintains ecological processes, manages the environmental effects of clearing and reduces greenhouse gas emissions.
South Austra	lia	
	Forestry Act 1950	To provide for the creation, management and protection of state forest reserves, including the conservation, development and management of native forest reserves.
	National Parks and Wildlife Act 1972	To provide protection measures for endangered and vulnerable plants and animals, and to provide for the establishment of reserves for public benefit and recreation.
	Native Vegetation Act 1991	To preserve native vegetation, including through legislative controls on native vegetation clearance.
	Natural Resources Management Act 2004 ^f	To promote the sustainable and integrated management of the state's natural resources and make provision for the protection of the state's natural resources, including the control of significant plantation water use through licensing or a forest permit system.
	Environment Protection Act 1993	To promote the principles of ecologically sustainable development based on sound environmental practices and policies that protect, restore and enhance the quality of the environment.
Tasmania		
	Forest Management Act 2013 (replaced Forestry Act 1920)	To provide for the declaration of Crown land as permanent timber production zone land required for the supply of forest products, and its management.
	Forest Practices Act 1985	To establish the Forest Practices Code and forest practices system to provide for the sustainable management of forests on any land subject to forest operations; and to enable the establishment of private timber reserves on private land to provide security of long-term forestry use for landowners.
	Nature Conservation Act 2002	To provide for the declaration of national parks and other reserved land, and set out the values and purposes of each reserve class with respect to the conservation and protection of fauna, flora and geological diversity.
	National Parks and Reserves Management Act 2002	To provide for the management of national parks and reserves under the <i>Nature</i> <i>Conservation Act 2002</i> , according to management objectives for each reserve class.
	Forestry (Rebuilding the Forest Industry) Act 2014 (replaced Tasmanian Forests Agreement Act 2013)	To provide for future potential production forest land and its possible conversion to permanent timber production zone land, and to provide for special species timber harvesting, including requiring the preparation of a special species management plan within three years of commencement of the Act.
Victoria		
	Forests Act 1958, as amended ^g	To provide for the management of state forests, including timber harvesting and fire management; for timber harvesting to comply with a code of practice; and for the protection of state forests and forest produce as property of the Crown.
	National Parks Act 1975, as amended ^h	To provide a framework for the establishment and management of national parks, and to make provision for certain other parks, including harvesting in selected parks.
	Conservation, Forests and Lands Act 1987	To provide a framework for a land-management system and to make necessary administrative, financial and enforcement provisions.
	Flora and Fauna Guarantee Act 1988	To provide the framework for the conservation of threatened species and ecological communities and management of processes threatening Victoria's native flora and fauna ⁱ .
	Catchment and Land Protection Act 1994	To set up a framework for the integrated management and protection of catchments, including forested catchments.
	Sustainable Forests (Timber) Act 2004 ^j	To provide a framework for sustainable forest management and sustainable timber harvesting in state forests.

Continued

7.1a

Continues

Jurisdiction	Legislation	Purpose
Western Aus	tralia	
	Conservation and Land Management Act 1984, as amended ^k	To make provision for the use, protection and management of certain public lands and waters, and their flora and fauna, and to establish responsible authorities.
	Forest Products Act 2000	To provide for the harvesting and sale of forest products from native forests and plantations on state forest and timber reserves, and their regeneration or replanting, in specified areas in the south west of the state.
	Environmental Protection Act 1986	To provide for the assessment of the environmental impacts of forest management proposals, and to set conditions on implementation of proposals to moderate adverse impacts; and to provide offences for unlawful environmental harm, including the clearing of native vegetation.
	Sandalwood Act 1929 ¹	To regulate the quantity of sandalwood to be pulled or removed from Crown and other land, with sandalwood being the wood of any tree of the genera <i>Santalum</i> or <i>Fusanus</i> , and any other species of aromatic wood which is or may be used as a substitute for sandalwood.
	Wildlife Conservation Act 1950 ¹	To provide for the conservation and protection of wildlife, with wildlife being flora and fauna native to the state.

^a The NSW Forestry Regulation 2012 also replaced the Forestry Regulation 2009 when the Forestry Act 2012 replaced the Forestry Act 1916.

^b Amended in (October) 2011, to amend the National Park Estate (South-Western Cypress Reservations) Act 2010, to delay the commencement of certain reservations.

^c The NSW Native Vegetation Regulation 2013 commenced on 23 September 2013.

^d The NSW Protection of the Environment Operations (General) Regulations 2009 was amended in March 2014 to allow residues from authorised clearing and timber harvesting to be burnt for electricity generation, consistent with other states.

^e Amended in 2016 to allow parts of the lease to be used for non-pastoral uses such as agriculture, horticulture, aquaculture, tourism or forestry, while also subject to land clearing guidelines specified in this Act and the NT Planning Act 1999.

^f Amended in 2014 to provide for the introduction of forest water licencing in the south-east of the state.

^g Amended in 2012 to provide for cutting and taking away fallen or felled trees in State forest and certain regional parks for domestic use as firewood without a licence or permit.

^h Amendments in 2013, 2015, 2016 relating to leasing powers and terms, environmental assessments, and prohibiting cattle grazing.

ⁱ An Action Statement must be prepared for each species, ecological community, and potentially threatening process, following a listing under this Act.

^j Amended in 2013 in relation to allocation orders, the management of timber resources, and the management and conduct of timber harvesting.

k Various amendments from 2011 to 2016, including replacing the Conservation Commission of Western Australia with the Conservation and Parks Commission.

¹ The Sandalwood Act 1929 and the Wildlife Conservation Act 1950 were both replaced by the Biodiversity Conservation Act 2016, which received assent on 21 September 2016 and provides for the conservation and protection of biodiversity and biodiversity components, and the ecologically sustainable use of biodiversity components in Western Australia.

Source: State, territory and Australian Government agencies.

Forest management plans

Australia's public native forests, including those held in nature conservation reserves and those available for wood production, are governed and managed under state or territory regulatory frameworks and strategic management plans. Many of these frameworks and plans are prescribed in legislation. A small number of nature conservation reserves are governed and managed by the Australian Government under Commonwealth legislation and management plans prescribed in that legislation. Australia's publicly managed plantation forests are also governed and managed under state or territory regulatory frameworks and management plans.

Management plans provide guidance for sustainable forest management practices. Examples of management plans prescribed in legislation for the conservation and sustainable management of forests are listed in Table 7.2 and described in Case studies 7.1 and 7.2. As at 2016, a total of 43 million hectares (32% of Australia's forests) were covered by management plans relating to their conservation and sustainable management (Table 7.3). This has increased from 22% of Australia's forests since SOFR 2013. Within this area, management plans are in place for 19 million hectares of forest in the National Reserve System. This is 57% of the area of forest in the National Reserve System (see Indicator 1.1c).

A forest area with a management plan is an area for which there is a long-term, documented and periodically reviewed management plan containing defined management goals. Management plans can take many forms, such as the examples listed in Table 7.2, as well as natural resource, environment and water catchment management plans that cover forests, and the components of strategic management planning systems required for forest management certification. Forests covered by a management plan are mostly public forests, but also include some privately owned or managed forests covered by a forest certification scheme.

Table 7.2: Examples of management plans prescribed in I	egislation for the conservation and sustainable management of
Australian forests	

Plan	Purpose	Coverage	
Management plans for all national parks – required under relevant legislation in each jurisdiction	To provide a framework of objectives, principles and policies to guide the long-term management of the broad range of values contained in national parks.	All state, territory and nationally managed national parks.	
Australian Capital Territory Tidbinbilla Nature Reserve Plan of Management 2012 – required under the Planning and Development Act 2007	The plan is a legal document that outlines how the Tidbinbilla precinct is to be managed.	Tidbinbilla precinct, which contains special- purpose reserve areas and national park areas, including Tidbinbilla Nature Reserve.	
New South Wales regional Forest Management Plans and Ecologically Sustainable Forest Management Plans ^a – required under the Forestry Act 2012	To publicly document the broad strategies, ecological principles, performance indicators and measurable outcomes for forest management, and commitment to Ecologically Sustainable Forest Management.	New South Wales State forests and other Crown-timber lands.	
New South Wales Special Areas Strategic Plan of Management 2015 – required under the Water NSW Act 2014 (see Case study 7.1)	Provides the strategic framework for the planning, delivery and reporting of land management activities within the Special Areas by WaterNSW and NSW National Parks and Wildlife Service. It is a long-term plan to secure high-quality water for the storages, maintenance of ecosystem integrity, and the management of cultural values within the Special Areas.	Special Areas comprise the 364,778 hectares of lands (forest and non-forest) that surround and protect water supply storages for Sydney, the Illawarra, Blue Mountains, Southern Highlands and Shoalhaven regions.	
South Australia State Natural Resources Management Plan 2012–2017 and Regional Natural Resources Management Plans – required under the Natural Resources Management Act 2004	To establish direction for South Australia in its management of natural resources by providing the framework for regional Natural Resource Management (NRM) boards working with state government agencies to develop regional NRM plans and programs.	Statewide and region-by-region natural resources in South Australia.	
Victoria regional Forest Management Plans – required under the Forest Act 1958	To ensure that state forest is managed in an environmentally sensitive, sustainable and economically viable manner, while being responsive to changing community expectations and expanding knowledge of the forest ecosystem.	State forests in Victoria's 12 Forest Management Areas.	
Western Australia Forest Management Plan 2004–2013 and Forest Management Plan 2014–2023 – required under the Conservation and Land Management Act 1984 (see Case study 7.2)	To set out the actions to be taken to conserve biodiversity; sustain the health, vitality and productive capacity of ecosystems; and produce the social, cultural and economic benefits valued by the community, taking account of the principles of ecologically sustainable forest management.	Forests on public land in the south-west of Western Australia that is vested in the Conservation Commission of Western Australia ^b .	

^a The regional Ecologically Sustainable Forest Management Plans for the Upper and Lower North East, Southern Region – South Coast, and Southern Region – Tumut and Eden, were replaced in December 2016 by the Forest Management Plan for the Coastal Forests of NSW, a management plan required under the Forestry Act 2012.

^b From October 2015, the Conservation and Parks Commission of Western Australia.

Source: State, territory and Australian Government agencies.

Table 7.3: Forest areas covered by management plan ('000 hectares)

	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Australia
Forests with a management plan									
Primarily conservation ^a	113	4,862	4,582	1,450	1,255	972	2,814	3,136	19,183
Multiple values including wood production ^b	0	2,414	0	18,236	352	1,195	512	1,378	24,087
Total forests with a management plan	113	7,276	4,582	19,686	1,607	2,167	3,326	4,514	43,270
Forests without a management plan	29	13,092	19,153	32,144	3,453	1,531	4,897	16,467	90,767
Total forest area	142	20,368	23,735	51,830	5,060	3,699	8,222	20,981	134,037

 'Primarily conservation' comprises forest areas in the Collaborative Australian Protected Areas Database (<u>www.environment.gov.au/land/nrs/science/capad</u>) with an existing, identified management plan (see Table 7.14).

^b 'Multiple values including wood production' includes total areas of multiple-use public native forests and commercial plantations covered by management plans or certification.

Sources: Collaborative Australian Protected Areas Database and publicly accessible data on Australian certified forests from Responsible Wood (<u>www.responsiblewood.org.au</u>) and Forest Stewardship Council (<u>info.fsc.org</u>).

🔊 This table, together with other data for Indicator 7.1a, is available in Microsoft Excel via www.doi.org/10.25814/5bda99c8d76da

Case study 7.1: Special Areas Strategic Plan of Management 2015, New South Wales

Special Area lands declared under the *Water NSW Act* 2014 comprise 364 thousand hectares of lands that surround and protect drinking water supply storages for Sydney, the Illawarra, Blue Mountains, Southern Highlands and Shoalhaven regions (Figure 7.1). The Special Areas primarily comprise intact native forest; the remainder is other native vegetation, wetlands, river systems, heritage sites, water storages and associated infrastructure, active and historic farmland, active and derelict mines, roads, utility corridors and water supply facilities.

Under the *Water NSW Act 2014*, WaterNSW and the NSW National Parks and Wildlife Service (NPWS) are required to jointly manage the Special Areas. The *Special Areas Strategic Plan of Management 2015* fulfils Section 52 of the Act that requires the joint sponsors (WaterNSW and NPWS) to prepare a plan of management for the Special Areas. Section 53 of the Act requires the joint sponsors to implement the plan.

NPWS is the primary conservation agency in NSW and is also the land manager of conservation reserves within the Special Areas that have been gazetted under the National Parks and Wildlife Act 1974, totalling 67% of the Special Areas land. WaterNSW has responsibility for the quality of water in Greater Sydney's drinking water catchment areas, and is the freehold owner of 19% of the Special Areas land (including the water storages). The remaining 14% of the land is privately owned or other tenure, including other Crown land, however the plan does not direct actions on privately owned land declared as Special Areas. To maintain water quality, WaterNSW encourages bestpractice sustainable land use by private landholders and developers in the urban water supply catchments through a mix of incentives, shared information, education and regulation. (Indicator 4.1e provides more information on water quality in forests.)

The Special Areas Strategic Plan of Management 2015 provides the strategic framework for the planning, delivery and reporting of land management activities within the Special Areas by WaterNSW and NPWS. It is a long-term plan to secure high-quality water for the storages, the maintenance of ecosystem integrity, and the management of cultural values within the Special Areas.

Special Areas land has been classified into two water quality protection schedules. Public access to the Special Areas is regulated in accordance with these schedules. Schedule 1 lands are lands immediately surrounding the water storages, and into which public entry is generally not permitted, although some visitor facilities and walking corridors do exist with WaterNSW's consent. Schedule 2 lands are a second-tier buffer zone that generally adjoins Schedule 1 lands. While some public entry and activities are permitted on Schedule 2 lands, restrictions apply. Access restrictions do not apply to privately owned land and public roads within the Special Areas.





Source: NSW Special Areas Strategic Plan of Management 2015.

Case study 7.2: Forest Management Plan, Western Australia

The Conservation Commission of Western Australia³⁵⁴ is the controlling body in which Western Australia's conservation estate is vested, including national parks, conservation parks, nature reserves, state forests and timber reserves, and marine reserves.

Under Western Australia's Conservation and Land Management Act 1984, public forests in the southwest of Western Australia are managed according to a forest management plan. The current plan is the Forest management plan 2014-2023355 (Figure 7.2), published in December 2013 by the Conservation Commission of Western Australia through the Department of Parks and Wildlife, which succeeded the Forest Management Plan 2004–2013³⁵⁶. These plans provide a framework for managing forest areas for a range of environmental, social and economic uses, and are based on a modified set of Montreal Process criteria of sustainability as the framework for identifying management actions in line with the principles of ecologically sustainable forest management. The criteria used are conservation of biodiversity, maintenance of productive capacity, maintenance of ecosystem health and vitality, conservation and maintenance of soil and water, maintenance of forests' contribution to the global carbon cycle, maintenance of heritage and maintenance of socio-economic values (CCWA 2013).

The Commission's overall goal in formulating Western Australia's Forest Management Plans is for biodiversity to be conserved; the health, vitality and productive capacity of ecosystems to be sustained; soil and water resources to be protected; the contribution to global carbon cycles to be sustained; and the social, cultural and economic benefits valued by the community to be produced in a manner that takes account of the principles of ecologically sustainable forest management. Western Australia's Department of Parks and Wildlife³⁵⁷ manage the land to which the Plan applies, while the Forest Products Commission (Western Australia) are responsible for the harvest and regeneration of forests within the areas available for timber production. Figure 7.2: The forest management plan for 2014–2023 for Western Australia



Source: CCWA (2013).

7.1a

- www.dpaw.wa.gov.au/images/documents/conservation-management/forests/FMP/20130282_WEB_FOREST_MGT_PLAN_WEB.pdf
 www.dpaw.wa.gov.au/images/documents/conservation-management/forests/FMP/preparing_FMP_2014-23/20120329_forest_management_
- plan_20042013_end_of_term_audit_performance_final_30_march_2012_ccwa.pdf
- ³⁵⁷ From July 2017, the Department of Biodiversity, Conservation and Attractions.

 $^{^{354}\,}$ From October 2015, the Conservation and Parks Commission of Western Australia.

Forest management codes of practice

Forest management codes of practice provide specific guidance for sustainable forest management practices in public and private production native and plantation forests in each state and territory, and in nature conservation reserves in Tasmania. In production forests the codes cover a range of issues, such as forest planning; forest access and roads; forest harvesting; the conservation of non-wood values; pest, weed and fire management; and the harvesting of non-wood forest products. The codes vary in their legal status and coverage as summarised in Table 7.4.

Plantation forestry codes of practice are referred to in the *Export Control (Unprocessed Wood) Regulations* made under the *Export Control Act 1982* (Cth). The Regulations declare

certain types of unprocessed wood, including unprocessed wood from a plantation, to be prescribed goods and therefore in need of an export licence. However, in those states where the minister has found that its plantation forestry code of practice protects environmental and heritage values, this declaration does not apply and a licence is not required. Codes of practice are assessed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) against the *Forest Practices Related to Wood Production in Plantations: national principles.* Plantation forestry codes of practice for most states and territories were approved by the minister in 2013, and for Queensland in 2016³⁵⁸.

Tasmania is the only Australian jurisdiction with a code of practice for the management of nature conservation reserves. The *Tasmanian Reserve Management Code of Practice* (2003) complements other codes, including Tasmania's *Forest Practices Code 2015*. It is the result of a commitment under

Jurisdiction	Title	Legal status	Coverage	
ACT	Code of Forest Practice (2005)	No legal status	Public plantations	
NSW	Integrated Forestry Operation Approvals ^a	Required under the Forestry Act 2012	Forestry operations in public native forests in State forests or other Crown timber lands	
	Plantations and Reafforestation (Code) Regulation 2001	Prescribed in the Plantations and Reafforestation Act 1999	Public and private plantations	
	Private Native Forestry Code of Practice (2008) ^b , Private Native Forestry Code of Practice (2013) ^c	Prescribed in the Native Vegetation Act 2003	Private native forests and native forests on Crown tenures that are not Crown- timber land under the <i>Forestry Act 2012.</i>	
NT	Codes of Practice for Forestry Plantations (2004)	No legal status	Public and private plantations	
Qld	Code of practice for native forest timber production on the Queensland Parks and Wildlife Service forest estate 2014	Defines minimum standards to meet requirements of the <i>Forest Act 1959</i> and other associated legislation.	Public native forests	
	Code applying to a native forest practice on freehold land (2005)	Prescribed in the Vegetation Management Act 1999	Private native forests	
	Managing a native forest practice: A self-assessable vegetation clearing code (2014)	Prescribed in the Vegetation Management Act 1999	Private native forests	
	Timber Plantation Operations Code of Practice for Queensland (2015)	No legal status	Public and private plantations	
SA	Guidelines for Plantation Forestry in South Australia 2009	No legal status but includes references to mandatory requirements.	Public and private plantations	
Tas.	Forest Practices Code 2015	Prescribed in the Forest Practices Act 1985	Public and private native forests and plantations	
	Tasmanian Reserve Management Code of Practice 2003	A commitment under the Tasmanian Regional Forest Agreement 1997	Public native forests in conservation reserves	
Vic.	Code of Practice for Timber Production 2014	Prescribed in the Conservation Forests and Lands Act 1987	Public and private native forests and plantations	
WA	Code of Practice for Timber Harvesting in Western Australia (1999)	No legal status	Public native forests	
	Code of Practice for Timber Plantations in Western Australia (2014)	No legal status	Public and private plantations	

Table 7.4: Forest management codes of practice, their legal status and coverage, by jurisdiction

a IFOAs are in place for the following regions: Upper North East, Lower North East, Eden, Southern, South Western Cypress, River Red Gum, and Brigalow-Nandewar.

^b For Southern, River Red Gum, Cypress and Western Hardwood regions

^c For Northern region

³⁵⁸ Further information on the assessments is available at <u>www.agriculture.</u> gov.au/forestry/australias-forests/plantation-farm-forestry/principles

the 1997 Tasmanian Regional Forest Agreement to develop and implement a code of practice to cover all environmental practices in reserves. The code provides information and guidance for best-practice operational standards for management activities in Tasmania's nature conservation reserves.

Regulations governing firewood collection

Firewood is wood used for residential heating, whereas fuelwood is wood or wood products used as industrial fuel or for bioenergy production. 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 forest sector, and important to regional communities. Industrial fuelwood includes wood waste generated during wood processing. Data on firewood and fuelwood consumption (use) are provided in Indicator 6.1d.

