



Report

**Interim method:
Estimation of forest-dependent jobs in
New South Wales**

Final report to Natural Resources Commission and NSW Forest Monitoring Steering
Committee

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Executive Summary

Objective employment data for sound decision-making

Recent years have seen a particular interest in understanding the socio-economic benefits provided by forests. These benefits are generated by activities such as recreation and tourism, timber production, production of non-forest products such as apiary, as well as from ecosystem services such as biodiversity banking.

The ability to understand, demonstrate and quantify these socioeconomic benefits across all types of forest and tenures has become increasingly important for informing policy analysis and decision-making with regard to forest resources and activities.

Despite this, there is little consistency in the way these benefits are reported.¹ A key challenge is that the data needed to assess these benefits is often non-existent, incomplete, inconsistent or of poor quality. To be able to objectively assess and monitor socio-economic benefits, it is first necessary to ensure that the method is informed by good quality 'baseline' data (i.e. data on the number and type of jobs that depend on forests, and number and type of forest-dependent activities).

Synergies Economic Consulting (Synergies) and Verterra Ecological Engineering (Verterra) have been engaged by the Natural Resources Commission (NRC), on behalf of the NSW Forest Monitoring and Improvement Program (FMIP) to develop a method that provides policymakers with estimates of forest-dependent jobs in NSW on a consistent and comparable basis, across different activities and tenures.

A new approach to quantify forest-dependent jobs

There is considerable conjecture about forest-dependent employment in NSW. This is largely driven by the considerable gaps in data and knowledge on forest-dependent activities across activities and forest tenures. Currently, the estimation and reporting of employment are mostly limited to forestry activities.² While the Australian Bureau of Statistics (ABS) and the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) collect and report relatively comprehensive data for the NSW timber industry, there are some limitations including a:

- lack of information and data regarding indirect employment generated;
- insufficient information to enable differentiation between plantation softwood and native hardwoods and activity on public versus private land tenure;

¹ See Heagney et al (2018); RMCG (2018); Ernst & Young (2019); Schirmer et al (2019).

² Where 'forestry activities' refers to commercial forestry, being the harvesting of timber for profit-making activities.

- lack of regularity and availability of employment data for some activities; and
- inability to estimate other forest-dependent jobs generated by activities outside of the timber and wood product industry.

While the employment data for timber production is limited, there is even less data available on other forest-dependent activities, such as recreation, tourism, and production of non-timber forest products. Where there is data available on these activities, it typically does not distinguish forest-dependent employment from other employment for the activity, nor does it include indirect employment or any other socio-economic values associated with these activities.

These significant data gaps and contentions surrounding forest-dependent employment are the key drivers for this project to establish a consistent definition and method for estimating forest-dependent jobs in NSW across all activities and tenures.

HOW DO WE DEFINE FOREST-DEPENDENT EMPLOYMENT?

A forest-dependent job is defined as a job that is attributable to an activity that would not be likely to occur in the absence of the forest; that is, the existence of the forest is a critical requirement of the activity that is generating the employment. The method uses a decision tree to identify activities to be included. This decision tree contains the following questions:

- Does the activity rely on NSW forest as a resource (e.g. extraction of timber, other materials)?
- Is the activity necessary to sustainably manage the forest (e.g. protection from fire, weed and animal pest control, afforestation)?
- Is the activity related to either an event or object that occurs on a regular basis/exists in a forest area (e.g. recreation event, tourist accommodation)?
- Would the event or object exist in the forest area if the forest resource were to be removed?

HOW CAN WE BETTER ESTIMATE FOREST-DEPENDENT EMPLOYMENT?

The comprehensive estimation of forest-dependent jobs requires a method that includes both the direct and indirect employment attributable to forest-dependent activities.

Estimating direct employment involves using available data from agencies/organisations involved in a specific forest-dependent activity (e.g. weed and pest management, organisation of sporting events) to develop metrics that are applied to estimate the direct employment attributable to that activity (e.g. Full Time Equivalents

(FTEs) per sporting event held). These same metrics can then be tested and applied more broadly to estimate direct employment for a forest area and for each activity.

Indirect employment is assessed by tracing the expenditure incurred in forest-dependent activities and the associated FTEs. For example, managing roads in forest areas includes direct employment of employees or contractors by an agency responsible for road maintenance, while indirect employment may include employment generated by expenditure on materials required to complete road maintenance activities (e.g. fuel, construction materials).

The activities related to this expenditure then extend beyond the forests and occur in a wide range of sectors throughout the economy and other industries – all of which must be taken into account in estimating indirect forest-dependent employment.

To enable this, the method adopts the well-evidenced Input-Output (I-O) modelling framework. I-O tables are published by the ABS and provide a representation of all supply chains in an economy. Indirect employment is estimated within I-O models by applying employment multipliers, which disaggregate the total employment of economic activity in the industry sector into employment created elsewhere in the economy. The application of this approach requires detailed data on the size and breakdown of expenditure associated with forest-dependent activities.

The method was developed with guidance from a cross-agency working group and has been subject to peer review by independent experts.

HOW DID WE DEVELOP, TEST AND REFINE THE METHOD? WHAT WERE THE CHALLENGES?

The method was developed through review of available data, extensive stakeholder consultation to source detailed data, and a pilot to test and refine the method in a specific location.

The process highlighted significant challenges and constraints that will need to be overcome to enable the method to be robustly applied in the future. These included:

- Data limitations make it difficult to develop activity and tenure-specific metrics for forest management and forest management support activities, with the method mostly limited to aggregated metrics for different agencies
- Lack of granularity of departmental data
 - The development of the method was complicated for some activities by issues with sourcing FTE and expenditure data at a sufficient level of granularity from government departments and agencies. That is, the information available did

not relate to specific forest-dependent activities, but rather the activities of the agency at a higher level, and for most activities it was not possible to attribute the information to specific areas or land tenures.

- Several agencies indicated difficulties with identifying employment and expenditure that are attributable to forest-dependent activities, which necessitated the use of higher-level data and various assumptions to establish direct and indirect employment metrics.
- Issues with commercial sensitivity of expenditure data has made it difficult to develop metrics for indirect employment for key activities in the timber and wood product industry.
- Some activities were difficult to differentiate due to their intersecting nature (e.g. many forest management support activities: policy development, science and research).
- Several contextual challenges were encountered in developing the method which constrained the availability and participation of stakeholders, as well as the ability to source required data including: 2019-20 bushfires and ongoing impacts on forest-related businesses and forest-based communities; COVID-19 impacts on the NSW economy and communities generally, and most particularly, the tourism and recreation sector; the 2021 floods and ongoing impacts particularly in forested communities and forest-related businesses on the North Coast NSW.

Given these challenges, a key focus area in developing the method has been to better understand the data available from relevant agencies, forest managers and industries so that recommendations can be made on improving collection and/or reporting of the socio-economic data.

WHAT DID WE FIND WHEN WE APPLIED THE METHOD? WHAT IS STRENGTH IN THE DATA USED?

The table below summarises the employment metrics derived for each identified forest-dependent activity based on the available data and applying assumptions explained further in this report. An additional table summarises the available data across the forest tenures and for key forest-dependent activities. Attachment A contains a full list of the employment metrics by forest-dependent activity.

Insights include:

- Forest-dependent employment differs significantly across NSW, particularly in relation to direct and indirect employment related to forest management, production of timber and wood products, sporting, health, and fitness events, and

organised and informal tourism and recreation activities. This relates to the intensity of use of the forest estate, both for timber harvesting and production purposes and for utilisation for recreation and tourism activities. Typically, forest-dependent employment is greatest in forest areas located in closer proximity to major population centres.

- With the exception of apiary, non-timber forest products are not a significant contributor to forest-dependent employment in NSW forests.
- Data available on organised tourism and recreation activities in NSW forests provides a strong base for robust estimation of direct and indirect employment, however there are significant data gaps for informal tourism and recreation.
- Employment in recreation and tourism activities varies significantly across tenure and location, with proximity to major urban centres being a key indicator.

Summary of employment metrics

Activity	Description of metric	Metric
Forest management		
NPWS direct employment	FTEs per '000 ha	0.06-3.33 ^a
NPWS indirect employment	FTEs per '000 ha	0.01-2.13 ^a
Forestry Corporation direct – hardwoods	FTEs per '000 ha	0.14
Forestry Corporation direct – softwoods	FTEs per '000 ha	0.84
Forestry Corporation direct – common	FTEs per '000 ha	0.03
Forestry Corporation indirect – forest access	FTEs per 100,000 m ³	1.045-4.85 ^b
Forestry Corporation indirect – fire suppression	FTEs per 100,000 ha	1.3
Forestry Corporation indirect – fire mitigation	FTEs per 100,000 ha	2.401
Forestry Corporation indirect – weed control	FTEs per 100,000 ha	1.4-2.38 ^b
Forestry Corporation indirect – pest animal control	FTEs per 100,000 ha	0.611-1.44 ^b
Forestry Corporation indirect – plantation establishment	FTEs per 100,000 ha	1.722-2.531 ^b
Forestry Corporation indirect – corporate overheads	FTEs per 100,000 ha	6.79
Wood and timber products^d		
Timber harvesting – indirect	FTEs per '000 cubic metres harvested	0.19 softwoods 0.24 hardwoods
Log haulage – indirect	FTEs per '000 cubic metres harvested	0.31
Commercial firewood indirect – harvesting	FTEs per '000 cubic metres harvested	0.24
Commercial firewood indirect – haulage	FTEs per '000 cubic metres harvested	0.31
Recreation and tourism		
Accommodation	FTEs per \$100,000 expenditure	0.99
Walking/trail running events	FTEs per '000 participants	1.5
Triathlons	FTEs per '000 participants	1.65
Mountain biking events – direct	FTEs per event	0.14

Activity	Description of metric	Metric
Mountain biking events – indirect	FTEs per 10 events	2.4
Multisport events/challenges	FTEs per '000 participants	2.2
Motor sport events	FTEs per 10 events	0.36 (small) 0.82 (medium) 3.55 (large)
Motor cycling events	FTEs per '000 participants	0.51
Rogaine/Orienteering events	FTEs per '000 participants	0.35
Functions and festivals	FTEs per \$100,000 expenditure	0.86
Auto-based tours	FTEs per '000 people	6.40
Land-based adventure tours	FTEs per '000 people	3.15
Walking/running tours	FTEs per '000 people	9.20
Education and training	FTEs per '000 people	3.04
Cultural experiences	FTEs per '000 people	0.40
Informal recreational and tourism activities	FTEs per \$100,000 expenditure	1.09
Recreational hunting	FTEs per '000 hunting days	0.48

The table below summarises the key forest-dependent activities and relevant stakeholders across tenures in NSW.

Tenure detail	Key Stakeholders	NSW area of forest ('000 hectares) ^a	Timber and Wood Products	Non-timber forest products	Forest Management	Forest Support Services	Recreation and tourism
Multiple-use public forest	Forest Corporation, Tourism operators	2,138	●	●	●	●	●
Nature conservation reserve	NSW National Parks and Wildlife Service, Tourism operators	5,570	N/a	N/a	●	●	●
Other crown land	Commonwealth, Forest Corporation	757	N/a	●	●	●	N/a
Leasehold forest	Harvest and Haulage contractors, Mill operators	4,249	●	●	●	●	N/a
Private forest	Harvest and haulage contractors, Mill operators	7,572	●	●	●	●	N/a

^a Forest area is based on ABARES State of Forest Report 2018

^b Unresolved tenure is land where there is insufficient data to determine land ownership

Note: Tenure type based on National Forest Inventory by ABARES

WHAT ARE THE OUTSTANDING ISSUES AND OPPORTUNITIES TO IMPROVE THE METHOD?

- The robustness of the employment metrics for forest management and forest management support activities would be improved if more granular data were

available from government agencies on the employment and expenditure attributable to specific activities.

- *Opportunity: NRC, with support from the NSW Forest Monitoring steering committee work with relevant government agencies to implement practical data capture measures and processes that enable expenditure on forest management and forest management support activities to be separately identifiable from other activities. This could include additional reporting requirements for agencies to allocate employment and expenditure to forest-dependent activities.*
- The nature of some forest management support activities, such as policy development and science and research activities, makes it difficult to distinguish between activities that are forest-dependent and those that are not.
 - *Opportunity: NRC, with support from the NSW Forest Monitoring steering committee work with the relevant government and non-government stakeholders to identify a feasible way to allocate employment and expenditure on these activities between forest-dependent and non-forest-dependent activities.*
- There is insufficient data on informal forest-dependent tourism and recreation activities on the reserve estate to enable robust estimations using the method.
 - *Opportunity: NPWS to adjust existing processes for collecting visitor expenditure data to enable the differentiation of expenditure by visitors on forest-dependent activities. This approach can then be trialled and extended with support from relevant members of the NSW Forest Monitoring steering committee to other forest tenures where visitor expenditure is important.*
- The metrics for organised forest-dependent tourism and recreation, sporting, health, and fitness events would be improved through more detailed data on the size and breakdown of expenditure
 - *Opportunity: The NSW Forest Monitoring steering committee develop a project specifically targeting data on this sector and, when the context for stakeholder consultation improves, work with stakeholders in this sector on identifying feasible activity-specific metrics for expenditure on forest-dependent activities.*
- Aside from apiary, there is limited information available on the production of non-timber forest products in NSW forests.
 - *Opportunity: NRC, with support from relevant members of the NSW Forest Monitoring steering committee liaise with land managers (in particular Forestry Corporation NSW and NPWS) to develop feasible and consistent data capture measures and processes for all non-timber productive activities permitted on forest land.*

- The ability to source expenditure data for some major participants in the timber and wood products sector was limited by both commercial sensitivities and contextual challenges at the time (COVID-19, bushfires, floods) which has impacted on the robustness of indirect employment metrics derived for key activities.
 - *Opportunity: When the industry context stabilises, the NRC and relevant members of the NSW Forest Monitoring steering committee work with representatives from the timber and wood product industry on agreed ways to sensitively source and share data to establish more accurate expenditure estimates for key timber and wood product industry activities.*
- Rural Fire Service (RFS) NSW declined to be included in the method despite being a significant source of employment that is in part likely to be defined as forest-dependent. The rationale provided by the RFS was that the employment attributable to the activities of the RFS would not differ were forest land to be designated as another tenure, as the entity responsible for management of forest land has primary responsibility for fire protection and prevention.
 - *Opportunity: NRC, with support from the NSW Forest Monitoring steering committee engage with RFS to encourage participation and include RFS data/activities in the next iteration of the method.*
- For many activities, stakeholders consulted with advised that the numbers provided were not 'business as usual' due to the impact of Covid-19 and other shocks such as bushfires and floods.
 - *Opportunity: When reviewing and enhancing the method in the future, attention be paid to the extent to which the employment and expenditure estimates on which the employment metrics are based remain appropriate.*

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1 Introduction

There is considerable conjecture in relation to the employment attributable to different activities that occur within forests, ranging from the harvesting of timber and manufacture of wood and paper products, to apiary and recreation and tourism activities that occur within forests. Within New South Wales (NSW) Government alone, agencies apply differing methodologies to estimate the employment attributable to these activities, preventing any meaningful comparison across activities or regions.

