

Australian Government Department of Agriculture ABARES



Australia's State of the Forests Report 2013

Criterion 7

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





Victorian forest officers assessing harvest operations at a log landing.

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 framework supports sustainable forest management, specifically the conservation, maintenance or enhancement of the forest attributes described in Criteria 1–6, and the extent to which it supports the capacity to monitor change and to conduct and apply research and development to forest management. The indicators can be arranged into three groups.

Legal, institutional and economic frameworks

Effective legal, institutional and economic frameworks are critical for sustainable forest management. The legal system defines and allocates legal and regulatory responsibilities, and provides for public participation and the protection of conservation values. Institutions provide mechanisms for policy-making and decision-making, and for the engagement of the wider community in continuous improvement in sustainable management of forests. Government economic policies on investment, taxation and trade influence the level of investment in forest conservation, forest growing and wood processing.

Capacity to measure and monitor changes

A comprehensive measurement and monitoring program provides 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 to demonstrate sustainable 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.

Capacity to conduct research and development and apply the results

A scientific understanding of the characteristics and functions of forest ecosystems is needed to underpin their sustainable management. Research and development (R&D) provide the basis for biological and wood inventories, forest health surveillance, improvements in operational forest management and silviculture, and the development of methods for assessing sustainable forest management. High-quality R&D and expert advice are required to inform decisionmaking and policy development. Changes in the institutional capacity for, and the magnitude of, investment in R&D can indicate changes in research investment priorities and delivery mechanisms.

Key findings

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

Legal, institutional and economic frameworks

- All states and territories and the Australian Government have legislation to support the conservation and sustainable management of Australia's forests. This is underpinned by a well-established policy environment guided by a *National Forest Policy Statement*.
- Twenty-eight million hectares of Australia's forests (22% of the area of forest) are covered by management plans relating to their conservation and sustainable management. Nationally, 14.8 million hectares of forest in the National Reserve System (56% of the area of forest in the NRS) has management plans in place.
- Codes of forest practice vary in their legal status and coverage but generally provide specific operational guidance on sustainable forest management practices in public and private forest available for wood production, including plantations. The codes of forest practice, as well as externally accredited environmental management systems and forest certification schemes, provide forest managers with a structured approach to forest planning and management, including protection of the environment. In 2011, 10.7 million hectares of native forests and plantations were certified for forest management under independent, third-party schemes (either the Australian Forest Certification Scheme or the Forest Stewardship Council scheme).
- Legislation covering carbon credits (the Carbon Farming Initiative) and illegal logging was introduced at the national level in 2011 and 2012, respectively.
- A range of options for training and educational qualifications is available in Australia in all areas relevant to sustainable forest management. However, the number of students entering and graduating from forestry-specific university degrees declined over the reporting period.
- The value of benefits from forests other than wood, such as biodiversity, carbon sequestration, production of water, and soil protection, is generally not integrated into an economic framework for forest conservation or management.
- Managed investment schemes have become a less important financial mechanism for plantation expansion since the global financial crisis.

Capacity to measure and monitor changes

- The Australian Government and all states and territories, except the Northern Territory, publish 'State of the Environment' reports at regular intervals, varying from three to five years. Tasmania and Victoria publish fiveyearly 'State of the Forests' reports, based on a framework of criteria and indicators similar to *Australia's State of the Forests Report*.
- Australia's five-yearly state of the forests reporting uses a framework of criteria and indicators developed under the international Montreal Process, which provides a mechanism for presenting disparate data in a consistent and repeatable format. Some data are collected nationally, and others are provided by the states and territories.
- Compared with SOFR 2008, the quality of data in SOFR 2013 has improved for almost half (21) of the 44 national reporting indicators. The data available for SOFR 2013 were assessed as comprehensive (the highest possible rating) in each of coverage, currency and frequency for 17 of the indicators, and comprehensive in any two of these aspects for a further 10 indicators. Capacity has been developed to report trends over time in 16 of the 44 indicators.
- The ability to measure, monitor and report on forests varies considerably by tenure. The most reliable information continues to be available for multiple-use public forest and some public nature conservation reserves. Significant gaps in data collection and monitoring remain for leasehold and private forests.

Capacity to conduct research and development and apply the results

- The number of staff engaged in forestry-related R&D activities fell over the reporting period. About 635 researchers and technicians were involved in forestry and forest products R&D in 2007–08. A recent sector-wide survey estimated that this number had decreased to 396 in 2011, with the decline occurring across the public and private sectors, including state and territory governments, CSIRO and academic institutions.
- Changes in funding and delivery models by the Australian Government reduced forest-related R&D capacity across a number of national organisations, including several for which government funding or support ceased. Some of these organisations were replaced under new funding arrangements. Changes in funding and delivery models by state and territory governments generally reduced forest R&D capacity in their forest management agencies.

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 to support 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 which are prescribed in legislation. Management of forests on private land is also regulated under various native vegetation Acts. Twenty-eight million hectares of forest (22% of Australia's forests) are covered by management plans relating to their conservation and sustainable management.
- 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 plantations. In Tasmania, there is a code of practice for the management of nature conservation reserves, including forested nature conservation reserves.
- Legislation covering carbon credits (the Carbon Farming Initiative) and illegal logging was introduced at the national level in 2011 and 2012, respectively.

This indicator provides an overview of the support that the regulatory 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 in policy development and decision-making processes. An effective regulatory framework also promotes continuous improvement in the sustainable management of forests across tenures.

Legislation

In Australia, primary responsibility for land management, including forest management, lies at the state and territory level, while the Australian Government also has certain powers and responsibilities at the national level. 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. In the states and territories, comprehensive 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. Table 7.1 lists examples of major pieces of legislation at the national and state and territory levels relating to the conservation and sustainable management of Australia's forests.

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 certain obligations of the Commonwealth 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; and to provide legislative recognition of the existence and work of the Forest and Wood Products Council. 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.			
ACT	Nature Conservation Act 1980	To protect native flora, fauna and habitats, especially threatened species; and to provide management authority for national parks and nature 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.			
NSW	Forestry Act 1916	To provide an adequate supply of timber and protect environmental values; and to provide for the administration, by the Environment Protection Authority, of the environment protection licence issued to Forests NSW (Note: After the end of the SOFR 2013 reporting period, the <i>Forestry Act 191</i> was replaced by the <i>Forestry Act 2012</i> that <i>inter alia</i> established the Forestry Corporation of NSW).			
	National Parks and Wildlife Act 1974	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.			
	Forestry and National Park Estate Act 1998	To transfer certain state forest and other Crown lands to the national parks estate and to Aboriginal ownership, and to provide for forest agreements and integrated forestry operations approvals for licensing operations in state forests for a 20-year period.			
	Native Vegetation Act 2003	To regulate the clearing of native vegetation (including trees) on private and some Crown lands, by requiring consent or compliance with a regional vegetation management plan or code of practice.			
NT	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.			
Qld	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 of Queensland.			
	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.			
SA	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	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.			

Table 7.1: Major pieces of legislation relating to the conservation and sustainable management of Australia's forests, by jurisdiction, active during the SOFR reporting period 2006–11

continued overleaf

Jurisdiction	Legislation	Purpose			
Tas.	Forestry Act 1920	To establish a forestry corporation with a commitment to sustainable forest management and multiple use, and to provide for the better management and protection of forests.			
	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 Nature Conservation Act 2002, according to management objectives for each reserve class.			
Vic.	Forests Act 1958	To consolidate the law for the management and protection of state forests, including timber harvesting and fire management; and to require that timber harvesting complies with a code of practice.			
	National Parks Act 1975	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.			
	Sustainable Forests (Timber) Act 2004	To provide a framework for sustainable forest management and sustainable timber harvesting in state forests.			
WA	Conservation and Land Management Act 1984	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.			
	Environmental Protection Act 1986	To provide for the assessment of the environmental impacts of forest management proposals, and to allow the minister 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.			

Table 7.1: Major pieces of legislation relating to the conservation and sustainable management of Australia's forests, by jurisdiction, active during the SOFR reporting period 2006–11 continued

Source: State, territory and Australian Government agencies.

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

Plan	Purpose	Coverage
Management plans for all national parks	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.
NSW's regional Ecologically Sustainable Forest Management Plans	To publicly document the broad strategies, ecological principles, performance indicators and measurable outcomes for forest management.	NSW state forests or other Crown timber lands covered by Regional Forest Agreements.
South Australia's State Natural Resources Management Plan	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 natural resources in South Australia.
South Australia's regional Natural Resource Management Plans	To set the direction for NRM in each region to improve the management of regional natural resources.	Region-by-region natural resources in South Australia.
Victoria's regional Forest Management Plans	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's Forest Management Plan 2004–2013	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 that is vested in the Conservation Commission of Western Australia.

Source: State, territory and Australian Government agencies.

Management plans and codes of practice

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 which are prescribed in legislation. Only 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 study 7.1.

Twenty-eight million hectares (22% of Australia's forests) are covered by management plans relating to their conservation and sustainable management (Table 7.3). 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 strategic management planning systems required for forest certification.

Case study 7.1: Forest Management Plans in Western Australia

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

Under Western Australia's *Conservation and Land Management Act 1984*, the public forests in the south-west of Western Australia are managed according to a forest management plan (FMP). The FMPs provide a framework for managing these forest areas for a range of environmental, social and economic uses. The plans 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 2004).

The Conservation Commission's overall objectives in formulating Western Australia's *Forest Management Plan 2004–2013* were for biodiversity to be conserved; the health, vitality and productive capacity of ecosystems 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 Environment and Conservation¹⁵⁷ and the Forest Products Commission managed the land to which the FMP applied. A new FMP is being developed for the period January 2014 to December 2023.

Source: CCWA (2004).



The forest management plan for 2004–2013 for Western Australia.

Table 7.3: Area of Australia's forests covered by a management plan

	Area ('000 hectares)								
Areas by plan type	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Australia
Forest area with a management plan	113	6,028	3,479	4,696	1,038	2,277	6,265	3,863	27,758
primarily conservation ^a	109	4,424	3,160	1,001	837	1,420	3,952	2,344	17,249
primarily production ^b	0	1,539	15	2,242	167	841	1,201	1,226	7,231
multiple or other values ^c	4	66	303	1,452	34	16	1,111	293	3,279
Forest area without a management plan	25	16,653	11,735	46,340	3,527	1,429	1,925	15,359	96,994
Total	138	22,681	15,214	51,036	4,565	3,706	8,190	19,222	124,752

 'Primarily conservation' includes forest areas in the Collaborative Australian Protected Areas Database (CAPAD) covered by existing management plans, certified forests zoned for biodiversity conservation, and forest areas managed by the Department of Defence zoned for biodiversity conservation.

^o 'Primarily production' includes net harvestable area of multiple-use public native forests covered by existing management plans or certification, and areas of plantation (Industrial plantations and Other forest) that are certified.

c 'Multiple or other values' includes forest areas covered by either a management plan or certification and not allocated to either of the previous two categories, plus forest areas managed under a water or natural resources management plan, plus forest areas managed by the Department of Defence.

Source: State, territory and Australian Government agencies, including the Australian Government Department of Sustainability, Environment, Water, Population and Communities (CAPAD 2010) and Department of Defence; includes data updated for Qld and the ACT (Table 7.12 in Indicator 7.1d), ABARES data, and publicly accessible data on Australian certified forests from Australian Forestry Standard Ltd (www.forestrystandard.org.au) and Forest Stewardship Council (<u>http://info.fsc.org</u>).

Codes of practice provide specific guidance for sustainable forest management practices in wood production forests. The codes cover a range of issues, such as forest planning; forest access and roading; forest harvesting; the conservation of non-wood values; pest, weed and fire management; and the harvesting of non-wood forest products. Codes of forest practice vary in their legal status and coverage. In Tasmania and Victoria, codes are prescribed in legislation, and cover public and private native and plantation production forests. In New South Wales, the Forest Practices Code is backed by legislation, and covers native and plantation production forests managed by Forests NSW¹⁵⁸. In August 2007, a Private Native Forestry Code of Practice came into effect in New South Wales under the state's Native Vegetation Act 2003. This code establishes a regulatory framework for the sustainable management of private native forests by ensuring that operations improve or maintain environmental outcomes. It is reviewed periodically as part of a statutory review process.

In the Australian Capital Territory, Queensland and Western Australia, codes of forest practice on public land are prescribed at the agency level only. In Queensland, the *Code Applying to a Native Forest Practice on Freehold Land* allows for commercial wood production in private native forests while satisfying the purposes of the state's *Vegetation Management Act 1999*.

Plantation codes of practice are referred to in Regulations concerning the export of unprocessed plantation wood under the *Export Control Act 1982*. Under this Act, the Export Control (Unprocessed Wood) Regulations provide for the removal of the requirement for licensing of exports of some plantation-sourced wood. Such a decision can be made by the minister, subject to a satisfactory assessment of a state or territory's plantation forestry code of practice against the National Plantation Principles.¹⁵⁹ Under the Regulations, a plantation code of practice covers the establishment, management and harvesting of all plantations in a state or territory, whether or not these practices are contained in a single document. All state and territory plantation codes of practice were assessed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) between late 2010 and 2012.¹⁶⁰

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 forest management codes of practice, including the Tasmanian Forest Practices Code 2000. It provides information and guidance for best-practice operational standards for activities in the state's nature conservation reserves. It applies to all land-based reserves managed under the National Parks and Reserves Management Act 2002, forest reserves managed under the Forestry Act 1920, and certain public reserves managed under the Crown Lands Act 1976. The code applies to reserves with significant natural and cultural values that are still in a largely natural condition; it does not apply to public reserves that have been highly modified and developed, such as school grounds. The code is the result of a commitment under the 1997 Tasmanian Regional Forest Agreement to develop and implement a code of practice to cover all environmental practices in reserves.

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.

¹⁵⁸ From January 2013, the Forestry Corporation of NSW.

¹⁵⁹ National Principles Related to Wood Production in Plantations, available at www.daff.gov.au/forestry/australias-forests/plantationfarm-forestry/principles or www.daff.gov.au/__data/assets/pdf__ file/0007/37609/principles_wood_production.pdf.

¹⁶⁰ Further information on the assessments is available at <u>www.daff.gov.au/</u> <u>forestry/australias-forests/plantation-farm-forestry/principles.</u>

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 designed to provide stability for forest-based industries, certainty for forest-dependent communities, and conservation 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.

In addition to the 10 RFAs, a CRA was completed for southeast Queensland, but an RFA was not signed for that region. The Queensland Government, industry and environmental groups developed a South East Queensland Forest Agreement, although this is not recognised as an RFA by the Australian Government.

Under the *Regional Forest Agreements Act 2002*, five-yearly RFA reviews reporting the performance of each RFA are to be tabled in the Australian Parliament by the Australian Government minister with responsibility for forestry. The first and second five-yearly reviews have been undertaken for the Tasmanian RFA, with the second completed in 2008. The first and second five-yearly reviews for the five Victorian RFAs were conducted as a combined review between 2009 and 2010. The first five-yearly review for the three New South Wales RFAs was conducted in 2009.

As part of the third five-yearly review of each RFA, the state concerned and the Australian Government will jointly determine the process for extending the agreement beyond 20 years. The 20-year periods of the 10 RFAs expire between 2017 and 2021.

In addition, two sets of regulations made under the *Export Control Act 1982*—the Export Control (Hardwood Wood Chips) Regulations 1996 and the Export Control (Regional Forest Agreements) Regulations—provide for the unlicensed export of wood and wood chips sourced from native forests in a region covered by an RFA.

Environment Protection and Biodiversity Conservation Act 1999

Australia's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), which came into effect in July 2000, 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, water resources and Commonwealth marine areas.