Regulations are in place across Australia to protect threatened species and ecological communities from the impacts of firewood collection. Many states and territories regulate the personal and commercial collection of firewood by permit systems. Regulatory controls on the clearing of native vegetation also restrict firewood collection. A National Approach to Firewood Collection and Use in Australia was developed and endorsed by governments in 2001 (ANZECC 2001), and in August 2005 the Natural Resource Management Ministerial Council agreed to a Voluntary Code of Practice for Firewood Merchants (NRMMC 2005). From 2005, a scheme operated by the Firewood Association of Australia (FAA) certified compliance of firewood merchants and suppliers with the voluntary code of practice, but the scheme ceased in 2011, although FAA members continue to adhere to the voluntary code of practice as an ongoing condition of their membership (DSEWPaC 2011a; FAA 2018).

Regional Forest Agreements

Regional Forest Agreements (RFAs) are 20-year plans for the conservation and sustainable management of Australia's native forests in the regions in which they apply. Ten RFAs were negotiated bilaterally between the Australian Government and four of the six state governments (New South Wales, Tasmania, Victoria and Western Australia), and commenced between 1997 and 2001. A map (Figure I.vi) in the Introduction shows the 10 regions to which RFAs apply. Davey (2018a) describes the origins and development of Australia's regional forest agreements.

Each RFA was the result of a Comprehensive Regional Assessment (CRA) involving substantial scientific study, consultation and negotiation, covering a diverse range of stakeholder interests. Information was gathered on the social, economic, environmental, and cultural and natural heritage values of each region's forests, and a science-based methodology was used to determine forest allocation for different uses and forest management strategies. RFAs are



Habitat tree, East Boyd State Forest, Eden, New South Wales. Habitat trees are retained within logged areas to provide fauna roosting and nesting sites.

designed to provide stability for forest-based industries, certainty for forest-dependent communities, and conservation for forest ecosystems through a Comprehensive, Adequate and Representative (CAR) reserve system. The *Regional Forest Agreements Act 2002* gives effect to certain obligations of the Commonwealth under RFAs, including public reporting.

Under the *Regional Forest Agreements Act 2002*, five-yearly RFA reviews on the performance of each RFA are to be reported and tabled in the Australian Parliament by the Australian Government minister with responsibility for forestry. The status of each five-yearly review is detailed in Table 7.12 of Indicator 7.1d.

In October 2013, the Australian Government committed to maintaining its support for long-term RFAs by seeking to extend and establish 20-year 'rolling lives' for each RFA. The initial 20-year periods of the 10 RFAs expire between 2017 and 2021. As at December 2018, the Tasmanian RFA and the three New South Wales RFAs have been extended for a further 20 years following assessment processes.

Commonwealth Government export licencing requirements under the *Export Control Act 1982* (specifically, the *Export Control (Hardwood Wood Chips) Regulations 1996* and the *Export Control (Regional Forest Agreements) Regulations)* do not apply to the export of wood and wood chips from native forests in a region covered by an RFA.

7.1a

Environment Protection and Biodiversity Conservation Act 1999

Australia's Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) applies to matters of national environmental significance, such as World Heritage properties and Natural Heritage places, wetlands of international importance, nationally listed threatened species and ecological communities, internationally listed migratory species, and water resources.

Part 4, Division 4, section 38(1) of the EPBC Act states that Part 3 of the Act does not apply to forestry operations undertaken in accordance with a Regional Forest Agreement (RFA); this does not apply to World Heritage listed areas or to Ramsar wetlands. This provision recognises that RFAs have already met the normal requirements for assessment and approval of operations because conservation values in each region were assessed as part of Comprehensive Regional Assessments before each RFA was signed, with the RFAs providing a substitute system and an equivalent level of protection to that provided by Part 3 of the EPBC Act. Davey (2018a) discusses the interrelationship between RFAs and the EPBC Act.

Requirements for assessment and approval under the EPBC Act still apply to forestry operations in forests outside an RFA region.

Illegal logging

Australia's *Illegal Logging Prohibition Act 2012* aims to support the trade in legally harvested wood and wood products by giving consumers and businesses greater certainty about the legality of the wood products they purchase. The Act makes it a criminal offence to intentionally, knowingly or recklessly import or process illegally logged timber or timber products, including domestically grown raw logs.

The *Illegal Logging Prohibition Regulation 2012* prescribes due diligence requirements to minimise the risk of obtaining illegally logged wood, and lists the wood products subject to those requirements. The due diligence requirements are for use by importers of the listed wood products and by processors of domestically grown raw logs. The requirements are estimated to annually affect approximately 20,000 businesses and individuals.

State-specific guidelines were developed and released during the reporting period to help processors better understand the legal frameworks used in New South Wales, Queensland, South Australia, Tasmania, Victoria and Western Australia to regulate the harvesting of wood.

Indicator 7.1b

Extent to which the institutional framework supports the conservation and sustainable management of forests

Rationale

This indicator examines the institutional frameworks that support sustainable forest management. Institutional frameworks provide mechanisms for engagement of the wider community in the process of continuous improvement and sustainable forest management.

Key points

- A well-established policy framework, guided by a *National Forest Policy Statement*, supports the conservation and sustainable management of Australia's forests, both nationally and in all states and territories.
- Codes of forest practice and externally certified environmental management systems are used by forest managers to provide a structured approach to the planning and management of protection of the environment.
- At June 2018, a total of approximately 8.9 million hectares of native forests and plantations were certified for forest management under either the Responsible Wood Certification Scheme or the Forest Stewardship Council scheme. Some forests and plantations were certified under both schemes.
- At June 2018, a total of 189 chain-of-custody certificates for tracking wood from the forest to the final product were issued under the Responsible Wood Certification Scheme, and 258 chain-ofcustody certificates were issued under the Forest Stewardship Council scheme.
- A range of training and education qualification options continues to be available in Australia across all areas relevant to sustainable forest management, from operational competency certificates, to coursework certificates and diplomas, and graduate and postgraduate degrees. Over time, there has been a decreasing trend in undergraduate degree completions, and an increasing trend in postgraduate degree completions.

Institutional frameworks provide mechanisms for policymaking and decision-making, and for engagement of the wider community in sustainable management of forests and in the processes of continuous improvement. Such frameworks provide for and support sustainable forest management through policies that promote good forest management, planning, monitoring and assessment, and community engagement and awareness. They also encourage the adoption of voluntary forest management certification schemes and environmental management systems, and the maintenance of appropriate levels of human resource skills in forest management.

Australia's forest policy framework

The management of Australia's forests is guided by a *National Forest Policy Statement* (Commonwealth of Australia 1992). The statement outlines 11 broad national goals (see Introduction, Box 1.i). The three goals most relevant to this indicator are integrated and coordinated decision-making and management; employment, workforce education and training; and public awareness, education and involvement. Through this statement and other policy mechanisms, Australia's national, state and territory governments are committed to the sustainable management of all Australia's forests, whether the forest is on public or private land, or within a conservation reserve or a production forest.

Through the *National Forest Policy Statement*, the governments of Australia agreed to *Forest Practices Related to Wood Production in Native Forests: National Principles* (Standing Committee of the Australian Forestry Council 1991) and *Forest Practices Related to Wood Production in Plantations: National Principles* (Ministerial Council on Forestry, Fisheries and Aquaculture 1995). The governments agreed that the principles should be applied to the management of all public and private native forests and plantations in Australia. These principles provide for a consistent and scientific basis for sound forest management to which all states and territories are committed.

The Forestry and Forest Products Committee (FFPC) is an intergovernmental body consisting of officials from the Australian, state, territory and New Zealand governments. FFPC provides advice to the Forestry Ministers Meeting and the Agriculture Senior Officials Committee on matters relevant to forests and forestry. Three working groups are established under the FFPC: the Montreal Process Implementation Group for Australia, the National Forest Inventory Steering Committee, and the Forest Fire Management Group.

Most state and territory government organisations and agencies responsible for forest management operate under long-term national and state or territory non-legislative policies, strategies and charters that influence the sustainable management of Australia's forests (Table 7.5). The extent to which these arrangements provide for sustainable forest management varies among states and territories. Generally, these arrangements apply comprehensively in public forests (except those under leasehold), but to a lesser extent in private and leasehold forests.

Much of Australia's production native forests and plantation forests are owned and/or managed by large public or private organisations. The operations of these organisations are usually conducted through recognised forest management systems, using policies, guidelines, protocols and other instruments that promote the sustainable management of forests and the engagement of the wider community. Their policies are stated publicly, generally relate to sustainability, forest stewardship and environmental awareness, and guide their forest management planning and operational practices.

Table 7.5: Key non-legislative policies, strategies and charters influencing the sustainable management of Australia's forests, July 2011 to June 2016

Jurisdiction	Non-legislative policy, strategy or charter	Purpose
National		
	National Forest Policy Statement	Outlines agreed objectives and policies for Australia's public and private forests, based on 11 national goals to be pursued within a regionally based planning framework that integrates environmental and commercial objectives so that provision is made for all forest values, including opportunities for effective public participation in decision making.
	National Indigenous Forestry Strategy	Encourages Indigenous participation in the forest industry and contributes to the overall sustainable development of Indigenous land and communities, addressing areas such as natural resource management, business development, cultural heritage, education, employment and training.
	Australian Forestry Standard (AS 4708-2007) The Australian Standard for Sustainable Forest Management (AS4708-2013)	Provides criteria and requirements from a credible standard which allows a forest manager to demonstrate sustainable forest management, including proactive stakeholder engagement, through independent, accredited, third-party certification.
	Australia's Native Vegetation Framework	Guides the ecologically sustainable management of Australia's native vegetation. Guides government, the community and the private sector, and engage all Australian and Indigenous peoples, in native vegetation management across Australia.
	Australia's Biodiversity Conservation Strategy 2010–2030	Provides a guiding framework for conserving Australia's biodiversity over the coming decades for all sectors – government, business and the community – by engaging all Australians – the public, businesses, Indigenous peoples, private landholders, non-government organisations and all levels of government.
	Australia's Strategy for the National Reserve System 2009–2030	Provides national guidance for improved cross-jurisdictional coordination, and supports collaborative action by protected area managers and key stakeholders to enhance the National Reserve System, including through strengthened partnerships and increased community support.
ACT		
	Nature Conservation Strategy 2013–2023	Guides a coordinated and integrated approach to nature conservation for all land management, planning, business and community sectors in the ACT, for the management of open spaces, rural and urban areas, riverine corridors and nature reserves, including strengthening community engagement in nature conservation.
NSW ^{a,b}		
	Environment Protection Authority Crown Forestry Compliance Strategy 2013-2016	Provides a comprehensive and transparent framework for regulating the environmental impacts of forestry operations in State forests and on other Crown timber lands.
	Forestry Corporation of NSW Forest Management Policy ^c	Provides a commitment to sustainably manage its plantation and native forest estate to produce a range of forest products, services and environmental benefits, and to create opportunities to engage with affected and interested stakeholders to understand their views and inform decisions made about management of the forest estate.
NT		
	Territory Natural Resource Management Plan	Promotes a shared vision that draws together the activities of all involved in natural resource management in the Territory. Provides clear strategies and goals for the management of the unique natural resources across the NT, which draws on scientific, Indigenous and community-based knowledge.

472

Continues

Jurisdiction	Non-legislative policy, strategy or charter	Purpose
Qld		
	Department of Agriculture and Fisheries, Forest Products Forest Management Policy Statement	Provides a commitment to a range of measures, including the responsible management of state land allocated to native forest production, and proactively communicating with and considering the views of interested and affected stakeholders.
	Queensland Forest and Timber Industry Plan	Provides an overarching vision of sustained business growth and innovation in Queensland's forest and timber industry through the implementation of specified actions. Strategic priorities include the responsible management of state forests for timber production and other commercial activities, recreation and conservation outcomes, and identifying and engaging with key stakeholders.
SA		
	Forest Industry Strategy: Vision 2050 Strategic Directions 2011–2016	Sets out a vision and targets, articulates key directions and strategies, and identifies major opportunities for industry to work with government and the community to strengthen the development of a sustainable future for the forest industry in South Australia.
	Blueprint for the Future South Australian Forest and Wood Products Industry (2014–2040) ^d	Provides direction for activities to achieve significant economic, social and environmental outcomes, and seeks to build upon key South Australian Government initiatives, including the Cellulose Fibre Value Chain Study, the South East Forestry Partnerships Program, and the South Australian Forest Industry Strategy.
	ForestrySA Policy for Sustainable Forest Management	Provides for a commitment to sustainable forest management, compliance with relevant legislative requirements, standards and codes, and proactively engaging and considering the views of stakeholders, and the community.
	No Species Loss: A Nature Conservation Strategy for South Australia 2007–2017	Promotes strategic and creative thinking by government, industry and urban, rural and Indigenous communities about how best to achieve biodiversity conservation and sustainable management in South Australia, through engagement partnerships.
Tas.		
	Permanent Native Forest Estate Policy ^e	Aims to maintain an extensive and permanent native forest estate to ensure that Tasmania's native forests are maintained in the long-term for all their various conservation, production and amenity values. The Forest Practices Authority has powers under the <i>Forest Practices Act 1985</i> to ensure compliance with this Policy.
	Forestry Tasmania Sustainable Forest Management Policy and Sustainability Charter ^f	Provides a commitment to continual improvement and to ensuring that the forest resource is managed sustainably through practices that are environmentally sound, socially acceptable and economically viable.
Vic. ^g		
	Sustainability Charter for Victoria's State Forests	Sets objectives for the sustainability of public native forests and of the timber harvesting industry on public land in Victoria, and promotes community involvement in how state forests are managed to enhance their diverse values and uses.
	VicForests Ecologically Sustainable Forest Management Policy	Provides a commitment to ensuring that state forests vested in the care of VicForests are managed to the highest possible standards to support the range of interests and rights of all stakeholders, and commits to stakeholder engagement.
	Environmental Sustainability Framework	Establishes three fundamental directions to drive environmental sustainability in Victoria: maintaining and restoring natural assets, using resources more efficiently, and reducing everyday environmental impacts.
	Timber Industry Action Plan	Provides the conditions for a productive, competitive and sustainable timber industry, and for a new strategic approach to biodiversity management.
WA		
	Forest Products Commission Forest Management Policy	Commits the commission to ensuring that renewable timber resources are managed sustainably through the implementation of forest management practices that are environmentally sound, socially acceptable and economically viable. Also commits to liaising with internal and external stakeholders on forest management issues and performance.

^a In August 2016, the NSW government released its *NSW Forestry Industry Roadmap*. A whole-of-government approach for reforming the NSW forestry industry with the aim of ensuring the forestry industry is economically viable and sustainable into the future.

^b During the reporting period, *NSW 2021* was implemented as the overarching framework of the NSW Government. *NSW 2021* included goals for protecting NSW's natural environment and a strategic framework for protecting high value conservation land, native vegetation, biodiversity and water habitats.

^c The Forest Management Policy is one of four elements with the Forestry Corporation of NSW 'Sustainability Framework' that sets out priorities in terms of environmental, community, staff and business sustainability.

^d A South Australian Forest and Wood Products Industry Policy Statement was the first step in implementing recommendations from the Blueprint for the Future South Australian Forest and Wood Products Industry 2014 to 2040. The statement reaffirmed the South Australian Government's commitment to the management of South Australia's plantation forests for all South Australians.

^e A full review of Tasmania's Permanent Native Forest Estate Policy from 2015 to 2017 led to the release of an updated version in June 2017.

^f From July 2017, Sustainable Timber Tasmania.

^g A Forest Industry Taskforce was formed in Victoria in 2015, with major stakeholders aiming to make long-term recommendations to government on the future of the forest industry.

Source: Australian Government Department of Agriculture and Water Resources; Australian Government Department of the Environment and Energy; state and territory agencies.

7.1b

Public participation and awareness

Australia has well-established non-legislative mechanisms for public participation and for raising awareness of forest management planning (Table 7.5), in addition to those prescribed in legislation (see Indicator 7.1a). These nonlegislative mechanisms include the provision of information on forest resources, impacts, uses and values; discussion papers on alternative plans; invitations to provide comment or written submissions; and discussion forums and public meetings.

At the national level, the Australian Government coordinates the *Australia's State of the Forests Report* series and the *Australia State of the Environment* report series, which provide periodic status updates based on available information for defined reporting periods. Key online sources of national forest information include the Forests Australia website³⁵⁹, the Forest Learning website³⁶⁰, and the Forest Education Foundation website³⁶¹.

All public forest management agencies publish forest-related information, such as annual reports and technical papers on research and matters of interest, and seek community engagement on issues of community concern. Some states and territories also publish their own state of the forests (or equivalent) reports (see Indicator 7.1d).

Many public forest management agencies provide forest education and awareness resources, and run formal education and awareness programs for schools, community groups and the general public. Examples of these resources and programs in New South Wales include those provided by the Office of Environment and Heritage³⁶² and the National Parks and Wildlife Service³⁶³. As well, the Forestry Corporation of NSW³⁶⁴ runs curriculum-aligned school excursions at Cumberland and Strickland State forests; between 2,271 and 3,585 children undertook excursions to these forests each financial year during the period 2011–16.

Many public forest management agencies also maintain visitor information centres, promoting public participation, education and awareness. Examples of these include those provided by ForestrySA in South Australia, at the Mt. Crawford Forest Information Centre and the Kuitpo Forest Information Centre.

Government agencies also engage in lengthy public consultation processes. For example, South Australia's Primary Industries and Regions SA (PIRSA) worked closely with stakeholders from industry and the local communities to determine a way forward for the state's Mid North Forests, an area regarded as the birthplace of plantation forestry in Australia. Bushfires destroyed 427 hectares of commercial plantations at Bundaleer in 2013 and 1,776 hectares of commercial plantations at Wirrabara in 2014. PIRSA sought and evaluated proposals from stakeholders for a range of commercial and recreation activities for the future of these forest areas.

A broad range of community volunteer programs that encourage public participation in, and raise awareness of, environmental management issues affecting forested landscapes are facilitated and supported in various ways by local, state, territory and Australian governments. Programs work towards rectifying environmental issues through a range of management activities including tree planting, wildlife and water quality monitoring, protection of soil from erosion, and the control of pests and weeds. Examples include Landcare, ParkCare, and regional catchment groups, such as those supported by the Australian Capital Territory Government Environment, Planning and Sustainable Development Directorate.

Nationally coordinated associations such as Australian Forest Growers represent and promote private forestry and commercial tree growing interests around Australia. Active branches in each of the states promote awareness and education in forests to landholders and the community through field days, conferences and promotional material.

Indigenous community participation and awareness

Raising awareness and increasing Indigenous community participation in forest management is encouraged as a key objective of the *National Indigenous Forestry Strategy*³⁶⁵ (see also Indicator 6.4c). The strategy specifically encourages Indigenous community participation in the forest and wood products industry by forming business partnerships that provide long-term benefits both to Indigenous communities and to the forest and wood products industry. The level of Indigenous community participation varies between states and territories and organisations.

The Forestry Corporation of NSW (FCNSW) employs an Aboriginal Partnerships Liaison Team to work with Aboriginal communities throughout NSW state forests, to conserve the qualities and attributes of places that have spiritual, historic, scientific or social value. FCNSW has worked in partnership with Aboriginal communities for many years on a range of activities including carrying out cultural heritage surveys; jointly managing culturally significant sites; providing forest products for cultural purposes, such as bark for canoes; and developing a First Peoples interpretative walk (see also Indicator 6.5d).

The NSW National Parks and Wildlife Service (NPWS) is also committed to working in collaboration with local Aboriginal groups to manage New South Wales national parks and reserves. One example is through Aboriginal joint management of national parks and reserves, sharing responsibility for management by having the opportunity to participate in planning and decision making. Many New South Wales national parks and reserves are now managed in this way, with Aboriginal management facilitated by an Aboriginal Joint Management Network.

Indicators 6.4a and 6.4c report on the level of Indigenous management, use and rights on Australia's forests.

- ³⁵⁹ www.agriculture.gov.au/abares/forestsaustralia
- ³⁶⁰ forestlearning.edu.au/
- ³⁶¹ www.forest-education.com/
- ³⁶² www.environment.nsw.gov.au/education-resources
- ³⁶³ www.nationalparks.nsw.gov.au/education-services
- ³⁶⁴ Until January 2013, Forests NSW.
- ³⁶⁵ www.agriculture.gov.au/forestry/policies/nifs

Monitoring of compliance with forest management codes and systems

The monitoring of compliance with forest management codes of practice, and with the regulatory framework deriving from state and territory legislation, is generally conducted by regionally based officers and field staff within an agency that has responsibility for enforcement and compliance. The highest levels of monitoring occur for wood harvesting in Australia's multiple-use public forests.