Synergies Economic Consulting (Synergies) and Verterra Ecological Engineering (Verterra) have been engaged by the Natural Resources Commission (the Commission) to develop a consistent method for estimating forest-dependent jobs in NSW. The project is part of the NSW Forest Monitoring and Improvement Program (FMIP) – a state-wide monitoring, evaluation, reporting and improvement program for adaptively managing NSW forests across tenures.

The method has been developed to provide a way of estimating the total number of direct and indirect forest-dependent jobs in NSW on a consistent basis across activities and a given area of forest. The project also included a pilot study area to test and refine the method.

This report details the context, development, and application of the method and is structured as follows:

- section 2 sets out the context and objectives for the development of the method
- section 3 outlines the steps followed in developing the method
- section 4 summarises the key challenges and limitations in developing the method
- section 5 details the method for forest management activities
- section 6 details the method for forest management support services activities
- section 7 details the method for timber and wood product activities.
- section 8 details the method for recreation and tourism activities
- section 9 details the method for non-timber forest product activities.

The report also includes the following attachments:

- Attachment A – the desktop review of available data and gaps
- Attachment B – detailed description of the input-output modelling methodology
- Attachment C – a list of all stakeholders contacted throughout the project

- Attachment D – an overview of forest land management activities included in the method.

2 Context and objectives

2.1 NSW Forest Monitoring and Improvement Program

The FMIP set out requirements for the monitoring, evaluation, reporting, and improvement of forest management and environmental protection. The key aim of the program is to improve the evidence base for decision-making across forest tenures and to strengthen the NSW Government's ability to strategically and adaptively manage forests and forestry practices over time. The NSW Government has committed over \$7 million to the program over a four-year period to 2021/22.

The FMIP is comprised of several projects across the following topics:

- People and forests
- Forest health and carbon
- Native animals and plants
- Water catchment and soil health
- Projects to improve evidence-based decision-making.

This project is one of the key initiatives being addressed under the 'People and forests' component of the program. The NRC releases annual progress reports detailing the status of activities being undertaken.³

2.2 NSW forests and forest managers

This project has adopted the definition of a forest used in the FMIP and developed by Australia's National Forest Inventory:⁴

An area, incorporating all living and non-living components, that is dominated by trees having usually a single stem and a mature or potentially mature stand height exceeding 2 metres and with existing or potential crown cover of overstorey strata about equal to or greater than 20 per cent. This includes Australia's diverse native forests and plantations, regardless of age. It is also sufficiently broad to encompass areas of trees that are sometimes described as woodlands.

³ 'Forest Monitoring and Improvement Program (FMIP)'. Natural Resources Commission. DOA: 23 September 2021; See: <https://www.nrc.nsw.gov.au/fmip>

⁴ 'Australia's forests'. See: <https://www.agriculture.gov.au/abares/forestsaustralia/australias-forests>; DOA: 12 October 2020. Department of Agriculture, Water and the Environment.

There is 20.4 million hectares of forest area in New South Wales, 15 per cent of the total forest area in Australia. NSW's forest areas are concentrated in coastal regions with a large area of forest also located in the western region.

In relation to native forests, policy, land management, regulation, science and research responsibilities are shared across the following NSW government agencies:

- Forestry Corporation of NSW (Forestry Corporation) – responsible for the management of State forests and the only organisation authorised to remove timber from State forests and other Crown-timber lands;
- National Parks and Wildlife Service (NPWS) – responsible for the management of the reserve system (inc. native forests) designated as – for example - national parks, conservation reserves, and wilderness areas;
- Local Land Services (LLS) – responsible for the administration of Private Native Forestry (PNF) approvals and advice and for the administration of the Land Management Framework to regulate native vegetation management on private land;
- Department of Planning and Environment (DPE) – broadly responsible for native vegetation and biodiversity policy and the administration of the Land Management Framework, including the native vegetation regulatory map, compliance and Biodiversity Offsets Scheme;
- Department of Primary Industries (DPI) – leads forestry policy and research and industry development, providing evidence-based information to forest managers and policy markets that underpins the sustainable use of forests;
- Environmental Protection Authority (EPA) – responsible for the regulation of native forestry operations on private and public land in NSW;
- Biodiversity Conservation Trust (BCT) – establishes agreements with landholders to conserve biodiversity and other strategic biodiversity offset services.
- Crown Lands – administers and manages NSW Crown Land including Crown reserves.
- Water NSW – a state-owned corporation that supplies and seeks to improve availability of water that is essential for water users and the communities throughout NSW which includes the protection of forested drinking water catchments within the Sydney basin.
- Hunter Water – a-state owned corporation providing drinking water, wastewater, recycled water and some stormwater services in the Lower Hunter Region in New

South Wales, Australia. The agency's activities include the protection of forested drinking water catchments within the Lower Hunter Valley.

In addition to NSW Government agencies other relevant entities include the Commonwealth Department of Agriculture Water and Energy (DAWE), Department of Defence, Forest & Wood Products Australia, and several Forest Industry R&D Hubs.

Private landholders also play a major role in the NSW forest sector, with approximately 40 per cent of the native forest estate in NSW being privately owned. Forest management, forest management support activities, and forest production activities (non-wood and wood and timber production) undertaken on private native forest land are also included in the method.

The method also includes employment generated through forest plantation establishment and maintenance, both hardwood and softwood. Forestry Corporation also manages approximately 200,000 hectares of softwood and 35,000 hectares of hardwood plantations. Various private growers also operate in NSW, principally in the softwood regions.

The large number and diversity of entities that have responsibilities directly or indirectly related to the management of forests makes the task of estimating jobs complex and challenging.

NSW forest areas, including public and privately owned plantation and natural forests, are managed for four key purposes:

- environmental conservation, including, biodiversity, carbon capture and storage, soil and water, and air quality;
- deriving economic benefit through sustainable production of forest and wood products;
- social uses, including tourism and recreation activities and scenic vistas; and
- cultural heritage conservation, including protection of Aboriginal and European sites and values.

All of these activities generate economic and social value to the NSW economy, with many activities also generating employment, both directly and indirectly throughout other sectors of the economy.

2.3 Project objectives

The overriding objective of this project is to develop a method to estimate total employment (direct and indirect) attributable to all forest-dependent activities in NSW. The method estimates employment for:

- individual activities (e.g. harvesting, apiary, sporting, health, and fitness events); and,
- different tenures of forest land (e.g. National Parks, State forests, plantations, private native forest).

This approach enables a like-for-like comparison of the employment attributable to activities that occur within forests, both across activities within a forest area and between forests on different tenures and in different regions.

3 Critical steps in developing the method

This section details key steps taken in developing the method, including reviewing current approaches, establishing key definitions, setting the methodological framework and approach, undertaking stakeholder consultation, and piloting the method. Although presented as linear, these steps in developing the method were iterative and highly interdependent.

3.1 Understanding current approaches and available data

The initial project phase involved a comprehensive review of existing information on the estimation and reporting of employment related to NSW forests, including the identification of key gaps in available data (Attachment A).

The current estimation and reporting of forest-dependent employment is mostly limited to commercial forestry activities. Data for the NSW timber industry is relatively comprehensive and generally of good quality, being collected and reported by the Australian Bureau of Statistics (ABS) and the Australian Bureau of Agricultural and Resource Economics (ABARES). The most well publicised source of data on employment in the NSW timber industry is the State of the Forests report, which is a five-yearly report produced by ABARES, although one notable limitation with the data included in this report is that it does not differentiate between plantation softwood and the native hardwood timber industry, or forests on public versus private land tenure. Furthermore, while data on the volume and value of timber production are reported reasonably regularly, data on employment is not regularly collected or always readily available.⁵

In terms of the employment data reported by ABS/ABARES, estimates are limited to direct employment on activities related to forestry activities. That is, these estimates do not consider the indirect employment that is generated by these activities in other sectors of the NSW economy. This is a key gap that is addressed by this method. In addition, the ABS/ABARES data also has limitations in terms of the accuracy of the direct employment estimates reported for forestry activities. For example, employment related to log transportation and the transportation of processed timber products are included as part of the employment in the transport sector, despite being attributable to the

⁵ Accurate data on the number of jobs dependent on wood and paper production are available only every five years as part of data produced by the Census of Population and Housing, with other sources of data found to be unreliable for reporting trends in employment (Binks et al. 2014). These data are not published at small scales by the ABS but are reported for every local government area in the Australian Forest and Wood Products Statistics series (see ABARES 2019 for web link to this series of reports). This series also uses Census data to identify key socio-economic impact characteristics of forest industry workers, including working hours, income, gender and age. While a recent nationwide study generated data on these things for the timber industry in most parts of Australia, it included only one NSW region (the South West Slopes – see Schirmer et al. 2017-2019).

activities within the forestry industry. This limitation has also been addressed as part of this method.⁶

While data on socio-economic values generated by timber production are limited, there is even less data readily available on other activities in NSW forests such as recreation, tourism and apiary. While there are limited sources of data available for some of these activities from managing agencies (e.g. databases of firewood licences) these do not provide information on social and economic benefit arising from the activity. For example, while it is useful to have data on the amount of firewood permitted to be removed, this is a poor indicator of how many jobs are generated by that firewood removal.

In addition, where there are studies that have estimated employment for other forest-dependent activities, they most often apply different methodologies and do not establish a repeatable method that can be applied to other areas of forest. In many cases, other studies that have estimated employment for forest-dependent activities have derived estimates using high-level metrics, such as visitations to forest areas and total expenditure by visitors. This typically results in employment estimates being overstated, as these high-level metrics include expenditure and activity that is not forest-dependent.⁷ There are also several activities where little is known regarding forest-dependent employment, such as the organisation of major sporting and fitness events and non-timber forest production (e.g. apiary, ecosystem services).

3.2 Defining a forest-dependent job

One of the key challenges in developing the method was the lack of a consistent definition of a forest-dependent job that takes into account the diverse activities that depend on forests.

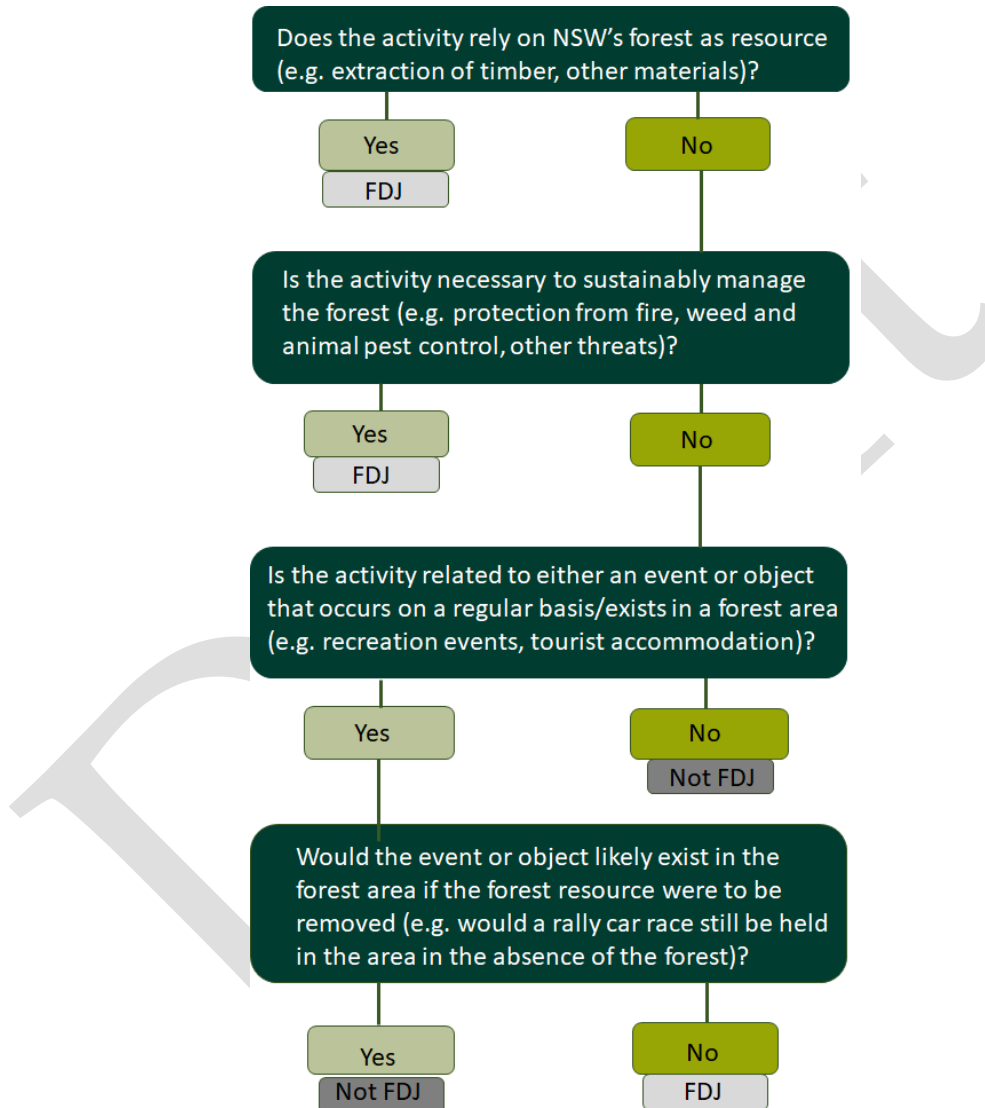
For the purpose of this method, a forest-dependent job is defined as a job that is attributable to an activity that would not be likely to occur in the absence of the forest. That is, the existence of the forest is a valued attribute of the activity which is generating the employment.