The EPBC Act only refers specifically to forests in relation to RFAs. Part 4, Division 4, section 38(1) states that 'Part 3 does

not apply to an RFA forestry operation that is undertaken in accordance with an RFA'. This provision recognises that RFAs have already met the normal requirements for assessment and approval of operations, as a result of the CRAs of conservation values that were undertaken before each RFA was signed. RFAs therefore provide an equivalent level of protection to that provided by Part 3 of the EPBC Act. The requirements for assessment and approval under the EPBC Act apply to forests outside an RFA region.

An independent review of the EPBC Act was undertaken by Dr Allan Hawke in 2009. Among other things, this review recommended 'that the current mechanisms contained in the Act for RFA forest management be retained, but be subject to rigorous independent performance auditing, reporting and sanctions for serious non-compliance' (DEWHA 2009c). In its response to the independent review, the Australian Government stated that it 'remains committed to RFAs as an appropriate mechanism for effective environmental protection, forest management and forest industry practices in regions covered by RFAs', and that it was also 'committed to working with state governments to improve the review, audit and monitoring arrangements for RFAs' (DSEWPaC 2011).

Illegal logging

The *Illegal Logging Prohibition Act 2012* was passed by the Australian Parliament and came into effect in November 2012. The Act 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 prohibits the importation of illegally logged timber and the processing of domestically grown raw logs that have been illegally logged. Criminal penalties apply for contraventions of the Act.

The Illegal Logging Prohibition Amendment Regulation 2013 that supports the Act was developed with stakeholders and was tabled in the Australian Parliament on 3 June 2013. The Regulation, which will commence on 30 November 2014, prescribes due diligence requirements to minimise the risk of sourcing illegally logged wood, and lists the wood products subject to those requirements. The due diligence requirements are intended for importers of the listed wood products and processors of domestically grown raw logs.

Carbon farming initiative

The *Carbon Credits (Carbon Farming Initiative) Act* 2011 was passed by the Australian Parliament in August 2011. The Carbon Farming Initiative (CFI) commenced in December 2011, and is designed to provide economic opportunities for farmers, forest growers and landholders, while reducing greenhouse gas emissions and storing carbon in the landscape. Farmers and land managers can potentially gain benefits through a range of activities under the CFI, including avoided deforestation, improved forest management, reforestation and revegetation.

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 at state and territory levels.
- Codes of forest practice and externally accredited environmental management systems are used by forest managers to provide a structured approach to the planning and management of protection of the environment.
- A full range of training and education qualification options continues to be available in Australia across all areas relevant to sustainable forest management. Despite this, the number of students entering and graduating from forestry-specific university degrees has declined, and there are ongoing shortages in skilled workers across Australia's forest industry.
- In 2011, about 10.7 million hectares of native forests and plantations were certified for forest management under either the Australian Forest Certification Scheme or the Forest Stewardship Council scheme. Some forest areas have been certified under both schemes.

Australia's forest policy framework

The management of Australia's forests is guided by a *National Forest Policy Statement* (Commonwealth of Australia 1992), which was signed by the Australian Government and all mainland state and territory governments in December 1992 and by the Tasmanian Government in April 1995. The statement outlines 11 broad national goals (see Introduction, Box 1.i). The three goals that are 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 regulatory 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.

At the national level, the Standing Council on Primary Industries (SCoPI) was launched by the Council of Australian Governments in September 2011 as part of a new ministerial council system. SCoPI subsumed parts of two previous ministerial councils: the Primary Industries Ministerial Council and the Natural Resource Management Ministerial Council. SCoPI is supported by the Primary Industries Standing Committee, which in turn is supported by the Productivity and Regulatory Reform Committee and its subcommittee the Forestry and Forest Products Committee (FFPC), to coordinate and facilitate forest policy and planning, and their review, across Australia's states and territories. These committees consist of representatives from the Australian Government and each state and territory government. The FFPC provides a significant forum for government agencies responsible for sustainable forest management to consider national issues relevant to forests and forestry.

Most of the state and territory government organisations and agencies that are responsible for forest management operate under long-term national and state or territory frameworks that relate to sustainable management of Australia's forests. Table 7.4 lists the major non-legislative policies, strategies and charters that influence the sustainable management of Australia's forests, by jurisdiction. The extent to which these arrangements provide for sustainable forest management—through forest management planning, and public and Indigenous participation—varies among states and territories. Generally, these arrangements are accommodated in management of public forests (except those under leasehold), but to a lesser extent in management of private and leasehold forests.

Much of Australia's privately owned production native forests and plantation forests are owned and/or managed by large organisations. These organisations also operate under 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 and generally relate to sustainability, forest stewardship and environmental awareness. These policies guide private organisations in their forest management planning and practices, and establish responsibility and accountability to the public for the forests that the organisations manage. Frequently, the policies and the management practices they underpin form the basis for certification of forest lands by independent certification bodies.

Public participation and awareness

In addition to those prescribed in legislation, Australia has well-established non-legislative mechanisms for public participation and for raising awareness of forest management planning. These 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.

The *National Forest Policy Statement* (Commonwealth of Australia 1992) calls for public awareness and involvement in the management of Australia's public forests through consultation processes and the availability of forest

Table 7.4: Major non-legislative policies, strategies and charters that influence the sustainable management of Australia's forests, June 2011

Jurisdiction	Non-legislative policy, strategy or charter	Purpose			
National	National Forest Policy Statement 1992	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.			
	Plantations for Australia: the 2020 Vision	Seeks to enhance regional wealth creation and international competitiveness through a sustainable increase in Australia's plantation resources.			
	National Indigenous Forestry Strategy 2005	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.			
	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.			
	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.			
	Farm Forestry National Action Statement 2005	Outlines the objectives and actions agreed by the Australian, state and territory governments and the forest and wood products industry to develo farm forestry.			
	The Australian Forestry Standard for Forest Management (AS 4708-2007)	Provides criteria and requirements which allow a forest manager to demonstrate sustainable forest management through independent, accredited, third-party certification.			
ACT	ACT Nature Conservation Strategy 1998	Provides a framework for a coordinated and strategic approach to protection of biological diversity and the maintenance of underpinning ecological processes.			
	ACT Lowland Woodland Conservation Strategy (Action Plan No. 27)	Seeks to maintain and improve the natural integrity of remaining lowland woodland ecosystems, including encouraging community participation in the conservation of lowland woodland and component species.			
NSW	Forests NSW ^a Forest Management Policy	Provides a commitment to sustainably manage the forest estate of Forests NSW and the supply of timber to the community, in conjunction with a range of environmental, social and economic benefits.			
	Farm Forestry Strategy for NSW 2003	Aims to build a vision for the future of farm forestry in New South Wales.			
NT	Northern Territory Agribusiness Industry Strategy 2011–2015	Provides an overarching strategy for the future development of the Northern Territory's animal and plant industries.			
	Territory 2030 Strategic Plan	Provides a framework for the government's strategic plans and policy initiatives, including the management of natural resources according to the principles of ecologically sustainable development.			

continued overleaf

Jurisdiction	Non-legislative policy, strategy or charter	Purpose			
Qld	DERM Forest Products ^b Forest Management Policy Statement	Provides a commitment to a range of measures, including the responsible management of state land allocated to native forest production.			
	Statewide Forest Process ^c	Aims to progressively pursue solutions for management and industry development of state-owned native forest.			
	Queensland Timber Plantation Strategy 2020 ^c	Articulates the Queensland Government's policy objective of securing sustainable growth in the timber plantation sector to deliver a range of economic, social and environmental benefits			
	Building Nature's Resilience: A Biodiversity Strategy for Queensland	Establishes policy directions for conserving the state's biodiversity, covering the marine, freshwater and terrestrial environments.			
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 th community to strengthen the development of a sustainable future for the forest industry in South Australia.			
	ForestrySA Policy for Sustainable Forest Management	Provides for a commitment to sustainable forest management, a safe environment for employees, and compliance with relevant legislative requirements, standards and codes.			
	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.			
Tas.	Permanent Native Forest Estate Policy	Sets minimum levels of native forest for the maintenance of a permanent native forest estate by forest communities at both the bioregional and state levels.			
	Forestry Tasmania's Sustainable Forest Management Policy and Sustainability Charter (Forest Management Plan 2008)	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.	2009 Timber Industry Strategy ^d	Provides a framework and long-term direction for the Victorian timber industry for the next 20 years.			
	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.			
	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.			
WA	Forest Products Commission Forest Management Policy	Commits the Forest Products 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.			
	Western Australia's Strategy for Plantations and Farm Forestry: 2008–2012	Aims to ensure that the forestry industry is well placed to contribute to Western Australia's environmental and economic sustainability.			

Table 7.4: Major non-legislative policies, strategies and charters that influence the sustainable management of Australia's forests, June 2011 continued

^a In January 2013, Forests NSW became a state owned corporation, the Forestry Corporation of New South Wales.

^b In April 2012, the roles performed by the Queensland Department of Environment and Resource Management (DERM) were transferred to a number of agencies. The role of DERM Forest Products was transferred to the newly formed Queensland Department of Agriculture, Fisheries and Forestry.

^c The Statewide Forest Process in Queensland was discontinued in March 2012. In December 2012, the Forest and Timber Industry Plan Working Group, comprising representatives from Timber Queensland, other industry stakeholders and the Queensland Department of Agriculture, Fisheries and Forestry, released the Queensland Forest and Timber Industry Plan. The Queensland Government response to this plan is being developed and may supercede the Queensland Timber Plantation Strategy 2020.

^d In December 2011, the Victorian Government released the *Timber Industry Action Plan* (TIAP), which builds on the 2009 *Timber Industry Strategy*. TIAP actions are designed to provide the conditions for a productive, competitive and sustainable Victorian timber industry.

Source: Australian Government Department of Agriculture, Fisheries and Forestry; Australian Government Department of Sustainability, Environment, Water, Population and Communities; state and territory agencies.



Children participating in forest learning activities.

information. Accordingly, all public forest management agencies publish forest-related information, such as annual reports and technical papers on research and matters of interest. At the national level, the Australian Government coordinates *Australia's State of the Forests Report* and the *Australia State of the Environment* report, which provide periodic status updates based on available information. The Australian Government also maintains the Forests Australia website¹⁶¹, which contains up-to-date information about Australia's forests. Some states and territories publish their own state of the forests (or equivalent) reports (see Indicator 7.1d).

Some state and territory agencies responsible for forest management also run forest education and awareness programs:

- The Cumberland Forest Visitor Centre in Pennant Hills, a suburb of Sydney, New South Wales, provides an extensive school holiday and activities program, along with a forest school education program and the opportunity to participate in its volunteer program (see Case study 6.5).
- The Australian Forest Education Alliance, a network of forest educators and forestry communication specialists across Australia covering government, industry and other organisations, maintains a website that provides school teachers, educators, children and the public with information on Australian forests and forest-based products, and access to forestry teaching resources. It is supported by links to key government and industry organisations and educational service providers.
- The Forest Education Foundation, based in Tasmania, aims to develop community knowledge and understanding of forest environments and their management, forest products and their processing, and human interaction with forest environments.

- The Toolangi Forest Discovery Centre in Victoria was established in 1994, and offered programs for primary, secondary and tertiary students, as well as programs for community groups such as U3A (University of the Third Age), Probus and international visitor groups. The centre closed in 2012.
- As an example of a specific program, between 2009 and 2012 Victoria's Department of Sustainability and Environment and Parks Victoria staff hosted a Biodiversity Campout at Warby–Ovens National Park in Victoria's north-east. This free community event showcased local wildlife, native flora, forest ecosystems and Indigenous cultural heritage through a range of interactive activities, including learning about plants and the forest ecosystem, and the importance, uses and value of forests.

Indigenous community participation and awareness

Raising awareness and increasing Indigenous community participation in forest management is encouraged as a key aim of the National Indigenous Forestry Strategy (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 to Indigenous communities and to the forest and wood products industry. The first step is raising awareness in Indigenous communities of the possibilities for participation in the forest and wood products industry. This is to be accomplished through regional planning forums and networks, which are intended to bring together Indigenous communities, industry and all levels of government.

Forest practice codes and systems, and monitoring of compliance

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 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.

Forests NSW¹⁶² has legal instruments in place to monitor and penalise operators, contractors or forest visitors in cases of non-compliance, and is externally regulated by the NSW Office of Environment and Heritage, the main compliance monitoring body in New South Wales.

¹⁶¹ <u>http://daff.gov.au/forestsaustralia/</u>.

 $^{^{\}rm 162}\,$ From January 2013, the Forestry Corporation of NSW.

The Office of Environment and Heritage, which works with the Environment Protection Authority (EPA), has wide monitoring and compliance responsibilities under the NSW *Native Vegetation Act 2003* (see Case study 7.2), while under the *Forestry Act 2012* the EPA administers NSW Forestry Agreements and Integrated Forestry Operations Approvals (IFOAs) that were established under the *Forestry and National Park Estate Act 1998*. The results of compliance audits are tabled annually in the New South Wales Parliament. Forests NSW also undergoes independent external auditing for compliance with the Australian Forestry Standard (AS 4708-2007) and environmental management systems (ISO 14001:2004).

Tasmania's forest practices system operates with the objective of achieving sustainable management of public and private forests, with due care for the environment, and includes Tasmania's *Forest Practices Code 2000*. 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, as required. Monitoring of compliance under Tasmania's forest practices system is carried out at three levels:

- Routine monitoring of operations is undertaken by Forest Practices Officers¹⁶³ employed by forest managers. This level of monitoring is often included in formal environmental management systems and forest certification, which also involve 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 section 4E(1)(b) of the *Forest Practices Act 1985*, is performed annually by the FPA (FPA 2011).

In Victoria, the Department of Sustainability and Environment (DSE)¹⁶⁴ was the environmental regulator responsible for conducting audits of commercial wood harvesting activities in Victoria's state forests from 2008. A previous forest audit program was administered by the Victorian Environment Protection Authority from 2003 to 2007. The current process covers harvesting operations managed by VicForests in eastern Victoria, and harvesting operations managed by the Department of Primary Industries (DPI)¹⁶⁵ in other parts of the state. DSE had the responsibility for ensuring that all wood harvesting operations were undertaken in compliance with relevant legislation and with Victoria's *Code of Practice for Timber Production 2007*. Compliance is required under the *Sustainable Forests (Timber) Act 2004*.

The current Victorian forest audit program was developed in 2009 and finalised in 2010. It is designed to allow for the independent examination of a range of activities associated with wood harvesting. The audit program is based on seven modules—two overview modules and five modules structured around the elements of the forest production lifecycle: tactical planning, operational planning, harvesting and closure, harvesting performance, and regeneration and finalisation. The audit program also aims to assess the effectiveness the state's regulatory framework and the effectiveness of the DSE as the regulator.

In Western Australia, the means for monitoring compliance in forest management is prescribed in the *Forest Management Plan 2004–2013*, which is prepared under the *Conservation and Land Management Act 1984* for land vested in the Conservation Commission of Western Australia. Under the plan, the Western Australian Department of Environment and Conservation and the Forest Products Commission, in consultation with the Conservation Commission, 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 Commission of Western Australia also undertakes independent audits to assist it in assessing the extent to which land to which the plan applies is managed in accordance with the plan. In auditing, it gives priority to assessing, among other things:

- · management of old-growth forest in informal reserves
- protection of stream zones and less well reserved vegetation complexes
- · selection and management of fauna habitat zones
- dieback hygiene
- protection of significant flora and understorey species
- soil management.



Cradle Mountain as seen across Lake Lilla, Cradle Mountain-Lake St Claire National Park, Tasmania.

¹⁶³ 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 2000*.