State agencies responsible for wood production from native forests give high priority to compliance with legislation, regulations, management plans, and codes of practice in their management of multiple-use public forests. Accordingly, compliance is generally high. In addition, most of these agencies are externally regulated.

Tasmania's forest practices system operates with the objective of achieving sustainable management of public and private forests, with due care for the environment. The forest practices system was set up through the *Forest Practices Act 1985*. Tasmania's Forest Practices Authority (FPA), an independent statutory body established under this Act, is responsible for monitoring compliance under Tasmania's forest practices system, and taking appropriate enforcement action. Monitoring of compliance under Tasmania's forest practices system is carried out at three levels:

- Routine monitoring of operations is undertaken by Forest Practices Officers³⁶⁶ employed by forest managers. This level of monitoring is often included in formal environmental management systems and forest management certification, which also involve independent third-party audits.
- 2) Formal reporting on compliance is required for all Forest Practices Plans (FPPs) under section 25A of the *Forest Practices Act 1985*. This is performed by Forest Practices Officers.
- 3) Independent monitoring of a representative sample of FPPs, in accordance with the *Forest Practices Act 1985*, is performed annually by the FPA.

Under the *Forest Practices Act 1985*, certificate of compliance reports must be lodged with the FPA within 30 days of the completion of each phase of operations prescribed within a Forest Practices Plan (see Case study 7.3). FPA monitoring showed that the compliance rate rose steadily after the introduction of the Forest Practices Code, and remained within the range of 85–95% over the 15 years to 2012 (Wilkinson et al. 2014).

The New South Wales Office of Environment and Heritage (OEH), which works with the NSW Environment Protection Authority (EPA), has wide monitoring and compliance

responsibilities under the NSW *Native Vegetation Act 2003*. The EPA also administers NSW Forest Agreements and Integrated Forestry Operations Approvals (IFOAs), under which the native forest operations of the Forestry Corporation of NSW are regulated. The NSW EPA's *Crown Forestry Compliance Strategy 2013–2016* provides the framework for regulating the environmental impacts of forest operations in State forests and on other Crown timber lands. The results of compliance audits on these land tenures are compiled annually and tabled in the NSW Parliament. FCNSW also has legal instruments in place to monitor and penalise people who conduct authorised and unauthorised operations on State forests and other Crown land.

Private native forestry (PNF) in New South Wales is defined as the management of native vegetation on privately owned land to obtain forest products on a sustainable basis. Under the NSW *Native Vegetation Act 2003*, harvesting and associated forestry operations conducted for the purposes of PNF requires an approved PNF Property Vegetation Plan (PVP). PNF operations under a PVP must be conducted in accordance with the NSW PNF Code of Practice, which also requires detailed forest operation plans and annual reporting by landholders, and EPA audits of forest operations. During 2013–14, the EPA undertook 69 operational inspections and 74 audits of PNF operations. Twenty-two reports about noncompliance or unauthorised PNF operations were received and investigated by the EPA during the period.

The NSW Department of Primary Industries Plantations Assessment Unit monitors compliance of plantations operations with the regulatory framework established under the *Plantations and Reafforestation Act 1999* and the *Plantations and Reafforestation (Code) Regulation 2001*. During the period 2011–16, the Plantation Assessment Unit conducted a total of 106 audits; 50 of these were conducted on plantations managed by Forestry Corporation of NSW, and 56 were conducted on privately managed plantations.

VicForests is the Victorian government business with responsibility for the sustainable harvest and commercial sale of wood from defined areas of Victoria's State forests. The Department of Environment, Land, Water and Planning³⁶⁷ (DELWP) is the environmental regulator responsible for conducting audits of commercial wood harvesting activities in Victoria's state forests. DELWP has the responsibility for ensuring that all wood harvesting operations are undertaken in compliance with relevant legislation and with Victoria's *Code of Practice for Timber Production 2014*. Compliance is required under the *Conservation, Forests and Lands Act 1987*.

The Victorian forest audit program is designed to allow for the independent examination of a range of activities associated with wood harvesting. The audit program also aims to assess the effectiveness the state's regulatory framework and the effectiveness of the DELWP as the regulator.

In Queensland, under the *Forestry Act 1959*, application of a code of practice for production forestry is a condition attached to sales permits from Crown land, and from some freehold land where forest consent areas exist. Monitoring of compliance is conducted through audits by the Forest Products division, Department of Agriculture and Fisheries³⁶⁸, and by the Queensland Parks and Wildlife

7.1b

³⁶⁶ The FPA accredits Forest Practices Officers, who have legislative authority under the *Forest Practices Act 1985* to undertake compliance and enforcement activities across all tenures under the Act or the *Forest Practices Code 2015*.

³⁶⁷ Until January 2015, the Department of Environment and Primary Industries.

³⁶⁸ Before February 2015, the Department of Agriculture, Fisheries and Forestry.

Service, as the custodians of State forests and timber reserves in Queensland.

In Western Australia, monitoring of compliance in forest management is prescribed in the *Forest Management Plan* 2014–2023³⁶⁹, which was prepared under the *Conservation* and Land Management Act 1984 for land vested in the Conservation Commission of Western Australia³⁷⁰. Under the plan, the Western Australian Department of Parks and Wildlife³⁷¹ and the Forest Products Commission, in consultation with the Conservation and Parks Commission of Western Australia, develop an annual audit program to monitor the extent to which land to which the plan applies is managed in accordance with the plan. The Conservation and Parks Commission of Western Australia also undertakes independent audits to assist it in assessing the extent to which land is managed in accordance with the plan.

Monitoring management of nature conservation reserves is generally less intensive than monitoring of multiple-use public forests. The exception is Tasmania, which is the only state or territory with a code of practice for the management of nature conservation reserves — the *Tasmanian Reserve Management Code of Practice* (2003) (see Indicator 7.1a). Enforcement of legislation and regulations on reserved land in Tasmania is primarily conducted by authorised officers in the Tasmanian Parks and Wildlife Service, who coordinate compliance activities throughout the state with respect to breaches of legislation on reserved land.

Certification of forest management

Forest management certification is the voluntary, independent assessment of forest management activities and operations in a particular area of forest against a credible standard that has criteria, requirements and indicators encompassing environmental, economic, social and cultural values. Certification schemes can require forest management practices to be more stringent than required by law alone. Forest certification assures consumers, governments and enterprises that the forest and wood products they buy are legally harvested from sustainably managed forests. It also provides for community consultation in the management of forests covered by certification.

- 372 www.responsiblewood.org.au/
- 373 au.fsc.org/en-au

The certification of the management of a forest area is carried out by an accredited, third-party certification body against standards set out by a forest certification scheme. Two forest certification schemes operate in Australia: the Australian Forest Certification Scheme (AFCS), renamed the Responsible Wood Certification Scheme (RWCS) in November 2017³⁷², and a scheme operated by the Forest Stewardship Council (FSC)³⁷³. Both the AFCS/RWCS and the scheme operated by FSC Australia have forest management standards and chain-of-custody standards. Forest management standards establish thresholds for sustainable forest management through a range of economic, social, environmental and cultural criteria and requirements for wood production in native and plantation forests. A chainof-custody standard has criteria and requirements to assess the process for tracking wood and forest products originating in certified forests through all phases of ownership, transportation and manufacturing, from a defined forest area to the final product and delivery to the consumer.

The area of forest certified in Australia under either scheme has remained relatively stable since 2008–09, except for the years 2015–16 and 2016–17 (Figure 7.3). At June 2018, a forest area of 8.8 million hectares was covered by RWCS certification, and 1.2 million hectares by FSC certification. Approximately 1.1 million hectares of forests are certified under both certification schemes; allowing for this overlap, as at June 2018 a combined forest area of 8.9 million hectares was covered by forest management certification in Australia.

Changes in the procedure used by the Queensland Department of Agriculture and Fisheries to account for leasehold land within its Defined Forest Area³⁷⁴ (DFA) resulted in this DFA increasing from 3.8 million hectares to 20.6 million hectares in early 2015 and 17.9 million hectares in late 2016, before decreasing to 3.0 million hectares in early 2017. These changes were reflected in the area of forest reported as certified across Australia under the AFCS/RWCS, which increased from 10.4 million hectares in June 2015 to 26.7 million hectares in June 2016 and 24.1 million hectares in June 2017, before decreasing to 8.8 million hectares in June 2018 (Figure 7.3).

At June 2018, a total of 189 chain-of-custody (CoC) certificates were issued under the RWCS, and 258 CoC certificates were issued under the FSC scheme (Figure 7.4). The number of CoC certificates issued under the FSC and AFCS/RWCS peaked in 2013–14 and 2014–15 respectively, and has gradually decreased since then (Figure 7.4). This decrease is partly due to some forest managers consolidating their CoC certificates for wood originating from multiple certified forest sites into a single CoC certificate.

In addition to forest certification, most multiple-use public forests and some private forests and plantations are managed in accordance with codes of forest practice (see Indicator 7.1a), as well as recognised environmental management systems (EMSs). EMSs are independently certified by accredited, third-party certification bodies to the International Organization for Standardization (ISO) standard 14001 *Environmental Management Systems—Requirements with Guidance for Use.* An EMS under ISO 14001 is a tool for

³⁶⁹ And the prior Forest Management Plan 2004–2013.

³⁷⁰ From October 2015, the Conservation and Parks Commission of Western Australia.

³⁷¹ From July 2017, the Department of Biodiversity, Conservation and Attractions.

³⁷⁴ "Defined Forest Area" is defined in the Australian Standard for Sustainable Forest Management AS 4708-2013 (www.responsiblewood. org.au/standards/australian/australian-standards-4708-forestmanagement/) as "An area of forest (including land and water) to which the requirements of this Standard are applied, and to which the forest manager can demonstrate management control, which allows them to achieve the requirements of this Standard".



Figure 7.3: Area of certified forest management in Australia, 2003–18

AFCS, Australian Forest Certification Scheme; RWCS, Responsible Wood Certification Scheme; FSC, Forest Stewardship Council. Note: AFCS/RWCS numbers are for June each year. FSC numbers are for March 2004, January 2005, February 2006, March 2007, January 2008–2011 and June 2012–2018. Some areas of forest have both AFCS/RWCS and FSC certification. Source: AFCS, RWCS, Forest Stewardship Council (FSC) International.

The data used to create this figure, together with other data for Indicator 7.1b, are available in Microsoft Excel via www.doi.org/10.25814/5bda99c8d76da



Figure 7.4: Chain-of-custody certificates issued in Australia, 2004–18

AFCS, Australian Forest Certification Scheme; RWCS, Responsible Wood Certification Scheme; FSC, Forest Stewardship Council Note: AFCS/RWCS numbers are for June for each year. FSC numbers are for January 2005, February 2006, March 2007, January 2008–2011 and June 2012–2018.

Source: AFCS, RWCS, Forest Stewardship Council Australia.

The data used to create this figure, together with other data for Indicator 7.1b, are available in Microsoft Excel via www.doi.org/10.25814/5bda99c8d76da

7.1b



Chain-of-custody certified hardwood sawlog, Eden, NSW.

managing the impacts of an organisation's activities on the environment, and provides a structured approach to the planning and implementation of environmental protection measures. Some public agencies and private forestry companies have EMSs in place alongside forest management certification.

Human resources and education

A range of options for training and educational qualification continues to be available in Australia across areas relevant to sustainable forest management. The levels of training and education available include operational competency certificates, coursework certificates and diplomas, and graduate and postgraduate degrees.

Tertiary education

The Southern Cross University offers the undergraduate forestry degree 'Bachelor of Forest Science and Management'. The Australian National University undergraduate course 'Bachelor of Science (Forest Sciences)' ceased to be offered during the reporting period, but that university continues to offer post-graduate courses and forestry-related subjects as part of environmental science courses. The University of Melbourne offers a Forest Science major as part of a Bachelor of Science and a Bachelor of Science (Extended). Post-graduate forest-related degrees are also offered at each of the above universities, and at the University of the Sunshine Coast. These degrees and postgraduate degrees (including graduate diplomas) continue to deliver graduates in forestspecific and forest-related study areas.

Over time, there has been a decreasing trend in undergraduate degree completions, and an increasing trend in postgraduate degree completions (Figure 7.5).



Certified timber, Blue Ridge Sawmill, Eden, NSW.

Fellowships and awards also provide professional development opportunities in the forest industry. The Joseph William Gottstein Memorial Trust Fund was established in 1971 as a national education trust to promote the development of Australia's forestry and forest products industry. The fellowship and award programs provided by the Gottstein Trust enable people working in the forestry and forest products industry to acquire knowledge and skills that benefit themselves, their employers and the industry as a whole. The Gottstein Forest Industry Scholarship is for undergraduate or postgraduate students studying approved courses in forestry, forest science or wood science³⁷⁵.

Vocational education and training

The ForestWorks Industry Skills Council (ForestWorks) is an industry-owned, not-for-profit organisation offering skills development services for the forestry industry and the wood and paper products industry. ForestWorks is also contracted by the Australian Government to develop, maintain and continuously improve the Forest and Wood Products (FWP) (formerly Forest and Forest Products) training package and the Pulp and Paper Manufacturing Industry (PPM) training package. These packages offer vocational education and training in technical qualifications at certificate level and at diploma level, to support those sectors of industry.

Course enrolments in government-funded Vocational Education and Training (VET) across both training packages were stable for several years up to 2011, then in 2012 enrolments decreased by 40%. Enrolments declined by a further 12% in 2013, to levels below half of the 2011 enrolments. This decline in enrolments was in line with the decline in overall apprenticeship and traineeship commencements across all industries in Australia after 2011. Tighter budgets led to reduced demand for training with accredited qualifications, with more focus on informal in-house approaches to skill development not requiring external payments to service providers. Industry also

³⁷⁵ gottsteintrust.org/

developed an increased preference for fee-for-service short courses and training in a broader range of skills than the technical skills previously delivered by registered training organisations. Such training is not captured by the National Centre for Vocational Education Research (NCVER) data collection (ForestWorks 2016).

As a result of these changes, several Technical and Further Education (TAFE) institutions removed or reduced their offerings of Forest and Forest Products qualifications. However, despite the significant reductions in enrolments in the FWP and PPM training packages, course completions have remained reasonably stable (Table 7.8), demonstrating a sustained level of interest in improved skills in the workforce. From 2016, the NCVER excluded all "fee-for-service" activity (including that delivered by TAFE and other government providers) from the scope of the "government-funded activity" data that it publishes, and only data for training activity funded by Commonwealth and state and territory governments are published. Data according to the new scope have been back-dated to 2003 (Table 7.8) (NCVER 2017), and so these completion data differ from those published in SOFR 2013.

In Tasmania, the not-for-profit Arbre Forest Industries Training and Careers Hub was launched in March 2016. This organisation was created to promote careers within the forest industry, by providing a clear entry and learning path for potential employees, and by introducing potential employees to employers.





Note: Postgraduate degree completions include graduate diplomas.

Source: Australian Government Department of Education and Training, Higher Education Statistics Collection, 2017.

The data used to create this figure, together with other data for Indicator 7.1b, are available in Microsoft Excel via www.doi.org/10.25814/5bda99c8d76da

Case study 7.3: Monitoring and compliance of native forest operations in Tasmania, 2011–16

Tasmania's Forest Practices Authority (FPA) has legislative authority to investigate and measure compliance against Tasmania's legal forest management instruments. The FPA undertakes annual audits of forest practices plans (FPPs), and investigates all potential breaches under the Forest Practices Act 1985. Under the Forest Practices Act 1985, the FPA must investigate all complaints relating to alleged breaches or poor practice (Table 7.6). It has the authority to apply sanctions where breaches of the Forest Practices Code 2015 have been identified. Formal legal investigations by the FPA are undertaken into serious breaches, sometimes in consultation with the Tasmanian Police. The majority of breaches can generally be attributed to human error or lack of knowledge about the requirements of the forest practices system, and are dealt with by 'corrective actions'.

Under the *Forest Practices Act 1985*, certificate of compliance reports must be lodged with the FPA within 30 days of the completion of each phase of operations

prescribed within a FPP (Table 7.7). Certificate of compliance reporting provides evidence that a FPP:

- fully complied with all provisions of the plan; or
- did not fully comply with all the provisions of the plan, with:
 - no further action required. This generally involves a change in the operation which did not result in adverse long term environmental harm
 - the matter being resolved through corrective action. This generally means a non-compliance was detected, a notice of compliance was issued, and a corrective action was taken to ensure compliance with the plan
 - further action required. This generally involves a noncompliance issue that requires further investigation and action by the FPA.

Generally, the level of compliance has been high, with the majority of operations not requiring a corrective action or further investigation for the reporting period 2011–2016.

Table 7.6: Number of investigations completed by the Forest Practices Authority 2011–12 to 2015–16

Year	Total number of formal investigations	Investigated and no breaches identified	Number of minor breaches	Number of major breaches
2011–12	92	25	52	15
2012-13	36	10	17	9
2013-14	55	17	30	8
2014-15	44	12	26	6
2015-16	32	11	12	9

Notes: Minor breaches include notices to rectify and warnings, but no further action. Major breaches include penalties, legal action and breaches where no action was pursued due to insufficient evidence and/or legislative time constraints.

🦻 This table, together with other data for Indicator 7.1b, is available in Microsoft Excel via <u>www.doi.org/10.25814/5bda99c8d76da</u>

Table 7.7: Certificates of compliance lodged with the Forest Practices Authority	
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				Co	Compliance of lodged certificates			
	Certificates Ce of compliance co due	Cartificates	_	- Fully complied	Not fully complied			
Year		of compliance lodged	No activity		No further action required	Corrective action required	Further investigation required	
2011–12	970	835	n.d.	702	122	2	8	
2012–13	747	696	29	591	66	0	10	
2013-14	1270	1096	71	928	85	2	9	
2014-15	1079	1056	78	834	134	1	9	
2015–16	1609	1371	108	1240	100	2	6	

n.d., no data

Notes: Data prior to 2013 report on lodgement of final certificates of compliance only. Data from 2013 onwards report on individual discrete operational phases, e.g. roading, harvesting or reforestation, which may all be covered by the one forest practices plan. 'No activity' was added as a category in 2012–13 to reflect instances where an FPP expired and no operations took place.

🔊 This table, together with other data for Indicator 7.1b, is available in Microsoft Excel via www.doi.org/10.25814/5bda99c8d76da

	VET	Completions										
Jurisdiction	Program	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
ACT	FWP	0	0	0	0	0	0	0	0	0	0	0
	PPM	0	0	0	0	0	0	0	0	0	0	0
NSW	FWP	111	56	72	63	76	101	114	37	68	37	39
	PPM	0	2	0	0	0	0	0	0	3	32	0
NT	FWP	10	0	0	2	0	0	0	0	0	0	0
	PPM	0	0	0	0	0	0	0	0	0	0	0
Qld	FWP	25	20	9	17	191	230	83	23	27	138	71
	PPM	0	0	0	0	0	0	0	0	0	0	0
SA	FWP	28	2	25	21	10	26	10	14	3	17	22
	PPM	0	0	0	0	0	0	0	0	0	0	0
Vic.	FWP	55	33	47	28	83	47	195	204	105	75	93
	PPM	0	0	0	0	0	0	14	0	0	0	0
Tas.	FWP	64	40	52	69	44	34	22	2	3	17	27
	PPM	0	0	0	0	6	0	0	0	2	0	3
WA	FWP	73	88	90	95	120	56	63	33	48	61	48
	PPM	0	0	0	0	0	0	0	0	0	0	0
Total	FWP	368	227	298	291	527	492	483	314	259	342	301
	PPM	0	2	0	0	6	0	14	0	6	32	3
Grand total		368	229	298	291	533	492	497	314	265	374	304

Table 7.8: National completions in government-funded forestry-related vocational education and training (VET), 2006–16

FWP, Forest and Wood Products training package; PPM, Pulp and Paper Manufacturing Industry training package.

Notes: FWP includes the former Forest and Forest Products Industry (FPI) training package. Values for 2016 are preliminary (as at 29 June 2018). All values are indicative only, because the National Centre for Vocational Education Research relies on providers to supply data. Source: National Centre for Vocational Education Research, VOCSTATS, VET program completions 2003–2016 database.