⁶ There are also potential issues in terms of the accuracy and robustness of ABS/ABARES data in terms of the size of samples that are relied upon to generate region and State-wide data on employment in forestry activities.

⁷ For example, basing employment estimates for tourism and recreation activities on total tourist visitations to a forest area and total expenditure by these visitors will capture expenditure and hence employment that does not relate to forest-dependent activities (e.g. food and beverage expenditure, general transport expenditure, expenditure on other activities that would occur in the absence of the forest).

To enable the practical application of this definition, a decision tree was developed with key criteria to assess whether activities are appropriate for inclusion in the method or not (Figure 2).

Figure 2 Decision tree for assessing activities to be included in estimations of forest-dependent jobs



Source: Synergies and Verterra (2021).

The table below sets out those activities that have been identified as appropriate for inclusion in the method based on the application of this decision tree.

Table 1 Activities identified applying the decision tree and included in the method for estimating forest-dependent jobs

Category	Forest-dependent activities	
Forest management activities	Forest planning Forest data collection and analysis Management of forest access Fire prevention and protection (including emergency response) Weed and animal pest management Other land conservation and management	Cultural heritage conservation Management of other facilities within forest areas (e.g. camping areas, toilets) Fleet management and maintenance Plantation management
Forest management support services	Forest policy development Regulation and compliance activities Forest consulting	Forest-related science and research Forest advocacy
Wood and timber products	Timber harvesting Timber haulage Log processing (including exports)	Wood and paper product manufacturing (includes exports) Timber wholesaling (includes exports) Commercial firewood
Recreation and tourism services and activities	Accommodation Walking and trail running events Triathlons and multisport events Cycling/trail biking Motorsport and motor cycling events Rogaine/Orienteering events	Auto-based tours Land-based adventure tours Walking/running tours Education and training Cultural experience tours Functions and festivals Recreational hunting
Non-timber forest products	Apiary Seed and plant collection	Biobanking Carbon sequestration Filming and photography

Source: Synergies and Verterra (2021).

3.3 Applying sound economic theory

The sections below detail the methodological framework for this project.

3.3.1 Direct employment

Direct employment refers to employment that is directly attributable to activities that are dependent on NSW forests. For example, the agencies responsible for managing forest land (e.g. Forestry Corporation, NPWS) employ forest managers to undertake a wide range of tasks associated with the management of the forest land. These jobs can be directly attributed to forest management. In addition, a proportion of the corporate or centralised employment of these agencies can also be attributed to this management.

The approach to estimating direct employment dependent on NSW forests involves identifying the individual activities that depend on forests (e.g. weed and pest management, organisation of sporting events) and developing metrics that are then

applied to estimate the direct employment attributable to that activity (e.g. X.X FTEs for fire prevention per hectare).

These metrics are developed based on employment information obtained from the relevant agency or organisation that is responsible for undertaking the activity (e.g. Forestry Corporation in relation to timber harvesting activities; National Parks and Wildlife Services in relation to managing National Park areas; apiarists in relation to managing bees on designated forest apiary permit sites).

These metrics can then be applied to the characteristics of a study area to derive estimates for direct employment.

This requires detailed consultation with stakeholders in relation to each of the activities to assess the linkage between the activity and direct employment. This also includes developing an understanding of how the employment intensity of activities varies based on the characteristics of the forest.

For example, there is direct employment associated with the management of recreational facilities in forest areas (e.g. camping grounds, picnic areas, BBQs, toilet facilities, etc.). However, the nature of these recreational facilities, and hence the direct employment related to the management of these facilities, varies significantly across forest areas. For example, the recreational facilities in a National Park or State forest located within the Sydney Basin (e.g. Royal National Park and Cumberland State forest) require far more resources (and hence more labour) to manage than those facilities located in more remote forest areas. Given the objective of the method, it is important that the metrics for direct employment related to the management of recreational facilities reflect this difference.⁸

The need for the development of several different metrics for estimating direct employment for the same activity highlights the importance of consulting with a broad range of entities, both within government and across the private sector, that directly employ people related to activities that occur within NSW forests (e.g. plantation management companies, timber harvesting contractors, tourism operators).

3.3.2 Indirect employment

Indirect employment relates to the FTE staff associated with expenditure on undertaking forest-dependent activities. For example, the management of roads in forest areas involves direct employment of employees or contractors by the agency responsible for the road maintenance (i.e. Forestry Corporation, NPWS, LLS, Crown Lands), while

⁸ In this case, this would be achieved by having different FTE per hectare/recreational facility metrics for forests based on their geographic location and their level of capital investment.

indirect employment relates to the employment generated by expenditure on materials required to undertake road maintenance activities (e.g. fuel, construction materials).

This means that indirect employment is assessed by tracing the expenditure incurred in relation to forest-dependent activities that extend beyond the forest sector and occur in a wide range of industry sectors throughout the economy. Hence, it is necessary to map how expenditure on forest-dependent activities impacts on activities and employment across other industries to enable the accurate estimation of indirect forest-dependent employment.

To do this, the method adopts the well-evidenced Input-Output (I-O) modelling framework. I-O tables are published by the ABS and provide a representation of all supply chains in an economy. I-O relationships between industries are described by a combination of backward and forward linkages. Attachment A provides a more detailed description of I-O modelling and its application in economic analysis.

Indirect employment is estimated within I-O models through the application of employment multipliers, which disaggregate the total employment impact of economic activity in the impacting sector into direct employment and additional employment created elsewhere in the economy. Two types of multipliers may be calculated that calculate employment on two different bases:

- Type I - per employment numbers in an industry, for example, the impact on the rest of the economy by the employment (or loss) of 100 employees in the impacting industry; or
- Type II - per each \$1 million shift in final demand by the impacting sector(s).

For this study, the following approach has been applied to estimate direct and indirect multipliers for each forest-dependent activity:

- use the Forestry and Logging Sector⁹ (hereafter referred to as the aggregate sector) as an initial guide to economic linkages between forestry activities in NSW and the rest of the NSW economy, through an I-O table of the NSW economy;
- use direct industry consultation to identify the key activities within NSW forests, including identifying any area-specific (superior) data;

⁹ Currently measured under 0301 (Forestry) and 0302 (Logging) of the 2006 Australian and New Zealand Standard Industry Classification.

- use the collected (superior data) data on specific activities within NSW forests (including those that occur outside of the forestry sector itself) to examine the match between the aggregate table and the pattern of activities identified;¹⁰ and
- use the superior data to disaggregate from the aggregate table a specific NSW forests sector within an I-O framework which matches current activities and can be used to measure the economic impact of aggregate shifts in expenditure on activities that occur within forests across NSW.¹¹

This new sector identifies the main expenditure areas related to the full range of activities that occur within NSW forests and its links with the rest of the economy. These form the sub-sectors of interest (that is where the indirect jobs are created). The sectoral distribution in the table can be used to establish a direct link between the specific activities in NSW forests and indirect job creation (e.g. expenditure on organisation and operation of major sporting events within NSW forests).

For ease of reference, a calculation sheet linking either expenditure or employment in each key activity and indirect job creation has been provided, using multipliers identified in the I-O table. The I-O model used in developing the method is based on 2020 ABS data, updated in January 2021.

This calculation sheet may be updated periodically as new information or a change in activity necessitates a modification of the I-O table. Results obtained from this process will be tested for acceptability by consultation with major stakeholders (NRC, Forestry Corporation, NPWS, DPI) and any required modifications will be made at that time.

It is noted that there are limitations associated with I-O modelling. One of the key limiting assumptions is that the I-O model assumed unlimited labour and capital is available at fixed prices, so that any change in demand for productive factors will not induce any change in their cost (e.g. as demand for labour increases, the cost of labour does not change as a result). Noting that this is a significant limitation for assessing the employment impacts attributable to major projects or policies, it is not considered a significant limitation when applying I-O modelling to assess the current level of employment attributable to a sector or activity within the economy.

¹⁰ This includes data on direct employment within the key activities.

¹¹ That is create a specific NSW Forestry Sector within and IO framework rather than relying on the aggregate Forestry and Logging in the current table (if the research differences substantial enough to justify disaggregation).

3.3.3 Data and Information requirements

The data and information required from key stakeholders differs significantly for direct and indirect employment methods.

For direct employment, the objective of the method is to establish relationships between data on direct FTEs and a metric for a given area of forest. Using the operation of recreational facilities as an example, the objective of the method is to identify an estimate for the number of direct FTEs required to maintain a recreational facility (noting that it may be necessary to derive estimates for different types of recreational facilities). The method then requires an estimate of the number of recreational facilities (by type) within the forest area to derive the estimate of direct employment attributable to those recreational facilities.

Alternatively, for indirect employment, the method requires detailed data to be collected from key stakeholders in relation to both the magnitude and breakdown of expenditure across all forest-dependent activities (e.g. expenditure by apiarists on goods and services required to maintain bee hives; expenditure by forest management on contractors to maintain roads and facilities within forests, etc.). While the method needs to be flexible based on the information that is obtainable from stakeholders, the key categories of expenditure requested from stakeholders are as follows:

- wages – wages paid in addition to those paid to FTEs (i.e. casual staff, overtime)
- consumables – goods and services purchased via retail or wholesale
- capital equipment
- construction works
- transport (by mode – motor vehicle, air)
- regulatory and other government charges
- promotion, marketing, and advertising
- other (with details provided for major expenditure items).

To avoid double counting between these two sources of employment, where possible, the direct employment associated with an activity (e.g. forest management activities) is explicitly identified separate to any indirect employment resulting from expenditure on the individual activities under each category.

3.4 Applying a consistent and repeatable approach across activities and tenures

As one of the key objectives of the project is to develop a method that enables comparative estimates of forest-dependent employment for different areas of forest, it is critical that the approaches and metrics that are developed for each individual activity are able to be consistently applied across all areas of forest; taking into account differences in tenure types, land managers and data availability.

For example, it is not appropriate for metrics to be developed based on areas of forest where there is granular data available to develop highly specific metrics unless it is possible for these metrics to be applied across all forest areas. Rather, the metrics that are developed for individual activities need to have regard for the data that is available across all forest areas.

Noting the need for consistency, it is also not appropriate for the method to gravitate to the lowest common denominator based on those regions with the poorest available data. Where data availability is poor in a region, it may be appropriate for generalised 'rules' to be developed based on data available in comparable forest areas. This method is transparent where such assumptions have been made.

Repeatability is also a key requirement of the method. The extent to which the method can be applied to areas of forest in NSW in the future is a key consideration in developing the method. That is, it is not appropriate to develop a method that may produce a precise estimate for the number of jobs generated by a specific activity within an area of forest, but this then requires extensive resources in collecting the data necessary to apply the method.

Therefore, it is important that consideration is given to the trade-off that exists between accuracy and repeatability, so the method that is developed provides accurate outputs while not requiring an unmanageable investment in resources for data collection and application.

This report makes these trade-offs transparent and has put forward several recommendations for strengthening the data inputs to better support consistency and repeatability of the method in the future.

3.5 Engaging stakeholders to develop the method

There were four key steps in the consultation process for the method:

- Step 1: Consult with members of the FMIP socio-economic working group¹² to identify the key stakeholders for each specific forest-dependent activity to develop an initial stakeholder list.
- Step 2: Targeted consultation with key agency stakeholders¹³ to identify any constraints on the provision of data and information necessary to inform the development of the method. Data and information requests were also provided to these agencies.
- Step 3: Discussions with other stakeholders relevant across each of the individual activities to discuss potential data to be provided to inform the method.
- Step 4: Continued consultation with stakeholders to collect data and information required to inform development of the method (See Appendix C for consultation log). This included undertaking multiple rounds of consultation with stakeholders where key gaps were identified in employment and expenditure information provided (see further discussion on consultation challenges below)

The table below provides a detailed list of all stakeholders included in the consultation process under each forest-dependent activity.

Table 2 Stakeholders consulted with by activity

Focus area	Stakeholders	
Forest management	Forestry Corporation	Crown Lands
	National Parks and Wildlife Services	Local Land Services
	Plantation management companies	Department of Defence
		Rural Fire Services
Forest management support services	Forestry Corporation	Department of Primary Industries
	National Parks and Wildlife Services	Environmental Protection Agency
	Department of Planning, Industry and Environment	Local Land Services
	Natural Resources Commission	
Timber and wood products	Forestry Corporation	Koppers
	Boral	Visy Paper
	Hume Forests	Newell's Creek
	Pentach	Hyne Timber
	Big River Timbers	Coffs Harbour Hardwoods

¹² The working group included representatives from the relevant agencies: Forestry Corporation, DPIE, the Department of Primary Industries, Local Land Services, Crown Lands, the Natural Resources Commission, and a socioeconomic expert from the FMIP Steering Committee.

¹³ Forestry Corporation, National Parks and Wildlife Services, the Department of Primary Industries, Local Land Services, Crown Lands, the Department of Defence, Rural Fire Services, and the Natural Resources Commission.

Focus area	Stakeholders
	<p>Weathertex Softwoods Timber Working Group</p>
Forest-dependent recreation and tourism services	<p>Motor Sport Australia Narooma Motorsport event Kempsey Sporting Car Club Rally of the Bay Rocky Train Entertainment</p>
Non-timber forest products	<p>NSW Apiarists' Association Boral</p>

Several challenges were encountered in undertaking the stakeholder consultation to inform the development of the method. The nature of these challenges differed across the various stakeholder groups, with the key issues highlighted below.

In relation to the government agencies, the key challenge was in identifying employment and expenditure data that is specifically related to forest-dependent activities, noting that the responsibilities of these agencies span a range of forest and non-forest-related activities. The data recording systems maintained by these agencies are not currently designed to enable reporting on employment and expenditure information that relates specifically to forest-dependent activities. This is clearly less of an issue for Forestry Corporation, given the entire activities of this entity are forest dependent.

The other issue encountered in consulting with government agencies (including Forestry Corporation and NPWS) was the lack of granularity of employment and expenditure data on forest-dependent activities that was able to be provided. As above, this is a product of current data collection and management systems that do not report on employment and expenditure on forest-dependent activities at a granular level.

Stakeholder consultation with ecotourism, recreation, and sporting, health, and fitness organisations was challenging, largely due to the impact of COVID-19 and ongoing impacts of 2019-20 bushfires and 2021 floods. These events impacted on the availability and willingness of these organisations to participate in the method.