¹⁶⁴ From April 2013, the Department of Environment and Primary Industries (DEPI).

¹⁶⁵ From April 2013, the Department of Environment and Primary Industries (DEPI).

Case study 7.2: Monitoring and compliance of forest management in New South Wales

Monitoring and compliance of native vegetation management in New South Wales

The New South Wales Office of Environment and Heritage (OEH) is responsible for promoting, monitoring and enforcing compliance with the New South Wales *Native Vegetation Act 2003*, a key piece of legislation protecting native vegetation in New South Wales. Amongst other things, the *Native Vegetation Act* and Regulation require private native forestry to be conducted in accordance with the Private Native Forestry Code of Practice.

The OEH works with state government agencies, local government, industry sectors and land management groups to provide information to help the community understand and comply with the native vegetation management framework and Private Native Forestry Code of Practice. Although achieving voluntary compliance is preferable, the organisation has a regulatory obligation to monitor, investigate and respond to issues of non-compliance with the *Native Vegetation Act* and take enforcement action where serious breaches are detected.

An annual Compliance and Enforcement Report Card is available as part of OEH's annual Native Vegetation Report Card, published at: www.environment.nsw.gov.au/vegetation/reports.htm.

Monitoring and compliance of forestry operations on State forests and private land in New South Wales

Data on monitoring and compliance activities specific to forestry on State forests and private land in New South Wales from 2007–08 to 2010–11, including activities conducted by OEH and Forests NSW, are presented in Table 7.5. The guidelines for reporting non-compliance incidents (NCIs) changed after 2007–08: incidents able to be resolved within 24 hours and not relating to systematic failures were no longer recorded in the Non-Compliance Incident Reporting system. The number of NCIs reported as "Other NCI issues (e.g. safety)" decreased further in 2010-11, which can be partly attributed to better supervision and training. The very low numbers of fines and prosecutions compared to the numbers of NCIs recorded is consistent with very few of the NCIs being major incidents.

Compliance item	2007–08	2008–09	2009–10	2010–11
Number of compliance check sheets conducted	4,720	3,998	3,764	3,407
Number of audits undertaken by regulators				
NSW OEH audits	12	11	25	28
DTIRIS (Fisheries) audits	n.r.	1	2	1
DTIRIS (Office of Private Forestry) audits	n.r.	n.r.	7	13
Number of non-compliance incidents recorded by Forests NSW supervision for	r corrective action	1		
NCIs related to soil erosion and water quality	318	28	143	135
NCIs related to flora and fauna	89	93	93	103
NCIs related to fish habitat and passage	0	0	38	67
Other NCI issues (e.g. safety)	689	434	319	72
Total	1,096	555	593	377
Number of fines (penalty infringement notices) issued to Forests NSW by regu	ılators			
Fines relating to the Threatened Species Conservation Act 1995	2	1	5	1
Fines relating to the Protection of the Environment Operations Act 1997	2	0	0	11
Fines relating to the Fisheries Management Act 1994	0	0	2	2
Total	4	1	7	14
Number of prosecutions recorded against Forests NSW				
Prosecutions under the Threatened Species Conservation Act 1995	0	0	0	1
Prosecutions under the Protection of the Environment Operations Act 1997	0	0	0	0
Prosecutions under the Fisheries Management Act 1994	0	0	0	0
Total	0	0	0	1

Table 7.5: New South Wales forestry monitoring and compliance, 2007–08 to 2010–11

DTIRIS = New South Wales Department of Trade and Investment, Regional Infrastructure and Services (also known as NSW Trade & Investment); NCI = non-compliance incident; n.r. = not recorded; NSW OEH = New South Wales Office of Environment and Heritage

Source: Forests NSW (2011).

The Conservation Commission of Western Australia undertakes comprehensive mid-term and end-of-term audits of the extent to which land to which the *Forest Management Plan 2004–2013* applies has been managed in accordance with the plan. This includes consideration of the extent to which key performance indicator targets have been achieved.

Monitoring of the management of nature conservation reserves, recreational use of public lands, and native forest harvesting on private lands in New South Wales, Queensland, Tasmania and Victoria is generally less extensive than monitoring for multiple-use public forests. However, stringent monitoring and compliance controls are exercised under legislated codes of forest practice. 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.

Human resources and education

A full range of options for training and educational qualification continues to be available in Australia across all 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.

However, while the range of qualification options remains available, there has been a significant reduction in the availability of forestry-specific undergraduate university degrees, and a greater emphasis on broader natural resource management degrees, some of which contain forestry-related units.

Tertiary education

Since 2007, undergraduate degrees in forestry have closed at two of Australia's leading universities, and only Southern Cross University (based in Lismore, NSW) continues to offer a dedicated undergraduate forestry degree in 2012. This change has been partly driven by the steady decline in undergraduate enrolments in forestry degrees in the past decade or so, which has also resulted in a decline in forestry degree graduates (Figure 7.1). Another factor in the closure of undergraduate forestry degrees was the relatively high cost of field-based teaching, which is unsustainable at lower levels of enrolment.

Forestry-related subjects remain available in some undergraduate degrees in sustainable resource management, environmental science and agricultural science. In some of these degrees, graduates who complete specific forestry subjects are able to obtain professional recognition as qualified forest managers. These degrees and postgraduate degrees (including graduate diplomas) continued to deliver graduates in forestry-related study areas (Figure 7.1).

Broader study areas outside forestry-specific degrees and courses also contribute to delivering graduates who gain employment in areas of forest management beyond the forestry industry. For example, Table 7.6 shows the completion levels for a range of broader undergraduate degrees in South Australia that may lead to employment in forest management. These completion levels have remained relatively steady over time.

Despite the decline in availability of forestry-specific degrees in Australia since 2007, there has been an increase in the demand for qualified professional foresters over this period. The domestic shortfall in graduates with professional forestry and related qualifications over this period has been largely filled through the recruitment of suitably qualified international graduates, particularly from New Zealand and South Africa (de Fégely 2010).



Figure 7.1: Australian university forestry and forestry-related degree completions, 2006-11

Note: 'Postgraduate degrees related to forestry' includes graduate diplomas.

Source: Australian Government Department of Industry, Innovation, Science, Research and Tertiary Education, Higher Education Statistics Collection, 2012.

In 2007, a National Forestry Masters Program was instigated in Australia to provide relevant, accessible and practical training for production of professional foresters, and thus address the domestic shortfall in graduates with forestry-specific degrees. The program is offered through five Australian universities¹⁶⁶ and to graduates from any background, and was developed in partnership with employers, industry groups and government bodies. The forest industry has also been trying to overcome the shortage of forestry graduates through scholarships, marketing campaigns and community engagement.

Fellowships and awards 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 science.¹⁶⁷

Vocational education and training

The ForestWorks Industry Skills Council (ForestWorks) assists in learning and skills development in the forest, wood, paper and timber products industry. ForestWorks is also contracted by the Australian Government to develop, maintain and continuously improve the Forest and Forest Products Training Package, and the Pulp and Paper Manufacturing Industry Training Package. These packages offer vocational education and training in technical qualifications, 25 at certificate level and 7 at diploma level. National completions in vocational education and training from 2006 to 2010 (Table 7.7) demonstrate a sustained level of interest in improved skills in the workforce.

Despite the availability of training and qualification options, shortages in skilled workers and gaps in the skill level of the existing workforce have been identified across the forest industry in Australia (ForestWorks 2012b). In some regions, the shortage of skilled workers has been exacerbated by competition from the growth in demand for skilled workers in Australia's rapidly expanding mining sector. The increased reliance on plantation timber is also increasing the need for skilled workers in plantation establishment, maintenance, harvesting and timber processing.

Certification of forest management

Forest 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 typically require forest management practices that are more stringent than provided for by law alone. Forest certification provides consumers, governments and enterprises with an assurance that the forest and wood products they buy are sourced from legally harvested and sustainably managed forests. It also provides for community consultation in the management of forests covered by certification.

The certification of a forest area is carried out by an accredited, third-party certification body against standards set out by a certification scheme. Two forest certification schemes

Table 7.6: University degree completions in South Australia in areas that may lead to employment in forest management, 2006-11

Degree	2006–07	2007–08	2008–09	2009–10	2010–11
Natural resource management	87	89	94	106	104
Spatial analysis	34	35	24	33	13
Environmental management	81	67	67	63	67
Environmental science (including biodiversity and conservation)	46	5	25	16	27

Source: Department of Primary Industries and Regions South Australia.

Table 7.7: National completions in vocational education and training, 2006–10

Qualification	Qualification level	2006	2007	2008	2009	2010
Forest and Forest Products	Diploma	3	2	10	12	42
	Certificate	419	309	338	324	522
Pulp and Paper Manufacturing Industry	Diploma	0	0	0	0	0
	Certificate	1	8	45	7	5
Total		423	319	393	343	569

Note: Figures are indicative only, because the National Centre for Vocational Education Research relies on providers to supply data. Source: National Centre for Vocational Education Research.

¹⁶⁷ www.gottsteintrust.org/index.htm.

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¹⁶⁶ The Australian National University, Southern Cross University, the University of Melbourne, the University of Queensland, and the University of Tasmania.

operate in Australia: the Australian Forest Certification Scheme and a scheme operated by the Forest Stewardship Council. Both have forest management standards and chainof-custody standards. Forest management standards support sustainable forest management through a range of economic, social, environmental and cultural criteria and requirements for wood production in native and plantation forests. A chain-of-custody standard is a 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 end consumer.

The certification of forest management practices expanded rapidly during the reporting period for SOFR 2008. The current reporting period has seen a steady increase in forest management area certified (Figure 7.2), from just over 9 million hectares in 2006–07 to about 10.7 million hectares in 2011¹⁶⁸. There has also been a rapid increase in the number of chain-of-custody certificates issued under the Australian Forest Certification Scheme and by the Forest Stewardship Council during this time (Figure 7.3).

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 environmental management systems (EMSs). EMSs are independently certified by accredited, thirdparty certification bodies to International Organization for Standardization (ISO) standard 14001:2004 (*Environmental Management Systems—Requirements with Guidance for Use*). An EMS under ISO 14001 is a tool for 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. Several major private forestry companies have EMSs in place.

Institute of Foresters of Australia, Registered Professional Forester scheme, and Association of Consulting Foresters of Australia

Established in 1935, the Institute of Foresters of Australia (IFA) is a professional body with more than 1,350 members. Membership represents all segments of the forestry profession, including public and private practitioners engaged in many aspects of forestry, nature conservation, resource and land management, research, administration and education. The institute has developed more than 30 policies¹⁶⁹, representing the consensus view of Australian professional foresters on a wide range of contemporary forestry issues—these cover sustainable forest management, and the processes and practices that translate these principles into outcomes. The IFA publishes the *Australian Forestry* journal.

The Registered Professional Forester scheme is a formal registration system that offers quality assurance on forestry expertise. The scheme is administered by the IFA and is available to members and non-members of the IFA.

The Association of Consulting Foresters of Australia was established in 1978 in response to the need to promote and protect the credibility and competence of Australia's consulting foresters.¹⁷⁰ The association is now a division of the IFA.



Chain of Custody labels on logs from forests certified under the Australian Forest Certification Scheme.

¹⁶⁸ The area under Forest Stewardship Council certification increased by around 342,000 hectares to 965,000 hectares in March 2012 (after the reporting period for SOFR 2013 and after the period graphed as '2011–12' on Figure 7.2), as a result of the certification of the Hancock Queensland Plantations estate.

¹⁶⁹ www.forestry.org.au/publications/ifa-policy-statements.

¹⁷⁰ www.forestry.org.au/consulting-foresters.

Figure 7.2: Area of certified forest management in Australia, 2003–12



AFCS = Australian Forest Certification Scheme; FSC = Forest Stewardship Council

Notes:

FSC numbers are for March 2004, January 2005, February 2006, March 2007, January 2008, January 2009, January 2010, January 2011 and January 2012.

Some areas of forest have both $\ensuremath{\mathsf{AFCS}}$ and $\ensuremath{\mathsf{FSC}}$ certification.

Source: Australian Forestry Standard Limited (Australian Forest Certification Scheme), Forest Stewardship Council Australia.

Figure 7.3: Chain-of-custody certificates issued in Australia, 2004-12



AFCS = Australian Forest Certification Scheme; FSC = Forest Stewardship Council Note: FSC numbers are for January 2005, February 2006, March 2007, January 2008, January 2009, January 2010, January 2011 and January 2012.

Source: Australian Forestry Standard Limited (Australian Forest Certification Scheme), Forest Stewardship Council Australia.

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 Australia State of the Environment 2011 report assessed Australia as having effective to very effective policies relating to managing production forests and conservation reserves. Some aspects of policies relating to managing bushfires and Indigenous forest land were assessed as only partially effective.
- The value of the wood in Australia's native forest (the 'standing timber') was estimated as \$1.8 billion in June 2011, and the value of plantation wood ('standing timber') as \$9.5 billion. These values cannot be compared because they were calculated using different timeframes and discount rates. The monetary value of benefits from forests other than wood, such as biodiversity, carbon sequestration and soil protection, is not included in these figures, and in general is not integrated into an economic framework for forest conservation or management.
- Australia's National Competition Policy has led to several reforms that affect the competitive climate for Australian forest-based industries, including that commercial state-owned forest entities be competitively neutral with the private sector.
- Managed investment schemes have become a less important financial mechanism for plantation expansion since the global financial crisis.
- The Australian Government introduced the Carbon Farming Initiative, which allows land managers to earn carbon credits for storing carbon or reducing greenhouse gas emissions. The Australian Government has also made investments which aim to promote sustainable management of privately owned forests.

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 forests' natural and cultural significance (State of the Environment 2011 Committee 2011), and '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 2011 report, published by the Australian Government Department of Sustainability, Environment, Water, Population and Communities, estimated the effectiveness of government policies in promoting conservation and sustainable management in the period 2006–11. It found, overall, that understanding, planning, inputs/resources, processes, outputs and outcomes were either very effective, effective or partially effective for production forests, bushfire, conservation reserves and Indigenousmanaged lands (Table 7.8). Against that background, however, was a declining level of inputs/resources, outputs and outcomes for conservation reserves, and declining inputs/ resources for Indigenous-managed lands (Table 7.8).

Table 7.8: Status of understanding, planning, inputs/resources, processes, outputs and outcomes associated with conservation and sustainable management of forests, 2006–11

Category	Production fore	sts	Bush	fire	Conservation rese	rves	Indigenous-mana lai	ged 1dsª
Understanding	Very effective	↑	Effective	↑	Very effective	\rightarrow	Effective	↑
Planning	Very effective	\rightarrow	Effective	↑	Effective	↑	Partially effective	\rightarrow
Inputs/resources	Effective	\rightarrow	Partially effective	↑	Effective	\downarrow	Partially effective	\downarrow
Processes	Effective	\rightarrow	Very effective	\rightarrow	Very effective	\rightarrow	Effective	\rightarrow
Outputs and outcomes	Effective	↑	Effective	\rightarrow	Effective	↓	Partially effective	↑

↑ = improving at time of assessment; \rightarrow = stable at time of assessment; \downarrow = declining at time of assessment

 Indigenous-managed lands in this instance refer to 'Indigenous owned and managed' and 'Indigenous managed' lands (see Indicator 6.4a and 6.4c for further information on these categories).

Source: Condensed from State of the Environment 2011 Committee (2011), pp. 348–351.