🦻 This table, together with other data for Indicator 7.1b, is available in Microsoft Excel via www.doi.org/10.25814/5bda99c8d76da

7.1b

Indicator 7.1c

Extent to which the economic framework supports the conservation and sustainable management of forests

Rationale

This indicator examines the extent to which government policies support the conservation and sustainable management of forests. Government policies on investment, taxation and trade influence the level of investment in forest conservation, forest establishment and timber processing.

Key points

- The effectiveness of government policies in promoting conservation and sustainable management of production forests and conservation reserves was assessed as effective or very effective by the *Australia State of the Environment 2016* report.
- At 30 June 2016, the asset value of wood ('standing timber') in Australia's production native forests was estimated by the Australian Bureau of Statistics as \$1.8 billion, and the asset value of wood ('standing timber') in Australia's commercial plantations was estimated as \$10.2 billion.
 - Throughout the period 2011 to 2016, the value of Australia's total standing timber assets varied between 0.19% and 0.26% of the total value of Australia's environmental assets.
- Bilateral trade agreements signed since 2011 are designed to ensure tariff-free entry for Australia's manufactured wood products into key export markets.
- Between 2010–11 and 2014–15, funding for new commercial plantations was increasingly sourced from institutional investors. Institutions have also been involved in purchases of established commercial plantations.

- In 2014–15, institutional investors owned 50% of Australia's commercial plantations, compared to 31% in 2010–11. During the same period, farm foresters and other private owners increased their area share of total commercial plantation area from 8% to 21%.
- This shift reflects the increasing contribution of private investment capital to the growth and development of the sector.
- Further structural adjustment and consolidation of the sawmill industry also occurred.
- The domestic softwood sawmill industry is becoming significantly more capital-intensive, and larger in scale.
- Various Australian Government policies and programs that commenced during the reporting period were aimed at reducing greenhouse gas emissions or promoting other environmental services from forests. The Australian Government and various state and territory governments also made investments to improve natural resource management, and encouraged private and community-based involvement in this sector.

In this indicator, 'economic framework' refers to the economic commitments and policy mechanisms of governments that promote the conservation and sustainable management of forests. 'Conservation' refers to the protection of forests to allow ongoing ecosystem functions and maintain the natural and cultural significance of forests (Jackson et al. 2016). 'Sustainable management' refers to the use of natural resources in a way that does not adversely affect the needs and interests of future generations.

Effectiveness of the economic framework

The Australia State of the Environment 2016 report, published by the Australian Government Department of the Environment and Energy, assessed the effectiveness of government policies in promoting conservation and sustainable management in the period 2011–16. The report rated five categories (understanding, planning, inputs, processes, and outputs and outcomes) across four criteria (production forests, bushfire, management of conservation reserves, and Indigenous-managed lands) (Table 7.9). Production forests, and management of conservation reserves, were rated 'effective' or 'very effective'; bushfire was rated 'effective' except in regards to management inputs; and Indigenous-managed lands were rated 'partially effective' in all categories. The *Australia State of the Environment 2016* report also reported an improving trend in conservation reserve and bushfire planning, and an improving trend in outputs and outcomes for Indigenous-managed lands and bushfire, but a deteriorating trend in management inputs for production forests and conservation reserves.

Value of Australia's environmental assets

The concept of environmental assets can include subsoil assets, both mineral and energy; land; soil resources; timber resources; aquatic resources, both cultivated and natural; water resources; and other biological resources. The Australian Bureau of Statistics defines environmental assets as comprising land; mineral and energy assets; native forest standing timber; and plantation standing timber (ABS 2017a).

The Australian national balance sheet recorded \$13,800 billion in assets on 30 June 2016, of which \$6,100 billion (44%) were classed as environmental assets (ABS 2016a, 2017a) (Table 7.10). The estimated value of Australia's environmental assets increased in the period 2011 to 2016 (Table 7.10), and is now the largest share of the nation's capital base.

The valuation for 'standing timber' in native forests is based on the net present value of the future stream of income from the estimated net area of forest available for wood production on private and public land, over the estimated rotation cycle of the forests. The discount rate applied is based on the average cost of forest industry borrowing. On this basis, in the 5 years to June 2016, the estimated value of Australia's native standing timber decreased by 5%, to \$1.8 billion (Table 7.10).

The valuation for 'standing timber' in commercial plantations is based on an insured asset value that is derived from ABARES data on plantation forest area and plantings, and industry insurance schedules³⁷⁶. On this basis, in the 5 years to June 2016, the estimated value of Australia's commercial plantation standing timber increased by 5% to \$10.2 billion (Table 7.10).

Since the Australian Bureau of Statistics (ABS) uses different methodologies and assumptions to estimate the asset value of wood ('standing timber') in Australia's native forests and in commercial plantations (ABS 2015a), the valuations for these forestry assets cannot be compared with each other. Moreover, these asset values include only the value of wood available for harvesting, and not the value of other benefits from native forests or plantations, such as biodiversity, carbon sequestration, prevention of soil erosion, or production of non-wood forest products.

Throughout the period 2011 to 2016, the estimated value of Australia's total standing timber assets varied between 0.19% and 0.26% of the total value of Australia's environmental assets.

Table 7.9: Assessment of understanding, planning, inputs, processes, outputs and outcomes associated with conservation and sustainable management of forests, 2011–16

Category	Production forests	Bushfire	Management of conservation reserves	Indigenous-managed landsª				
		Assessment grad	Assessment grade and recent trend ^b					
Understanding	Very effective —	Effective ↑	Very effective —	Partially effective				
Planning	Very effective	Effective ↑	Effective ↑	Partially effective				
Inputs	Effective ↓	Partially effective	Effective ↓	Partially effective				
Processes	Effective —	Very effective	Effective —	Partially effective				
Outputs and outcomes	Effective —	Effective ↑	Effective —	Partially effective ↑				

a 'Indigenous-managed lands' is equivalent to the land categories 'Indigenous owned and managed' and 'Indigenous managed' in Indicators 6.4a and 6.4c.
 b 'Recent trend' refers to the direction of change at the time of assessment (2016):
 ⁺, improving ;
 ⁺, deteriorating ;
 ⁻, stable.

Source: Australia State of the Environment 2016 (Metcalfe and Bui 2017).

🔊 This table, together with other data for Indicator 7.1c, is available in Microsoft Excel via www.doi.org/10.25814/5bda99c8d76da

³⁷⁶ These schedules are compiled by Australian Forest Growers: www.afg.asn.au.

Fable 7.10: Estimated value o	f environmental asse	ts, 2006–16 (\$ billion)
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Time point	Land	Mineral and energy assets	Native forest standing timber	Plantation standing timber	Total
June 2006	2,714	229	2.1	7.9	2,953
June 2007	3,096	272	2.1	8.4	3,378
June 2008	3,311	358	2.1	9.7	3,681
June 2009	3,224	604	1.9	9.3	3,840
June 2010	3,896	586	1.8	9.4	4,492
June 2011	3,866	612	1.9	9.7	4,489
June 2012	3,732	772	1.7	9.8	4,515
June 2013	3,910	950	1.6	9.9	4,871
June 2014	4,276	1084	1.6	9.9	5,372
June 2015	4,847	1150	1.7	10.0	6,009
June 2016	5,105	1021	1.8	10.2	6,138

Note: Totals may not tally due to rounding.

Source: ABS (2017a).

🔊 This table, together with other data for Indicator 7.1c, is available in Microsoft Excel via www.doi.org/10.25814/5bda99c8d76da

Overview of the economic framework

The World Bank publishes indicators of the general investment environment across countries. These apply to the economy as a whole, and incorporate various regulatory and financial measures, such as property registration, ease of obtaining credit, and the institutional capacity to enforce contracts. On the basis of these indicators, Australia was ranked 15th out of 190 countries in 2016 for the ease of doing business (World Bank 2017).

Australia's strong economic framework can be attributed partly to reforms that increase the competitiveness of Australian products. A key reform was the National Competition Policy (NCP): a program of economic reforms undertaken by all Australian governments between 1997 and 2006 aimed at prohibiting anti-competitive activities and promoting competitive neutrality (NCC 2007). The NCP introduced several reforms that affect the competitive climate for Australian forest-based industries. For example, the principle of competitive neutrality requires commercial state-owned forest entities that compete with private sector entities to be exposed to similar expenses and costs (Ferguson et al. 2010).

Trade policy

Australia's trade policy focuses on trade liberalisation to improve access for Australian exports in global markets, and Australian access to imports. Global and multilateral efforts, including international treaties such as free trade agreements (FTAs), facilitate improved market access. Australia is a member of the World Trade Organization (WTO), which facilitates multilateral trade negotiations and ensures that the rules of international trade are correctly applied and enforced. Australia's rights and obligations under the WTO underpin its market access negotiations, and WTO rights and obligations are a minimum for Australia's bilateral and plurilateral³⁷⁷ free trade agreements.

Australia entered into four bilateral trade agreements between 2011 and 2016: the Malaysia–Australia FTA (MAFTA) 2013; the Korea–Australia FTA (KAFTA) 2014; the Japan– Australia Economic Partnership Agreement (JAEPA) 2015; and the China–Australia FTA (ChAFTA) 2015.

FTAs reduce barriers to trade and investment, for example by eliminating tariffs and simplifying compliance measures, such as the need to apply for export licences; by liberalising services; and by addressing other issues, such as intellectual property, e-commerce and government procurement.

Japan and China are two of Australia's largest export markets, both for raw commodities and for manufactured products. JAEPA provides tariff-free entry for Australia's wood products, such as medium-density fibreboard, particleboard and structural laminated timber. Before JAEPA, Japan applied general tariffs of up to 30% on some manufactured products. Duty-free access continues for Australian exports of woodchips and paper products to Japan (DFAT 2017a).

ChAFTA locked in existing 0% Chinese tariffs on logs and a range of manufactured products, including woodchips and certain paper products. Tariffs on medium-density fibreboard (MDF) made from radiata pine were eliminated upon this agreement coming into force. Tariffs on some other products will be eliminated from 01 January 2019. Exclusions from tariff concessions also apply to a small number of products considered sensitive in China's economy or culture, including some fertilisers, wood and paper products (DFAT 2017b).

³⁷⁷ Under WTO rules, all WTO members are party to *multilateral* agreements, but only some members need to be party to *plurilateral* agreements.

Investment in plantations

Significant changes have occurred between 2010–11 and 2014–15 in the ownership structure of the commercial plantation estate. These changes reflect the restructuring towards institutional ownership, and the increasing contribution of private investment capital to the growth and development of the forestry sector.

Figure 7.6 shows the change in area proportion of commercial plantations by ownership category (ownership data refer to ownership of trees, not land). In 2014–15, institutional investors owned 50% of Australia's commercial plantations, compared to 31% in 2010–11. During the same period, farm foresters and other private owners increased their area share of total commercial plantation area from 8% to 21%, as a result of plantations that were previously owned by Managed Investment Schemes (MISs) primarily under lease arrangements reverting back to the landowner. In contrast, the proportion owned by timber industry companies fell from 13% to 4%, and the proportion owned by government organisations fell from 24% to 21%.

Following the many challenges faced by agribusiness MISs during the previous reporting period³⁷⁸, many MIS management companies became commercially unviable. In 2014–15, MISs owned 5% of Australia's commercial plantations, compared to 24% in 2010–11 (Figure 7.6). During this period, ownership of these MIS forestry assets transferred largely to institutional and private investors (including international superannuation funds).

In New South Wales, a number of Forestry Plantation Authorisations were cancelled during the period 2012–13 to 2015–16, and some areas of plantations planned to be established under MISs were converted into other land uses³⁷⁹. Some poorly grown plantations were cleared, and the properties converted to agricultural use; a few such plantations had been harvested for woodchip or small logs before cancellation of authorisations. Some of the cancelled authorisations were attached to land that had never been planted.

Indicator 6.2a also discusses investment in new public and private forest plantations, and Indicator 2.1b reports separately on ownership of plantation trees and ownership of plantation land.

Figure 7.6: Change in commercial plantation ownership over time



Notes: Ownership data refer to ownership of trees. Joint venture arrangements between government agencies and private owners are included under 'Government organisations' where government is the manager of the plantation resource. Totals may not tally due to rounding. Source: Gavran (2013, 2014); ABARES (2016b).

🔊 Data for this figure, together with other data for Indicator 7.1c, is available in Microsoft Excel via <u>www.doi.org/10.25814/5bda99c8d76da</u>

³⁷⁸ These challenges included the global financial crisis, reduced investor confidence in MISs generally, an inability to raise further capital, and regulatory changes that affected sales of MISs products. **CRITERION 7**

7.1c

³⁷⁹ DPI Forestry, Plantation Assessment Unit, February 2017.

Investment in wood processing

The main drivers of current investment in wood processing in Australia are resource availability, forest management practices, and economies of scale. Consolidation of sawmilling operations, driven by the increased sourcing of wood from commercial plantations and a reduction in the availability of logs from native forests, has continued.

The ABARES National Wood Processing Survey 2012–13 (Gavran et al. 2014) reports further structural adjustment and consolidation of the sawmill industry since the 2006–07 and 2010–11 surveys. The number of sawmills in Australia fell significantly between 2006–07 and 2012–13 (by 60% for hardwood sawmills, and by 25% for softwood sawmills). The domestic softwood sawmill industry has become significantly more capital-intensive and larger in scale, which has limited the reduction in total log processing despite the decline in number of sawmills. These adjustments also reflect continued changes in Australia's forest management practices, including further restrictions or reductions in availability of logs from public native forests in some states, tighter regulation of private native forests, and the ongoing privatisation of public plantations.

Forest and Wood Products Australia (FWPA) provides results of its research projects to the forest and wood products industry, including research on hardwood and softwood sawmilling and processing, and research on increasing wood performance and yield. Omega Consulting and FWPA (2017) reported on the level of investment between July 2012 and June 2017 by selected softwood sawmilling, hardwood sawmilling, panel and plywood operations in the timber industry. During this period, a combined total of \$473 million was invested by the operations surveyed, across approximately 70 individual processing locations. The report found a high level of focus on scanning and optimisation technologies to support higher recovery, improved productivity and improved grade yield, so as in turn to reduce manual interaction with the materials handling process. Not all capital items were reported as investment in new activities: some capital items were identified as major replacements or upgrades to current plant, and a significant quantity of capital expenditure was associated with replacement or upgrading of product transfer equipment.

Government departments at the national, state and territory levels also administer programs that directly promote investment in wood processing, or provide funding for wood processing enterprises. For example, in October 2013 the Australian Government committed a total of \$21.8 million of funding for wood processing projects as part of the Economic Growth Plan for Tasmania. This funding was for several enterprises, including the milling of plywood, and the production of laminated timber and wood panels (DIRDC 2015).

In South Australia, the South East Forestry Partnerships Program (SEFPP), a state government assistance package, allocated \$27 million in grants over three rounds between November 2012 and June 2015. SEFPP aimed to encourage a viable and strong timber sawmilling industry and create and secure jobs. Grants were available to applicants who provided a dedicated service to, or were located or intending to locate in, the state's south-east. Primary Industries and Regions South Australia (PIRSA) is overseeing 13 projects that are expected to generate over \$63 million of total investment in this region's forestry industry (PIRSA 2017). Most of these projects replace and upgrade existing sawmilling plant and equipment with modern technology and processes to increase processing volumes and improve efficiency. In Victoria, the Regional Growth Fund committed a total of \$620,000 in grants to a number of wood processing enterprises in 2013–14 (DSDBI 2014).

Indicator 6.2a also discusses investment in harvesting and wood product manufacturing.

Investment in environmental services

A number of Australian Government policies and programs that commenced during the reporting period and that aimed to reduce Australia's greenhouse gas emissions represent investment in environmental services based on forests and wood products.

The Australian Government established the Clean Energy Finance Corporation (CEFC) in 2012 to invest in the clean energy sector³⁸⁰. The CEFC invests commercially in projects with the strongest potential for emissions reduction, including low-carbon electricity generation (such as solar, wind, storage and bioenergy), energy efficiency, and low-emissions technologies (CEFC 2017a).

Since its inception, the CEFC has committed over \$1.4 billion in finance to investments in clean energy projects valued at over \$3.5 billion. For example, in November 2015 the CEFC provided \$100 million towards the Australian Bioenergy Fund (ABF), an equity fund for bioenergy and energy from waste. The ABF will invest in a range of technologies including biomass-to-energy projects (e.g. using plantation timber residues and sawmill waste) and wood pelletisation. The ABF aims to benefit a broad cross-section of the economy, including local government, mining, forestry and agriculture (CEFC 2017b).

In August 2011, the Australian Parliament passed the *Carbon Credits (Carbon Farming Initiative) Act 2011.* The Act established the Carbon Farming Initiative (CFI), a voluntary scheme that allowed eligible farmers and land managers to earn tradeable carbon credits by storing carbon or reducing greenhouse gas emissions on their land. The CFI operated between September 2011 and December 2014, when it was integrated with the Emissions Reduction Fund (ERF)³⁸¹ (DoEE 2017a).

The ERF is the central component of the Australian Government's suite of policies designed to reduce emissions, and operates alongside programs such as the Renewable

³⁸⁰ The CEFC is a statutory authority established under the Commonwealth *Clean Energy Finance Corporation Act 2012*. The Act creates the CEFC Special Account that is credited with \$2 billion each 1 July, for five years from 1 July 2013.

³⁸¹ Amendments to the CFI legislation that implemented the ERF came into effect in December 2014.

Energy Target and the National Carbon Offset Standard (DoEE 2017c). The ERF is a voluntary scheme that allows eligible participants to earn Australian carbon credit units for projects that store carbon or avoid emissions. These credits can be sold either to the Government (through a carbon abatement contract) or in the secondary market, to generate income. 'Methods' developed under the ERF define the types of projects that can be undertaken under the ERF, and specify project activities and methodologies for measuring the resulting reductions in emissions. Methods relating to the land sector include plantation forestry, increasing soil carbon, expanding opportunities for environmental and carbon sink plantings, reforestation and revegetation, and protecting native forest or vegetation that is at imminent risk of clearing (CER 2017a, 2017b).

The Australian Government is also contributing to carbon reduction and supporting local environmental outcomes by working with the community to re-establish green corridors and urban forests through planting 20 million trees by 2020. The Government has committed funding of \$70 million over six years from 2014–15 to the 20 Million Trees program as part of the National Landcare Program. As at 30 April 2017, \$42.9 million has been approved across 166 projects to plant more than 13.4 million trees, with the majority of trees funded to date under the program expected to be planted between 2017 and 2019 (NLP 2017a).

In New South Wales, the Biodiversity Banking and Offsets Scheme, known as BioBanking, which commenced in July 2008, addresses the loss of biodiversity values (including threatened species) due to habitat degradation, land clearing and development. BioBanking is a legislated³⁸², voluntary scheme that enables landowners and developers³⁸³ who commit to enhance and protect biodiversity values on their land to generate 'biodiversity credits' to offset their operations. These credits can be sold to those seeking to invest in conservation outcomes, including philanthropic organisations and governments. On 25 August 2017, BioBanking was replaced by the Biodiversity Offsets Scheme under the *Biodiversity Conservation Act 2016* (NSW OEH 2017).

Investment to improve natural resource management

Australia's national system of natural resource management has developed over several decades into a unique social and organisational infrastructure involving governments, industry groups, local communities and land managers that implement programs to support natural resource management, including of forests, on privately held lands.

Australian Government investment

Between 2008 and 2013, the Australian Government invested more than \$2 billion in the Caring for our Country program. The program provided grants for regional organisations to deliver projects that helped to meet priorities relating to the environmental management of Australia's natural resources. Caring for our Country included Landcare, a national grassroots movement that started in the 1980s and that consists of groups and individuals focused on sustainable natural resource management. The Caring for our Country and Landcare programs were merged in 2014 to form the National Landcare Program, an Australian Government initiative³⁸⁴ to support local environmental and sustainable agriculture projects, and to support management practices that maintain or enhance Australia's natural resource base.