In terms of the timber and wood product industry, the challenging operating environment had a key impact on the quality of data and information that was able to be obtained from stakeholders. In addition to the impact of COVID-19, the impact of the 2019/20 bushfires and the severe floods experienced in 2021 appears to have impacted on the willingness of industry participants to engage in the method development process. In addition to this, several key industry participants were unable to provide the requested expenditure data due to issues with the commercial sensitivity of data. In these instances, where possible assumptions have been made to enable metrics to be derived. Where there is insufficient basis for making the necessary assumptions, there remains gaps in the method that are to be addressed as part of future processes to

improve the method, noting this will likely require targeted engagement with industry stakeholders.

Further discussion of these specific challenges is outlined in Section 4.

3.6 Piloting and refining the method

The method was applied to a pilot project area to test its robustness. The pilot area comprised of 12 Local Government Areas (LGAs) in the North Coast region.¹⁴ The key purpose of the pilot project was to test the data requirements of the method to determine whether the direct and indirect employment metrics developed for the range of forest-dependent activities are workable by generating real data.¹⁵

For example, the metrics developed for employment attributable to sporting, health, and fitness activities are typically based on the number of participants in the activities or events. Hence, it is necessary to test whether a robust estimate for the number of participants in the various categories of sporting, health, and fitness activities can be derived based on information available from the entities provided with permits for holding these events on forest land.

Similarly, for the production of timber and non-timber forest products, the employment metrics included in the method typically relate to either the number of operational producers or volume of timber production within a defined region. The pilot testing of these components of the method involved assessing the extent to which robust estimates for these indicators could be obtained using available information.

The learnings from the pilot study have been central to refining the method to ensure repeatability and feasibility. Importantly, the pilot testing identified gaps in the method, particularly where it was not possible to source the information required on the intensity of particular forest-dependent activities. These gaps were addressed by reviewing available data and information and making transparent assumptions where necessary.

¹⁴ Kyogle, Richmond Valley, Tenterfield, Clarence Valley, Glen Innes Severn Shire, Coffs Harbour, Armidale Regional, Bellingen, Nambucca, Kempsey, Walcha, and Port Macquarie-Hastings.

¹⁵ The data able to be obtained from the application of the method to the pilot area was not of sufficient quality and robustness for the results of the application of the method to be reported. Rather, the pilot study was used as a means to test and refine the approach to various forest-dependent activities and to identify key gaps in the method and in the data available to inform the modelling.

4 Limitations and challenges

4.1 Lack of granularity of departmental data

The development of the method was complicated for some activities by issues with sourcing FTE and expenditure data at a sufficient level of granularity from government departments and agencies. The more granular the employment and expenditure data that is available in relation to the forest-dependent activities of government agencies, the most robust the direct and indirect employment metrics that can be derived.

Several agencies indicated difficulties with identifying employment and expenditure that could be attributable to forest-dependent activities. This necessitated the use of higher-level employment and expenditure data and various assumptions to establish direct and indirect employment metrics.

The implementation of measures to more effectively identify and track employment and expenditure on specific forest-dependent activities consistently across agencies in NSW would provide more accurate data to support more robust employment metrics – the report includes recommendations in this area. Several measures have been recommended throughout the method, including working with departments and agencies to augment existing reporting practices in relation to expenditure on forest-dependent activities and working with other stakeholders to expand the capture of data in relation to forest-dependent activities in recreation and tourism.

4.2 2019/20 bushfires

The 2019/20 bushfires affected over 5.3 million hectares of public and private land across the coastal regions of NSW. The table below presents a summary of the areas of forest affected throughout the State.

Table 3 Summary of forest areas impacted by 2019/20 bushfires by tenure

Forest tenure	Description of impact
State forests	<ul style="list-style-type: none"> The area impacted included around 0.8 million hectares of native State Forests and 62,000 hectares of State Forest timber plantations, which equates to around half of the native forest area managed by Forestry Corporation and a quarter of the state-owned plantation estate. Following the fires, 70 per cent of Forestry Corporation's native harvesting operations moved into hardwood plantations. Contractual force majeure was widespread throughout the softwoods industry. Operations moved to salvage harvesting. In consultation, a representative from the Softwoods Working Group stated that this is likely to lead to a material reduction in harvesting and haulage contracts.
National parks	<ul style="list-style-type: none"> The area impacted included 2.7 million hectares of national parks (37 per cent of the State's national park estate). 55 parks or reserves have had more than 99 per cent of their area affected by fire 70 parks or reserves have 75 to 99 per cent of their area affected 29 parks or reserves have 50 to 74 per cent of their area affected.

Forest tenure	Description of impact
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Private land	• Approximately 1.8 million hectares of private native forest affected.
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Source: Government websites, Department of Planning, Industry and Environment, Forestry Corporation of NSW]

The fires resulted in significant issues during stakeholder engagement with several key stakeholders in the wood and timber product sector stating that the bushfires had materially impacted the scale and viability of their businesses. Those businesses that did engage and were willing to provide FTE and expenditure data all stated recent figures do not reflect 'business as usual'. When asked to supply data for a 'normal year' of operation many stated the past normal is unlikely to persist.

4.3 COVID-19

The COVID-19 pandemic has significantly impacted the economy and society in NSW over the past 18 months, particularly the tourism and recreation sector, large segments of which have been subject to an unprecedented shutdown for prolonged periods. This imposed significant constraints on the consultation with tourism operators, with most businesses either not in operation during the period in which consultation was undertaken or unwilling to provide FTE and expenditure information. Many businesses also stated their historical data would be irrelevant to the future operation of their businesses and as such, do not represent 'business as usual'.

4.4 2021 NSW floods

Extreme rainfall on the east coast of Australia throughout late March 2021 led to significant flooding in NSW, primarily affecting regions from the North Coast to Sydney. This intense period of flooding resulted in significant disruptions to significant parts of the forestry and other sectors, with over 100,000 people losing access to electricity. The clean-up activities required following this event presented additional challenges for the stakeholder consultation, particularly with the forestry industry.

5 Forest management

Definition

Employment directly and indirectly related to the management of native forests (including State forests and native forests on private land) and plantations in NSW. All forest tenures are relevant for this activity category, including multiple use, conservation, other crown lands, leasehold, and freehold lands.

Key activities

- Fire prevention and protection
- Pest and weed management and other nature conservation (biodiversity and intervention)
- Silviculture activities
- Management of forest access (including road maintenance)
- Aboriginal and European cultural heritage conservation
- Maintenance and operation of facilities located on forest land (e.g. recreation facilities)
- Maintaining vegetation groundcover and managing disturbance (soil and water protection).

Employment metrics

- Direct and indirect FTEs by area for NPWS forest management activities by LGA (metrics encompass all of NPWS forest management activities)
- Direct FTEs for Forestry Corporation of NSW by forest region and LGA
- Indirect FTEs by area for Forestry Corporation's forest management activities (e.g. forest access, fire suppression, fire mitigation, weed control, pest animal control, etc.)
- Direct and indirect FTEs by area for Crown Lands' forest management activities
- Direct and indirect FTEs by Private Native Forestry (PNF) Plan for LLS' forest management activities
- Direct and indirect FTEs by area for establishment and management of plantations
- Indirect FTEs by area for private native forest under PNF Plans.

Key findings

- There is significant variability in terms of the employment intensity of NPWS's forest management activities across the forest estate, with direct employment metrics ranging from 0.11 to 2.81 FTEs per '000 hectares and indirect employment metrics ranging from 0.04 to 2.13 FTEs per '000 hectares.
- Those regions recording the highest employment metrics (e.g. Sydney North, Sydney South, Northern Rivers, Hunter, North Coast) are located in regions containing forest land that is within close proximity to urban areas. This is consistent with the expectation that these forest areas require more intensive management relative to forest land in remote areas.
- Forestry Corporation's direct employment is heavily concentrated, with 55 per cent of total FTEs attributable to 6 of the agency's 39 management areas.
- The metrics for direct and indirect employment attributable to forest management activities undertaken by other government agencies (e.g. LLS, DPI, Crown Lands) are limited to high-level metrics with little or no differentiation across activities and tenures. This is due to the lack of granularity in the employment and expenditure data collected by these agencies.

- Available information indicates forest management activities undertaken by government agencies other than NPWS and Forestry Corporation are, while important, less likely to be a material source of overall forest-dependent employment in NSW relative to other activities.

Key data gaps and limitations

- NPWS provided FTE and expenditure data that covered the full range of their activities.
- The FTE and expenditure data on which the metrics for forest management activities have been derived include forest management support activities. That is, the employment metrics in this section of the method for NPWS cover all of NPWS's forest-dependent activities, which includes both forest management activities and forest management support services. As such, there are no employment metrics for forest management support services for NPWS in the relevant section (Section 6) of the method.
- There is limited detail on the FTEs and expenditure attributable to specific forest land management activities across all government agencies. This prevented the development of activity-based metrics for most agencies and necessitated a more top-down approach (i.e. metrics for all forest land management activities) being developed at a regional level.
- Several key government agencies responsible for forest land management activities, specifically Local Land Services, Crown Lands, and the Department of Defence, were unable to provide robust information regarding the proportion of their direct employment and expenditure attributable to forest land management activities which prohibited the development of region-specific metrics for those tenures.
- The NSW Rural Fire Service (RFS) opted not to provide information for the method on the basis that RFS's activities should not be attributed to the forest estate – that their activities are not forest-dependent. The RFS' interpretation is inconsistent with the definition of 'forest dependent jobs' used for this project and therefore represents a gap in the current method.
- Due to a lack of participation from private plantation companies, Forestry Corporation's metrics for plantation establishment and plantation management were applied for private plantation management companies.

Opportunities for addressing gaps and strengthening the method

- While NPWS and FCNSW data is generally adequate, there is a distinct lack of data on the direct employment and expenditure related to specific forest land management activities. NRC should work, via members of the NSW Forest Monitoring Steering Committee with NPWS and FCNSW to implement data capture measures as part of budgeting processes to enable expenditure on forest management activities to be separately identifiable from other activities.
- There is a lack of robust data and information available to robustly estimate the direct employment and expenditure attributable to the forest land management activities undertaken or administered by some NSW government agencies, namely, LLS, Crown Lands, Local Councils, Biodiversity Trust, EES, Water NSW, Hunter Water and the Commonwealth Department of Defence. NRC, with the support of the NSW Forest Monitoring Steering Committee should work with these agencies to implement data capture measures (including standard approaches to allocating employment and expenditure between forest management and other activities) as part of budgeting processes to enable employment and expenditure on forest management activities to be separately identifiable from other activities.
- NRC, with the support from relevant members of the NSW Forest Monitoring Steering Committee engage with private hardwood and softwood plantation companies to source employment and expenditure information regarding their forest land management activities. This information would

then be used to develop metrics to replace the FCNSW metrics that are currently used in the method (see above).

- NRC, with the support of the NSW Forest Monitoring Steering Committee engage with RFS to facilitate participation in the next iteration of the method.

The method for estimating employment related to forest management activities involves assessing the FTEs and expenditure attributable to these activities for each NSW Government agency responsible for managing or administering the management of forest land.

The method needed to be tailored to the data available from each stakeholder. For example, where stakeholders have been able to provide a detailed regional breakdown of FTE and expenditure data, it has been possible to develop region-specific metrics for forest management activities attributable to that entity. Alternatively, where data is only available at the higher level, more coarse metrics have been derived.

Similarly, the robustness of the application of the I-O framework to derive indirect employment metrics varies based on the extent to which detailed expenditure breakdowns have been provided by each stakeholder. Where detailed expenditure data has been obtained, a custom industry sub-category has been developed and the indirect employment metrics derived more accurately reflect the nature of the forest management activities undertaken by that entity. Alternatively, where a breakdown is not available, the most appropriate industry sub-category in the NSW I-O tables has been applied to derive the indirect employment metrics.

Attachment C contains a detailed description of the scope of activities included in the 'forest management' category.

5.1.1 National Parks and Wildlife Service

NPWS is part of the Department of Planning and Environment (DPE). NPWS is responsible for the management of more than nine per cent of the total land area in NSW (over seven million hectares of land). NPWS is responsible for the management of forests that occurs in the dedicated reserve system such as National Parks and Reserves¹⁶. FCNSW also manage formal and informal reserves on state forest as part of the NSW reserve system.

¹⁶ As defined under the NSW NPWS Act 1974.

NPWS provided the following data for 2017/18 to inform the method:¹⁷

- employment data by NPWS activity category¹⁸ (by total days of employment)
- expenditure data, across 20 categories, by locality.

It is important to note that the expenditure data provided for a given area is the area in which the expenditure occurred. For example, a significant proportion of NPWS expenditure (\$26 million) was allocated to Sydney in 2017/18 as this includes the maintenance of major office facilities in Sydney as well as some small, but high use national parks (e.g. Royal National Park).

In addition, NPWS employment and expenditure data is not specifically provided for forested land. Forests account for approximately 75 per cent of NPWS estate in NSW. Non-forested national parks and reserves are principally located in Western NSW.

As a consequence, the data provided by NPWS needed to be adjusted to:

- 1) refine the allocation of expenditure across localities so that expenditure is based on the driver of employment, rather than the location in which the expenditure occurred; and
- 2) identify, for each locality, the extent to which employment and expenditure can be allocated to forest-related activities, as opposed to non-forest-related activities undertaken by NPWS.

These processes are further detailed in the sections below.