Table 7.9: Value of Australia's environmental assets

			Value (\$ billion)		
Date	Rural land	Subsoil oil and gas	Other subsoil	Native standing timber	Plantation standing timber
June 2003	143	123.1	44.8	1.9	10.1
June 2004	178	140.7	56.7	2.0	10.1
June 2005	200	153.2	70.2	2.1	10.0
June 2006	207	173.4	114.2	2.0	9.7
June 2007	222	182.4	147.9	2.0	10.3
June 2008	243	226.0	217.0	2.0	11.6
June 2009	254	307.0	413.6	1.8	10.4
June 2010	263	280.2	388.9	1.7	9.8
June 2011	263	288.5	415.7	1.8	9.5

Notes:

'Subsoil oil and gas', and 'Other subsoil' are derived series. 'Subsoil oil and gas' is the combined value of four categories (petroleum [recoverable]—crude oil; petroleum—natural gas; liquefied petroleum gas [LPG]—naturally occurring; petroleum—condensate) presented in ABS (2012g). 'Other subsoil' is total subsoil minus 'Subsoil oil and gas'.

Figures are not adjusted for inflation.

Source: ABS (2012g).

Value of Australia's environmental assets

The value of Australia's environmental assets increased in the period 2006–11. The Australian national balance sheet recorded \$10.1 trillion in assets on 30 June 2011, of which \$4.4 trillion (44%) was classed as environmental assets (ABS 2012g). The values of some of these assets are listed in Table 7.9.

The Australian Bureau of Statistics (ABS) assesses the asset value of wood ('standing timber') in Australia's native forests and, separately, Australia's plantations. The valuation for native forests is based on the net present value of the future stream of income from the estimated net area of native forest available for production on private and public land, over the estimated rotation cycle of the forests and using a discount rate based on the average cost of forest industry borrowing. On this basis, Australia's native standing timber decreased in value from \$2.0 billion to \$1.8 billion between June 2006 and June 2011; changes in a number of economic parameters could have led to this re-valuation. The valuation for plantations is based on a insured asset value, derived from plantation forest area and planting data from ABARES, and relevant industry insurance schedules compiled by Australian Forest Growers¹⁷¹. On this basis, the value of Australia's plantation standing timber increased from \$9.7 billion in June 2006 to \$11.6 billion in June 2008, before decreasing to \$9.5 billion in June 2011. These valuations of native forest and plantation standing timber cannot be compared to each other because of the different methodologies and assumptions used in the calculations.

The values in the ABS balance sheet for native standing timber and plantation standing timber include the value of wood available for harvesting, but not the value of other benefits from forests, such as maintaining biodiversity, carbon sequestration or preventing soil erosion.

¹⁷¹ <u>http://www.afg.asn.au/</u>.

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 use 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 183 countries in 2011 for the ease of doing business (World Bank 2012). This is higher than several other member countries of the Organisation for Economic Co-operation and Development, including Japan, Germany and France, but lower than Singapore, New Zealand and the United States of America.

Australia's strong economic framework can partly be attributed to reforms that increase the competiveness of Australian products. A key reform was the introduction of Australia's National Competition Policy (NCP) in 1995, which is a package of Commonwealth, state and territory legislation aimed at promoting 'good' competitive behaviour. Governments signed three agreements as part of the NCP: the Competition Principles Agreement, the Conduct Code Agreement, and the Agreement to Implement the National Competition Policy and Related Reforms (NCC 2012).

The NCP introduced several reforms that affect the competitive climate for Australian forest-based industries. For example, since the introduction of the NCP, commercial state-owned forest entities such as sawmills are subject to the principle of competitive neutrality (Ferguson et al. 2010), which requires state entities competing with the private sector to be exposed to similar expenses and costs. Before the introduction of this principle, state entities were not subject to commercial obligations such as business taxes and dividends, which may have discouraged the entrance of private-sector entities into the market.

Version 2.0 of the Australian Forest Valuation Standard was released in 2008, followed by Version 2.1 in 2012 (Leech and Ferguson 2012). The standard provides guidelines for conducting forest valuation of commercial goods or services of native forests and plantations.

Trade policy

Australia's trade policy focuses on trade liberalisation, to improve access for Australian exports in global markets, as well as Australian access to imports. Improved market access is facilitated both through global and multilateral efforts and through the use of free trade agreements (FTAs). 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. FTAs reduce barriers to the trade of goods—for example, by eliminating tariffs and simplifying compliance measures, such as the need to apply for export licences—and liberalise services such as intellectual property protection, investment and the movement of people. Australia has signed two FTAs since 2008, one with Chile (effective March 2009) and the other with the Association of Southeast Asian Nations (effective January 2010). An Australia–Malaysia FTA was signed in May 2012 but is not yet implemented. In addition to bilateral trade negotiations, the Australian Government is advocating a reduction in trade barriers for non-agricultural goods, including those produced in the forest sector, in the WTO Doha Round negotiations (DFAT 2011).

Plantation investment

Until recently, forest-sector managed investment schemes were important financial mechanisms for plantation expansion. New taxation arrangements for managed investment schemes came into effect on 1 July 2007, with the aims of encouraging expansion of the plantation estate, and supporting investment in long-rotation plantations by allowing trading of managed investment scheme investments (DAFF 2012a). Since the global financial crisis, however, managed investment schemes have become a less important proportional driver of plantation expansion (see Case study 7.3). In 2008, about 81% of new plantations established were funded by managed investment schemes (Table 7.10), whereas in 2010-11 managed investment schemes funded only 24% of plantation expansion (which itself had slowed considerably-see Indicator 6.2a). Some investments were taken over by other private investors, and others were written off (Gavran 2012).

Table 7.10: Investment in new plantations, by investor type, 2008 and 2010–11

Investor type	Proportion of (%	f investment
	2008	2010–11
Managed investment schemes	81	26
Institutional investors	-	42
Timber industry companies	-	23
Farm foresters and other private owners	-	4
Government organisations	14	5

- = not available but deduced to total 5%

Note: '2008' refers to the calendar year; '2010–11' refers to the 2010–11 financial year.

Source: Gavran (2012), Gavran and Parsons (2009).

The House of Representatives Standing Committee on Agriculture, Resources, Fisheries and Forestry produced a forest-sector inquiry report in 2011 that made several recommendations in relation to plantations (SCARFF 2011). For example, it recommended that the Australian Government lead a process through the Council of Australian Governments to create a national plan for plantations, to ensure selection of appropriate species and planting locations and that there is appropriate infrastructure to support those plantations. It also recommended that the managed investment scheme mechanism be assessed for its appropriateness in meeting policy objectives.

Case study 7.3: Managed investment schemes (MIS)

Managed investment scheme companies faced many challenges during the reporting period, including the global financial crisis, reduced investor confidence in managed investment schemes generally, an inability to raise further debt, and regulatory changes that had the potential to affect sales of managed investment scheme products.

On 13 May 2010, the Australian Government amended the four-year holding period tax law for forest-sector managed investment schemes. The aim of this change was to ensure that investors will not have their previously claimed tax deductions denied if they fail to hold their forest-sector investments for four years for reasons genuinely beyond their control.

The collapse of a number of forest-sector managed investment scheme companies led to the strengthening of related prudential arrangements. In November 2011, the Australian Securities and Investments Commission (ASIC) released new financial requirements for responsible entities of managed investment schemes. Under the changes, responsible entities must prepare 12-month cash-flow projections, which must be approved at least quarterly by directors. New net tangible asset capital requirements and a liquidity requirement were also introduced. In January 2012, ASIC released five benchmarks and five disclosure principles for agribusiness schemes that will help retail investors understand the risks, assess the rewards being offered, and decide whether investment in these products is suitable for them.

The changes introduced by ASIC were designed to ensure that investors are well informed before making investment decisions and to bolster investor confidence in Australia's investment markets, leading to a more secure future for Australia's forest-based industries.

Tasmanian forest-based industries

In November 2010, the Australian Government announced \$22.4 million in funding to help the Tasmanian forestsector industries re-position for the future (Ludwig and Green 2010). This commitment was delivered through two programs: the \$17 million Tasmanian Forest Contractors Exit Assistance Program, administered by the Australian Government Department of Agriculture, Fisheries and Forestry; and the \$5.4 million Tasmanian Forest Contractors Financial Support Program, administered by the Tasmanian Government. Assistance was aimed at Tasmania's native forest harvest and haulage contracting businesses, 29 of which accepted exit assistance under this program (DAFF 2011a).

Further assistance for Tasmania was agreed in the Tasmanian Forests Intergovernmental Agreement, which was signed by the Prime Minister and the Tasmanian Premier on 7 August 2011. This agreement aimed to provide certainty for Tasmania's forest-based industries, support local jobs and communities, and protect the state's forests. Of the \$277 million committed under the agreement, \$45 million was set aside for the Tasmanian Forests Intergovernmental Agreement Contractors Voluntary Exit Grants Program. This funding was allocated for grants and associated delivery costs, for voluntary exits from operations in Tasmania's public native forests, for haulage, harvest and silvicultural contractors in the 2011–12 financial year (DAFF 2012b). A total of 61 applicants were offered exit grants with a combined total of \$43 million.

Investment in timber processing

Current investments in timber processing in Australia are largely driven by changes in resource availability resulting from changes in forest access and forest management practices, linked to economies of scale. For example, increased sourcing of wood from plantations and a reduction in the availability of logs from native forests have led to a consolidation of sawmilling operations in larger mills (Burns and Burke 2012). These larger mills are capable of processing logs at a lower unit cost than earlier, smaller mills, thereby helping to maintain competitiveness. The \$450 million expansion of Visy's pulp and paper mill at Tumut in New South Wales was successful in doubling the production capacity of the mill (Visy 2011).

In January 2009, the Australian Government launched its \$9 million Forest Industries Development Fund, a competitive grants program to boost the international competitiveness of Australian forest products. The fund encouraged increased investment in measures designed to add value to Australia's forest resources. Supported industry initiatives included an Australia-wide project for the design and delivery of modular wood-based Indigenous housing for rapid deployment in remote areas, a new facility to process the timber of highland species into high-value timber flooring products, a project to optimise softwood processing efficiency, and a project to automate a product grading process to improve recovery and add value to forest resources. This funding is estimated to have leveraged investments worth more than \$20 million from the private sector and other sources (DAFF 2011b).

Investment in environmental services

In August 2011, the Australian Parliament passed the *Carbon Credits (Carbon Farming Initiative) Act 2011*. The Act establishes the Carbon Farming Initiative, which allows farmers and land managers to earn carbon credits for storing carbon or reducing greenhouse gas emissions on their land (see Indicator 5.1a - Box 5.1, and Indicator 7.1a).

Australia also has programs at state and territory level that promote other types of environmental services from forests. For example, the Sawlogs for Salinity pilot project, part of the Victorian Government's Plantation Incentive Strategy, provided \$650,000 in incentive payments to landowners to plant trees that can be used to produce sawlogs on land where there will be environmental benefits, particularly relating to salinity. The project used a science-based framework, the Catchment Analysis Tool, to predict the nature and extent of certain services, including environmental services, provided by plantations. About 743 hectares of new plantations were established through this project in the west Gippsland and Corangamite regions.



Farm trees planted for stock shelter and wood production, Mount Lofty Ranges, South Australia. Large contiguous areas of farm trees that meet the definition of forest are recorded in the National Forest Inventory under the 'Other forest' category (Indicator 1.1a).

Investment to improve management of privately owned forests

Australian landholders are increasingly aware of the benefits associated with maintaining forests and native vegetation to manage salinity and erosion (State of the Environment 2011 Committee 2011). Governments and industry groups have implemented a range of programs to support natural resource management on privately held lands.

These programs include Caring for our Country, an Australian Government grants-based program to help meet national priorities relating to the environmental management of Australia's natural resources. This program focuses on six national priority areas: the National Reserve System; biodiversity and natural icons; coastal environments; sustainable farm practices; natural resource management in northern and remote Australia; and community skills, knowledge and engagement. It supports regional natural resource management groups; local, state and territory governments; Indigenous groups; industry bodies; land managers; farmers; Landcare groups and communities.

The Caring for our Country program, which began in 2008, will involve a total investment of just over \$2 billion in the five years to 2013. Since this investment is not all for specific areas, it is difficult to estimate the total investment in forest management. However, a significant proportion of the total funding will benefit forests—for example, through the Environmental Stewardship Program, which involves a total investment of \$63.3 million and has secured more than 47,500 hectares of nationally threatened ecological communities, including forests.

State and territory governments have also developed programs to encourage private and community-based natural resource management within their jurisdictions. In particular, 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.

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 reliable information continues to be available for multiple-use public forests and some public nature conservation reserves. Significant gaps in data collection and monitoring remain for leasehold and private forests.
- Australia's states and territories vary in their levels of forest and environmental data collection, monitoring and reporting. Tasmania and Victoria each publish fiveyearly 'state of the forests' reports, based on a framework of criteria and indicators similar to Australia's national State of the Forests report.
- Use of a framework of criteria and indicators, developed under the Montreal Process¹⁷², for Australia's five-yearly state of the forests reporting provides a mechanism for presenting disparate data in a consistent and repeatable format. The quality of data have improved for almost half (21) of the 44 national reporting indicators in SOFR 2013 compared with SOFR 2008. The data available for SOFR 2013 were assessed as comprehensive (the highest possible rating) in each of coverage, currency and frequency for 17 of the indicators, and comprehensive in any two of these aspects for a further 10 indicators. The capacity has been developed to report trends over time for 16 of the 44 indicators.

- Although the SOFR 2013 report is wide-ranging, few of the 44 national reporting indicators are measured easily, and the availability, coverage and currency of data vary considerably. Some data are collected nationally, and others are provided by the states and territories.
- The Australian Government and all states and territories, except the Northern Territory, also publish 'state of the environment' reports at regular intervals, which vary from three to five years. These reports provide information on the condition of the broader natural environment and, where possible, indicate trends or changes for a range of measures relating to the environment.
- Australia's strategy for the National Reserve System stipulates that the effectiveness and performance of protected area management must be monitored and evaluated against conservation goals. Nationally, 14.8 million hectares of forest in the National Reserve System (56% of the area of forest in the National Reserve System) has management plans in place.

¹⁷² The Montreal Process Working Group on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests – see <u>www.montrealprocess.org</u>.

The opening paragraph of Indicator 7.1d in SOFR 2008 remains pertinent for SOFR 2013:

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, in turn, offers an opportunity for forest managers to review and prioritise data collection to make future measurement and monitoring more timely and relevant. 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 reliable information is available for multiple-use public forests and a few public nature conservation reserves for which governments require reporting. Reliable information is also available for Industrial plantations on both public and private land.

In publicly managed native forests—especially those managed for multiple uses, including wood production data are available for reporting on a range of indicators, and inventories and assessments are undertaken regularly for management purposes and to monitor and report on performance. 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, while the national State of the Forests reporting process provides a whole-of-nation overview and is the basis for meeting legislated national and international obligations.

In contrast to government data collection and 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 privately managed and leasehold forests. Another area with large gaps in information across all tenures and jurisdictions is non-wood forest values (see Indicators 2.1d, 4.1a–e, 5.1a, 6.1b and 6.1d).

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 are the only ones to publish state of the forests reports (SOFRs) that cover all forests, regardless of type or tenure. These reports are based on the same framework of 7 criteria and 44 indicators for sustainable forest management as used in Australia's national SOFR, and are also published at five-yearly intervals. New South Wales (annually) and Western Australia (five-yearly) publish regular indicator-based reports on the sustainable management of production forests on public land. ForestrySA (South Australia) publishes an annual report covering plantation forests on public land.

Tasmania's SOFR provides information on the state of Tasmania's public and private forests, as required under *Tasmania's Forest Practices Act 1985*; the most recent report was released in 2012 (FPA 2012).