The Australian Government invested \$1 billion over four years from July 2014 to June 2018 for Phase One of the National Landcare Program, including support for the Landcare Networks, 20 Million Trees program and Australia's 56 regional natural resource management organisations. Local programs funded from 2014-15 to 2016-17 include \$15 million to protect threatened bushland in the Cumberland Plain of Greater Western Sydney area, and \$3 million to improve the environmental health of Victoria's Dandenong Ranges. The National Landcare Program Phase One also continues investment for programs that commenced before 2014-15, including World Heritage Grants totalling \$40 million over 2013 to 2018 for projects to ensure that World Heritage property management is in accordance with the World Heritage Convention commitment. Funding is available for the management of properties including the Tasmanian Wilderness, Greater Blue Mountains, and Gondwana Rainforests of Australia World Heritage Areas.

The Australian Government has also committed to investing more than \$1 billion for Phase Two of the National Landcare Program. The majority of this investment will be delivered over a period of five years, from July 2018 to June 2023, and will include a \$450 million Regional Land Partnerships component to deliver national priorities at a regional and local level.

As the funding towards Caring for our Country was not all designated for specific areas, it is difficult to estimate the total investment in forest management. However, investment data is available on in the Environmental Stewardship Program (ESP) (see Case study 7.4) that was developed as part of the Caring for our Country program, and that continues under the National Landcare Program. The ESP provides long-term support for private landholders to maintain and improve the condition of targeted matters of national environmental significance. The total area managed under the ESP is 52,123 hectares across various threatened ecological communities, including forests, in New South Wales, South Australia and Queensland. Total payments between 2011–12 and 2015–16 to ESP grantees were \$59.4 million.

7.1c

³⁸² The scheme is implemented through Part 7A of the *Threatened Species Conservation Act 1995*, the Threatened Species Conservation (Biodiversity Banking) Regulation 2008 and the BioBanking Assessment Methodology.

³⁸³ As well as other organisations, including government agencies such as NSW Roads and Maritime Services.

³⁸⁴ Jointly administered by the Australian Government Department of the Environment and Energy and the Department of Agriculture and Water Resources.

Case study 7.4: Environmental Stewardship Program and Box Gum Grassy Woodland Monitoring Project

In 2007–08, the then Australian Government Department of Sustainability, Environment, Water, Population and Communities³⁸⁵ developed the Environmental Stewardship Program (ESP). The objective of the program is to maintain and improve the extent and condition of targeted matters of national environmental significance under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Participating land managers are contracted for up to 15 years to conduct management activities to protect and enhance the condition of the threatened ecological community(s) on their land. Activities may include grazing management, weed and pest animal control, and maintenance of buffer zones. Land managers are required each year to submit annual progress reports that include the results of monitoring undertaken. The Box Gum Grassy Woodland ecological community, which is listed as critically endangered, was the first matter of National Environmental Significance targeted by the ESP.

The Australian National University (ANU) has established a network of long-term biodiversity monitoring sites on 157 properties in New South Wales and Queensland. The ANU is funded to manage areas of Box Gum Grassy Woodland under the first four rounds of the ESP, and has been monitoring the condition of these sites since 2010. The main objective of the ANU monitoring is to develop a large-scale, long-term dataset which can highlight the influence of the ESP on the current and future condition of the Box Gum Grassy Woodland ecological community and its associated fauna.

Interim and annual reports³⁸⁶ document the progress and results of the ANU Environmental Stewardship BGGW (Box Gum Grassy Woodland) Monitoring Project. The 2016 annual report is positive, stating that overall, the "ESP represents the most comprehensive, cost-effective, and rigorously designed agri-environment scheme implemented in Australian history. With 6 years of existing monitoring data, the program is in an excellent position to extend the monitoring program so that the long-term values of Environmental Stewardship in preserving and maintaining BGGW condition can be discerned".

Source: Florance et al. 2016



A patch of Box-Gum Woodland ecological community on a private property near Murrumbateman, New South Wales.

³⁸⁵ From July 2016, the Australian Government Department of the Environment and Energy.

³⁸⁶ www.nrm.gov.au/national/continuing-investment/environmental-stewardship

In 2015, the Australian Government committed to investing \$700 million over four years to the Green Army program as part of the Agricultural Competitiveness White Paper. The Green Army is an environmental action program that supports local environment and heritage conservation projects across Australia that are hosted by community organisations, Landcare groups, natural resource management organisations, environment groups, Indigenous organisations and local councils. From the commencement of the Green Army program until its closure on 30 June 2018, there will have been an estimated 1264 projects across Australia, many of which aimed to improve the condition of privately owned forests.

Investment by state and territory governments and industry groups

State and territory governments also fund and administer programs that encourage private and community-based natural resource management in their jurisdictions. Extension programs encourage private sector and community participation in natural resource management activities through education, technology transfer, and support programs.

Industry groups such as the Australian Forest Products Association, as well as government departments at the national, state and territory levels, also provide the community with information on sustainable natural resource management.

Case study 7.5: Government investment related to forest conservation and resource management in New South Wales

In New South Wales, the *Biodiversity Conservation Act* 2016 established the NSW Biodiversity Conservation Trust (BCT), which will oversee the new Private Land Conservation program across the state and has a key role in the new Biodiversity Offsets Scheme discussed above. The BCT will invest \$240 million over the next five years to support working with landholders, farmers and other organisations that wish to participate in private land conservation (New South Wales Government 2017).

The Conservation Partners Program, administered by the New South Wales Office of Environment and Heritage, supports landholders in voluntarily protecting and managing native vegetation, wildlife habitat, geological features, historic heritage and Aboriginal cultural heritage on their properties. Landholders can choose from a range of protection options, which recognise and formalise their commitment to conservation on their properties. In turn, the government provides support matched to the level of protection for the land. Options for landholders under the program include permanent legal protection for property under a conservation agreement; legal declaration of land as a wildlife refuge; and (non-legally binding) registration of property to be managed for conservation (NSW OEH 2016c).

Forestry industry structural adjustment packages in river red gum, cypress pine, and private native forests in New South Wales, which operated during the previous reporting period, concluded during the current reporting period. The River Red Gum Structural Adjustment Package (comprising funding of \$51.5 million for industry restructuring and \$45.5 million to the National Parks and Wildlife Service) was delivered in response to the New South Wales government decision to create 85,721 hectares of new national and regional parks. The Brigalow-Nandewar (South Western Cypress) Structural Adjustment Package (comprising funding of \$48.8 million for industry restructuring and \$67.5 million to the National Parks and Wildlife Service) was delivered in response to the New South Wales government decision to create 350,000 hectares of conservation reserves in the Brigalow-Nandewar region.

Case study 7.6: Private forest management in Tasmania

In Tasmania, Private Forests Tasmania (PFT) is a government-funded authority established in 1994 to promote, foster and assist the private forestry sector. It works to facilitate and expand the development of the private forest resource in Tasmania. This includes advising and assisting private landowners in the management of native forests and the establishment and management of plantations on private land (PFT 2017).

PFT also pursues business development opportunities related to the management and use of private forests throughout Tasmania. This includes working toward securing the role of private forests in the forest products market, researching and promoting new market opportunities for forest products, addressing impediments to integrating trees into agricultural landscapes, and developing innovative systems to attract investment to the private forest estate (PFT 2016). Initiatives reported by PFT during 2015–16 included supporting the development of a group forest certification option for Tasmania.

In 2014–15, PFT received funding from the Tasmanian government's Agrivision 2050 Plan for a Private Forest Development Program, with the main objective of increasing the extent of commercial tree plantings on Tasmanian farms. PFT has partnered with the University of Tasmania in collaboration with CSIRO to implement this project.

Indicator 7.1d

Capacity to measure and monitor changes in the conservation and sustainable management of forests

Rationale

This indicator examines the capacity of forest owners and agencies to measure and monitor changes in the forest and the impact of forest activities. A comprehensive measurement and monitoring programme provides the basis for forest planning to support sustainable management.

Key points

- The ability to measure, monitor and report on forests varies considerably by tenure. The most comprehensive information continues to be available for multipleuse public forests, with lesser information on nature conservation reserves. Significant gaps in data collection and monitoring remain for leasehold and private forests, and for other Crown land.
- Australia's states and territories undertake forest and environmental data collection, monitoring and reporting in various ways. Tasmania and Victoria publish five-yearly 'state of the forests' reports, based on a framework of criteria and indicators similar to the national *Australia's State of the Forests Report* series (the SOFR series). Other states use similar approaches only for multiple-use public forests.
- Use of a framework of criteria and indicators, developed under the Montreal Process³⁸⁷, for Australia's fiveyearly national state of the forests reporting provides a mechanism for presenting disparate data in a consistent and repeatable format, and for covering the range of forest values.
- The availability, coverage and currency of the data available for the SOFR series vary considerably between indicators, but have improved overall for SOFR 2018 compared to SOFR 2013.
 - For 23 of the 44 national reporting indicators, the data available for SOFR 2018 were assessed as comprehensive in each of coverage, currency and frequency. The data were assessed as comprehensive in two of these three aspects for a further 11 indicators.

- The capacity to report trends over time was present for 18 of the 44 indicators.
- Compared with SOFR 2013, the quality of data presented in SOFR 2018 was assessed as improved for 14 of the 44 national reporting indicators.
- Australia also reports on the state of its forests internationally.
 - This occurs through the Global Forest Resources Assessment and the State of the World's Forest Genetic Resources processes undertaken by the Food and Agriculture Organization of the United Nations
 - Australia also reports against the United Nations
 Sustainable Development Goals and the United Nations
 Global Forest Goals of the Strategic Plan for Forests.
- Australia's strategy for its National Reserve System stipulates that the effectiveness and performance of protected area management must be monitored and evaluated against conservation goals. Management plans are in place for 19 million hectares of forest in the National Reserve System (57% of the area of forest in the National Reserve System).

³⁸⁷ The Montreal Process Working Group on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests – see www.montrealprocess.org

The extent to which relevant and up-to-date information about forests is available for reporting provides a measure of the capacity to demonstrate sustainable forest management. Reporting on the capacity to measure change over time offers an opportunity for forest managers to review and prioritise data collection to make future measurement and monitoring more timely and relevant to management. If a reporting system is to measure change in Australia's forests successfully, it must be underpinned by adequate and ongoing data collection.

Monitoring and reporting by tenure

State and territory agencies and some private forest owners and managers collect primary forest inventory data, but the frequency and scope of such data collection vary across jurisdictions and by tenure. The most comprehensive information is available for multiple-use public forests and nature conservation reserves for which governments require regulatory and other reporting. Reliable information is also available for commercial plantations on both public and private land.

In publicly managed native forests – especially those managed for multiple uses, including wood production – inventories and assessments are undertaken regularly for management purposes and to monitor performance, and data are available for reporting on a range of indicators. State forest management agencies are also committed to reporting regularly on forest management in multiple-use public forests in relation to environmental, economic and social values. Their reporting processes provide the level of detail required for their jurisdictions. The national state of the forests reporting process that leads to the SOFR series provides a whole-of-nation overview, and is the basis for meeting legislated national and international obligations.

In contrast to government data collection and regulatory and other reporting requirements, private landowners and managers (including leaseholders) are rarely required, and often have little incentive, to collect data on their forests or to make such data publicly available. As a result, the most significant gaps in information on Australia's forests are for private and leasehold forests. Other areas with large gaps in information across all tenures and jurisdictions are some nonwood forest values (see Indicators 2.1d, 4.1a–e, 6.1b and 6.1d, for example) and ecosystem services (Indicator 6.1c), as well as measures of growth stage (Indicator 1.1b). and indicators for sustainable forest management as used in Australia's SOFR, are also published at five-yearly intervals, and provide a component of the input from those states into the national SOFR.

Tasmania's SOFR provides information on the state of Tasmania's public and private forests, as required under the *Forest Practices Act 1985* (Tasmania). The most recent report, *State of the forests Tasmania 2017*, was released in 2017 (FPA 2017a³⁸⁸) and is a major source of data and information about Tasmania for *Australia's State of the Forests Report 2018*.

Under the *Sustainable Forests (Timber) Act 2004* (Victoria), the Victorian Government is required to produce a SOFR every five years; the most recent is *Victoria's State of the Forests Report 2013* (DEPI 2014d)³⁸⁹. In addition, VicForests, the state-owned business that is responsible for the sustainable harvest, regeneration and commercial sale of timber from Victoria's native public forests, produces annual *Sustainability Reports*³⁹⁰ (VicForests 2016b). These present information on the activities performed by VicForests to achieve environmental, social and economically sustainable outcomes, including long-term monitoring of threatened species, retained trees and water quality.

New South Wales prepares indicator-based reports on the sustainable management of multiple-use public forests each year. These reports describe progress on the implementation of the four Forest Agreements and Integrated Forestry Operations Approvals (IFOAs)³⁹¹ that apply in seven forest regions of New South Wales. The reports summarise the results of monitoring ecologically sustainable forest management criteria and indicators, wood supply, compliance with IFOAs for each IFOA region, and achievement of milestones defined in the four Forest Agreements and the IFOAs³⁹². New South Wales also prepares state of the environment reports each three years, most recently in 2015.

Western Australia published state of the environment reports in 1992, 1998 and 2007, and reports specifically on key performance indicators for forests through a management plan process (see below).

In South Australia, ForestrySA publishes an annual report covering plantation forests on public land (there is no native forest harvesting in South Australia). In addition, the South Australian Environment Protection Authority is required to report each five years and has produced a state of the environment report for South Australia in 2003, 2008 and 2013.

State and territory forest measurement, monitoring and reporting

Australia's states and territories vary in the levels of forest and environmental reporting that they publish. Of the states and territories, Tasmania and Victoria publish state of the forests reports (SOFRs) that cover all forest types and tenures. These reports are based on the same framework of criteria

- ³⁸⁸ www.fpa.tas.gov.au/FPA_publications/state_of_the_forests_tasmania_ reports; www.fpa.tas.gov.au/__data/assets/pdf_file/0005/163418/ State_of_the_Forests_Report_2017_-_erratum_Feb_2018.pdf
- ³⁸⁹ www.forestsandreserves.vic.gov.au/__data/assets/pdf_file/0019/52705/ VIC_SFR2013_lowres.pdf
- 390 www.vicforests.com.au/about-vicforests/corporate-reporting-1/ sustainability-report-2016
- ³⁹¹ www.epa.nsw.gov.au/your-environment/native-forestry/integratedforestry-operations-approvals/annual-reports
- ³⁹² Annual reporting against the three western New South Wales IFOAs covers compliance, timber harvesting and achievement of milestones.

The four states with regional forest agreements (RFAs) – New South Wales, Tasmania, Victoria and Western Australia – are required to produce five-yearly independent reviews assessing the progress and performance of each RFA. The review process varies slightly for each RFA, but generally the reviews require an independent assessment of the results from monitoring Montreal Process sustainability criteria and indicators, of activities undertaken against the RFA milestones and obligations agreed by each state with the Australian Government, and against the recommendations of previous reviews. The status of the reviews is summarised in Table 7.11. Indicator 7.1a provides further information on RFAs.

Many other measurement and monitoring activities support state and territory reporting. Examples are provided below.

Australian Capital Territory

Annual or regular forest monitoring undertaken in the Australian Capital Territory includes monitoring of fire recovery in Namadgi National Park and Tidbinbilla Nature Reserve, monitoring of deer impacts in Namadgi National Park, and monitoring of biodiversity and health of box-gum woodland.

New South Wales

Examples of monitoring programs and projects undertaken by various departments and agencies in New South Wales include the following:

- the New South Wales *Report on Native Vegetation*. This report is updated yearly, with the most recent report covering 2013–14³⁹³. It provides a comprehensive picture of the status of the regulation, protection and extent of native vegetation in the state
- 'State of the Parks', a monitoring and reporting framework used by the National Parks and Wildlife Service of NSW. This is based on International Union for Conservation of Nature best-practice guidelines, and collects information on park attributes (e.g., gazetted area, bioregions, international agreements, and catchment management areas), contextual information (e.g., plans, values, threats, stakeholders, commercial activities and visitation), and the effectiveness of dealing with management issues such as pest plants and animals, weeds, visitors, fire, law enforcement, and natural and cultural heritage³⁹⁴. However, no 'State of the Parks' data have been publicly available since 2007.

Table 7.11: Status of five-yearly reviews of regional forest agreements (RFAs)

	Five-yearly reviews ^a						
State	_	Firs	st period	Seco	ond period	Third period	
RFA	Signing year	Due	Status ^b	Due	Status ^b	Due	Status ^b
Tasmania ^c							
Tasmania	1997	2002	Completed	2007	Completed	2012	Completed
Victoria							
East Gippsland	1997	2002		2007		2012	Completed
Central Highlands	1998	2003	Collectively	2008	Collectively	2013	Completed
North East	1999	2004	second-period	2009	first-period	2014	Completed
Gippsland	2000	2005	completed	2010	completed	2015	Completed
Western Victoria	2000	2005		2010		2015	Completed
New South Wales ^d							
Eden	1999	2004		2009	Combined with	2014	Combined
North East ^e	2000	2005	Collectively	2010	the third period	2015	with the second period
Southern	2001	2006	— completed —	2011	commenced ^f	2016	review and commenced ^f
Western Australia							
South West	1999	2004	Combined with the second period review, and completed	2009	Combined with the first review period, and completed	2014	Commenced ^f

^a Review reports are available at <u>www.agriculture.gov.au/forestry/policies/rfa</u>.

^b Status of reviews is at 31 August 2018.

^c An assessment was completed for Tasmania in 2017, and the RFA was extended for a further 20 years.

An assessment was completed for New South Wales in 2018, and the three RFAs were extended for a further 20 years.

^e The North East RFA covers two regions, Upper North East and Lower North East.

^f Completion scheduled for 2018.

7.1d

³⁹³ www.environment.nsw.gov.au/resources/nativeveg/nsw-report-nativevegetation-2013-14.pdf

³⁹⁴ www.environment.nsw.gov.au/sop/

- a project to map threatened ecological communities in State forests, which developed a method to identify communities most likely to be affected by wood harvesting activities, and which was completed in 2016³⁹⁵
- a program, completed in 2016, that mapped koala habitat and occupancy in New South Wales native forests, to inform new identification and protection requirements in native forest areas on private and public land³⁹⁶
- mapping of the extent and severity of Bell-Miner-Associated Dieback across 1.25 million hectares in northern NSW, across all tenures, using aerial surveys, satellite imagery, and follow-up ground checking. This is a joint project undertaken by the Forestry Corporation of NSW³⁹⁷, the Department of Primary Industries and the National Parks and Wildlife Service
- regular biodiversity monitoring, plantation health monitoring, and soil and water monitoring, undertaken by the Forestry Corporation of NSW, as reported in the Forestry Corporation *Annual Report Sustainability Supplement*, most recently covering 2015–16³⁹⁸
- collation of records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails listed under the former *Threatened Species Conservation Act 1995* (NSW)) and some fish into the Atlas of NSW Wildlife by the Office of Environment and Heritage. The Atlas also contains known and predicted distributions of vegetation communities, and of endangered populations and key threatening processes listed under the former *Threatened Species Conservation Act 1995* (NSW).

Northern Territory

The Northern Territory's 'Three Parks Program' managed by the Parks and Wildlife Commission of the Northern Territory combines remotely sensed imagery of fire history with on-ground data collected from a network of 220 permanent plots in Litchfield, Kakadu and Nitmiluk National Parks. Plot sampling involves annual recording of fire incidence and severity. Detailed flora and fauna sampling is undertaken every five years.

Queensland

The Queensland Government undertakes a range of activities for monitoring and reporting changes in the extent, state, condition and sustainable management of Queensland's state forests and nature conservation reserves. Examples of forest monitoring undertaken in Queensland include:

- ³⁹⁵ www.epa.nsw.gov.au/native-forestry/tec-mapping-project.htm
- ³⁹⁶ www.epa.nsw.gov.au/native-forestry/koala-mapping-program.htm
- ³⁹⁷ Until January 2013, Forests NSW.
- ³⁹⁸ www.forestrycorporation.com.au/__data/assets/pdf_file/0017/692000/ SustainabilitySnapshot2015-16.pdf
- ³⁹⁹ Until February 2015, the Department of Agriculture, Fisheries and Forestry.