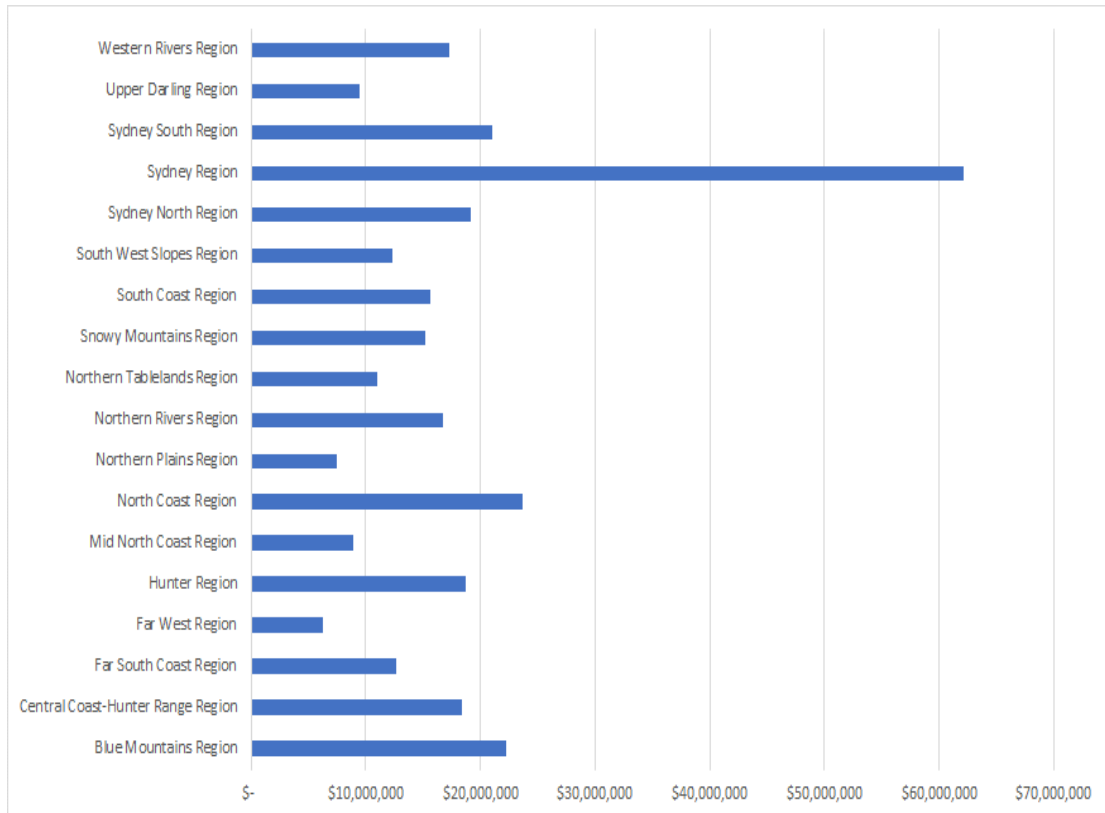
Allocation of expenditure

The expenditure data provided by NPWS was firstly allocated across the 18 NPWS regions, as shown in the figure below.

¹⁷ This data was collected and analysed by the NPWS as part of a previous internal project that involved assessing the allocation of NPWS's activities across different postcodes. The cost and time required to replicate this data means it was not possible to obtain more recent employment and expenditure data for use in the method.

¹⁸ Categories included 'Biodiversity and wildlife management', 'Communities and Parks', 'Fire Management', 'Park Operational Assets', 'Park Visitor Experience', 'Park Visitor Facilities', and 'Pest Management'.

Figure 3 Allocation of NPWS expenditure by NPWS region (2017/18)

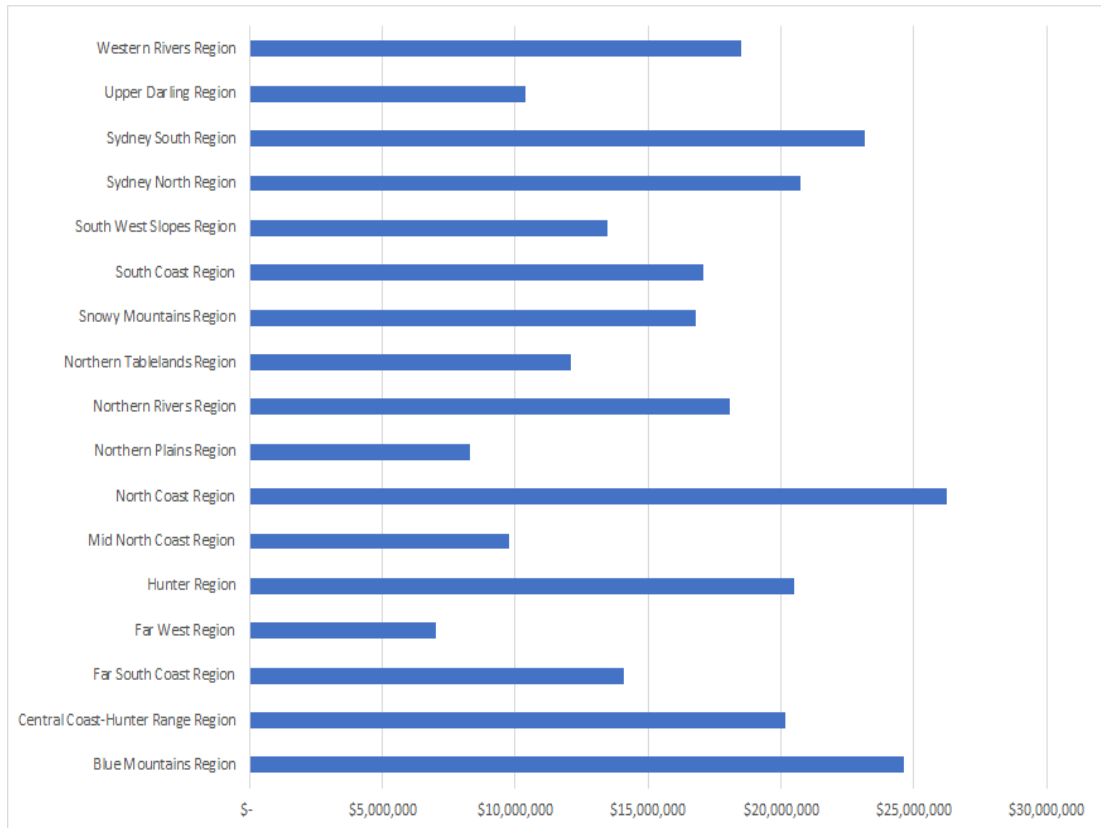


Data source: Based on locality-based expenditure provided by NPWS for 2017/18.

The figure shows the dominance of expenditure in the Sydney region, accounting for more than double the expenditure of any other area despite containing limited areas of national park estate. This is largely due to the location of centralised activities (e.g. head office) and small area-high use parks in the Sydney region.

NPWS has advised that it is appropriate for expenditure in Sydney to be allocated across the other regions, on the basis that the expenditure incurred in this area relates to the management of national park estate located across the other regions. NPWS also advised that direct labour is likely to be the most appropriate driver for these costs. As a result, the expenditure incurred within the Sydney region has been allocated across the other 17 regions using wage expenditure as the cost allocator. This results in the allocation of expenditure shown in the figure below.

Figure 4 Reallocation of NPWS expenditure by wage and region (with central costs allocated) (2017/18)



Data source: Based on locality-based expenditure provided by NPWS for 2017/18.

Expenditure attributable to forest land

The NPWS expenditure data relates to all expenditure incurred by NPWS across the entire national park estate. Noting that while forests account for the majority of the NSW national park estate, there are several other land categories which NPWS is responsible for managing.¹⁹ The table below shows the total area under NPWS administration and total area of forest cover by NPWS region, excluding Sydney.

Table 4 Total administrative area and area under forest cover by NPWS district

NPWS District	Total area (hectares)	Forest cover (hectares)	% forest cover
Blue Mountains	837,786	829,975	99%
Central Coast-Hunter Range	437,054	430,544	99%
Far South Coast	461,621	456,053	99%
Far West	978,227	117,274	12%
Hunter	248,098	210,386	85%

¹⁹ Desert and arid shrubland, heathland, alpine, coastal, grassland, caves, and wetlands.

NPWS District	Total area (hectares)	Forest cover (hectares)	% forest cover
Mid North Coast	206,258	181,972	88%
North Coast	386,456	366,560	95%
Northern Plains	468,128	380,246	81%
Northern Rivers	163,163	143,691	88%
Northern Tablelands	604,624	589,085	97%
Snowy Mountains	458,499	399,994	87%
South Coast	391,890	381,953	97%
South West Slopes	440,095	391,125	89%
Sydney North	37,208	34,439	93%
Sydney South	83,162	81,009	97%
Upper Darling	687,215	357,901	52%
Western Rivers	379,092	209,532	55%
Totals	7,268,576	5,561,739	77%

Note: 'Total area' refers to the total area under administration by NPWS.

Source: Forest cover derived using ABARES mapped forest cover intersected with NPWS region boundaries.

The table shows that for the majority (14 of 17) of NPWS regions, the forest cover accounts for over 80 per cent of the total area under administration by NPWS. There are three regions that represent outliers in terms of the proportion of forest cover – Far West (12 per cent), Upper Darling (52 per cent), and Western Rivers (55 per cent).

The percentage of the NPWS regions covered by forest area has been applied to the total expenditure attributable to the respective regions to identify the total expenditure (and associated breakdown) attributable to forest-dependent activities.²⁰

Based on the above, estimates have been derived for total forest-dependent expenditure across all of NPWS's regions, excluding Sydney. These estimates are detailed below.

Deriving metrics for direct and indirect employment

Having identified the total expenditure and breakdown attributable to NPWS's forest-dependent activities for each region, the next step is to derive metrics for direct and indirect employment.

It is important to note that the study area to which the method is to be applied will not necessarily align precisely with the NPWS regions. Hence, the method will involve deriving per hectare metrics for direct and indirect employment for each region. This will enable GIS mapping to be used to determine the number of hectares from each

²⁰ For example, for the Hunter region, 85 per cent of the area under NPWS administration is forest cover. This proportion will be applied to the total expenditure attributable to the Hunter (which will also include the allocation of centralised costs from the Sydney region) to determine the total expenditure and breakdown that is attributable to NPWS forest area within the Hunter.

NPWS region that fall within the study area. The relevant metrics can then be applied to derive estimates for direct and indirect employment attributable to NPWS's forest-dependent activities within the study area.

Direct employment

In addition to identifying 'wages' in the region-by-region expenditure data, NPWS also provided an FTE breakdown by activity. The FTE data included an estimate of total FTE days of 425,335 across all of NPWS's activities. Based on an assumption of 220 FTE days per annum, this equates to a total FTE count of 1,933. Applying this to total wages expenses for 2017/18 (\$192,584,826) results in an estimate of \$99,630 per FTE.

This estimate has been applied to the forest-related expenditure attributable to wages in each region to determine the number of direct FTEs attributable to each region. This number is then divided by the number of hectares of forest cover to derive a metric for direct employment per hectare (as detailed in the table below).

Table 5 Direct employment metrics for NPWS forest-related activities by district

District	Forest-related wages	Forest-related FTEs	Forest cover (hectares)	Forest-related FTEs per '000 hectares
Blue Mountains	\$18,190,435	182.6	829,975	0.22
Central Coast-Hunter Range	\$13,877,897	139.3	430,544	0.32
Far South Coast	\$10,554,075	105.9	456,053	0.23
Far West	\$675,530	6.8	117,274	0.06
Hunter	\$11,704,590	117.5	210,386	0.56
Mid North Coast	\$6,114,239	61.4	181,972	0.34
North Coast	\$18,618,861	186.9	366,560	0.51
Northern Plains	\$5,145,532	51.6	380,246	0.14
Northern Rivers	\$9,269,109	93.0	143,691	0.65
Northern Tablelands	\$8,309,939	83.4	589,085	0.14
Snowy Mountains	\$10,928,716	109.7	399,994	0.27
South Coast	\$11,045,092	110.9	381,953	0.29
South West Slopes	\$7,799,997	78.3	391,125	0.20
Sydney North	\$11,430,187	114.7	34,439	3.33
Sydney South	\$16,108,098	161.7	81,009	2.00
Upper Darling	\$3,619,531	36.3	357,901	0.10
Western Rivers	\$5,259,700	52.8	209,532	0.25
Totals	\$168,651,528	1,692.8	5,561,739	NA

Source: Synergies and Verterra analysis of 2017/18 FTE and expenditure data provided by NPWS.

Indirect employment

These estimates have also been used to undertake I-O modelling to estimate total indirect FTEs attributable to this expenditure in forested areas within each NPWS region (as detailed in the table below).

Table 6 Indirect employment metrics for NPWS forest-related activities by district

District	Total forest-related expenditure	Forest-related indirect FTEs	Forest cover (hectares)	Forest-related indirect FTEs per '000 hectares
Blue Mountains	\$9,693,959	79.8	829,975	0.10
Central Coast-Hunter Range	\$8,749,868	64.7	430,544	0.15
Far South Coast	\$5,415,232	26.0	456,053	0.06
Far West	\$294,011	1.4	117,274	0.01
Hunter	\$7,985,825	61.1	210,386	0.29
Mid North Coast	\$3,653,712	19.7	181,972	0.11
North Coast	\$9,901,411	73.3	366,560	0.20
Northern Plains	\$2,579,012	17.0	380,246	0.04
Northern Rivers	\$8,407,746	74.8	143,691	0.52
Northern Tablelands	\$5,015,795	48.7	589,085	0.08
Snowy Mountains	\$5,776,648	30.6	399,994	0.08
South Coast	\$7,630,132	45.6	381,953	0.12
South West Slopes	\$5,678,347	18.1	391,125	0.05
Sydney North	\$10,043,909	73.3	34,439	2.13
Sydney South	\$9,455,808	63.4	81,009	0.78
Upper Darling	\$2,471,780	4.0	357,901	0.01
Western Rivers	\$5,934,390	49.3	209,532	0.24
Totals	\$108,687,585	750.8	5,561,739	NA

^a Excludes wages.

Source: Synergies and Verterra analysis of 2017/18 FTE and expenditure data provided by NPWS.

5.1.2 Forestry Corporation

Forestry Corporation is responsible for the management of 2.15 million hectares of forest which includes 1.9 million hectares of native forest, 225,000 hectares of softwood plantations, and 35,000 hectares of eucalypt plantations. Forestry Corporation's forest management activities include engaging contractors to manage forest access, administering and regulating recreation and tourism activities, and fire prevention and protection and pest management.

Direct employment

Forestry Corporation provided a detailed breakdown of FTE allocations across their three operating Divisions:

- Hardwood forests (1.725 million ha of native forest and 35,000 ha of hardwood plantation)
- Softwood plantations (225,000 hectares of softwood plantation and 165,000 ha of native forest)
- Corporate Business Services.

Where possible, FTEs have been directly allocated between Forest Management Zones (FMZs) for hardwood and softwoods. In addition, the 107 corporate FTEs were broken into 17.1 FTEs for hardwoods and 34.9 FTEs for softwoods,²¹ with the remaining 55 FTEs common across the business.