Under Victoria's Sustainable Forests (Timber) Act 2004, the Victorian Government is required to produce a SOFR every five years, with a 2013 version the next to be released. Criteria and Indicators for Sustainable Forest Management in Victoria (DSE 2007b) sets out the range of environmental, economic and social indicators that will be monitored in the state. These are closely aligned with the Montreal Process and Australia's national framework, with the seven criteria the same as those used for Australia's SOFR 2008 and SOFR 2013. In addition, VicForests, the state-owned business that is responsible for the sustainable harvest, regeneration and commercial sale of wood from Victoria's native public forests, produces an annual Sustainability Report. This presents 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.

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 processes vary slightly for each RFA, but generally they independently assess the results from monitoring the 44 Montreal Process sustainability indicators used in Australia, and from monitoring the RFA milestones and obligations agreed by the states with the Australian Government. Five-yearly RFA reviews have been completed in New South Wales, Tasmania and Victoria.

In New South Wales, progress on the implementation of four State-based forest agreements and integrated forestry operations approvals (IFOAs) is reported annually. The reports provide a snapshot of the results of monitoring ecologically sustainable forest management criteria and indicators; wood supply; compliance with integrated forestry operations approvals for each region; and achievement of milestones defined in the four forest agreements and the IFOAs. All states and territories, except the Northern Territory, also produce 'state of the environment' (SoE) reports at regular intervals, which vary from three to five years. SoE reports are generally designed to communicate credible, timely and accessible information about the condition of the environment to decision makers and the community, and, where possible, to indicate trends or changes in the environment. A summary of the status of SoE reporting in the jurisdictions is as follows:

- The Australian Capital Territory produces an SoE report every four years. An objective of these reports is to provide accurate, timely and accessible information to the community and government on the condition of, and trends in, the environment; underlying pressures; and sustainability trends. SoE reporting in the Australian Capital Territory is a requirement of the *Commissioner for the Environment Act 1993*.
- New South Wales publishes an SoE report every three years to provide information on the status of the main environmental issues facing the state. The most recent report, published in 2012, was prepared by the Environment Protection Authority in accordance with the *Protection of the Environment Administration Act 1991*.
- The latest four-yearly Queensland SoE report was released in 2011. It includes an assessment of the state of major environmental and cultural assets, the identification of significant trends, and a review of the significant programs, activities and achievements of public authorities in the protection, maintenance, restoration and enhancement of the state's environment. SoE reporting in Queensland is a statutory requirement under both the *Environmental Protection Act 1994* and the *Coastal Protection and Management Act 1995*.
- The next five-yearly SoE report from South Australia, due for release in 2013, aims to provide an assessment of efforts to deal with significant environmental issues. South Australia's SoE reporting is a legislative requirement under the *Environment Protection Act 1993*.
- Tasmania's SoE report for 2012 summarises environmental condition, trends and changes, and provides recommendations for future management of the environment in Tasmania. Tasmania's SoE reports are a legislative requirement under the *State Policies and Projects Act 1993*.
- Victoria's next five-yearly SoE report is due for release in 2013, and will be based on a new framework for environmental reporting. The report is intended to inform the Victorian community about the health of the natural environment and influence government to achieve environmental, social, cultural and economic sustainability. Production of the report is a statutory role of the Commissioner for Environmental Sustainability under the *Commissioner for Environmental Sustainability Act 2003*.

 The most recent SoE report from Western Australia was released in 2007 by the Environmental Protection Authority, Western Australia. These reports are designed to communicate credible, timely and accessible information about the condition of the environment to decision makers and the community, focusing on major environmental issues.

SOFR 2008 reported that two states published 'state of the parks' reports between 2003 and 2008: New South Wales in 2004 and Victoria in 2007. No state of the parks report has been subsequently published by a state or territory. However, the New South Wales Office of Environment and Heritage produced the *Management of the NSW Park System—2010* report.¹⁷³ This report, which reflects the New South Wales park system at June 2010, provides a broad overview and assessment of the approaches used to manage the system.

A wide variety of measurement and monitoring activities support state and territory reporting. Examples for Victoria and Western Australia are provided below.

Victoria

After the release of Victoria's State of the Forests Report 2008, the state assessed its ability to report on its forests, including the costs and barriers associated with reporting. As a result, the Victorian Department of Sustainability and Environment¹⁷⁴ now undertakes a range of activities for monitoring and reporting changes in the extent, state, condition and sustainable management of Victoria's public forests and parks. These activities are known collectively as the Victorian Forest Monitoring Program (VFMP¹⁷⁵), formerly known as the Forests and Parks Monitoring and Reporting Information System.

The VFMP aims to provide a continuously updated, tenure-blind public forest description, using a combination of permanent plots, aerial photography and satellite imagery. Its development and full implementation is expected to take 5–7 years (Wallace 2010). In total, 786 ground plots are being established and will be measured once every five years (Figure 7.4). By 2012, about 250 of these plots had been established and measured across Victoria's public forests and parks.

The VFMP will provide Victoria with the capability to produce consistent statewide data for its public forests and parks—that is, not limited to state forest areas available for wood production. Ongoing remeasurement will allow the state to better monitor changes in its forests over time. The data and information generated will be an input to land management policy and decision making and will support state and national reporting of sustainable forest management through *Victoria's State of the Forests Report*.

175 http://www.depi.vic.gov.au/forestry-and-land-use/forest-management.

¹⁷³ www.environment.nsw.gov.au/sop10/index.htm.

¹⁷⁴ From April 2013, the Department of Environment and Primary Industries.





Western Australia

Western Australia's *Forest Management Plan 2004–2013*, produced by the Conservation Commission of Western Australia, specifies a number of monitoring and auditing actions, some of which are also ministerial requirements (CCWA 2004). The Conservation Commission undertakes comprehensive mid-term and end-of-term audits of the extent to which land to which the plan applies has been managed in accordance with the plan, including the extent to which key performance indicator (KPI) targets have been achieved. The Conservation Commission submitted the mid-term and end-of-term audit reports to the Environmental Protection Authority on 24 December 2008 and 30 March 2012, respectively (CCWA 2012b).

The Western Australian Department of Environment and Conservation, in consultation with the Conservation Commission, developed protocols for addressing each KPI in the plan, identifying data to be collected, assessing the extent to which each KPI has been achieved, and specifying who is responsible for collecting and analysing the data. These protocols are contained in the document *Protocols for Measuring and Reporting on the Key Performance Indicators of the Forest Management Plan 2004–2013*. During this reporting period, the Conservation Commission has given priority to auditing:

- · management of old-growth forest in informal reserves
- protection of stream zones and less well reserved vegetation complexes
- selection and management of fauna habitat zones
- marri (Corymbia calophylla) retention
- dieback hygiene
- protection of significant flora and understorey species
- soil management.

Western Australia also runs the FORESTCHECK project, which monitors biodiversity in jarrah forest managed for sustainable wood production (see Case study 1.3 in Indicator 1.2a).

National forest monitoring and reporting

The National Forest Inventory (NFI) in the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES), Australian Government Department of Agriculture, Fisheries and Forestry¹⁷⁶, compiles data supplied by states and territories, and integrates these data into national classification schemes and databases. Data compilation for Industrial plantations is undertaken annually at the state and territory level, and every five years at the national level (Gavran and Parsons 2011). The NFI has primary responsibility for national forest reporting in Australia, including coordinating the preparation of the fiveyearly SOFRs. Australia remains one of the few industrialised forested countries yet to introduce a national sample-based forest monitoring system.

The production of *Australia's State of the Forests Report* gives effect to a requirement in the *National Forest Policy Statement* 'to produce and publish a "state of the forests" review every five years' (Commonwealth of Australia 1992). The state and territory governments agreed to the *National Forest Policy Statement* with the Australian Government in 1992 (Tasmania in 1995). Publication of *Australia's State of the Forests Report* also gives effect to a statement in the Commonwealth *Regional Forest Agreements Act 2002*, which specifies that 'the Minister must cause to be established a comprehensive and publicly available source of information for national and regional monitoring and reporting in relation to all of Australia's forests'.

Australia's state of the forests reporting is based on a framework of 7 criteria and 44 indicators that are closely aligned with the international Montreal Process (MIG 1998). This framework provides a mechanism for presenting Australia's disparate forest data in a consistent and repeatable format, in spite of varying state and territory data collection processes, classification systems and standards. The coverage and currency of data, frequency of data collection, and capacity to report on trends also vary considerably among indicators, and few indicators are capable of easy measurement.

Table 7.11 summarises Australia's capacity to report against the 44 indicators for SOFR 2013, including the reporting of trends, based on the coverage, currency and frequency of data available for each indicator. The table also notes changes over the period 2006–2011 in the quality of the data that contribute to the reporting.

Overall, the data available for SOFR 2013 were comprehensive in each of coverage, currency and frequency for 17 of the indicators, and comprehensive in any two of these aspects for a further 10 indicators. Trends over time could be reported for 16 of the 44 indicators for SOFR 2013, and there has been an overall improvement in the quality of data for almost half (21) of the indicators, compared with SOFR 2008. The availability of national data and the capacity to report for one indicator (1.1b) were particularly deficient, and three indicators (1.1b, 1.1d and 6.3b) have seen an overall decline in the quality of data since SOFR 2008. For 20 indicators, the overall quality of data have not changed.

New datasets reported in SOFR 2013

A number of new social, economic and environmental datasets have been compiled, analysed and presented in SOFR 2013, including the development of nationally consistent datasets from new national data. These include:

- development of an updated National Forest Inventory dataset of Australia's forest cover, type and tenure, resulting from using a Multiple Lines of Evidence process to integrate states and territories data with a variety of remotely sensed data
- improvement of the reporting of protected forest areas by use of the National Conservation Lands Database that lists private land protected by covenant, identifying private forest reserves
- updated and comprehensive lists of vertebrate species found in forest
- compilation of new national databases for the reporting of threatened fauna and flora species
- use of a new national forest commerciality database to identify spatially the area of forest available and suitable for harvesting
- compilation and reporting of firewood and fuelwood usage data
- compilation of a new national database on silvicultural systems in multiple-use public native forests from information from state forest management agencies
- compilation of nationally consistent public data on Indigenous land tenure, including spatial information, which allowed the Indigenous estate to be divided into four land tenure and management categories
- development of a Non-Indigenous Heritage Sites of Australia dataset, that compiles current non-Indigenous heritage lists and registers from all jurisdictions into a national dataset
- use of employment and demographic data from the Australian Bureau of Statistics 2011 Population and Housing census in socio-economic indicators
- presentation of time-series data on the resilience and adaptability of forest-dependent communities, including forest-dependent Indigenous communities
- incorporation of quantitative data on the importance of forests to people, from surveys of community attitudes towards native and plantation forest management, wood products and the potential role of forests and wood in climate-change mitigation.

¹⁷⁶ From September 2013, the Department of Agriculture.

Table 7.11: Quality of data coverage, currency, frequency and capacity to report trends, and overall change since SOFR 2008, for each indicator addressed by SOFR 2013

Indicator		· · · · · · · · · · · · · · · · · · ·		Data quality		
		Data coverage	Data currency	Data update frequency	Capacity to report trend	Change in data quality since SOFR 2008
Criterion 1	l: Conservation of biological diversity					
1.1a	Area of forest by forest type and tenure—forest type ^a			b		c
	Area of forest by forest type and tenure—tenure ^a					7
1.1b	Area of forest by growth stage					∠ d
1.1c	Area of forest in protected area categories					7 e
1.1d	Fragmentation of forest cover					∠ f
1.2a	Forest dwelling species with ecological information					7 g
1.2b	Status of forest dwelling species at risk					7 1 h
1.2c	Representative species monitored					7 1 i
1.3a	Species at risk of loss of genetic variation					7 j
1.3b	Genetic resource conservation mechanisms in place					7 k
Criterion 2	2: Maintenance of productive capacity of forest ecosystems					
2.1a	Native forest available for wood production					7 L
2.1b	Age class and growing stock of plantations					_
2.1c	Annual removal of wood products compared with sustainable volume					m
2.1d	Annual removal of non-wood forest products compared with sustainable level					_
2.1e	Effective forest regeneration and plantation re-establishment					7 1 n
Criterion 3	3: Maintenance of ecosystem health and vitality					
3.1a	Scale and impact on forest health and vitality					7 °
3.1b	Forest burnt by planned and unplanned fire	р				7 q
Criterion 4	: Conservation and maintenance of soil and water resources					
4.1a	Forest managed primarily for protective functions					r
4.1b	Management of the risk of soil erosion			s		r
4.1c	Management of the risks to soil physical properties			s		r
4.1d	Management of the risks to water quantity			s		r
4.1e	Management of the risks to water quality			S		r
Criterion 5	5: Maintenance of forest contribution to global carbon cycles					
5.1a	Contribution to global greenhouse gas balance					
Criterion 6	5: Maintenance and enhancement of long-term multiple socio-e	economic benef	fits to meet the	needs of societ	ies	
6.1a	Value and volume of wood and wood products					t
6.1b	Values, quantities and use of non-wood forest products				u	7 1 v
6.1c	Value of forest-based services					w
6.1d	Wood and non-wood product production and consumption					x
6.1e	Recycling of forest products					71 у
6.2a	Investment and expenditure in forest management					7 z
6.2b	Investment in research, development and extension, and new technologies					00
6.3a	Area of forest available for public recreation/tourism					
6.3b	Recreation/tourism activities available					∠ bb
6.4a	Area to which Indigenous people have use and rights					7
6.4b	Registered places of non-Indigenous cultural value					7
6.4c	Protection of Indigenous values					—
6.4d	Importance of forests to people					7
6.5a	Direct and indirect employment					cc
6.5b	Wage rates and injury rates					dd

Table 7.11: Quality of data coverage, currency, frequency and capacity to report trends, and overall change since SOFR 2008, for each indicator addressed by SOFR 2013 continued

Indicator				Data quality		
		Data coverage	Data currency	Data update frequency	Capacity to report trend	Change in data quality since SOFR 2008
6.5c	Resilience of forest dependent communities					7
6.5d	Resilience of forest dependent Indigenous communities					7
Criterion 7	7: Legal, institutional and economic framework for forest conse	rvation and sus	stainable mana	igement		
7.1a	Legal framework					—
7.1b	Institutional framework					7
7.1c	Economic framework					7 ee
7.1d	Capacity to measure and monitor					_
7.1e	Capacity to conduct and apply research and development					_

Key:

Rating	Data coverage	Data currency	Data update frequency	Capacity to report trend
	Whole country assessed	Current data (data since 2006)	Annual to five-yearly	Capacity to report trends across all or most tenures
	Incomplete national data	Mixed current and historical data	Less frequently than five-yearly	Partial capacity
	No data; case studies only	Historical data (pre-2006 data only)	Occasional or once only	No capacity
7	Overall data quality has improved since S	OFR 2008		
Ľ	Overall data quality has declined since SC	DFR 2008		

Overall data quality is unchanged since SOFR 2008

^a 1.1a has been split in order to separately report data status/quality for forest type and tenure.