- broad-scale monitoring using long-term plots across a range of forest types in north Queensland through the Terrestrial Ecosystem Research Network
- fire-related monitoring including long-term burning plots in several regions
- long-term inventory plots on multiple-use public forest and private native forests
- a statewide vegetation mapping program to map regional ecosystems (defined as vegetation communities in a bioregion that are consistently associated with a particular combination of geology, landform and soil)
- the Statewide Landcover and Trees Study, which uses satellite imagery to monitor forests and woodlands to assess vegetation extent and clearing activities
- monitoring of significant species, including mahogany glider (*Petaurus gracillis*), northern bettong (*Bettongia tropica*), koala (*Phascolarctos cinereus*), Kroombit tinker frog (*Taudactylus pleione*) and Hastings River mouse (*Pseudomys oralis*)
- monitoring of acacia-dominated communities in central Queensland
- identifying and monitoring the conservation of biodiversity including preparing recovery plans that are required under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

There are also approximately 150 permanent tree growth monitoring plots across 18 sites in southern Queensland, some measured by the Department of Agriculture and Fisheries³⁹⁹ and others measured by the Private Forestry Service Queensland, generally on a 3–5 year cycle. These monitoring plots vary in size and shape, and have been subject to a range of different silvicultural treatments. They are mostly located in dry eucalypt forest.

South Australia

Fire management plans guide fire management activities in regions of high fire risk across South Australia. Each regional plan includes a monitoring section with specific recommendations for that region. For example, the Southern Flinders Ranges Fire Management Plan specifies an examination of the suitability of the proposed Ecological Fire Management Guidelines for species of declining woodland birds.

Tasmania

Monitoring is a requirement of the *Forest Practices Act* 1985 (Tasmania), and is implemented by Tasmania's Forest Practices Authority (FPA). The FPA employs scientists who undertake monitoring and research projects in areas related to cultural heritage, botany, geomorphology, soil science, visual landscape and zoology. These projects contribute to the scientific knowledge underpinning the Forest Practices Code provisions for natural and cultural values and associated planning tools. Two types of monitoring are undertaken by the FPA. Compliance monitoring determines whether prescribed management is actually conducted. Effectiveness monitoring determines whether the management specified has achieved its objective, and whether the outcome was actually a consequence of that management. The effectiveness of the biodiversity provisions of the Forest Practices Code was reviewed in 2012 (Koch et al. 2012), which identified gaps and was used to determine monitoring priorities (FPA 2012).

The FPA reports annually on the findings of biodiversityrelated projects (FPA 2014, 2015a, 2016b). Most projects are done in collaboration with other research providers, including the University of Tasmania, Forestry Tasmania⁴⁰⁰, the Department of Primary Industries, Parks, Water and Environment, and private forest management companies.

In addition to broad-scale monitoring in Tasmania, site-specific surveys are undertaken to ensure that non-wood values are assessed before forest disturbance activities commence, as required by the Forest Practices Code and the Tasmanian Reserve Management Code of Practice. These surveys aim to identify and protect Indigenous and non-Indigenous heritage sites, geomorphic features, and threatened species and communities. Information from these surveys is contributed to state-wide databases for conservation and forest-practices planning.

Victoria

The Victorian Department of Environment, Land, Water and Planning (DELWP)⁴⁰¹ undertakes a range of activities for monitoring and reporting changes in the extent, state, condition and sustainable management of Victoria's State forests and nature conservation reserves. These activities are known collectively as the Victorian Forest Monitoring Program (VFMP)⁴⁰². The VFMP was initiated in 2010 with the aim of providing a continuously updated description of forests, using a combination of permanent plots measured every five years (see Figure 7.4, SOFR 2013), and aerial photography and satellite imagery. Up to June 2017, 662 permanent plots had been installed and measured. Re-measurement commenced in October 2015.

Examples of other forest monitoring projects underway in Victoria include:

• periodic re-measurement by VicForests of permanent plots in the Permanent Growth Plot Program, to monitor tree growth in multiple-use public forest

- 402 www.forestsandreserves.vic.gov.au/forest-management/victorian-forestmonitoring-program
- ⁴⁰³ Until July 2017, the Department of Parks and Wildlife (DPaW)
- ⁴⁰⁴ From October 2015, the Conservation and Parks Commission of Western Australia
- 405 www.dpaw.wa.gov.au/images/documents/conservation-management/ forests/FMP/20130282_WEB_FOREST_MGT_PLAN_WEB.pdf

- biodiversity surveys undertaken by VicForests in 1939 regrowth mountain ash (*Eucalyptus regnans*) forest in the Central Highlands Forest Management Area. Plots have been marked permanently to enable re-measurement
- surveys undertaken in the Central Highlands Forest Management Area as part of the Leadbeaters Possum Recovery Project, to detect colonies of this species
- Grampians, Glenelg, Southern (East Gippsland) and Central Highlands Ark projects undertaken by DELWP that involve regional monitoring of mammals using hair tubes, traps and cameras on various land tenures, to assess the effectiveness of fox and wild dog control programs
- monitoring of forest fuel loads by Forest Fire Management Victoria in the Victorian Bushfire Monitoring Program, for development of fire protection strategies
- biodiversity surveys in 1939 regrowth mountain ash forest in the Central Highlands Forest Management Area undertaken by VicForests. The plots measured have been marked permanently to enable re-measurement.

Western Australia

Forests on public land in south-west Western Australia are managed by the Department of Biodiversity, Conservation and Attractions (DBCA)⁴⁰³ in accordance with the *Forest Management Plan 2014–2023* produced by the Conservation Commission of Western Australia⁴⁰⁴ (CCWA 2013)⁴⁰⁵. The plan specifies a number of monitoring and auditing actions based on key performance indicators. The current plan covers the period 2014–2023 and replaces the previous plan that covered the period 2004–2013.

The Conservation and Parks Commission undertakes mid-term and end-of-term audits of plan implementation, including the extent to which key performance indicator targets have been achieved. The plan uses the Montreal Process criteria and indicators structure, so monitoring and auditing provides data and information that is consistent with the needs of national State of the Forests reporting.

Monitoring of forest and vegetation condition within the plan area is undertaken through various activities including biological surveys and FORESTCHECK, *Phytophthora cinnamomi* mapping, evaluation of prescribed burns, inventory, operational monitoring, and assessments undertaken related to performance indicators. FORESTCHECK, the key forest biodiversity monitoring program of DBCA, has been monitoring biodiversity in jarrah (*E. marginata*) forests since 2001. *The Forest Management Plan 2014–2023* uses results from FORESTCHECK for monitoring a number of indicators, and aims to maintain and extend this system (see Case study 7.7).

⁴⁰⁰ From July 2017, Sustainable Timber Tasmania.

⁴⁰¹ Until January 2015, the Department of Environment and Primary Industries (DEPI).

Case study 7.7: The FORESTCHECK project: integrated biodiversity monitoring in jarrah forest

FORESTCHECK is an integrated monitoring system designed to support forest management in the southwest of Western Australia. It provides information about changes and trends in key elements of forest biodiversity in jarrah (*Eucalyptus marginata*) forest associated with management activities, including wood harvesting and silvicultural treatments.

The initial set of 48 monitoring grids established throughout the range of the jarrah forest has been increased to 67 grids, in order to expand the coverage of forest ecosystems and the range of silvicultural treatment and fire history sampled. Grids established since 2013 cover silvicultural practices implemented during the period of the *Forest Management Plan 2004–2013* in the Jarrah South and Jarrah Sandy Basins forest ecosystems. Additional grids have also been established in examples of long-unburnt forest.

Sets of grids are assessed on a five-yearly basis for attributes including forest structure, soil condition, and levels of litter and coarse woody debris. Elements of biodiversity are also assessed, including vascular flora, vertebrate fauna (birds, mammals and reptiles), cryptogams (lichens, liverworts and mosses), macrofungi and invertebrate fauna.

To date, most grids have been monitored twice each – once between 2001 and 2006, and once between 2007 and 2012, but some grids have been monitored up to four times. More than 3,700 species have been recorded in the FORESTCHECK system, with invertebrates being the richest group of organisms. Overall species richness and composition are influenced more strongly by forest ecosystem type and by the season in which the monitoring is undertaken, than by silvicultural treatment or by time since fire. Macrofungi, cryptogams and bird species assemblages are sensitive to the season of monitoring, probably reflecting climatic conditions and changes in the structure of the vegetation between sampling events.

Biodiversity is monitored in a way that allows detection of changes caused by wood harvesting or other silvicultural disturbance. Data from the first round of monitoring show that species return to a site after wood harvesting, as the forest structure and habitats re-establish. This process can take from a few years to several decades, depending on the habitat requirements of individual species. Habitat features such as tree hollows and large woody debris take many years to form, and maintenance of site biodiversity therefore requires that they are retained when wood is harvested (CCWA 2013). For all species groups studied (vascular flora, macrofungi, lichens, bryophytes, mosses, insects and other invertebrates, birds and animals), the effect of wood harvesting was negligible after 40 years: few significant impacts were evident and most species groups were resilient to the disturbance imposed

Figure 7.7: Monitoring post-fire responses at Forestcheck grids following the January–February 2015 Lower Hotham bushfire



A Mature jarrah (*Eucalyptus marginata*) tree collapsed following ignition of dead wood in an old injury at the base of the stem



B Ashbed resulting from complete burning of a fallen marri (*Corymbia* calophylla) tree

(Abbott and Williams 2011). Data from the second round of monitoring are currently being prepared for publication.

Seven grids were burnt during a large bushfire in January– February 2015 (Figure 7.7). This has provided a valuable opportunity to monitor post-fire responses of selected biota, as well as changes in the amount and condition of fine and coarse woody debris on the forest floor, and impacts on stand structure.

Source: Western Australian Department of Biodiversity, Conservation and Attractions (Lachlan McCaw).

National forest monitoring and reporting

The National Forest Inventory (NFI) held in the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES), Australian Government Department of Agriculture and Water Resources, is a compilation of data and information supplied by states and territories, supplemented with national data, and with these data integrated into national classification schemes and databases. Tabular data on commercial plantations are collected yearly, and spatial data on all forests are collected every five years. Maintenance of the NFI is mandated in Australia's *National Forest Policy Statement* (Commonwealth of Australia 1992).

ABARES has primary responsibility for national forest reporting in Australia, including coordinating the preparation of the five-yearly *Australia's State of the Forests* series (the SOFR series). The process and mandate for preparing the SOFR series is summarised in the Introduction.

Australia's national state of the forests reporting through the five-yearly SOFR series is based on a framework of 7 criteria and 44 indicators of sustainable forest management that are closely aligned with the international Montreal Process⁴⁰⁶. This framework provides a mechanism for presenting Australia's disparate forest data in a consistent and repeatable format, in spite of varying state, territory and national data collection processes, classification systems and standards. Reporting against Montreal Process criteria and indicators deliberately does not score, rank or aggregate individual indicators, allowing users of the report (researchers, policy makers, forest owners or managers) to make their own interpretation of the meaning and causes of changes in forest parameters, and the overall condition of any particular forest area.

Coverage and currency of data, frequency of data collection, and capacity to report on trends also vary among indicators, and only certain indicators are readily measured quantitatively.

Table 7.12 summarises Australia's capacity to report against these 44 indicators for SOFR 2018, based on the coverage, currency, and update frequency of data available for each indicator, and the capacity to report trends. Table 7.12 also presents changes over the period 2011–2016 (that is, since SOFR 2013) in the quality of the data that contribute to the SOFR series reporting. This analysis was performed separately for three components of Indicator 1.1a (forest area, type and tenure), for two components of Indicator 6.1d (wood products, and non-wood products) and for two components of Indicator 6.4a (area of Indigenous forest, and Indigenous heritage). The lowest-scoring component of an indicator was incorporated into the summary statistics.

Overall, the data available for SOFR 2018 were assessed as comprehensive in three aspects (coverage, currency and update frequency) for 23 of the indicators (up from 17 for SOFR 2013), and comprehensive in any two of these aspects for a further 11 indicators. Trends over time could be reported for 18 of the 44 indicators for SOFR 2018 (up from 16 for SOFR 2013), and there has been an overall improvement in the quality of data for 14 of the indicators. The capacity to report for one indicator (Indicator 1.1b, forest growth stage) was particularly deficient, and this and Indicator 6.1c (value of forest-based services) were the only indicators with an overall decline in data quality since SOFR 2013.

New and improved datasets reported in SOFR 2018

A number of new and improved social, economic and biophysical datasets have been compiled for the National Forest Inventory, and analysed and presented in SOFR 2018. These include:

- a national forest cover dataset that has been further improved using the Multiple Lines of Evidence approach (Indicator 1.1a)
- a new national forest tenure dataset (Indicator 1.1a)
- an improved dataset on areas of forest managed for protection, including data on covenanted private forests and on Ramsar wetlands (Indicator 1.1c)
- a new national forest fragmentation dataset (Indicator 1.1d)
- a corrected and updated spatial dataset of forest commerciality (Indicator 2.1a)
- new tables of key pests and weeds by jurisdiction (Indicator 3.1a)
- consistent fire area data, and new fire area metrics, based on a national compilation of data from states and territories (Indicator 3.1b)
- data on forest carbon stocks by pool (above-ground, below-ground) and by jurisdiction (Indicator 5.1a)
- a corrected and improved dataset of forest on Indigenous land, by Indigenous land management category (Indicator 6.4a)
- a new Indigenous heritage dataset (Indicator 6.4a).

Gaps in SOFR 2018 data

There are remaining or ongoing gaps in the data compiled for SOFR 2018:

- native forest growth-stage data are not collected routinely by many state and territory jurisdictions (Indicator 1.1b)
- there are gaps in species lists for forest-dwelling invertebrate fauna, fungi, lichens and algae (Indicator 1.2a)
- information on the production, consumption and trade of non-wood forest products, and the value of forest-based services, is difficult to obtain (Indicators 2.1d, 6.1b and 6.1d)
- nationally meaningful data on soil and water parameters are deficient (Indicators 4.1b–e)
- data on the use of forests for tourism and recreation are incomplete (Indicator 6.3a-b).

7.1d

⁴⁰⁶ www.montrealprocess.org; see also Appendix 1.

Table 7.12: Data coverage,	, currency, update frequency	, capacity to report trends	, and overall change in dat	a quality since SOFR 2013
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Criterion	and Indicator	Data coverage	Data currency	Data update frequency	Capacity to report trends	Change in data quality since SOFR 2013
Criterion	1: Conservation of biological diversity					
	Area of forest by forest type and tenure – forest area					7
1.1aª	Area of forest by forest type and tenure – forest type					7
	Area of forest by forest type and tenure – tenure					7
1.1b	Area of forest by growth stage ^b	с				Ľ
1.1c	Area of forest in protected area categories					٦d
1.1d	Fragmentation of forest cover					7
1.2a	Forest dwelling species with ecological information			e		7
1.2b	Status of forest dwelling species at risk					
1.2c	Representative species monitored					⊅f
1.3a	Species at risk of loss of genetic variation					∕¶g
1.3b	Genetic resource conservation mechanisms in place					٦h
Criterion	2: Maintenance of productive capacity of forest ecosystems					
2.1a	Native forest available for wood production					٦i
2.1b	Age class and growing stock of plantations					_
2.1c	Annual removal of wood products compared with sustainable volume					7 1
2.1d	Annual removal of non-wood forest products compared with sustainable level					_
2.1e	Effective forest regeneration and plantation re-establishment					٦i
Criterion	3: Maintenance of ecosystem health and vitality					
3.1a	Scale and impact on forest health and vitality					—
3.1b	Forest burnt by planned and unplanned fire					7
Criterion	4: Conservation and maintenance of soil and water resources					
4.1a	Forest managed primarily for protective functions					_
4.1b	Management of the risk of soil erosion					—
4.1c	Management of the risks to soil physical properties					—
4.1d	Management of the risks to water quantity					—
4.1e	Management of the risks to water quality					—
Criterion	5: Maintenance of forest contribution to global carbon cycles					
5.1a	Contribution to global greenhouse gas balance					—
Criterion	6: Maintenance and enhancement of long-term multiple socio	-economic ber	nefits to meet	the needs of so	ocieties	
6.1a	Value and volume of wood and wood products					
6.1b	Values, quantities and use of non-wood forest products					—
6.1c	Value of forest-based services					Ľ
6 1 di	Wood and non-wood product production and consumption – wood products					_
0.10	Wood and non-wood product production and consumption – non-wood products		k	k		—
6.1e	Recycling of forest products					7
6.2a	Investment and expenditure in forest management					—
6.2b	Investment in research, development and extension, and new technologies					7
6.3a	Area of forest available for public recreation/tourism					—
6.3b	Recreation/tourism activities available					_
6 / 2	Area to which Indigenous people have use and rights – forest area					7
0.40	Area to which Indigenous people have use and rights – heritage					_

Continued

Continues

Criterion	and Indicator	Data coverage	Data currency	Data update frequency	Capacity to report trends	Change in data quality since SOFR 2013
6.4b	Registered places of non-Indigenous cultural value					_
6.4c	Protection of Indigenous values					—
6.4d	Importance of forests to people				m	—
6.5a	Direct and indirect employment					_
6.5b	Wage rates and injury rates					—
6.5c	Resilience of forest dependent communities					—
6.5d	Resilience of forest dependent Indigenous communities					—
Criterion	7: Legal, institutional and economic framework for forest con	servation and	d sustainable n	nanagement		
7.1a	Legal framework					_
7.1b	Institutional framework					_
7.1c	Economic framework					_
7.1d	Capacity to measure and monitor					_
7.1e	Capacity to conduct and apply research and development					—

Кеу	Data coverage Data currency		Data update frequency	Capacity to report trend	Change in data quality since SOFR 2013	
	Whole country assessed	Current data (data since 2011)	Annual to five-yearly	High	∕7 Overall data quality has improved since SOFR 2013	
	Incomplete national data	Mixed current and historical data	Less frequently than five-yearly	Partial	— Overall data quality is unchanged since SOFR 2013	
	No data; case studies only	Historical data (pre-2011 data only)	Occasional or once only	None	∠ Overall data quality has declined since SOFR 2013	

^a Indicator 1.1a has been divided in order to report separately data quality for forest type, forest area, and forest tenure.

^b Sufficient, consistent and coordinated data have not been collected at the state and territory level since 2008 to enable satisfactory data-based reporting

against this indicator (see Table 1.13). Available data is therefore increasingly out of date.

^c Data are only available for the old-growth stage. National data on other growth stages are not available.

 $^{\rm d}$ $\,$ Reflects improvements in data on tenure of private forest reserves.

e There are gaps with regard to species lists for vascular plants, invertebrate fauna, fungi, lichens, algae or micro-organisms in forests.

f Variable across states and territories. Very good in Tasmania and Western Australia.
 g Data remain patchy across species and jurisdictions, but are improving over time for targeted threatened species.

^h Data on genetic conservation have improved.

ⁱ Capacity to report on private native forest available for wood production remains limited. Information on plantations has improved, however it has decreased for some jurisdictions for public native forests.

^j Indicator 6.1d has been divided in order to report separately data quality for wood and non-wood forest products.

^k For bee products only. Data were not available for other non-wood products.

¹ Indicator 6.4a has been divided in order to report separately data quality for forest on Indigenous land, and forest on Indigenous heritage sites.

^m Good capacity to report trend on national attitudinal surveys.

🔊 This table, together with other data for Indicator 7.1d, is available in Microsoft Excel via www.doi.org/10.25814/5bda99c8d76da

7.1d

Other national reporting relevant to forests

In addition to Australia's five-yearly SOFR series, regular national reports that provide updated information on Australia's forested environments include the five-yearly State of the Environment report series⁴⁰⁷ (Jackson et al. 2017).

Emissions and sequestration of greenhouse gases across industry sectors, including carbon stocks in forests, emissions from forests and sequestration into forests, are recorded in Australia's National Greenhouse Gas Inventory maintained by the Department of the Environment and Energy. These parameters are reported in National Forest Inventory reports⁴⁰⁸ (DoEE 2018b). Indicator 5.1a gives more information about the National Greenhouse Gas Inventory and the carbon cycle in Australia's forests.

International forest reporting and monitoring

Australia is a member country of the Montreal Process, which reports on forests using an internationally agreed framework of criteria and indicators (the 'C&I process') for monitoring sustainable forest management in temperate and boreal forests. The national SOFR series is Australia's reporting mechanism to the Montreal Process.

A Global Forest Resources Assessment (GFRA) is produced by the Food and Agriculture Organization of the United Nations (FAO) every five years, as a consistent description of the world's forests and how they are changing over time. The FAO also prepares State of the World's Forests reports on the status of forests and key issues concerning the forest sector, and prepares a State of the World's Forest Genetic Resources report. Australia's national SOFR series is the primary source of data for Australia's Country Report to the GFRA process, the State of the World's Forests reports, and the State of the World's Forest Genetic Resources reports.