Table 7 Forestry Corporate FTEs by business area and region

Region	FTEs	Area	FTEs per '000 hectares
Hardwoods (native forest and plantations)			
Eden	25.2	164,822	0.15
Lower North East	78.3	468,916	0.17
Southern	34.7	308,650	0.11
Upper North East	81.2	413,342	0.20
Western	34.0	530,735	0.06
Corporate – Hardwoods	17.1	-	-
Total hardwoods	270.5	1,886,465	0.14
Softwoods (plantations)			
Bathurst	61.7	84,642	0.73
Bombala	26.0	41,900	0.62
Grafton	16.6	16,904	0.98
Tumut	75.0	108,758	0.69
Walcha	9.5	14,944	0.64
Corporate – Softwoods	34.9	-	-
Total softwoods	223.8	267,149	0.84
Corporate (common)	55.0	2,153,614	0.03
Totals	549.3	2,153,614	0.26

Note: Based on 2020 FTE information.

Source: Synergies and Verterra analysis based on FTE data provided by Forestry Corporation.

Applying the method requires estimates of the area of FMZs within a study area for both softwoods and hardwoods. The relevant FTE per '000 hectares metric for each FMZ is then applied to the area estimates. The metric for corporate (common) FTEs is then applied to the total area of land under management by Forestry Corporation and added

²¹ Based on information provided by Forestry Corporation.

to the hardwood and softwood estimates to produce a total estimate for direct employment attributable to Forestry Corporation’s forest management activities within a study area.

Indirect employment

Forestry Corporation also incurs significant expenditure in undertaking its activities in NSW forests. This expenditure generates indirect employment in other sectors of the NSW economy that needs to be reflected in the metrics derived for Forestry Corporation (relative to the breakdown of expenditure data provided).

There are two key drivers of Forestry Corporation’s management activities:

- 1) Forest type (exotic softwood, hardwood & cypress)
- 2) Resource classification (i.e. reserve, production forest, mixed use forest).

There are also three key areas of Forestry Corporation’s employment in management activities:

- Community service areas (870,163 hectares)
- Softwood plantations (195,400 hectares)
- Hardwood and cypress forests (1,123,465 hectares).

The table below details the metrics for individual forest management activities across these categories. The metrics have been developed based on expenditure data provided by Forestry Corporation, Forestry Corporation’s annual reports, and other publicly available reports and publications.

Table 8 Expenditure estimates for Forestry Corporation’s forest management activities

Activity	Community service areas	Softwood plantations	Hardwood & cypress forests
Forest access (road construction and maintenance)	\$2.10 per ha	\$3.85 per m ³	\$9.75 per m ³
Fire suppression ^a	\$2.66 per ha	\$2.66 per ha	\$2.66 per ha
Fire mitigation ^a	\$4.89 per ha	\$4.89 per ha	\$4.89 per ha
Weed control	\$1.63 per ha	\$2.78 per ha	\$1.63 per ha
Pest animal control	\$1.11 per ha	\$2.62 per ha	\$1.11 per ha
Plantation establishment	-	\$2,007 per ha	\$2,950 per ha
Corporate and overheads	\$12.00 per ha	\$12.00 per ha	\$12.00 per ha

^a Unable to distinguish expenditure between land use categories based on expenditure data provided by Forestry Corporation.

^b Is only to be applied where plantation area has been established in the study period during the period over which the method is being applied.

Source: Expenditure data provided by Forestry Corporation; Forestry Corporation Sustainability Report; Forestry Corporation Biomaterial Report; ABARES data.

These expenditure estimates have been used to derive indirect FTE metrics for each of the forest management activities undertaken by Forestry Corporation (see table below). These metrics have been derived by applying the above expenditure estimates to the appropriate sectors in the NSW I-O table, as identified in the table below.

Table 9 Indirect employment metrics for Forestry Corporation's forest management activities (FTEs per unit)

Activity	Sectors	Community service areas	Softwood plantations	Hardwood forests
Forest access (road construction and maintenance)	(State) Public Administration and Safety	1.045 per 100,000 ha	1.89 per 100,000 m ³	4.85 per 100,000 m ³
Fire suppression	(State) Public Administration and Safety	1.3 per 100,000 ha	1.3 per 100,000 ha	1.3 per 100,000 ha
Fire mitigation	Public Order Safety and Regulatory Activities (State) Public Administration and Safety	2.401 per 100,000 ha	2.401 per 100,000 ha	2.401 per 100,000 ha
Weed control	Nature Reserve and Conservation Park Operations	1.4 per 100,000 ha	2.38 per 100,000 ha	1.4 per 100,000 ha
Pest animal control	Building, Cleaning, Pest Control and other Support Services	0.611 per 100,000 ha	1.44 per 100,000 ha	0.611 per 100,000 ha
Plantation establishment	Nature Reserve and Conservation Park Operations	NA	1.722 per 100,000 ha	2.531 per 100,000 ha
Corporate and overheads	Professional Scientific and Technical Services Corporate Head Office Management	6.79 per 100,000 ha	6.79 per 100,000 ha	6.79 per 100,000 ha

Note: Where multiple sectors are identified, the expenditure has been applied evenly across the sectors.

Source: Synergies modelling.

5.1.3 Crown Lands

Over five million hectares of forest area in NSW is classified as 'leasehold' or 'other crown land'. Of a total of 3.5 million hectares of crown land, 1.265 million hectares is administered by Crown Lands and widely dispersed throughout the state. Crown Lands are responsible for the management of most of this land, with Crown Land Trusts and in some cases local governments having the remainder of the management responsibilities for crown lands. Management of crown land includes fire prevention and protection, weed and pest control, and basic maintenance of roads within forest areas.

Direct employment

Crown Lands has estimated that 17 FTEs are currently directly employed in forest management activities (primarily fire protection and prevention and weed and pest

control). In addition to these FTEs, there are also 430 corporate FTEs within Crown Lands.

Forest land accounts for 3.87 per cent of the land administered by Crown Lands.²² Based on this proportion, it is estimated that around 17 of Crown Lands' 430 corporate FTEs are attributable to forest land management activities. This results in a direct employment metric for Crown Lands' forest management activities of 0.013 FTEs per '000 hectares.²³

Indirect employment

Crown Lands has advised that it incurs approximately \$216 million of non-labour expenditure in managing Crown Land throughout NSW. Applying the proportion of forest land to total land administered by Crown Lands (3.87 per cent) results in an allocation of non-labour expenditure to forest land management activities of \$8.36 million, or \$6.60 per hectare.²⁴

I-O modelling undertaken for this expenditure results in a metric for indirect employment of 0.045 FTEs per '000 hectares.²⁵ The expenditure was applied equally to the (State) Public Administration and Safety and Nature Reserves and Conservation Park Operations sectors.

This metric can be applied to the total area of forest land under management by Crown Lands within a given study area to determine indirect employment attributable to Crown Lands' forest management activities.

5.1.4 Local Land Services

LLS' responsibilities in relation to the management of forest land are as follows:

- management of Travelling Stock Routes (TSR) within forest areas;
- issuing and administering Private Native Forestry (PNF) approval for landholders;
- administering the NSW Land Management Framework (including biosecurity management); and

²² 1.265 million hectares of forest land out of a total of 32.7 million hectares.

²³ While it was noted by Crown Lands that the intensity of management requirements is likely to differ across the forest estate, primarily driven by fire and pest risk (i.e. proximity to developed areas), the FTE data available was insufficient to enable a robust assessment of the differences in employment intensity across the Crown Lands estate. As such, the metric derived is to be applied evenly across all forest areas managed by Crown Lands.

²⁴ Crown Lands was not able to provide any further advice (sufficiently robust for inclusion in the method) regarding how this expenditure burden varies across different parts of the NSW forest estate.

²⁵ Noting that the total expenditure of \$8,359,200 translated to 56.43 FTEs.

- provision of grants for the protection and rehabilitation of forests (e.g. administering of funding to Landcare groups).

Due to the limitations in relation to the employment and expenditure data that was sourced from LLS, it was not possible to develop direct or indirect employment metrics for several of these activities.

Employment and expenditure data was provided by LLS in relation to the issuing and administering of PNF approvals. PNF approvals apply for a 15-year period and together with operating rules control timber harvesting intensity and identify exclusion zones. In addition to issuing and administering these approvals, LLS also provide extension services to landholders. These services involve working with landholders to identify and assess options for the management of private native forest.

Direct employment

LLS has identified 15 FTEs that are directly attributable to forest management activities (noting this is limited to the issuing and administering of PNF Plans).²⁶ This represents 1.78 per cent of the total operational staff of 842. LLS is also comprised of 54 corporate FTEs. Applying the above proportion to this total results in an estimate of 0.96 corporate FTEs that are attributable to forest management activities, resulting in a total of 15.96 FTEs.

The most appropriate metric for estimating direct employment for LLS is based on the number of PNF Plans administered (i.e. FTEs per PNF Plan), as this is the major driver of LLS' workload related to forest management activities. LLS has advised that annual average PNF Plans administered has been estimated at 280. This implies a metric of 0.057 FTEs per PNF Plan for direct employment attributable to LLS's forest management activities.

This metric is to be applied to the number of PNF Plans administered in a given study area to estimate direct employment for LLS.

Indirect employment

LLS has provided an estimate of \$1 million for the operational (i.e. non-labour) expenditure attributable to its PNF activities. In addition, total non-labour operating expenditure in 2020 was \$161 million.²⁷ Applying the 1.78 per cent proportion derived

²⁶ Of this total, 12 FTEs are operational and 3 are policy-related.

²⁷ Local Land Services (2020). Local Land Services Annual Report 2019-20.

above results in the allocation of \$2.9 million of corporate costs to LLS's forest management activities. This results in total non-labour expenditure of \$3.9 million.

I-O modelling undertaken for this total expenditure results in 13.36 FTEs. This translates to a metric of 0.048 FTEs per PNF Plan.²⁸ This metric was derived by applying this expenditure to the Property Operators and Real Estate Services sector. As for direct employment, this metric is to be applied to the number of PNF Plans within a given study area to determine indirect employment attributable to LLS' activities.

5.1.5 Department of Defence

The Department of Defence is responsible for the management of small areas of forest throughout NSW (around 39,000 hectares). The Department of Defence has advised that, in terms of direct employment, forest management activities are undertaken by dedicated personnel within the Department, with specific services subcontracted by the Estate Maintenance and Operations Service contractor responsible for land management.

Given the limited area of forest land that is managed by the Department of Defence, the direct and indirect FTE metrics for the relevant NPWS region are to be applied to the area of forest land managed by Defence. This is based on discussions with the Department of Defence that of the various entities responsible for forest land management, the activities of the NPWS are likely to be most reflective of the forest land management activities undertaken on Defence land.

5.1.6 Local governments

Local governments are also responsible for the management of forest land. The tenure of this land is generally Crown land. Consultation undertaken as part of the pilot project indicates that it is most likely these local government management activities are funded by Crown Lands. Hence, the employment associated with these activities is accounted for in the Crown Lands indirect employment metrics.

5.1.7 Plantation management companies

As previously discussed, there are extensive areas of privately owned plantations throughout NSW. The larger plantations are managed by private plantation management companies, such as Hume Forests and Snowy Mountain forests.

²⁸ Based on the estimate of 280 PNF Plans provided by LLS.

Given the lack of employment or expenditure data provided by private plantation management companies, the direct and indirect employment metrics for Forestry Corporation (see section 5.1.2) have been applied to estimate the employment attributable to the maintenance (and establishment) of softwood and hardwood plantations.

5.1.8 Private landholders

A significant proportion of the forest estate in NSW is privately owned. This presents a challenge for the method, as there is limited data available regarding the employment and expenditure on management activities on the private native forest estate.

Data from an attitudinal survey conducted by the University of Canberra in 2017²⁹ indicates that around 20 per cent of private native forest landholders (accounting for around 25 per cent of the private native forest estate) either consult LLS or engage a private forestry consultant to assist with the management of their forest land.³⁰ It is assumed that this proportion (25 per cent) represents the proportion of the native forest estate that is subject to active management by landholders.³¹ On this basis, the indirect employment metrics for hardwood forests for Forestry Corporation (see section 5.1.2) have been applied for this proportion of the private native forest estate.³²

No metrics have been developed for the remainder of the private native forest estate on the basis that there is unlikely to be material expenditure, and hence employment, attributable to the management of this land.

²⁹ Dare, L., Schirmer, J., and Mylek, M. (2017). Private native forest owner attitudinal survey – Northern NSW. See: https://www.dpi.nsw.gov.au/_data/assets/pdf_file/0019/752230/Private-native-forest-owner-attitudinal-survey-Northern-NSW.pdf

Note – this survey focused on private native forestry in northern NSW only, which has the greatest number of PNFs in the State. As such, will overestimate figures in terms of the proportion of landholders with PNF Plans. However, noting this limitation, it is considered to be the best data available to inform this part of the method. A broader study of land management activities and expenditure incurred by private native forest landholders throughout NSW would improve the robustness of the method.

³⁰ Remaining landholders either consult with no one, families or friends, neighbours, Landcare groups, or other.

³¹ Dare, L., Schirmer, J., and Mylek, M. (2017). Private native forest owner attitudinal survey – Northern NSW. See: https://www.dpi.nsw.gov.au/_data/assets/pdf_file/0019/752230/Private-native-forest-owner-attitudinal-survey-Northern-NSW.pdf

³² While this may be considered an overestimate as most private native forest landholders are unlikely to incur the same level of expenditure on forest management activities as Forestry Corporation, it is important to note that there will also be other private native forest landholders who are not included in the method under the proposed approach that also incur expenditure that has employment impacts. Having regard to this and based on the data available, the approach outlined is considered the most robust available.

To determine the employment attributable to the management of private native forest, the indirect employment metrics detailed in section 5.1.2 are to be applied to 25 per cent of the total area of private native forest in a given study area.

5.1.9 Rural Fire Service

While not directly responsible for managing forest land in NSW, a significant proportion of the RFS's activities occur on forest land. This includes assisting with forest protection and prevention activities where this risk cannot be effectively managed by the responsible entity and assisting with the management of fires. Notwithstanding the significant volunteer component of RFS, a proportion of its direct employees are attributable to these forest management activities.