- ^b Some states and territories are developing datasets and systems that will be updated more frequently (e.g. annually).
- c Although overall data quality is unchanged, estimation of the extent of Australia's forest cover is more robust because of the 'Multiple Lines of Evidence' approach (Indicator 1.1a) used for SOFR 2013, which uses and validates multiple datasets and gives increased confidence in the estimate.
- ^d 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.
- e Reflects improvements in data on tenure of private forest reserves.
- f Fragmentation metrics derived from National Carbon Accounting System data for SOFR 2008 were not recalculated for SOFR 2013.
- ^g Reflects significant improvement in capacity to report vertebrate fauna and vascular plants.
- ^h Reflects significant improvement in capacity to report listed invertebrate and non-vascular plants.
- ⁱ Variable across states and territories. Very good in Tasmania and Western Australia.
- ^j Data remain patchy across species and jurisdictions, but are improving over time for targeted threatened species.
- ^k Publication of Status of Australia's Forest Genetic Resources (Singh et al. 2013) made a broader range of data available for SOFR 2013.
- ¹ Capacity to report on private forests is still limited.
- ^m Capacity to report on private forests is still limited.
- Capacity to report on private native forests is limited.
- Reflects a wider availability of data through published sources and consultation.
- P Complete MODIS data (500-metre resolution) provide coarse coverage only.
- 9 SOFR 2008 used MODIS thermal anomalies at 1000-metre resolution, whereas SOFR 2013 uses MODIS burnt area bands of 500-metre resolution.
- The overall quality of data remains the same as SOFR 2008, although the ratings for data coverage, currency and frequency more accurately reflect data quality.
- ^s Data are collected from some sites in multiple-use forest and nature conservation reserves more frequently than annually as part of regular monitoring programs.
- t Data in SOFR 2013 and SOFR 2008 were sourced from Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) Australian Forest and Wood Products Statistics, which is released twice yearly.
- ^u Very limited capacity to report trend.
- v Data are for 2006 only, but for all of Australia.
- » Data are current (2006 onwards) but not updated periodically. Ability to identify trends is limited.
- * Data in SOFR 2013 and SOFR 2008 were sourced from ABARES Australian Forest and Wood Products Statistics, which is released twice yearly.
- ^y Data for this indicator use information from regular reports from the Food and Agriculture Organization of the United Nations, the Australian Bureau of Statistics (ABS) and ABARES. These information sources were not used in SOFR 2008, which primarily used research reports that were not part of a series.

^z Data are sourced from financial reports published by state government agencies, ABS and ABARES (Australian Forest and Wood Products Statistics), which are updated regularly and at the national scale. Numerical data provided in SOFR 2013 were not published in SOFR 2008.

- ^{aa} Information is current (2006 onwards) and at the national scale. Most data are updated regularly (within five years). It is possible to identify trends, although some series are not continuous. A similar approach was used for SOFR 2008.
- ^{bb} Data coverage is limited to public tenures where data are collected (and publicly available), and data collection is declining.
- cc Data are sourced from the ABS Census, which is undertaken every five years at the national scale. The latest ABS Census information is for 2011. Trend analysis is possible (in five-yearly periods). A similar approach was used for SOFR 2008.
- d Data are from the ABS and Safe Work Australia. The data are at the national scale and updated regularly (within five years). A similar approach was used for SOFR 2008.
- ^{ee} Indicator uses information from Australia State of the Environment 2011, which provided an assessment for forestry. This information was not used for SOFR 2008. Other information is used in a similar way to SOFR 2008.

Gaps in SOFR 2013 data

There remain a number of ongoing national gaps in the data compiled for SOFR 2013. These include:

- Australia does not have a national sample-based forest monitoring system, such as a Continental Forest Monitoring Framework (Wood et al. 2006), to act as a nationally consistent system to underpin reporting across a number of indicators of forest condition
- few of the national reporting indicators can be measured directly, and the availability, coverage and currency of data vary considerably. Some data are collected nationally, and other data are provided by states and territories
- quantitative information is not equally available across environmental, economic and social indicators
- native forest growth-stage data are not collected routinely by state and territory jurisdictions
- nationally meaningful data on forest fragmentation and on soil and water parameters are deficient
- there are gaps in regard to species lists for invertebrate fauna, fungi, lichens, algae or micro-organisms in forests and the overall understanding of their key roles in ecological processes
- · data on the use of forests for tourism and recreation are patchy
- information on the production, consumption and trade of non-wood forest products is difficult to obtain
- data are lacking on the management performance of the Comprehensive, Adequate and Representative (CAR) reserve system against conservation values, and on the condition of protected areas in the National Reserve System.

Data variation across tenures and jurisdictions

The ability to measure, monitor and report on forests varies considerably by tenure. The most reliable and comprehensive information across a range of parameters continues to be available for plantations, and for native forests in multiple-use public forestss and a few nature conservation reserves; data are more limited for native forests in other tenure categories, including many nature conservation reserves and, especially, in leasehold and private forests.

In the preparation of SOFR 2013, data were received from New South Wales, the Northern Territory, South Australia, Tasmania and Victoria for all indicators for which state and territory data were relevant, although these data were of variable quality; data were received for only some indicators from the Australian Capital Territory, Queensland and Western Australia, with these data again being of variable quality. For other indicators, national-level data were used from national government departments or organisations, including ABARES (biophysical, production and socioeconomic data); the Australian Bureau of Statistics (socioeconomic data); the Australian Government Department of Climate Change and Energy Efficiency (carbon data); the Australian Government Department of Industry, Innovation, Science, Research and Tertiary Education (socio-economic data); the Australian Government Department of

Sustainability, Environment, Water, Population and Communities (DSEWPaC) (biodiversity and conservation data); Forests and Wood Products Australia (socio-economic data); and ForestWorks (socio-economic data).

Other national reporting relevant to forests

In addition to Australia's five-yearly SOFR, regular national reports that include updated information on Australia's forested environments include the five-yearly SoE report (State of the Environment 2011 Committee 2011), and the annual state of the parks report (Director of National Parks 2011) (for Australian Government–managed national parks).

The purpose of national SoE reporting is to capture and present key information on the state of the Australian environment, and provide an overall assessment of the outlook for the environment. Examples of issues faced in SoE reporting that also are faced in SOFR reporting include the following:

- Assessing the state of Australia's environment is inherently difficult. Australia is a big country, with a wide variety of ecosystems and heritage. There are many unconnected means by which we (Australia) gather and store information on our environment, and accessing this information at a national scale is tremendously complicated and not always possible.
- The difficulties we face with a national SoE report in terms of inadequate data are in part a symptom of a lack of national coordination. Australia is a federation with nine major jurisdictions and hundreds of local authorities, plus thousands of individual government departments and nongovernment organisations.

(State of the Environment 2011 Committee 2011)

The annual state of the parks reports present systematic and consistent background information on each Commonwealth reserve proclaimed under the *Environment Protection and Biodiversity Conservation Act 1999*. The report includes information on the major monitoring efforts for the year in each reserve.

Australia's National Carbon Accounting System (NCAS; now known as the National Greenhouse Gas Inventory) also provides for the regular measurement and monitoring of Australia's forests. The focus is on measuring and monitoring changes in carbon stocks, emissions and sequestration across the landscape, including detecting changes in forest carbon stocks. Indicator 5.1a gives more information about the NCAS 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. SOFR is Australia's reporting mechanism to the Montreal Process. Global Forest Resources Assessments (GFRAs) are 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. The FAO also prepares *State of the World's Forests* reports on the status of forests and key issues concerning the forest sector. SOFR is the primary source of data for Australia's country report used in GFRA and *State of the World's Forests* reports. The FAO was also scheduled to prepare a *Status of the World's Forest Genetic Resources* report in 2013 using national reports, including *Status of Australia's Forest Genetic Resources* (Singh et al. 2013).

The Montreal Process, the International Tropical Timber Organization, Forest Europe, the FAO and the Observatory for the Forests of Central Africa have developed a new Collaborative Forest Resources Questionnaire that better aligns global data collection schedules and requirements for reporting on forests through GFRAs with data collected, monitored and reported within international C&I processes such as the Montreal Process.¹⁷⁷

SOFR data are also used to report to the United Nations Convention on Biological Diversity and other international agencies. NCAS data are used for reporting carbon-related forest information, including data on forest change, to the United Nations Framework Convention on Climate Change, including for its Kyoto Protocol.

Effectiveness of monitoring the national forest reserve system

The National Reserve System (NRS) represents the collective efforts of Australian governments and non-government 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 the forest component of the NRS is reported in Indicator 1.1c across all tenure categories.

Australia's strategy for the NRS has national targets for a comprehensive, adequate and representative (CAR) system that meets regional, national and international goals. It 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 (NRMMC 2009). 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. To monitor the currency and development of the NRS, 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 therefore helps Australia to meet international obligations and goals under the United Nations Convention on Biological Diversity, including for implemented management plans and management effectiveness assessments; these are to be incorporated into a global database maintained by the World Conservation Monitoring Centre¹⁷⁸ as part of the United Nations Environment Programme.¹⁷⁹

Leverington et al. (2010) reported that 10–30% of Australia's protected areas had been assessed for management effectiveness (primarily in New South Wales, Queensland and Victoria), comprising 30–50% of the area of protected areas nationally. Australia overall was judged at a basic standard of effective management—a significant reason for this rating was the status of management plans, and an inability to monitor and report on protected area values, objectives and management outcomes.

Nationally, 14.8 million hectares of forest in the NRS has management plans in place, which is 56% of the area of forest in the NRS; 30% is covered by transitional management arrangements; and the remaining 14% has no management planning documentation (Table 7.12). More than 75% of the area of forest in the NRS in the Australian Capital Territory, the Northern Territory, Tasmania and Victoria is managed under an existing management plan. The majority of forest area in the NRS in Queensland and South Australia is not covered by existing management plans as 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 7.12).

Monitoring for a range of conservation values and objectives in public forests in the NRS in Victoria has commenced through the VFMP. In New South Wales, monitoring has commenced through a state of parks assessment system (Hockings et al. 2009). Nationally, however, information is deficient or unavailable on the management performance against values of the CAR reserve system and on the condition of protected areas in the NRS.

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¹⁷⁷ See www.un.org/esa/forests/pdf/national_reports/unff10/ Montreal%20Process.pdf.

¹⁷⁸ 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.

¹⁷⁹ See Parties to the Convention on Biological Diversity COP 10 Decision X/31, <u>https://www.cbd.int/decision/cop/default.shtml?id=12297</u>.

Table	7.12	: Status o	f manaaement	plans covering	forests in	the National	Reserve System

	Proportion of area of forest in National Reserve System with management plans of given status (%)								
Status	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Australia
None	5	10	0	33	30	1	11	2	14
Transitional	0	22	16	55	34	22	0	37	30
Exists	95	68	84	12	36	77	89	61	56

None = no form of management documentation identified in the Collaborative Australian Protected Area Database (CAPAD).

Transitional = planning documentation identified in CAPAD is in preparation or in draft, or intent is documented, or old plans exist that require updating. Exists = planning documentation identified in CAPAD is in statutes or plans formally adopted after consultation, with strategies and implementation actions. Forest areas in the National Reserve System are given in Table 1.23.

Source: Australian Government Department of Sustainability, Environment, Water, Population and Communities (CAPAD 2010), including data updated for Qld and the ACT; forest area data from the National Forest Inventory.

Forest condition

The Montreal Process¹⁸⁰ underpinned development of the 7 criteria and 44 indicators of sustainable forest management against which the state of Australia's forests is reported every five years. This process 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.

Other forest indicator frameworks have been created with different rationales and for other purposes. An example of a framework that has been developed specifically to track change in vegetation condition over time, and can be applied to forests, is the Vegetation Assets States and Transitions (VAST¹⁸¹) framework. This framework scores various indicators at a site of interest, then combines the individual indicator scores into scores for species composition, vegetation structure and regenerative capacity. Aggregated scores for each of these three groups can then be plotted against a time series of natural and management events that may have affected vegetation condition (see Case study 7.4). The VAST framework is increasingly used by managers at the site level to understand the historical basis of current forest condition and the nature of resilience in forest ecosystems, and to obtain insights into future management options.



Image taken during a field survey of native vegetation condition near Darwin, Northern Territory.

¹⁸⁰ www.montrealprocess.org.

¹⁸¹ http://data.daff.gov.au/brs/brsShop/data/vast_report.pdf.

Case study 7.4: Tracking change and trend in native forest condition

The condition of native vegetation communities reflects the effects of contemporary and (to a lesser extent) historical land management practices, and can be assessed using plant species affected by management practices. However, tracking vegetation transitions gives different information from mapping vegetation states: it provides decision makers with information on changes and trends in the resource base due to environmental and anthropogenic changes, allows land managers to monitor the outcomes of management interventions, and indicates to all stakeholders the link between forest use and management and observed changes in forest condition over time.

The Vegetation Assets States and Transitions framework assesses the effects of site forest management practices using reference sites that are assumed to have had homogeneous plant communities before European influence. Scores for species composition, community structure and regenerative capacity for each site are calculated for different time periods. The scores are weighted 20:30:50 to reflect their relative importance in maintaining resilience and integrity of plant communities, and summed to give a total vegetation transformation index (expressed as a percentage). The index is put into one of five score classes: Unmodified (80–100%), Modified (60–80%), Transformed (40–60%), Replaced/Adventive (20–40%) and Replaced/Managed (0–20%). The timeline of changes in the plant community at a site is then set alongside historical and contemporary records, and relationships are established via a set of ecological attributes.

This approach provides a format for systematic assemblage and correlation of historical and environmental records across a range of Australian vegetation types. The resulting insight into the origins of the current status of sites can then be used to inform decision making about restoration and regeneration.

The changes plotted in Figure 7.5 for spotted gum (*Corymbia maculata*) forest in South Brooman State Forest, New South Wales, and in Figure 7.6 for Cumberland State Forest, New South Wales, provide examples of the insight that can be gained at the site level using this approach.



Figure 7.5: Changes in spotted gum forest, South Brooman State Forest, Batemans Bay, New South Wales

Key management practices: A = Indigenous management; B = site picked over for high-quality sawlogs, fire suppressed and/or excluded; C = site again picked over for high-quality sawlogs; D = sawlogs harvested over 85% of site, removing 50% of canopy; E = site rehabilitated naturally; F = wildfire burnt 100% of site; G = site rehabilitated naturally

Source: http://aceas.org.au/portal Vegetation Transformation Study Sites.

continued overleaf





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

- Changes in research and development (R&D) capacity since 2007 have occurred at the national, state and territory levels of government and within academic institutions. Generally, numbers of staff engaged in R&D activities have fallen over the reporting period.
- One of the notable changes since 2007 has been the increase in R&D relating to climate change, some of which is directly relevant to forests. However, the level of other forest-related R&D has fallen.
- As an indication of Australia's forest R&D capacity, about 635 researchers and technicians were involved in forestry and forest products R&D in 2007–08. That number has declined since then—a recent sector-wide survey estimates the number to be 396 in 2011, with the decline occurring across the public and private sectors, including CSIRO and universities.
- Changes in funding and delivery models by the Australian Government reduced forest R&D capacity across a number of national organisations, including several for which government funding or support ceased. Some of these organisations were being replaced under new funding arrangements.
- Changes in funding and delivery models by state and territory governments generally reduced forest R&D capacity in their forest management agencies.

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 standing wood inventories, forest management, the silviculture of harvested 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.

'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 surveys and reporting periods. For both types of research, estimates include contributions from both public and private sources.

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 CSIRO and academic institutions. Many of these changes reflect either general changes in overall government priorities or specific changes in government priorities for scientific R&D. For example, there has been an increase in R&D relating to climate change, some of which is directly relevant to forests.

National-level forest research and development capacity

Over the period 2006 to 2011, 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 Research Priorities and Co-ordination Committee; and the Forest and Wood Products Research, Development and Extension Forum
- the Commonwealth Scientific and Industrial Research Organisation
- Forest and Wood Products Australia
- the Cooperative Research Centre for Forestry
- the Bushfire Cooperative Research Centre
- the Terrestrial Ecosystem Research Network
- the Australian Bureau of Agricultural and Resource Economics and Sciences
- the Rural Industries Research and Development Corporation
- Land & Water Australia.

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, along with the changes in their R&D capacity since 2007.