Australia has committed to reporting against the United Nation's Sustainable Development Goals (SDGs). The GFRA provides the direct input for global forest reporting against the forest indicators in SDG 15 Life on Land. The GFRA is also a source for reporting against the Global Forest Goals of the United Nations Strategic Plan for Forests 2017–2030. Data compiled for Australia's national SOFR series are thus used for Australia's contribution to the GFRA, the UN SDGs and the UN Global Forest Goals. SOFR data are also used to report to the UN Convention on Biological Diversity and other international agencies. Data in Australia's NFI are also one input to the reporting of forestrelated emissions data to the UN Framework Convention on Climate Change, including for its Kyoto Protocol.

Effectiveness of monitoring the national forest reserve system

Australia's National Reserve System (NRS) represents the collective efforts of Australian governments and nongovernment organisations to achieve an Australian system of protected areas, as a major contribution to the conservation of Australia's native biodiversity (NRMMC 2004). The area of forest in the NRS is reported in Indicator 1.1c.

Australia's Strategy for the National Reserve System 2009-2030⁴⁰⁹ (NRMMC 2009) has national targets for a comprehensive, adequate and representative (CAR) reserve system that meets regional, national and international goals. The strategy also stipulates that the effectiveness and performance of protected area management must be monitored and evaluated to provide a measure of the achievement of conservation goals in a manner that is open to public scrutiny. Assessment includes evaluating the coverage of protected area systems and the extent to which biodiversity is represented, evaluating the adequacy and appropriateness of management systems and processes, and assessing the condition of protected areas and trends in specific conservation values. The Australian Government collects information from state and territory governments and other protected area managers about the location and management of protected areas, and collates and stores this information as the Collaborative Australian Protected Area Database (CAPAD).

The NRS helps Australia to meet international obligations and goals under the UN Convention on Biological Diversity, including for implemented management plans and management effectiveness assessments. These data are being incorporated into a global database maintained by the World Conservation Monitoring Centre⁴¹⁰ as part of the UN Environment Programme⁴¹¹.

Management plans provide guidance for sustainable forest management practices, and for the monitoring and evaluation of management performance. Nationally, 19.1 million hectares of forest in the NRS has management plans in place, which is 57% of the area of forest in the NRS; a further 27% is covered by transitional management arrangements, while the remaining 16% has no management planning documentation (Table 7.13).

⁴⁰⁷ www.environment.gov.au/science/soe

 ⁴⁰⁸ www.environment.gov.au/climate-change/climate-science-data/ greenhouse-gas-measurement/publications#national

⁴⁰⁹ www.environment.gov.au/land/nrs/publications/strategy-nationalreserve-system

⁴¹⁰ See <u>www.unep-wcmc.org</u>. The World Conservation Monitoring Centre Protected Areas Programme manages the World Database on Protected Areas (<u>www.protectedplanet.net</u>), develops and supports the scientific basis for the valuation of protected areas, assesses the management and ecological effectiveness of these areas, and monitors this performance at a global level.

⁴¹¹ See Parties to the Convention on Biological Diversity COP 10 Decision X/31, <u>www.cbd.int/decision/cop/default.shtml?id=12297</u>



Monitoring and measurement.

As at 2016, more than 75% of the area of forest in the NRS in the Australian Capital Territory, New South Wales, the Northern Territory and Victoria was managed under an existing management plan identified in CAPAD. The majority of forest area in the NRS in Queensland and South Australia is not covered by existing management plans identified in CAPAD. However, many areas of forest in the NRS in Queensland are managed under pre-existing management plans rated as transitional. In addition, while South Australian state legislation requires NRS areas to have management plans, processes may not have commenced or have been completed to allow all of these to be described as existing under CAPAD requirements (Table 7.13).

Table 7.13: Status of management plans covering forests in the National Reserve System, 2016

Status	Proportion of area of forest in the National Reserve System with management plans of given status (%)								
	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Australia
Existsª	99	84	78	16	48	60	85	58	57
Transitional ^b	0	13	11	51	25	26	0	35	27
None ^c	1	3	10	33	27	14	15	7	16

^a Exists: planning documentation identified in CAPAD is in statutes or plans formally adopted after consultation, with strategies and implementation actions.

^b Transitional: planning documentation identified in CAPAD is in preparation or in draft, or intent is documented, or old plans exist that require updating.

^c None: no form of management documentation identified in the CAPAD.

Forest areas in the National Reserve System are given in Table 1.17.

Source: Australian Government Department of the Environment and Energy (CAPAD 2016), including data updated for Qld and the ACT; forest area data from the National Forest Inventory.

🔊 This table, together with other data for Indicator 7.1d, is available in Microsoft Excel via www.doi.org/10.25814/5bda99c8d76da

7.1d

Indicator 7.1e

Capacity to conduct and apply research and development aimed at improving forest management and delivery of forest goods and services

Rationale

This indicator reports on the scientific understanding of Australian forest ecosystem characteristics and functions needed to underpin sustainable forest management. Research, inventory and the development of assessment methodologies provide the basis for sustainable forest management.

Key points

- This indicator reviews the provision of forestry and forest products research and development (R&D) by national agencies, state and territory agencies, and universities.
- An estimated 276 researchers and technicians were involved in forestry and forest products R&D in Australia in 2013. This is a reduction from 455 estimated for 2011, and 733 estimated for 2008. The decline has occurred across the public and private sectors, including government agencies and universities.
- Ongoing changes in funding and delivery models by state and territory governments have generally reduced forest R&D capacity in their forest management agencies. The total number of forestry and forest products researchers employed by state and territory agencies was reported as 89.5 full-timeequivalent (FTE) staff in 2015–16, approximately half the 171.8 FTE reported for 2011–12.
- Ongoing changes in funding and delivery models by the Australian Government reduced forest R&D capacity across a number of national organisations, including some for which government funding or support ceased during the SOFR 2018 reporting period. However, a number of new, university-based forestry and/or forest products research centres were established during the SOFR 2018 reporting period.

A scientific understanding of the characteristics and functions of Australian forest ecosystems is needed to underpin their management. Research and development (R&D) provides the basis for biological surveys and forest inventories, forest management, the silvicultural regime for harvesting forests, forest health surveillance, and the development of methods for assessing sustainable forest management. This indicator examines the institutional capacity for forest-related R&D; Indicator 6.2b quantifies investments in R&D by three industry subsectors.

Australia has gained a good level of scientific understanding of the characteristics and functions of its unique forest ecosystems, based on more than 100 years of research in a broad range of forest areas. This knowledge is required to underpin sustainable forest management. However, since 2007, Australia's capacity to conduct and apply R&D to improve the scientific understanding of forests and delivery of forest products has progressively decreased. Significant changes in R&D capacity have occurred at the national, state and territory levels of government, and within the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and academic institutions. Many of these changes reflect either general changes in overall government priorities or specific changes in government priorities for science-based R&D.

'Forestry' R&D covers research in relation to commercial management and protection of forests, including environmental and ecological considerations. It does not cover research on areas managed specifically for conservation (e.g. forest areas in nature conservation reserves), or programs monitoring growth, health, nutrition and biodiversity. 'Forest products' R&D covers research on value-adding to wood in its broadest sense, but not work on final product development (e.g. furniture production), production runs in mills, environmental monitoring or quality control assessment. These categories have been stable across a number of industry surveys and SOFR reporting periods.

National-level forest research and development capacity

Over the SOFR 2018 reporting period 2011–16, Australia's capacity to conduct and apply forest R&D at the national level has been coordinated and delivered through a number of organisations, including:

- the Australian Bureau of Agricultural and Resource Economics and Sciences
- the Australian Centre for International Agricultural Research
- the Commonwealth Scientific and Industrial Research Organisation
- Forest and Wood Products Australia
- the Cooperative Research Centre for Forestry
- the Bushfire and Natural Hazards Cooperative Research Centre
- the Plant Biosecurity Cooperative Research Centre
- the Terrestrial Ecosystem Research Network.

As an indication of the extent to which these organisations enhanced Australia's capacity to conduct and apply forest R&D, their activities are briefly described below.

Australian Bureau of Agricultural and Resource Economics and Sciences

The Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES), within the Australian Government Department of Agriculture and Water Resources, provides integrated economic, social and scientific research for strategic policy development across the agriculture, fisheries and forestry sectors.

ABARES also contributes to R&D aimed at improving sustainable forest management, and the sustainable and profitable delivery of forest goods and services. For example, ABARES coordinates the preparation of the *Australia's State* of the Forests Report series, publishes the Australian Forests and Wood Products Statistics series, and undertakes or coordinates other nationally relevant research on Australia's forests.

Australian Centre for International Agricultural Research

The Australian Centre for International Agricultural Research (ACIAR) commissions collaborative agriculture, fisheries and forestry research projects in developing countries, and over a 30-year period has invested over AU\$100 million to fund 150 forestry projects and activities in 29 countries, with most of these projects implemented in Indonesia, Vietnam and Papua New Guinea.

While ACIAR forestry research projects are not conducted in Australia, there are direct and indirect benefits for

Australian forest research. ACIAR funding contributes directly to building and sustaining forest research capabilities in Australian research institutions, including universities and CSIRO. ACIAR projects have resulted in improved knowledge of the performance of various Australian trees under different environmental conditions, including many commercially important eucalypts and acacias. Reliable techniques for growing sandalwood plantations have also been developed. The enhanced networks that exist with collaborating partner country scientists facilitate ongoing exchange of scientific information, and in the case of forest biosecurity can assist Australia to monitor the spread of new threats to Australian forests and forestry, particularly in neighbouring countries in the Pacific region (Bartlett 2016).

Commonwealth Scientific and Industrial Research Organisation

The Commonwealth Scientific and Industrial Research Organisation (CSIRO) is Australia's national science research agency. Approximately 25 staff work in forestry disciplines (2017), down from 235 staff (including 85 scientists) that worked in CSIRO Forestry and Forest Products in 2000 (Kile et al. 2014).

Between 2007 and 2014, forest research programs at CSIRO were mostly delivered under the Sustainable Agriculture Flagship and the Climate Adaptation Flagship. Following another major restructure in 2014, remaining forest research has been delivered by the Forest and Landscape Processes and Risks Program within CSIRO Land and Water, with a focus on sustainable forest production, carbon and water balance in forests, growing and managing forests in developing countries for poverty alleviation, and predicting risk from bushfires and bushfire management. The program aims to develop strategies for keeping Australia's forests productive and healthy into the future, so that they continue to provide a range of products and services like wood, habitat and clean water. This research also contributes to carbon sequestration and forest sustainability⁴¹².

CSIRO research is mostly performed in collaboration with other national, state and territory research agencies, universities and research institutions, as well as international research agencies.

Forest and Wood Products Australia

Forest and Wood Products Australia (FWPA) is a not-for-profit company jointly funded by the forest and wood products sector (through levies) and the Australian Government. It invests in R&D projects relevant to the Australian forest and wood products sector, and undertakes promotional and marketing activities for the sector. Current investments are delivered through five programs (FWPA 2017):

- 1. Promoting the advantages of wood products
- 2. Aligning products to market needs
- 3. Assisting value chain optimisation
- 4. Increasing resource availability and reducing risk
- 5. Impacting decision making and industry capability.

7.1e

⁴¹² Commonwealth Scientific and Industrial Research Organisation: More about CSIRO Land and Water. <u>www.csiro.au/en/Research/LWF</u>

Research completed during the SOFR 2018 reporting period was aimed at improving forest industry productivity and competitiveness, informing industry's climate change response, increasing investment, increasing forest usage, and ensuring that the sustainability of forests, wood products and services was effectively communicated.

Research in wood product manufacturing has led to the identification of new products and methods for manufacturing processed forest products (excluding pulp, paper and cardboard) – for example, new applications for timber in construction, new timber treatments and new export markets.

Bushfire Cooperative Research Centre, and Bushfire and Natural Hazards Cooperative Research Centre

In Australia, bushfires often affect forests and the communities associated with them. Following the Black Saturday bushfires of February 2009 in Victoria, the Australian Government granted the Bushfire Cooperative Research Centre (CRC) an extension of funding to examine national issues arising from the tragedy. This led to a new three-year research program for the Bushfire CRC, from 2010 to 2013. The research built on outputs from the CRC's first seven years of research, to give communities and fire managers a solid basis to better prepare for, manage and respond to severe bushfires. The research focused on understanding the risks associated with bushfires, how to better communicate these risks to the public, and how to better manage the direct threat of bushfires when they occur.

The Bushfire and Natural Hazards CRC (BNH CRC), launched in 2013, builds on the prior work of the Bushfire CRC, and is conducting coordinated and interdisciplinary research. This includes working with communities to improve disaster resilience and reduce the human, social, economic and environmental costs from bushfires and other natural hazards. Research undertaken by the BNH CRC supports the development of cohesive, evidence-based policies, strategies, programs and tools to build a more disaster-resilient Australia⁴¹³. The BNH CRC provides long-term research that directly supports emergency services and other government and non-government agencies as they work to prevent, prepare for, respond to and recover from natural disasters.

The BNH CRC, like the Bushfire CRC before it, is 'enduser driven'. This means that the various emergency service agencies, departments and non-government organisations around the country that are CRC partners have a significant say in the development and use of the research program.

Plant Biosecurity Cooperative Research Centre

The Plant Biosecurity Cooperative Research Centre (PBCRC) was established in 2012 in recognition of the need to strengthen Australia's plant biosecurity scientific capacity. The PBCRC aims to develop and deploy scientific knowledge, tools, resources and capacity to safeguard Australia, its plant industries and regional communities from the economic, environmental and social consequences of damaging invasive plant pests and diseases (PBCRC 2012).

Research conducted by the PBCRC has relevance to native and commercial forests, and includes strategies for the eradication of the fungal pathogen Phytophthora cinnamomi, a significant cause of dieback in native forests, as well as strategies for the detection and management of pests and diseases damaging to commercial forestry. In collaboration with NSW Department of Primary Industries and Queensland Department of Agriculture and Fisheries⁴¹⁴, PBCRC scientists are investigating how to manage the impact of myrtle rust (Austropuccinia psidii), a disease that has the potential to cause widespread change in native plant species and impacts on the ecological communities they support (see Case study 3.1). Myrtle rust also has the potential to have severe economic impacts on plant nurseries, native and plantation forestry and new growing industries such as lemon myrtle production.

The PBCRC continues the work of the Cooperative Research Centre for National Plant Biosecurity, which began operating in November 2005. PBCRC has an extensive collaborative network of researchers and educators from 27 participating organisations from both Australia and overseas, representing industry, universities, and state and federal government.

Involvement of end-users of the research as participants ensures maximum benefit and impact in the delivery of project outputs, development of new products and services, and capture of intellectual property.

Cooperative Research Centre for Forestry

The Cooperative Research Centre (CRC) for Forestry was an Australia-wide joint venture supported by the forest industry, research organisations, state agencies and the Australian Government, which was wound up in June 2013. Some of the CRC for Forestry's research programs and research personnel were taken over by the Forest Industries Research Centre at the University of the Sunshine Coast, or by the National Centre for Future Forest Industries at the University of Tasmania (see below).

The research at the CRC for Forestry was organised around four programs: managing and monitoring for growth and health, high-value wood resources, harvesting and operations, and trees in the landscape. By 2012, the CRC for Forestry had developed into a broadly-based research organisation with 31 partners across Australia. It performed research along the whole value chain of production forestry, including social, environmental and regional economic considerations, and focused on research outcomes for adoption by industry end-users.

Some of the work of the CRC for Forestry was picked up by the National Centre for Future Forest Industries (2012–15), with research covering utilisation of plantation hardwood, plantation productivity and risk mitigation. Participants included the University of Tasmania, Queensland Department of Agriculture and Fisheries, CSIRO and the University of the Sunshine Coast.

⁴¹³ Bushfire and Natural Hazards Cooperative Research Centre: About us. www.bnhcrc.com.au/About

⁴¹⁴ Until February 2015, the Department of Agriculture, Fisheries and Forestry.

Terrestrial Ecosystem Research Network

The Terrestrial Ecosystem Research Network (TERN) provides infrastructure and networks that enables Australia's ecosystem science community to collect and integrate ecosystem data across broad spatial and temporal scales. It is designed to examine Australian ecosystems and ecosystem processes at different scales from targeted monitoring at the local level, through to surveillance monitoring at regional scales, through to continental-scale observation and modelling. TERN has built on significant past research on understanding Australian ecosystems, including forests, by collating, calibrating, validating and standardising existing datasets⁴¹⁵.

TERN is designed to connect ecosystem scientists, enabling them to collect, contribute, store, share and integrate data across relevant disciplines. Examples relevant to Australia's forests include:

- OzFlux, a network of towers around Australia that continuously measure the exchanges of carbon dioxide, water vapour and energy between the terrestrial ecosystem and atmosphere. Twenty-six active OzFlux sites cover forest types ranging from open woodland and savanna to tall, wet eucalypt forest and rainforest
- AusPlots, a plot-based surveillance monitoring program undertaking baseline assessments of ecosystems across the country. AusPlots Forests monitoring plots are distributed through tall eucalypt forest ecosystems around Australia

• The Australian SuperSite Network (ASN) is a national network of multidisciplinary ecosystem observatories, including ten SuperSites that each represent a significant Australian biome. The network includes a range of forest types from mulga (*Acacia aneura*) woodlands to tall eucalypt forest and tropical rainforest.

Long-term ecological research in Australia's forests

Long-Term Ecological Research (LTER) sites are dedicated to multidisciplinary, long-term, site-based ecological research; some LTER sites are dedicated to forest research. Long-term research is critical to the understanding of ecosystem processes and to formulating policy to establish and maintain sustainable forest management. Networks of LTER sites existed in Australia and around the world during the SOFR 2018 reporting period, including Tasmania's Warra LTER site (see Case study 7.8), and Queensland's Karawatha LTER plots.

In 2012, several of Australia's forested LTER sites were also brought together under TERN's Long-Term Ecological Research Network (LTERN) to establish a new coordinated and collaborative approach across forest types (including tropical rainforests, tall eucalypt forests and mallee woodlands), land tenures and land uses (including plantation forestry, conservation, restoration, tourism and

Case study 7.8: Warra Long-Term Ecological Research site

The Warra LTER site was established in 1995 to facilitate understanding of the ecological processes in Tasmania's wet eucalypt forests. The site contains forests managed under different regimes, and provides for ecological and silvicultural research experiments. Research areas include forest biodiversity, hydrology, fire, climate change, fauna, harvesting practices and social impacts, and Warra is the Tasmanian focal area for research into wet eucalypt forests and their management. Research at Warra is supported by nine site partner agencies.

New research infrastructure investment at Warra provided through TERN includes the Warra Flux Tower (part of the OzFlux Network), the Warra Supersite (part of the Australian Supersites Network), a 5 x 5 km AusCover plot, and three 1-ha AusPlots Forests plots. Fully documented datasets from ongoing measurements made at Warra are lodged on TERN data portals⁴¹⁶.

Warra continues to host substantial research activity. Over 220 research projects have been conducted at Warra since its commencement, many of which are ongoing. This research has generated 320 reports and publications as at June 2017, over 100 of which are in international peer-reviewed journals. In addition to the TERN-funded infrastructure, long-term 'flagship' projects at Warra include the Silvicultural Systems Trial, Log Decay Study, Mt Weld Altitudinal Monitoring Plots, Warra Weirs Hydrological monitoring, Wildfire Chronosequence Plots, and the Southern Forests Experimental Forest Landscape.

Science findings from these studies have been used throughout the life of Warra to inform operational management. Examples include the development of Variable Retention silviculture for harvesting mature wet eucalypt forests; a Landscape Context Planning System for long-term retention of sufficient forest in the landscape surrounding harvested areas to sustain forest-dependent species; and guidelines for managing the coarse woody debris habitat for species dependent on this habitat.

7.1e

⁴¹⁵ Terrestrial Ecosystems Research Network website: What is TERN? <u>www.tern.org.au/What-is-TERN-pg22570.html</u>

⁴¹⁶ TERN SuperSites website: Warra Tall Eucalypt SuperSite. <u>supersites.tern.org.au/supersites/wrra</u>

agriculture). The LTERN facility integrates some established plot networks and long-term ecological monitoring programs across Australia. These span a number of ecosystems including tropical rainforests and savannas, tall eucalypt forests, mallee woodlands and shrublands, alpine regions, and deserts. LTERN is designed to monitor biodiversity and better understand disturbance regimes associated with fire, wood harvesting, livestock grazing, climate change and invasive species. The data collected across each plot network can vary, but the range includes vegetation, soils, invertebrates, birds, reptiles, arboreal marsupials, genetics and phenology⁴¹⁷.