As previously discussed, RFS advised that it does not consider it appropriate to be included in the method as it does not identify any of its employment to the forest estate (either direct FTEs or flow-on employment). The rationale provided in writing by RFS as part of the stakeholder consultation process was as follows:

While there are approximately 1200 FTEs directly attributable to the NSW RFS, it is the view of the RFS that none of this employment should be attributed to the forest estate. This is because the NSW RFS is established as a public good and employment consideration based on community risk is tenure blind. Individual landowners/managers are responsible for fire management and prevention activities on their own land under the *Rural Fires Act 1997* (i.e. NPWS, Forestry Corporation, Crown Lands, private landowners) and as such, the method will capture the direct and indirect fire protection and prevention activities undertaken by these entities.

The coordination role of the RFS in relation to risk management, preparedness and incident management is managed by NSW RFS Officers, with response capacity primarily led by volunteers. If the forest estate were to be classified under another tenure, the forestry fire management resources would be removed, and may impact on the local volunteer workforce requirements (depending on context) than is currently the case and hence, however it is unlikely to significantly impact on salaried employment. Thus there is no significant employment that is directly attributable to the forest estate.

Based on the above, RFS have not been included in the method.

6 Forest management support services

Definition

Employment directly and indirectly related to support services for the management of native forests (including State forests and native forests on private land) and plantations in NSW. All tenures under this heading are relevant, that is multiple use, conservation, other crown lands, leasehold, and freehold lands.

Key activities

- Forest policy development
- Forest regulation and compliance activities
- Forest-related science and research (production and conservation)
- Forest conservation programs and agreements
- Forest advocacy
- Forest consulting.

Employment metrics

- Direct and indirect FTEs for government agencies responsible for forest policy activities, predominantly by area of forest (per PNF Plan for LLS)
- Direct and indirect FTEs for regulation and compliance activities undertaken by EPA and DPI by area of forest (multiple use forests for EPA and plantations for DPI)
- Direct and indirect FTEs for forest-related science and research undertaken by government agencies by area of forest.
- Direct and indirect FTEs for forest-related conservation programs and agreements.

Key findings

- Expenditure incurred in relation to the administration of forest conservation programs and agreements is the main source of forest-dependent employment in the forest management support services category.
- Aside from this activity, forest support services are not a significant driver of forest-dependent employment in NSW, with no agency reporting a large number of direct FTEs or expenditure attributable to these activities.

Key assumptions

- The direct and indirect employment metrics for NPWS and Forestry Corporation have been excluded from this section of the method to avoid double counting as their data on forest management support services was embedded in forest management activities more broadly (see Section 5).
- Forest advocacy has been excluded as a result of relevant stakeholders being unable to provide sufficient information to derive metrics for direct or indirect employment attributable to this activity.
- Data for forestry consulting has been excluded as the expenditure attributable to these activities has been accounted for in the indirect employment metrics for forest management activities (and to some extent in the direct employment metrics in the wood and timber products section).

Key data gaps and limitations

- NPWS and Forestry Corporation data does not separate employment and expenditure on forest policy support services from general forest management activities.
- Information was not made available on employment or expenditure by Environment, Energy and Science (within DPIE) for forest policy and forest-related science and research activities.
- The Biodiversity Conservation Trust (BCT) provides funding for forest conservation programs and agreements with landholders that support significant indirect employment. The method is limited to the use of published information on expenditure on these activities and would be improved by consulting with BCT to better understand the nature of the expenditure and the types of activities that are undertaken.
- Several government agencies, particularly the EPA and LLS, reported difficulties in identifying FTEs and expenditure on forest management support activities, particularly policy.
- Forest science and research activities cannot be easily attributed to different areas of land or land tenures. In addition, some forest-related science and research projects do not necessarily relate only to forests. Science and research projects are also undertaken on an ad hoc basis and by entities external to Government (i.e. universities, research institutes) so there is no central source of data and information on the size and nature of these projects.

Opportunities for addressing gaps and strengthening the method

- NRC engage with Forestry Corporation and NPWS to establish processes for separately identifying forest management and forest management support services within their appropriate Human Resource and financial management systems.
- NRC engage with government agencies that undertake forest management support activities (e.g. DPIE (EES), BCT, DPI, EPA, and LLS) to establish processes for identifying and recording the employment and expenditure attributable to forest management support activities.
- Identify and map forest science and research activities in NSW Government and externally with a view to establishing a working group to oversee this work. The group could be tasked with providing a better understanding of employment related to these activities and developing reporting arrangements that can differentiate between forest and non-forest areas, and different forest tenures.
- Identify and map forest conservation programs and agreements funded by BCT and EES to better understand the nature and breakdown of forest-dependent employment on these activities. This would require liaising with relevant staff at BCT and EES.

The sections below set out the steps required to derive an estimate for the direct and indirect employment attributable to the forest management support activities.

6.1.1 Forest policy – government

The first step in estimating the employment attributable to forest-related government policy is to identify those NSW government departments and entities that play a role in

administering policy, and undertaking other policy-related activities, in the sector.³³ The following entities were identified through consultation with the Working Group:

- Department of Planning Industry and Environment (Environment, Energy and Science)
- National Parks and Wildlife Service
- Department of Primary Industries
- Local Land Services
- Environment Protection Authority
- Natural Resource Commission.

Direct employment

Direct employment attributable to forest policy relates to those FTEs within the NSW government that undertake policy-related activities within the forest sector. This involves identifying the FTEs within each of the government entities listed above that undertake policy development and analysis and assessing the extent of policy-related activities by forest areas. The method for each entity is detailed below (noting that no separate metrics for NPWS have been established in relation to forest policy, as discussed in section 5.1.1).

Department of Planning Industry and Environment

Environment, Energy and Science (EES) within DPIE has a significant policy function related to the management of forest land. This includes policy development around biodiversity conservation and forest fire.

Despite this, information has not been made available on the direct employment attributable to the forest policy activities undertaken by EES. As per the recommendations on forest management support services, this is a gap in the method that needs to be addressed as part of future work.

Department of Primary Industries

DPI Forestry includes a policy unit, a plantation regulation unit and a forest science unit.

³³ It is noted that national policy on forests is administered by the Commonwealth Government and hence the employment related to the policy activities for the relevant departments will be attributable to NSW forests. This employment has not been included in this method due to the difficulties in identifying the extent to which policy activities at the national level are attributable to areas of forest at the State/Territory level.

DPI has advised that there are currently nine FTEs in the Forest Policy group. These FTEs are directly attributable to the development and maintenance of forest-related policy.³⁴

DPI's forest policy activities primarily relate to production forests (i.e. multiple use forests and plantations). As such, the appropriate metric for estimating employment attributable to DPI's forest policy-related activities is FTE per '000 hectares of production forests. Based on the estimate for the total area of production forests in NSW of 1,815,858 hectares,³⁵ the metric for direct employment attributable to DPI's forest policy-related activities is 0.005 FTEs per '000 hectares of production forest. This metric can be applied to the total hectares of production forest in a given study area to estimate the direct employment attributable to DPI's Forest Policy Group.

DPI also has a lead role in forest biosecurity policy which regulates the management of pests and weeds. The number of FTEs that may be attributable to forest biosecurity policy was not investigated.

Local Land Services

LLS has 3 FTEs responsible for forest policy-related activities. Based on an estimate of 280 PNFs administered per annum, this translates to a direct employment metric of 0.0107 FTEs per PNF Plan. For example, if there are 30 PNF Plans administered in a study area, 0.32 FTEs are associated with LLS's policy-related activities.

Environment Protection Authority

Up until February 2020, EPA's forest-related activities were undertaken by a standalone forest branch. The EPA has since moved to a functional structure, with forest-related staff distributed across several teams and their roles diversified to include the broad spectrum of industries regulated by the EPA.

EPA has advised it is not possible to attribute FTEs to forest policy-related activities and hence the method does not include a direct employment metric for the EPA.

³⁴ Given the small number of FTEs in the DPI Forest Policy Group as a proportion of the total employees in the DPI, it is not considered necessary to account for overhead/corporate FTEs attributable to this activity from within DPI.

³⁵ Comprised of 1,380,070 hectares of native hardwoods managed by Forestry Corporation, 50,377 hectares of plantation hardwood managed by Forestry Corporation, 193,041 hectares of plantation softwood managed by Forestry Corporation, 113,000 hectares of private plantation softwood, 36,800 hectares of private plantation hardwood, and 42,570 hectares of private native forest (with approved PNF Plans).

Natural Resources Commission

The NRC provides independent advice to the NSW Government on natural resources management matters, including issues associated with forest and forestry policy and management matters as requested. The NRC does not develop forest policy.

There is a total of 23.1 FTEs in the NRC. The NRC has advised that approximately 28 per cent of its current overall workload can be attributed to the forest estate, although this fluctuates depending on the work commissioned by Government. On this basis, an average of 6.4 FTEs account for NRC's forest-related activities. It is not appropriate to further disaggregate this metric across the forest estate due to the breadth of the NRC's work. Hence, the direct employment metric for NRC's forest-related activities has been derived by dividing this estimate (6.4 FTEs) by the total area of the forest estate in NSW (20.4 million). This results in a metric of 0.31 FTEs per million hectares.

Indirect employment

The indirect employment attributable to forest-related government policy is driven by expenditure on functions related to the development and analysis of policy, as outlined below for each of the four Government entities.

Department of Planning Industry and Environment

As noted above, it has not been possible to source employment and expenditure information on the forest policy activities undertaken by EES-DPIE which should be addressed in future work.

Department of Primary Industries

DPI has advised that total expenditure attributable to the Forest Policy team is estimated at \$1.44 million per annum. As noted, DPI's forest policy role relates to mixed use and plantation forests so the metric for indirect employment has been derived to apply to both these forest types. This results in an expenditure metric of \$793 per '000 hectares of production forest.

This expenditure was applied equally to the (State) Administrative and Support Services and Nature Reserve Conservation Park Operation sectors in the I-O model to derive a metric of 0.005 FTEs per '000 hectares of production forest. This metric is to be applied to the total area of production forest in a study area to derive an estimate for indirect employment attributable to DPI's forest policy activities.

Local Land Services

LLS was not able to provide any expenditure information in relation to its forest policy activities. Noting that only 3 FTEs within LLS are attributable to this activity, it is unlikely that their expenditure is a significant driver of forest-dependent employment.

Environmental Protection Agency

EPA has provided expenditure estimates in relation to the TEC mapping project and their forest monitoring activities. The average annual expenditure attributable to these two programs over the four-year period for which data is available is \$1.025 million.

Given EPA's role in the forest sector, all this expenditure can be attributed to native hardwood forests. Modelling conducted based on the breakdown of this expenditure provided by EPA resulted in a metric of 0.004 FTEs per '000 hectares of native hardwood forest for EPA's forest-related policy activities. The expenditure was applied to the Public Order, Safety and Regulatory Services sector to derive this metric.

This metric is to be applied to the total area of native hardwood forest in a study area to derive an estimate for indirect employment attributable to EPA's forest policy activities.

Natural Resources Commission

The NRC has provided an estimate for total non-labour expenditure of \$4,411,000 per annum. Applying the 28 per cent assumption, this results in an estimate for forest-related expenditure of \$1.24 million. As noted above, it is not appropriate to further disaggregate this estimate across the forest estate.

I-O modelling undertaken on this expenditure results in a metric for indirect employment of 0.0002 FTEs per '000 hectares. The expenditure was applied equally to the (State) Public Administration and Safety and Nature Reserves and Conservation Park Operations sectors to derive this metric.

To calculate the indirect employment attributable to the NRC's forest-dependent activities, this metric is to be applied to the total hectares of forest within the study area.

6.1.2 Forest regulation and compliance

Forest regulation and compliance within NSW forests are primarily the responsibility of the EPA and DPI. This section also includes the activities of EES in the administration of conservation activities on private forest land and the Biodiversity Conservation Trust (BCT) in managing and administering conservation and biodiversity offset agreements with landholders on private forest land.

Direct employment

Direct employment attributable to the regulation of forest activities relates to relevant FTEs within EES, BCT, RFS, EPA, DPI, and LLS. The method requires the identification of relevant FTEs and an assessment of the extent of regulatory activities by forest area (e.g. intensity of certain activities within a forest area).

Environment, Energy & Science (EES)

EES officers are responsible for regulating and monitoring compliance with the Biodiversity Conservation Act, particularly on private land. This includes remote assessment monitoring through the Statewide Landcover and Tree Study (SLATS) and on ground investigation of alleged breaches of the Land Management Codes. EES were unable to provide an estimate of the number of FTEs responsible for carrying out this work.

Environmental Protection Agency (EPA)

The EPA's regulatory functions apply to activities conducted within multiple use forests. The EPA has advised that the key driver of its regulatory workload is the volume of timber harvested. The EPA was unable to provide an estimate of the number of FTEs responsible for carrying out the EPA's regulatory activities within multiple use forests for inclusion in the method.

In the event that an FTE estimate is obtained from the EPA for these activities in the future, it is proposed that a metric be developed for direct employment based on the total hectares of multiple use forest in NSW (i.e. FTEs per '000 hectare of multiple use forest).

Department of Primary Industries (DPI)

DPI's forest-related regulatory functions are limited to the regulation of plantations, specifically, authorising and registering plantations exceeding 30 hectares. The resources required for this is primarily driven by the area of plantation under regulation.

DPI has advised that it maintains 9 FTEs for this regulatory function, with 4.9 FTEs allocated to the regulation of softwood plantations, and 4.1 FTEs to hardwood plantations. Based on the total hectares of softwood and hardwood plantations in NSW forests, this results in the following metrics for direct employment:

- 0.016 FTEs per '000 hectares of softwood plantation³⁶

³⁶ Based on a total of 306,000 hectares of softwood plantations in NSW.

- 0.047 FTEs per '000 hectares of hardwood plantation.³⁷

Indirect employment

The indirect employment attributable to the regulation of forest activities is driven by expenditure by the EPA and DPI on regulatory functions in forest areas.

Environment, Energy & Science (EES)

As discussed in section 6.1.1, the activities of EES have not been included in the method due to a lack of information on employment and expenditure attributable to its forest-dependent activities.

Environmental Protection Agency

As discussed above, the EPA's forest-related regulatory activities have not been included in the method due to data limitations.