Research Priorities and Co-ordination Committee, and Forest and Wood Products Research, Development and Extension Forum

Until June 2011, the Research Priorities and Coordination Committee (RPCC) played a role in coordinating forest research conducted by the state, territory and Australian governments-for example, by producing a strategic research directions document (Forestry and Forest Products Committee 2008). The RPCC reported to the Forestry and Forest Products Committee (see Indicator 7.1b), advising the committee on research-related issues, research needs and technology transfer relevant to maximising forest productivity and to managing a range of forest values within the context of sustainable forest management. The RPCC played a research coordination role, rather than a research planning or research policy role (FWPA 2010b). The RPCC also managed a number of research working groups comprising key researchers drawn from government agencies, universities and other nongovernment research providers. Reforms to the ministerial council system were announced by the Council of Australian Governments in February 2011, and the formal role of the RPCC in forest research coordination ended in June 2011.

This change coincided with the proposal to establish a national-level Forest and Wood Products Research, Development and Extension Forum (FWP RD&E Forum). The Forum was proposed under the RD&E Strategy for the Forest and Wood Products Sector, part of the National Primary Industries RD&E Framework developed under the Primary Industries Ministerial Council, with the roles of improving research coordination and identifying overall research priorities and more collaborative research structures (FWPA 2010b). Among other things, it was planned that the FWP RD&E Forum would 'monitor and work to maintain forest and wood products sector research, development and extension (RD&E) capability, including by defining the research capability needed in the sector and developing mechanisms to deliver this' (FWPA 2010b). It was also planned that the FWP RD&E Forum, once established, would comprise funding bodies, research providers, and users of RD&E in the forest and wood products sector.

Commonwealth Scientific and Industrial Research Organisation

The Commonwealth Scientific and Industrial Research Organisation (CSIRO) is Australia's national science research agency. CSIRO maintains forest research capacity to support national and international priorities, including sustainable production of wood fibre, reducing greenhouse gas emissions and energy use, adapting forest management to climate change, addressing degradation of natural resources, conserving biodiversity, and water security. It performs forest and forest products research for the entire forestry value chain. Since 2007, CSIRO has restructured its operations in response to budget pressures, resulting in a reduction in the number of forest research positions (FWPA 2010a). The work of the previous Forest Biosciences division (and of the previous Forestry and Forest Products division) is now spread across a number of other research divisions.

Since the restructure, forest research programs at CSIRO have mostly been delivered under the Sustainable Agriculture Flagship, which aims to secure Australian agricultural and forest industries by increasing productivity and reducing the intensity of carbon emissions. CSIRO also undertakes forest research under the Climate Adaptation Flagship, which aims to equip Australia with practical and effective adaptation options to respond to climate change and climate variability. 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) Ltd was declared Australia's industry-owned forest R&D company in August 2007 under the *Forestry Marketing and Research and Development Services Act 2007.* FWPA replaced the Forest and Wood Products Research and Development Corporation (FWPRDC), which had been established in 1994 as a statutory authority under the *Primary Industries and Energy Research and Development Act 1989.*

FWPA was established as a not-for-profit company, jointly funded by the forest and wood products sector (through levies) and the Australian Government. The company invests in R&D projects relevant to the Australian forest and wood products sector, and undertakes promotional and marketing activities for the sector. FWPA invests in and coordinates R&D to improve industry productivity and competitiveness, inform industry's climate change response, increase investment, increase forest usage, and ensure that the sustainability of forests, wood products and services are effectively communicated (FWPA 2011). Research in wood product manufacturing aims to identify new products and methods for processed forest products (excluding pulp, paper and cardboard)—for example, new applications for timber in construction, new timber treatments and new export markets. FWPA also aims to grow industry's capacity and capability through effective technology transfer, and education activities that support the industry and its products.

Forest research areas funded by FWPA have included growth and yield modelling, wood quality, forest health management, silviculture, water use, soil quality, plant disease, tree genetics, tree breeding and resource evaluation. Broader issues that have been addressed under FWPA research funding include forest management strategies for climate change and maximising the greenhouse advantages of forest products.

Cooperative Research Centre for Forestry

The Cooperative Research Centre (CRC) for Forestry has been an Australia-wide joint venture supported by the forest industry, research organisations, state agencies and the Australian Government. It is being succeeded by the National Centre for Future Forest Industries, based at the University of Tasmania in Hobart.

The mission of the CRC for Forestry was to support a sustainable and vibrant Australian forest industry through research, education, communication and collaboration. The CRC's research 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.

Case study 7.5 summarises the research outputs of the CRC for Forestry.



One of the four CRC for Forestry research programs was Harvesting and Operations.

Bushfire Cooperative Research Centre

In Australia, bushfires often affect forests and the communities associated with them.

The Bushfire CRC conducts research that builds a better understanding of the complex and interacting social, economic and environmental aspects of bushfires. Its overall objective is to improve the management of bushfire risk to the community and to firefighters, in an economically and ecologically sustainable way. It also aims to provide a research framework that improves the effectiveness of bushfire management agencies, including forest management agencies.

Following the Black Saturday bushfires of February 2009 in Victoria, the Australian Government granted the Bushfire 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 new research builds 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 new research focuses 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 CRC has a strategy of integrating research into the areas where it will be used and so maximising research impact. The strategy also aims to build on successful partnerships with industry, while seeking to engage with other identified groups.

Terrestrial Ecosystem Research Network

The Terrestrial Ecosystem Research Network (TERN) was created in 2009 as an overarching and integrated network to service ecosystem research in Australia. It was established by the Australian Government Department of Innovation, Industry, Science and Research through the National Collaborative Research Infrastructure Strategy, and the Queensland Government. TERN builds on significant past research on understanding Australian ecosystems, including forests, by focusing on collating, calibrating, validating and standardising existing datasets. TERN also funds new research infrastructure and collection systems, expands observation and monitoring programs into unrepresented ecosystems, and builds digital infrastructure to store and publish this information in a form that can be searched and accessed freely under licences that acknowledge the data provider(s).

TERN is designed to connect ecosystem scientists, enabling them to collect, contribute, store, share and integrate data across relevant disciplines. Collectively, this increases the capacity of the Australian ecosystem science community to advance science and contribute to effective management and sustainable use of ecosystems. TERN operates as a network of nine facilities that each contribute to achieving TERN's goals. The facilities are run in partnership with a range of research institutions and government agencies. It is intended that TERN's legacy is a sustainable long-term ecosystem research network for Australia, with shared access to research data for improved understanding and management of ecosystems (TERN 2012).

Case study 7.5: Outputs from the CRC for Forestry

The Cooperative Research Centre (CRC) for Forestry^a operated from 2005 to 2013, following the previous CRC for Temperate Hardwood Forestry (1991-97) and the CRC for Sustainable Production Forestry (1997-2005). Research outputs from the forestry CRCs supported the Australian forest industry through a time of transition, during which the size of the Australian plantation estate doubled to 2 million hectares, almost entirely through establishment of hardwood plantations funded by private-sector investment. This rapid expansion of the plantation estate and the consequent future increased harvest of wood from this source required research on improved risk management, wood quality, harvesting and supply-chain efficiency. Over the same period, an array of environmental services, such as biodiversity conservation, carbon sequestration and improved water quality, grew in significance and public profile; this led to a need for research on integration of the provision of environmental services into production forest estates.

Important CRC innovations include:

- a portable near-infrared (NIR) scanner that predicts cheaply and accurately the internal wood properties of a tree, including cellulose content and pulp yield, and thus its commercial value
- the FastTRUCK software system for optimising forest transport and log-production operations, which can significantly reduce industry transport costs
- a guide for selection of on-board computer systems that increase machine efficiency during harvesting operations
- an Industry Pest Management Group that provided technical support, ran collaborative workshops for information exchange, and disseminated baseline plantation health data and advice on alternative pest management methods
- the Blue-gum Productivity Optimisation System, a web-based decision-support system driven by *Eucalyptus globulus* growth and nutrition models, which helps plantation managers assess potential plantation performance across different market conditions, climates and site characteristics
- improvements in operations and coupe design for variable retention silviculture in wet eucalypt forests, maximising biodiversity benefits without compromising the productivity of the regenerating forest
- applications that extract informative datasets, such as tree height, from the large stream of information collected by LiDAR remote sensing ; these applications have resulted in major changes to inventory, mapping and planning of forest operations (see Case study 7.6)



Eucalypt flowers. Detailed knowledge of the pollination biology and breeding systems of eucalypts underpinned development of tree improvement programs in the CRC for Forestry.

- a handbook of practical guidance for forest managers on undertaking successful and effective community engagement—an important part of cultivating the best possible relationships with the communities in which forestry companies operate
- a remote-sensing product that uses weekly or fortnightly data acquired from the MODIS satellite to detect changes in forest condition and monitor forest health at reduced cost
- protocols for assessing and monitoring the genetic risk to native forest of pollen flow from nearby plantations, based on groundbreaking research into the genetic consequences of large-scale commercial forestry
- establishment of a world-leading tree breeding program for *Eucalyptus globulus*, with solid analytical techniques and economic objectives, ensuring that genetic gains are rapidly and efficiently transferred to the expanding plantation estate
- new silvicultural options for producing eucalypt sawlogs in plantations, through control of initial stand density, pruning, thinning and fertilising, and based on a thorough understanding of the physiology of tree growth and development.

More than 170 research students have graduated from CRC-supported PhD and Masters by Research programs since 1991. The series of forestry CRCs have thereby also shaped the long-term human resource capacity of the forestry sector for future innovation.

<u>www.crcforestry.com.au</u>.
Source: Adapted from CRC for Forestry (2012).

Australian Bureau of Agricultural and Resource Economics and Sciences

In 2010, two of Australia's national research agencies—the Australian Bureau of Agricultural and Resource Economics (ABARE) and the Bureau of Rural Sciences (BRS)—merged to form the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) within the Australian Government Department of Agriculture, Fisheries and Forestry (DAFF)¹⁸². ABARES was formed to provide integrated economic and scientific research previously carried out separately by ABARE and BRS for strategic policy development.

ABARES role in delivering integrated economic, social and scientific forest research for policy development also contributes to R&D aimed at improving forest management and the 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 other nationally relevant research on Australia's forests.

Rural Industries Research and Development Corporation

The Rural Industries Research and Development Corporation (RIRDC) is a statutory authority established under the *Primary Industries and Energy Research and Development Act 1989.* It was one of 15 rural research and development corporations established by the Australian Government in 1990. The RIRDC was established to work with industry to invest in R&D for a more profitable, sustainable and dynamic rural sector. Through its five-year corporate plans, the RIRDC aligns its investment in R&D with the Australian Government's rural research priorities. Under its Corporate Plan 2007–12 (RIRDC 2007c), the RIRDC was involved in R&D that addressed natural resource management and sustainability issues of national importance. It invested in a range of research areas, including agroforestry systems and the impact of climate change and variability, with topics such as:

- bioenergy in forest industries
- the productivity of oil mallee agroforestry systems
- the bio-economic potential for agroforestry in northern cattle grazing
- agroforestry feedstocks for biofuels and bioenergy to mitigate and adapt to climate change.

Much of this research was coordinated by the RIRDC through the Joint Venture Agroforestry Program when Agroforestry and Farm Forestry were listed by the RIRDC as 'National Rural Issues'. RIRDC investment in agroforestryrelated research decreased significantly after the reporting period for *Australia's State of the Forests Report 2013*.

Land & Water Australia

Land & Water Australia (LWA) was also established by the Australian Government in 1990 (as the Land and Water Research and Development Corporation) under the same legislation as the RIRDC. LWA was the only research and development corporation to focus on 'public good sustainability' (LWA 2009). Under its unique charter, LWA invested in generating and managing new knowledge, with the aim of achieving the sustainable management and use of Australia's natural land and water resources, including forests. It developed an integrated portfolio of research investments focused on productivity growth balanced with sustainability, working in partnerships with industry, universities and CSIRO. It also acted as a leading research broker, organising collaborative R&D programs. LWA's operations ended on 30 June 2009 when government funding ceased.

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. Longterm 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 reporting period. 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 agriculture).

One of the LTERN sites is an LTER site dedicated to native forest research at Warra in southern Tasmania (see Case study 1.8, and <u>www.warra.com</u>). The Warra LTER site was established in 1995 to facilitate understanding of the ecological processes of Tasmania's wet eucalypt forests. The site contains both working forests and conservation reserves, 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. Warra is also a member of the Australian Supersites Network, another part of the TERN infrastructure. The network comprises a number of 'Supersites' located across the country, each representative of a different ecosystem type.

¹⁸² From September 2013, the Department of Agriculture.

Other nationally coordinated research

Over the period 2006–2011, the Australian Government has directly supported measures that contributed to boosting Australia's capacity to conduct and apply forest R&D. These measures were focused on climate change and the forest industry, and included:

- the National Climate Change and Commercial Forestry Action Plan 2009–12 developed by the Primary Industries Ministerial Council
- the Forest Industries Climate Change Research Fund.

The National Climate Change and Commercial Forestry Action Plan 2009–12 responded to climate change through adaptation and mitigation, underpinned by R&D and communication. This plan guided action by the forest industry with the support of the state, territory and Australian governments. Covering forests intended for commercial production (representing 12% of Australia's forest cover), the plan identified knowledge gaps and proposed actions to assist the forest industry to respond to climate change, including developing practical strategies and actions to manage the risks and to take advantage of opportunities brought about by climate change.

The Forest Industries Climate Change Research Fund funded 24 climate change–related research projects. The outcomes from these projects have helped the forestry and forest products industries to better understand the implications of climate change and to build capacity in the areas of adaptation, mitigation, bioenergy, and inventory and data collection.

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 2007–08 (Turner and Lambert 2011). The definitions of 'Forestry R&D' and 'Forest Products' R&D used by Turner and Lambert are detailed in Indicator 6.2a.

Turner and Lambert calculated that there were about 635 researchers and technicians involved in forestry and forest products R&D in 2007–08, together with additional support staff and external contractors. This represented steady declines since about 1990 in the Commonwealth and state sectors, not fully compensated by increases in the university and private sectors. These increases in university and private sector research capacity were due to more organisations reporting research, rather than an expansion of any particular research group.

The number of researchers and technicians involved in forestry and forest products R&D is likely to have declined further since 2007–08; the most recent of this series of sectorwide surveys (currently unpublished) estimates the number of researchers and technicians to have declined to 396 in 2011 (J Turner and M Lambert, pers. comm., 2012). The continued decline has occurred across the public and private sectors, including CSIRO.

The expertise of each researcher was not recorded for these surveys, but discussions with employing organisations indicated that there has been a decline in some areas of research (for example, forest health, silviculture and forest hydrology) compared with others. The overall reduction in research capacity presents a risk for industry, especially when capacity in key areas is greatly diminished. Table 7.13

Table 7.13: Full-time-equivalent employees engaged in forest-related research and development in Australia

Organisation category	1985	2008	2011
CSIRO			
Scientists	145	75	38
Technical staff	132	81	39
States			
Scientists	180	117	77
Technical staff	206	109	71
Private companies			
Scientists	6	59	30
Technical staff	3	57	30
Universities			
Scientists	11	90	72
Technical staff	10	47	39
Total			
Scientists	342	341	217
Technical staff	351	294	179
Total of all scientists and technical staff	693	635	396

^a Excludes postgraduates.

Source: Turner and Lambert (2011), J Turner and M Lambert, pers. comm. 2012.

summarises the data on forestry and forest product research capacity for the various categories of R&D organisation, as compiled in these surveys from 1985 to 2011 (estimates of researcher numbers do not take into account changes in facilities and infrastructure).