State and territory forest research and development capacity

The capacity of Australia's states and territories to conduct and apply forest R&D is led by the government agencies that are responsible for forest policy, management or conservation in each jurisdiction. Much of this state and territory forest research effort is conducted in collaboration with other organisations, including national organisations such as CSIRO and various CRCs as well as universities, and can involve state and territory government research units hosted by these institutions. Changes in the capacity of state and territory agencies to conduct and apply forest R&D have occurred during the SOFR 2018 reporting period, largely as a result of changes in government priorities and provision of funding. Only partial information is available on forest research capacity in individual states and territories. Table 7.14 reports the number of government-employed researchers and technicians for 2011–12 and 2015–16 for each jurisdiction, separated into plantations and native forest R&D effort. The numerical data and associated changes in capacity are discussed by jurisdiction in subsequent sections. Table 7.15 reports the number of government-employed researchers and technicians for 2011–12 and 2015–16 in each of the various R&D activity areas (discipline areas), separated again into plantations and native forest R&D effort.

The national data for research capacity reported by state and territory agencies shows a significant decline from 2011–12 to 2015–16, with total forest-related R&D capacity in 2015–16 reduced to nearly one-third of that in 2011-12. While the overall numbers differ to those reported by Turner and Lambert (2016, see below), probably owing to differences in timing of data collection and classification of personnel and roles, the relative changes year-on-year are consistent across the two datasets. The reduction in research capacity focussing on plantations is more marked than that for native forest, but both are substantial. The overall reduction in research capacity presents a risk for industry, especially when capacity in key areas is greatly diminished. From 2011–12 to 2015–16, capacity declined in almost all discipline areas. Notable among these is the loss of silvicultural research and tree breeding expertise in the plantation sector, and the reductions in flora and fauna ecology expertise across both native forest and plantations.

Full-time-equivalent government R&D employees 2011-12 2015-16 Jurisdiction Plantations Native forest Total Plantations Native forest Total 7.0 7.0 7.0 7.0 ACT 0.0 0.0 12.5 25.0 8.0 NSW 12.5 8.0 16.0 NT 3.2 0.0 3.2 0.9 0.2 1.1 Qld 31.6 0.9 32.5 20.5 1.2 21.7 15.8 16.6 0.0 SA 0.8 1.0 1.0 Tas. 21.8 21.8 43.6 3.1 6.3 9.3 Vic. 21.9 0.0 0.0 21.9 17.8 17.8 WA 0.0 22.0 22.0 0.0 15.6 15.6 Australia 84.9 86.9 171.8 33.5 56.0 89.5

Table 7.14: Full-time-equivalent state and territory government employees engaged in forest-related research and development

Notes: For South Australia and Tasmania the 2011–12 values are 2010–11 data from SOFR 2013. Numbers of private sector, Commonwealth-funded, universityfunded, and CSIRO personnel are reported in other tables. New South Wales total staff numbers have been split equally between plantations and native forest. Total for Tasmania in 2011–12 has been split equally between plantations and native forest. The 2.0 FTE from the Forest Practices Authority of Tasmania have been split equally between plantations and native forest for 2015–16. Totals may not tally due to rounding.

Source: Data reported by states and territories.

🔊 This table, together with other data for Indicator 7.1e, is available in Microsoft Excel via www.doi.org/10.25814/5bda99c8d76da

⁴¹⁷ Long Term Ecological Research Network website: What is LTERN? www.ltern.org.au/about/what-is-ltern

Table 7.15: Full-time-ea	uivalent research effort	by government em	ployees by type o	f activity, as re	ported by jurisdictions

	Government R&D employees (full-time equivalent)						
	PI	antations	N	ative forest			
Research and development activity	2011–12	2015-16	2011–12	2015–16			
Silvicultural research	16	0.8	1.5	1.0			
Tree breeding (not horticultural)	3.8	2.2	1	1.0			
Forest hydrology	1.2	0.2	1.7	1.4			
Timber use	3.1	1.5	0	0.2			
Fire behaviour	0.2	0.5	0.7	1.8			
Forest pathology	2.6	2.0	3	0.5			
Agroforestry	1.5	0	1.5	0			
Fauna ecology including aquatic biota	4	1.5	21.6	17.3			
Fire ecology	0.2	0.1	16.6	15.1			
Forest health and biosecurity	11.1	5.1	3	3.3			
Flora ecology	0.5	0	3	2.3			
Non-timber forest products	0.5	0	0.5	0.1			
Climate change	1.7	0	1.5	0.4			
Statistical analysis	0.7	0.8	0.5	0.9			
Forest industries	15	9.6	0	0			
Sustainable forest management	0.8	3.5	7.9	4.9			
Spatial analysis, modelling and remote sensing	0	1.5	0	1.5			
Forest carbon	0	1.5	0	1.5			
Resource analysis	0	0.5	0	0.5			
Other (not elsewhere classified)	21.9	2.1	22.8	2.1			
Total	85.0	33.5	86.9	56.0			

Notes: For South Australia and Tasmania the 2011–12 values are 2010–11 data from SOFR 2013. New South Wales total staff numbers have been split equally between plantations and native forest. Tasmania's 43.6 FTE for 2011–12 has been split equally between plantations and native forest in the 'Other' activity. The 2.0 FTE from the Forest Practices Authority of Tasmania have been split equally between plantations and native forest for 2015–16, in the 'Other' activity. Totals may not tally due to rounding.

Source: Data reported by states and territories.

🔊 This table, together with other data for Indicator 7.1e, is available in Microsoft Excel via www.doi.org/10.25814/5bda99c8d76da

Australian Capital Territory

The Environment, Planning and Sustainable Development Directorate of the Australian Capital Territory Government supports forest management and facilitates research on forested areas, focussing on native forest. It undertakes research on local flora and fauna, prepares scientific advice on the environment and natural resource management, conducts ecological surveys, monitors biodiversity, and prepares and guides implementation of threatened species action plans. Numbers of personnel and focus of research activities have remained stable during the SOFR 2018 reporting period.

New South Wales

Forest R&D in New South Wales is undertaken by the NSW Department of Primary Industries (DPI) Forest Science group, under a memorandum of understanding with the Forestry Corporation of NSW, and through collaborative research arrangements. The DPI Forest Science group has scientific and technical expertise in forest ecology and sustainability, forest health and resource assessment, carbon in forests, wood products and bioenergy, and biometric services. The number of full-time-equivalent (FTE) positions in forest-related R&D at the DPI Forest Science group decreased from 25 in 2011–12 to 16 in 2015–16. Decreases in capacity occurred across a number of research areas, including agroforestry, flora and fauna ecology, and climate change. Research previously reported under forest pathology and forest entomology in 2011–12 was more accurately reclassified as forest health and biosecurity for 2015–16.

The information on government agency research and development activities for 2015–16 relates to the DPI Forest Science group only. The majority of forest researchers work opportunistically in both native forests and plantations, so it is not possible to split their time accurately between native forest and plantation work. Other New South Wales agencies did not report forest-related R&D employees.

Queensland

The Queensland Government through its Department of Agriculture and Fisheries⁴¹⁸ retains a substantial forestry R&D portfolio. The primary focus of research effort by Queensland Government personnel is on plantations, with a specific focus on forest value, health and forest product

⁴¹⁸ Until February 2015, the Department of Agriculture, Fisheries and Forestry.

innovation. Queensland reported a decline in total numbers of forest research personnel from 32.6 FTE in 2011–12 to 21.7 FTE in 2015–16 (a 33% reduction), offset by an increase in numbers of collaborating research personnel at academic institutions from 1.2 FTE in 2011–12 to 24.6 FTE in 2015, the latter split evenly between plantations (12.6 FTE) and native forests (12.0 FTE). Collaborating academic institutions include the University of the Sunshine Coast, University of Queensland, Griffith University and Queensland University of Technology. The research staff employed by the University of the Sunshine Coast include adjunct staff members and higher degree research candidates at the university's Forest Industries Research Centre, and the university's Tropical Forests and People Research Centre established in 2014.

South Australia

The focus of state government forestry research in South Australia over the period 2011–12 to 2015–16 was on plantations. During 2015, the majority of Forestry SA staff transferred to the private sector and were employed by OneFortyOne plantations. South Australia reported 1.0 FTE forestry-related research personnel for 2015–16.

Tasmania

For 2015–16, Tasmania reported a total of 9.3 FTE forest researchers in government agencies, comprising 4.8 FTE at Forestry Tasmania⁴¹⁹, 2.5 FTE at the Department of Primary Industries, Parks, Water and Environment (DPIPWE), and 2.0 at the Tasmanian Forest Practices Authority (FPA). This is a substantial reduction from the 43.6 FTE forest researchers in government agencies reported for 2010–11. In previous reporting periods, much of the Tasmanian forest-related research effort occurred through the CRC for Forestry (see above), which operated from July 2005 to June 2013.

Over the SOFR 2018 reporting period, Forestry Tasmania undertook and collaborated in research into native forest silviculture, plantation silviculture, forest remote sensing, and biology and conservation (including forest health surveillance) and, together with the Tasmanian Parks and Wildlife Service, managed the Warra Long-term Ecological Research site (see Case study 7.8) in southern Tasmania. At least one-third of Forestry Tasmania's research expenditure was devoted to development and extension work for the strategic or operational uptake of research.

The majority of Forestry Tasmania researchers were in flora and fauna ecology, silviculture, tree breeding, hydrology, diseases and pests. Research effort in silviculture was maintained over the period 2011 to 2016. There is an increasing research effort undertaken at the landscape level, in the emerging disciplines of conservation biology, landscape ecology, landscape genetics and dynamic forest management, due to the increasing recognition of the need to manage forests at this scale. Forest research in earth sciences and cultural heritage undertaken by the FPA during 2011–16 concentrated on landscape-scale erosion history and erosion risks, determining the influence of Aboriginal-lit fires on vegetation and landscape character, stream monitoring, determining the principles of carbon sequestration in Tasmanian native forests, and developing procedures for systematic recording and protection of cultural heritage. The FPA also undertook research in natural values, biodiversity and conservation management, and updated and improved the Mature Habitat Availability Map used for strategic management of mature forest features such as tree hollows. FPA staff collaborated with staff of Forestry Tasmania and the Australian National University to explore the use of LiDAR for creating a similar map with greater spatial resolution.

FPA research is done in collaboration with researchers, students and staff in government departments, institutions, and companies such as University of Tasmania, Murdoch University, University of Queensland, Australian National University, University of the Fraser Valley in British Columbia, Canada, DPIPWE, Forestry Tasmania, Private Forests Tasmania, Timberlands Pacific, Gunns, Forico, Timberlands Pacific and Norske-Skog. FPA researchers also provided assistance to researchers working in similar fields overseas, specifically in Papua New Guinea and the USA.

In addition to state-funded R&D personnel, Tasmania reported 4.5 FTE forest researchers employed by private companies for 2015–16. These companies were Norske Skog, Timberlands Pacific and Forico. Research by academic institutions is reported separately below.

Victoria

The number of forest researchers employed by the state of Victoria has remained relatively stable, declining from 21.9 to 17.8 FTE between 2011–12 and 2015–16 (a 19% reduction). All research personnel have focussed on native forest, with a significant proportion working on fire ecology (6.8 FTE), fauna ecology (5.8 FTE) and sustainable forest management (1.5 FTE) during 2015–16. The data on FTE forest researchers in government agencies shown in Tables 7.14 and 7.15 include employees of the Department of Environment, Land, Water and Planning (DELWP)⁴²⁰, VicForests and the Arthur Rylah Institute (ARI), DELWP.

In addition, Victoria reported 26.3 academic FTEs working in forest R&D. This figure includes those funded by DELWP through the Integrated Forest and Ecosystem Research (IFER) program at the University of Melbourne (see below) and the BNH CRC (Bushfire and Natural Hazards Co-operative Research Centre, see above). These personnel were all focussed on native forests, and for 2015–16 included 5.2 FTE working on forest hydrology, 12.9 FTE on fire behaviour, 4.5 FTE on fire ecology, 0.9 FTE on sustainable forest management and 2.8 FTE on forest health.

⁴¹⁹ From July 2017, Sustainable Timber Tasmania.

⁴²⁰ Until January 2015, the Department of Environment and Primary Industries.

Western Australia

The number of forest researchers employed by the state of Western Australia declined from 22.0 FTE to 15.6 FTE between 2011-12 and 2015-16 (a 29% decline). All research personnel focussed on native forests, with a significant proportion working on fire ecology (4.5 FTE), fauna ecology (3.5 FTE) and sustainable forest management (3.3 FTE) during 2015–16. These data on R&D capacity are based on an audit of staff and projects undertaken by the Science and Conservation Division of the Department of Parks and Wildlife⁴²¹, as at the end of 2015–16. In 2013–14, research activity was reported for the area covered by the Western Australian Regional Forest Agreement and the Forest Management Plan, with the addition of 3.0 FTE research staff working on fire ecology and operating in the North Kimberley and Great Western Woodlands (Goldfields Region).

National research capacity surveys

A series of surveys conducted by Turner and Lambert on expenditure on R&D for forestry and forest products has also collected data on R&D capacity, using a consistent methodology, at intervals in the period 1981–82 to 2012–13 (Turner and Lambert 2016). The definitions of 'Forestry R&D' and 'Forest Products' R&D used by Turner and Lambert, and survey results on R&D expenditure, are detailed in Indicator 6.2a. Table 7.16 summarises the data on forestry and forest product research capacity for the various categories of R&D organisation, as compiled in the Turner and Lambert surveys from 1985 to 2013. Changes in researcher numbers as a measure of research capacity do not take into account concurrent changes in facilities and infrastructure.

Turner and Lambert estimated that there were 276 researchers and technicians involved in forestry and forest products R&D in 2012–13, together with additional support staff and external contractors. This represented a steady decline in research staff in the Commonwealth and state sectors since about 1990, not fully compensated by increases in research staff in the university and private sectors. The increases in university and private sector research capacity to 2008 were due to more organisations reporting research, rather than an increase in actual numbers of any particular research group.

The expertise of each researcher was not recorded for these surveys, but discussions with employing organisations indicated that there has been a greater decline in some areas of research, such as forest health, silviculture and forest hydrology, compared to others.

Organisation	Staff type	R&D staff numbers			
		1985	2008	2011	2013
CSIRO	Scientists	145	75	38	32
	Technical staff	132	81	39	16
	Support	48	17	4	0
	Subtotal	325	173	81	48
State agencies	Scientists	180	117	77	56
	Technical staff	206	109	71	37
	Support	46	21	9	0
	Subtotal	432	247	157	93
Private companies	Scientists	6	59	30	21
	Technical staff	3	57	30	15
	Support	1	14	7	1
	Subtotal	10	130	67	37
Universities	Scientists	11	90	72	54
	Technical staff	10	47	39	21
	Support	6	46	39	23
	Subtotal	27	183	150	98
Total		794	733	455	276

Table 7.16: Research capacity for forestry and forest products in Australia, from Turner and Lambert (2016)

Source: Turner and Lambert (2016)

🦻 This table, together with other data for Indicator 7.1e, is available in Microsoft Excel via www.doi.org/10.25814/5bda99c8d76da

 $^{421}\,$ From July 2017, the Department of Biodiversity, Conservation and Attractions.

University-based forest research capacity

Much of our scientific understanding of Australia's forests is developed in universities, with the capacity for forest research present at a number of Australia's universities. Research is carried out both by university research staff and by students enrolled in Honours, Masters or Doctoral degrees. Universities produce high-quality, peer-reviewed research that adds to the development of assessment methodologies and the scientific understanding of Australia's forests, and which is needed to underpin sustainable forest management.

Many academic institutions contribute to the range of forest research programs established under research agencies funded by the Australian Government, as well as research agencies funded by state and territory governments. In addition, research centres and facilities at universities provide focal points for research training and collaboration, including with other universities, government agencies and the private sector.

The Australian Research Council (ARC) is responsible for administering Excellence in Research for Australia (ERA), Australia's national research evaluation framework. Eight Australian universities reported activities in the field of forestry sciences in the most recent (2015) ERA survey: the Australian National University, Murdoch University, Southern Cross University, the University of Melbourne, the University of Queensland, the University of Tasmania, the University of the Sunshine Coast, and the University of Western Sydney. Research in forest products also occurs at Monash University (through the Australian Pulp and Paper Institute) and Queensland University of Technology (through the Biorefineries for Profit project).

In Tasmania, the ARC Centre for Forest Value situated on the University of Tasmania's Hobart campus was established in early 2016. The research effort of the centre covers forest ecology and restoration, timber in service, and supply chain information management, and the Centre also trains forest scientists to work within the forest industry. The Centre has eight industry partners: Greening Australia, Forestry Tasmania (now Sustainable Timber Tasmania), SFM Environmental Solutions, Forico, Neville-Smith Forest Products, Next 50 Architects, FWPA, and the Island Workshop Prefab Lab. The Centre succeeded the National Centre for Future Forest Industries (2012–2015).

In Queensland, the Forest Industries Research Centre (FIRC), located at the University of the Sunshine Coast, is focused on issues relating to complex forestry value chains, and thus the economic and environmental sustainability of forest industries. This approach covers research disciplines including genetics and genomics, silviculture and stand management, forest health and pest management, ecology and biodiversity management, timber and biomass harvest and haulage, fibre quality and value, timber processing and biorefinery, renewable energy and biofuels, and timber construction materials. FIRC takes a multidisciplinary approach to understand and identify value in the interactions between these research disciplines. Also in Queensland, the Centre for Future Timber Structures, University of Queensland, is a Centre of Excellence for the education of future timber industry professionals and innovation in the use of timber in the built environment. Areas of research include fibre-reinforced timber composites, fire safety of timber structures, and timber use in advanced manufacturing. Partners include the Queensland Department of Agriculture and Fisheries, the University of Queensland, and industry.

In New South Wales, the Western Sydney University Hawkesbury Institute for the Environment operates the world's only 'free air carbon dioxide enrichment' (FACE) experiment in native forest (EucFACE), as well as a series of Whole-Tree Chambers in the Hawkesbury Forest. EucFACE is designed to predict the effects of rising atmospheric carbon dioxide (CO₂) levels on Australia's native forests, including trees, animals, soil and grasses. The Whole-Tree Chambers provide enclosed, controlled environments for trees up to nine metres tall, in which researchers manipulate air temperature, soil moisture, irrigation, CO₂ levels and humidity to determine the integrated effects of altered climates on tree physiology.

Also in New South Wales, researchers in Southern Cross University's Forest Research Centre investigate the ecology of native forests both in Australia and overseas, as well as studying how native forests and plantations can sustainably produce wood products, environmental services and carbon. Particular areas of focus include tropical and subtropical forestry and agroforestry, computer modelling for forest management and decision-support systems, forest ecology and management, forest genetics, new products from trees, mixed-species plantations, and community engagement in land-use planning.

In the Australian Capital Territory, the Fenner School of Environment and Society at the Australian National University takes a multi-disciplinary approach to research, research training and policy in environment and sustainability, including issues relating to the management, conservation and sustainability of forest ecosystems. The School includes economists, hydrologists, historians, ecologists, foresters, geographers and climatologists, working both nationally and internationally.



Harvested pine logs awaiting transportation from a plantation, Queensland.

In Western Australia, the State Centre of Excellence on Climate Change, Woodland and Forest Health at Murdoch University focuses on tree, woodland and forest decline under climate change, with the aim of restoring biodiversity values, and developing policies and action for the restoration of woodlands and forests.

In Victoria, the Integrated Forest Ecosystem Research (IFER) program is a research initiative between the School of Ecosystem and Forest Sciences at the University of Melbourne and DELWP. It aims to enhance the evidence base for managing the impacts of fire, climate and management regimes on multiple forest values in Victoria's forest ecosystems. The IFER program investigates forest ecosystems in Victoria under six main landscape-level themes: fire behaviour, carbon, biodiversity, water, vulnerability, and social and economic values.

On 04 June 2016, the Australian Government announced the establishment of a National Institute for Forest Products Innovation to be jointly based at the University of Tasmania in Launceston, and at the University of South Australia campus in Mt Gambier. The Institute will focus on innovation in the forest products industry and will provide additional research and development across Australia in forest management, timber processing, wood fibre recovery, advanced manufacturing and the bio-economy.

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