University-based forest research capacity

Capacity for forest research is maintained at a small number of Australia's universities. The general framework for forest research at Australia's universities is based on research programs in Honours degrees (one year), Masters degrees (two years) and Doctorates of Philosophy (PhDs) (generally three or more years). These programs are supervised by qualified experts who direct and contribute to the delivery of high-quality, peer-reviewed research outcomes that add to the scientific understanding of Australia's forests needed to underpin sustainable forest management. Much of the development of assessment methodologies contributing to our scientific understanding of Australia's forests occurs in universities. Many of these academic institutions contribute to the forest research programs (discussed above) established under the research agencies funded by the Australian Government, as well as research agencies funded by state and territory governments (discussed below).

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 management and conservation. Changes in their capacity to conduct and apply forest R&D have occurred in the five years since SOFR 2008, largely as a result of changes in government priorities and funding. Much of the forest research effort is conducted in collaboration with other organisations, including national organisations such as CSIRO and CRCs, as well as universities.

Limited information is available on forest research capacity in individual states and territories. Some information is presented below for the Australian Capital Territory, New South Wales, South Australia, Tasmania, Victoria and Western Australia.

Australian Capital Territory

The Conservation, Planning and Research section of the Environment and Sustainable Development Directorate of the Australian Capital Territory Government supports forest management and facilitates research on forested areas. 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.

New South Wales

Forest R&D by government agencies in New South Wales is undertaken by Forests NSW (the state's manager of publicly owned production forests)¹⁸³, by the Department of Primary Industries and through collaborative research arrangements. New South Wales forest R&D has focused on resource development, sustainability and the enhancement of the environment within the state. Priority fields of research have been those that add value to planted forests, commercial services and native forest businesses in New South Wales.

The number of full-time-equivalent (FTE) positions in forestrelated R&D at Forests NSW decreased from 36 in 2006–07 to 25 in 2010–11 (Table 7.14), indicating an overall decline in research capacity, as well as changes in research priority. Decreases in capacity occurred across a number of research areas, including silviculture and agroforestry. The decrease in staff numbers in tree breeding, timber use, fire behaviour and fire ecology meant that direct capacity for research in those areas no longer remained in 2010–11. However, increases in FTE position numbers occurred in forest pathology (from 2 to 3 positions) and climate change (from 1 to 3 positions), and there were several areas in which the number of FTE positions did not change.

Table 7.14: Full-time-equivalent employees engaged in forestrelated research and development in Forests NSW

Research area	Number of FTE employees			
	2006-07	2010–11		
Silvicultural research	3	1		
Tree breeding (not horticultural)	3	0		
Forest hydrology	1	1		
Timber use	3	0		
Fire behaviour	1	0		
Forest pathology	2	3		
Agroforestry	7	3		
Fauna ecology	8	8		
Fire ecology	1	0		
Forest entomology	3	3		
Flora ecology	1	1		
Non-timber forest products	1	1		
Climate change	1	3		
Statistical analysis	1	1		
Total	36	25		

FTE = full-time-equivalent

Note: Data are for plantation and native forest R&D combined. Source: Forests NSW.

¹⁸³ From January 2013, the Forestry Corporation of NSW.

South Australia

Forest R&D in South Australia is focused on outcomes relating to plantation forestry, climate change and the environment. Primary Industries and Resources South Australia (PIRSA)184 Forestry supports targeted research, which provides information to guide both policy development and forest and forest ecosystem management. For example, with funding provided by PIRSA Forestry, ForestrySA commissioned CSIRO to undertake research into the consequences of predicted climate change on plantation forestry in South Australia. This led to publication of Climate Change and South Australia's Plantations: Impacts, Risks and Options for Adaptation (Pinkard and Bruce 2011). The report provides recommendations for climate change adaptations, and covers many aspects of forest establishment and management in South Australia. PIRSA Forestry and ForestrySA also collaborate with other agencies to undertake research into crosscutting issues, such as management of Phytophthora cinnamomi.

Table 7.15 presents the number of FTE employees engaged in forest-related R&D for ForestrySA for 2006–07 and 2010–11. Research capacity for plantation forests has been stable over this time. ForestrySA's capacity for R&D in native forests is limited—this reflects ForestrySA's plantation focus and South Australia's *Native Vegetation Act 1991*, which strongly constrains the harvesting and clearing of native vegetation in South Australia.

Table 7.15: Full-time-equivalent employees engaged in forest-related research and development in ForestrySA

Research area	Number of FTE employees					
	Planta	itions	Native forest			
	2006–07	2006–07 2010–11		2010–11		
Silvicultural research	13.0	13.0	0	0		
Tree breeding (not horticultural)	0.5	0.5	0	0		
Forest hydrology	0.5	0.5	0	0		
Timber use	0.5	0.5	0	0		
Fire behaviour	0.25	0.25	0	0		
Forest pathology	0.25	0.25	0	0		
Agroforestry	0.25	0	0	0		
Fauna ecology	0	0	0.4	0.4		
Fire ecology	0.25	0.25	0	0		
Forest entomology	0.2	0.2	0	0		
Flora ecology	0	0	0.4	0.4		
Climate change	0.25	0.25	0	0		
Statistical analysis	0.1	0.1	0	0		
Total	16.05	15.8	0.8	0.8		

FTE = full-time-equivalent Source: ForestrySA.

¹⁸⁴ From October 2011, Primary Industries and Regions South Australia.

Tasmania

Forest R&D capacity in Tasmania declined between 2005–06 and 2010–11 (Table 7.16). Large reductions in FTE research positions occurred in the public and private sectors, while the academic sector experienced a slight increase in forest R&D capacity.

State government agencies performing forest R&D in Tasmania include the Department of Primary Industries, Parks, Water and Environment (DPIPWE), the Forest Practices Authority and Forestry Tasmania. Forestry Tasmania's Division of Forest Research and Development undertakes research into native forest silviculture, plantation silviculture, biology and conservation. Together with the Parks and Wildlife Service of DPIPWE, the division also manages the Warra LTER site in southern Tasmania. At least one-third of Forestry Tasmania's research expenditure is devoted to development and extension work involved in the strategic or operational uptake of research. The Forest Practices Authority employs scientists who undertake forest monitoring and research programs in areas related to archaeology, botany, geomorphology, soils science, visual landscape and zoology, as well as contributing to the scientific knowledge underpinning the Tasmanian Forest Practices Code 2000 and associated specialist manuals (FPA 2012).

Much of Tasmania's forest-related research effort over the reporting period occurred through the CRC for Forestry (FPA 2012). Academic forest research in Tasmania included collaborations with CRCs (principally the CRC for Forestry, but also the Bushfire CRC), CSIRO and the University of Tasmania. However, the number of researchers employed in private companies decreased, partly as a result of outsourcing to CRCs and other external research providers (FPA 2012).

The majority of Tasmanian forest researchers worked in flora and fauna ecology, and silviculture (Table 7.17). The greatest reductions in forest R&D capacity over the reporting period occurred in plantation research (silviculture, tree breeding, fauna ecology and fire behaviour); smaller reductions occurred in native forest research (flora ecology, hydrology and pathology). Some research areas showed a modest increase in forest R&D capacity; these included climate change, silviculture, fire behaviour and tree breeding in native forest research, and hydrology, entomology and climate change in plantation research.

The Australian and Tasmanian governments jointly funded research into alternatives to clearfelling in Tasmania's old-growth forests. This funding facilitated acceleration of existing research programs based at the Warra LTER site in southern Tasmania, and enabled the expansion and application of these programs in other parts of Tasmania. The final report on this five-year research and extension program was delivered in October 2010 (Tasmanian Community Forest Agreement Technical Support Group 2010). The research program covered silviculture, biodiversity, forest health, safety, productivity, and social and economic issues. A key outcome was the delivery of a Variable Retention Manual, describing the variable retention harvesting and thinning technique as an alternative to clearfell harvesting in Tasmania's wet eucalypt forests. This research program Table 7.16: Tasmanian forest and forestry research and development effort, 2005–06 and 2010–11

Period	Number of FTE employees					
	Government agencies	Private companiesª	Ace	Academia		
			Staff	Students		
2005-06	69.0	10.4	38.4	36.3	154.1	
2010-11	43.6	2.5	40.2	41	127.3	

FTE = full-time-equivalent

^a The number of FTE researchers is an estimate only, due to data availability.

^b 'Academia' includes Tasmanian-based CRC activities (principally the CRC for Forestry but also the Bushfire CRC), CSIRO Sustainable Ecosystems, and various schools of the University of Tasmania.

 'Students' are higher-degree students engaged full time in research, on projects often determined in collaboration with the CRC for Forestry or private forestry companies.

Source: Tasmanian Forest Practices Authority.

Table 7.17: Full-time-equivalent employees engaged in forest-related research and development in Tasmania

Research area	umber of FT	E employee	5	
	Planta	tions	Native	forest
	2005–06	2010–11	2005–06	2010–11
Silvicultural research	21.6	9.8	3.6	6.9
Tree breeding (not horticultural)	12.7	8.2	0	1.3
Forest hydrology	3.8	6.2	4.5	2.4
Timber use	2.4	2.3	0.4	0.1
Fire behaviour	1.0	0	0	1.6
Forest pathology	6.5	5.0	2.0	1.0
Fauna ecology (including genetics)	16.6	12.8	23.5	25.0
Fire ecology	0	0	1.1	1.1
Forest entomology	0	0.8	1.6	1.3
Flora ecology (including genetics)	5.7	5.5	32.8	21.1
Non-timber forest products	0	0.1	0.4	0.1
Climate change	1.1	1.6	0.7	4.6
Statistical analysis	1.2	0.1	1.2	0.1
Other	1.5	6.1	0.9	2.2
Total	74.0	58.5	72.7	68.8

FTE = full-time-equivalent

Note: This table does not allocate 7.4 FTE sector R&D employees for 2005–06. Source: Tasmanian Forest Practices Authority.

provided assurance that variable retention silviculture can be safely and effectively implemented in old-growth forests and is supported by soundly based science, validated by peerreviewed papers.

Victoria

Most of Victoria's forest R&D capacity is held in academia, supported by investment by the Victorian Government. This is shown in Table 7.18, which presents the number of FTE employees engaged in forest-related R&D in Victoria for 2006–07 and 2010–11. Significant increases in forest R&D capacity occurred in the research areas of climate change, fire behaviour and fire ecology; in general, capacity declined for plantation research and increased for native forest research. Over the reporting period, there was a shift to a landscapebased approach to fire ecology monitoring and research (Table 7.18), and a stronger strategic focus on achieving state-wide applicability in data development. In 2010–11, the Victorian Department of Sustainability and Environment established a further three-year research program with the University of Melbourne. The aims of the program are to develop an improved capacity and evidence base to manage impacts of fire (natural and managed), climate variability and climate change; and investigate forest management regimes relating to water quantity and quality, biodiversity values, carbon assets, other social and economic values, and the vulnerability and resilience of Victoria's public forests. This involves:

- integrated understanding of multiple forest values for adaptive forest management
- understanding the effects of fire, climate and management on the vulnerability and resilience of Victorian forests
- understanding and managing Victoria's forest carbon

CRITERION 7

- understanding water security from Victoria's forested catchments in the face of climate variability, climate change and fire
- understanding interactions between fire, landscape pattern and biodiversity
- assessing social, economic and community safety values of forests in fire-prone landscapes.

Western Australia

The number of FTEs employed by the Western Australian Department of Environment and Conservation (DEC) in research relevant to sustainable forest management varied between 20 and 25 during the period 2005–11. A decline from 2008 to 2010 (Figure 7.7) resulted from the retirement of permanent staff who were not replaced. The increased FTE from 2010 to 2011 reflects updated staff allocations that better align with work requirements within the Science Division of DEC—for example, in the area of climate science (CCWA 2012b). Key disciplinary areas of forest research were biodiversity, ecosystem health and vitality, and soil and water. Research effort on jarrah and karri forest ecosystems was broadly proportional to the areas of each forest ecosystem, and in addition to research at the whole-of-forest scale (CCWA 2012b). Some of DEC's forest research effort also went towards achieving, and demonstrating the achievement of, the objectives of Western Australia's *Forest Management Plan* 2004–2013, and into the development of the draft *Forest Management Plan 2014–23* (DEC 2012b).

Table 7.18: Full-time-equivalent employees engaged in forest-related research and development in Victoria

Research area	arch area Number of FTE employees							
	Government agencies				Academia			
	Planta	itions	Native	forest	Planta	tions	Native forest	
	2006–07	2010–11	2006–07	2010-11	2006–07	2010–11	2006–07	2010–11
Silvicultural research	1.5	0.6	0	0	0	0	0	0
Tree breeding	1.4	0.6	0	0	0	0	0	0
Forest hydrology	0	0	0	0	0	0	5.15	4.0
Timber use	0.4	0	0	0	0	0	0	0
Fire behaviour	0	0	0.35	1.35	0	0	0.65	2.25
Forest pathology	0	0	0	0	0	0	0	0
Agroforestry	0.5	0.1	0	0	0	0	0	0
Fauna ecology	0.2	0.1	0	0	0	0	0	0
Fire ecology	0	0	0	1.0	0	0	6.35	7.5
Forest entomology	0	1.0	0	0	0	0	0	0
Flora ecology	0	0	0	0	0	0	0	0
Non-timber forest products	0.3	0.2	0	0	0	0	0	0
Climate change	0	0	0	3.4	0	0	2.6	4.5
Other (forest industries)	0.1	0	0	0	0	0	0	0
Other (sustainable forest management)	0.1	0	3	3	0	0	6.95	5.5
Other (plantations and health)	1.5	2.5	0	0	3.6	0	0	0
Total	6.1	5.1	6.35	11.75	3.6	0	21.7	23.75

FTE = full-time-equivalent

Source: Victorian Department of Sustainability and Environment, Victorian Department of Primary Industries.





Source: Conservation Commission of Western Australia.

Case study 7.6: LiDAR research and development

In the past, most features within forests, such as tree heights and the location of streams and roads, were mapped using a combination of aerial photographic interpretation and ground-based surveys. Most of Australia's state and territory forest managers are now turning to airborne and groundbased laser scanning technology to replace traditional methods of forest mapping in native and plantation forests.

Light aircraft equipped with 'light detection and ranging' (LiDAR) equipment are flown over forests while emitting high-repetition, short-duration pulses directed at the target forest, and measuring the return reflection time to gauge target distance and bearing. Ground-mounted LiDAR sensors are also being developed to measure structural features within forests. As a direct sampling tool, LiDAR can capture a range of terrain and forest measures more rapidly, objectively and cost-effectively than current ground-based survey techniques (Turner 2007).

Over the past 10 years, LiDAR technology has been researched and tested in Australia's forests. It can accurately measure tree and forest heights, and determine features such as drainage lines, roads and slopes, leading to digital elevation maps. The development of LiDAR from a research tool to a fully operational assessment tool allows LiDAR to contribute to many areas of forest management, including forest mapping, topographic mapping, catchment management, reserve planning and mapping, carbon accounting, wood resource assessment, harvest planning, forest health and fuel-load assessments, and monitoring of mechanical harvesting operations and illegal logging activities.

Direct applications of LiDAR include determining forest canopy height and cover, forest stand density and basal area, forest growth stage, forest and vegetation classification, vertical and horizontal forest structure, forest fuel characteristics and regeneration success rates. The simultaneous measurement of vertical and horizontal forest structure can now provide an accurate three-dimensional representation of a forest's structure (Figure 7.8). By 2012, LiDAR technology had been adopted operationally across Tasmania's forests and in public production forests in New South Wales and South Australia.



Figure 7.8: Airborne LiDAR 'virtual forest' image of uniform stands of *Pinus radiata* plantation forest surrounding remnant patches of taller *Eucalyptus* trees



Oliver Creek, Daintree forest, Queensland.

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