Department of Primary Industries

DPI has advised that annual estimated expenditure on the regulation of plantations is \$156,036, with \$86,516 attributable to softwood plantations and \$72,520 attributable to hardwood plantations. Modelling conducted based on the breakdown of this expenditure results in the following metrics for indirect employment:

- 2.8 FTEs for the regulation of softwood plantations
- 2.2 FTEs for the regulation of hardwood plantation.

Based on the area totals detailed above, this translates to the following indirect employment metrics:

- 0.009 FTEs per '000 hectares of softwood plantations
- 0.025 FTEs per '000 hectares of hardwood plantations.

6.1.3 Forest-related science and research

Extensive scientific research and development is undertaken by a range of entities in NSW forests. This includes research undertaken by Environment, Energy and Science (EES), and DPI Forest Science; research activities either undertaken or funded by other NSW government departments; and research undertaken by external entities, including

³⁷ Based on 87,100 hectares of hardwood plantation in NSW.

CSIRO, Forest and Wood Products Australia, and various universities and research organisations. Forest-related research includes training and services activities undertaken by tertiary education institutions within NSW forest areas.

Given the difficulties associated with estimating employment, both direct and indirect, for forest-related research activities that occur across a large number of research entities, this method focuses on estimating the employment attributable to Government research activity in NSW forests through the DPI Forest Science Unit and EES within DPIE.³⁸ Note, there is a specific recommendation to address this data gap with further targeted work.

Department of Primary Industries (DPI)

Direct employment

The Forest Science Unit estimates there are currently 16.8 FTEs engaged on forest-related research activities being administered by the unit. Due to the breadth of this research activity, it is not possible to develop a standard metric to be applied to forest-related research activity undertaken in a given area.

The method requires that this information (i.e. FTEs engaged on forest-related research activities) be sourced from the DPI Forest Science Unit. DPI has advised the following in terms of the distribution of relevant FTEs by forest tenures:

- State forests – 56.25 per cent
- Plantations – 25 per cent
- Private native forest – 15 per cent
- National Park – 3.75 per cent.

These proportions need to be applied to the total FTE estimate to derive FTE estimates for each of the tenure types.³⁹ Once these tenure-specific FTE estimates have been derived, the next step is to identify the proportion of the total area for each tenure type that is within a given study area and apply that proportion to the FTE estimate.

³⁸ It is acknowledged that this will underestimate the magnitude of employment that is attributable to forest-related research activities in NSW, however it is unlikely that the research-related employment that is not captured by the method will be overly material relative to other forest-related activities.

³⁹ For example, for 2020/21, this would equate to direct FTEs of 9.45 for State forests; 4.2 for plantations; 2.5 for private native forests; and 0.6 for National Parks.

For example, if the study area is comprised of 30 per cent of the total area of State forests in NSW, this proportion is applied to the FTE estimate for research activities attributable to State forests to derive the FTE estimate.⁴⁰ This is then repeated for other tenure types.

Indirect employment

Indirect employment attributable to forest research activities undertaken by the DPI Forest Science Unit relates to expenditure incurred by researchers in undertaking these activities (e.g. travel, accommodation, sampling, and laboratory analysis).

Given the breadth of forest-related research activities, standardised metrics cannot be developed. The method requires the operational (i.e. non-labour) expenditure incurred by the DPI Forest Science Unit. The Unit has advised that total operational expenditure for 2020/21 is estimated at \$2,135,895.

As per the method for estimating direct employment, the next step is to allocate this expenditure across the various forest tenures based on the above proportions.⁴¹ The proportions of the total area of each tenure type located within a given study area are then applied to these tenure-specific expenditure estimates to estimate the total expenditure attributable to forest research activities within the area. This is to be completed for each tenure type.

I-O modelling was undertaken by applying the above expenditure estimate to the Scientific Research Services sector, resulting in a total estimate for indirect employment of 12.07 FTEs. This translates to a metric of 0.565 FTEs for every \$100,000 of expenditure. This metric is to be applied to the total research expenditure within a study area to derive an estimate for indirect employment attributable to these activities.

Environment, Energy & Science (EES)

In addition to forest policy activities, EES also undertakes research in relation to native vegetation and ecology. This includes research to assess pressures on natural vegetation to assist with land management. Key research projects currently being undertaken by EES include:

- Monitoring, Evaluation and Reporting (MER) Program
- Native vegetation monitoring

⁴⁰ For example, for 2020/21, under this scenario, the total FTEs attributable to research activities in State forests within the study area would be 2.8 FTEs.

⁴¹ For 2020/21, this results in tenure-specific expenditure estimates of \$1.2 million for State forests; \$0.53 million for plantations; \$0.32 million for private native forests; and \$0.08 million for National Parks.

- Vegetation Information System
- Woodland ecology.⁴²

While these research activities apply across multiple land categories in addition to forest, a material proportion of the research activity undertaken is forest-dependent and therefore warrants inclusion in the method. As discussed above, this is a gap in the method to be addressed as part of future work.

6.1.4 Forest conservation programs and agreements

Environment, Energy & Science (EES)

EES provides funding for and administers biodiversity conservation activities on private forest land through the 'Saving our Species (SoS)' program. The program involves volunteers, scientists, businesses, community groups, and government coordinating activities aimed at preserving threatened plant and animal species throughout NSW. Key activities under the SoS program include:

- consulting with experts in the development of projects;
- providing targeted conservation projects aimed at protection of specific plant and animal species;
- monitoring and reporting on the effectiveness of projects; and
- encouraging partnerships with community, corporate and government in threatened species conservation.⁴³

The SoS program annual report for 2019/20 details \$28.8 million in expenditure incurred under the program, with a breakdown by region across NSW.⁴⁴ The report does not identify the proportion of this expenditure that is forest-dependent. Recommendations have been made to address this gap in future work.

⁴² 'Native vegetation research'. NSW Department of Planning, Industry and Environment. DOA: 4 November 2021. See: <https://www.environment.nsw.gov.au/research/NativeVegetationResearch.htm>

⁴³ 'Saving our Species program'. NSW Department of Planning, Industry and Environment. DOA: 4 November 2021; See: <https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/saving-our-species-program>

⁴⁴ NSW Government (2020). Saving our Species: Year in Review 2019-20.

Biodiversity Conservation Trust (BCT)

The BCT plays a significant role in funding and administering land conservation activities on private land in NSW. The BCT currently manages 2,106 agreements with private landholders covering more than 2.252 million hectares, including:

- over 1,000 in-perpetuity agreements with private landholders that cover over 274,470 hectares;
- 327 permanent offset agreements that cover 71,102 hectares as part of the National Reserve System; and
- 766 term or revocable agreements across more than 1.9 million hectares, of which 34 are long-term agreements covering 11,329 hectares under the BCT's Conservation Management Program.⁴⁵

According to the BCT Annual Report for 2019/20, there are 99 employees at the BCT. It has not been possible as part of developing the method to identify the proportion of the BCT's workforce that is attributable to forest-dependent activities. This is a gap to be addressed in future work.

The BCT funds land management and conservation activities undertaken by landholders through agreements that can be categorised as follows:

- conservation partnership programs
 - voluntary program
 - landholders can apply to the BCT for small grants
 - agreements include in-perpetuity conservation agreements and wildlife refuge agreements
- conservation management programs
 - funded programs under which landholders receive annual payments
 - agreements include conservation tenders and fixed price offers
- biodiversity stewardship agreements (biodiversity offsets)
 - agreements between BCR and landholders to generate and sell biodiversity credits
 - a proportion of the revenue derived from the sale of the credits is used to manage the site, with the remaining profit going to landholders

⁴⁵ 'Private land conservation in NSW'. Biodiversity Conservation Trust. DOA: 4 November 2021; See: <https://www.bct.nsw.gov.au/private-land-conservation-nsw>

- landholders are required to complete a feasibility assessment and business case and accredited assessors determine the biodiversity values of the land.

Based on BCT's most recently available Annual Plan, the following annual funding is provided to landholders under these three types of agreements:

- \$1.2 million in small grants issued under the conservation partnership program
- \$4.9 million under the conservation management program
- \$8.2 million in biodiversity offsets.

To estimate the forest-dependent indirect employment attributable to these activities, it is firstly necessary to engage with BCT to identify the landholder agreements within a given study area (on forest land) and the total annual expenditure paid to landholders for land management and conservation activities on that land.

I-O modelling was undertaken by applying the above expenditure estimate to the Nature Reserves and Conservation Park Operations sector, resulting in a total estimate for indirect employment of 109.5 FTEs. This translates to a metric of 0.766 FTEs for every \$100,000 of expenditure. This metric is to be applied to the total expenditure on forest land within a given study area to derive an estimate for indirect employment attributable to these activities.

6.1.5 Forest advocacy groups

There are a range of forest advocacy groups that are active in the NSW forest sector, ranging from broad, peak advocacy groups such as Timber NSW and NSW Nature Conservation Council to regional-based, or subject-focused groups. These groups have not been included in the method due to stakeholders consulted with being unable to provide the employment and expenditure information necessary for the development of robust employment metrics.⁴⁶

6.1.6 Forestry consulting

While there are a number of consultants operating in the NSW forest sector, forestry consulting has not been included in the method as a separate category to avoid double counting. This is due to the fact that the vast majority of consulting activity is driven by

⁴⁶ Several stakeholders from forest advocacy groups reported that their organisations do not account for material direct or indirect employment and are primarily volunteer based. However, annual reports and other publicly available information show significant staff costs for some advocacy groups.

stakeholders already incorporated in the method (e.g. Forestry Corporation, plantation managers, private landholders).

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7 Wood and timber products

Definition

Employment directly and indirectly related to the production of wood and timber products using material sourced from NSW forests. These activities occur across the following tenure types – multiple use forests, other crown lands, leasehold, and freehold forest.

Key activities:

- Timber harvesting, including thinning
- Timber haulage
- Log processing (includes export supply)
- Wood and paper product manufacturing (includes export supply)
- Timber wholesaling (includes export supply)
- Commercial firewood production.

Employment metrics

- Direct employment is based on employment data reported by ABS/ABARES for the activities identified above.
- Indirect employment metrics for timber harvesting, haulage and log processing are based on the volume of timber harvested from NSW forests. Separate metrics have been developed for softwood and hardwood timber for harvesting and haulage and for the key product categories for log processing.
- Indirect employment metrics for wood and paper product manufacturing and timber wholesaling is based on the volume of products manufactured and sold, with State-level data being used to attribute the total volumes of hardwood and softwood timber harvested across key product categories.

Key findings

- This method relied on ABS employment data given the limitations identified below. The ABS employment data provides the best available coverage of the direct employment across the different activities in the wood and timber product industry (e.g. forestry and logging, timber processing, wood and paper product manufacturing, timber wholesaling). However, ABS does not capture sufficient granularity such as employment associated with timber transporting. It also does not account for indirect employment generated by the non-labour expenditure incurred by industry participants.
- There are good information sources regarding the different types of timber harvested and processed (except firewood from private land), including spatial information, and regarding the types of wood and timber products manufactured from raw timber. This provides the basis for a robust method for estimating direct and indirect employment attributable to these activities.

Key assumptions

- Due to issues encountered in engaging with stakeholders in the wood and timber products industry, the employment metrics that have been developed in this section of the method report heavily rely upon the FTE and expenditure data provided by Forestry Corporation.

- Employment included in the 'Forestry support services' ABS industry category has not been included in the method on the basis that this employment will have been captured in the 'forest management' and 'forest management support services' sections of the method.
- Direct FTEs attributable to the activities of Forestry Corporation have been netted off the employment estimate for the 'Forestry and logging' ABS industry category on the basis that including the former would constitute double counting.

Key data gaps and limitations

- Due to the issues in engaging with industry stakeholders, there are several activities which:
 - do not have employment metrics due to a lack of robust expenditure information (including sawlog and pulp log processing, wood product manufacturing and timber wholesaling), and
 - Rely on a single employment metric where it has not been possible to separately identify direct and indirect employment (e.g. harvesting of native hardwood and plantation hardwood timber).

Opportunities for addressing gaps and strengthening the method

- NRC work with the wood and timber products industry to establish an industry working group to address the gaps in the method, particularly regarding the expenditure for sawlog and pulp log processing, wood product manufacturing, and timber wholesaling, for which it has not been possible to develop robust employment metrics.
- As part of the industry working group, identify direct employment and non-labour expenditure attributed to the activities listed above, to enable the development of direct and indirect employment metrics consistent with other sections of the method.
- NRC work with the industry working group to understand the extent to which there exists an overlap between employment generated by expenditure on timber harvesting and the employment reported for the 'Forestry and logging' ABS industry category.
- As part of the industry working group, investigate the scope for additional granularity in terms of the employment metrics included in the method, particularly in relation to sawlog processing and wood product manufacturing.

The employment attributable to these activities is mostly generated by the harvesting of timber from forest areas and the processing, manufacturing, and selling of wood and paper products.

The driver of the employment generated by these activities is the volume of timber harvested and processed and the quantity (e.g. tonnage) of wood and paper products manufactured and sold. As such, all of the metrics – both for direct and indirect employment – are based on a quantity (e.g. volume harvested, tonnage processed, tonnage of product manufactured/sold) (see Table 10).

Table 10 Employment drivers and metrics for timber and wood product activities

Activity	Key employment drivers	Employment metrics
Timber harvesting	Volume of timber harvested Forest tenure (multiple use forest, private native, plantation)	FTEs per tonne harvested (separate metrics for different tenures and wood types)

Activity	Key employment drivers	Employment metrics
	Type of plantation (i.e., softwood vs hardwood)	
Timber haulage	Volume of timber harvested	FTEs per tonne (separate metrics for different types of timber)
Log processing	Tonnage of logs processed Type of timber	FTEs per tonne of timber processed (separate metrics for
Engineered wood products	Quantity of products manufactured Type of product being manufactured	FTEs per tonne of product manufactured (separate metrics for different product types where appropriate)
Wood and paper product manufacturing	Quantity of products manufactured Type of product being manufactured	FTEs per tonne of product manufactured (separate metrics for different product types where appropriate)
Export	Quantity of products exported Type of product being exported	FTEs per tonne of product exported
Timber sales	Value of timber products sold	FTEs per value of timber products sold
Recycling of timber products	Quantity of timber recycled	FTEs per tonne of timber product recycled
Commercial firewood	Quantity of firewood collected Forest tenure	FTEs per tonne of firewood collected (potentially different metrics for different tenures)
Bioenergy	Quantity of timber products used in bioenergy production	FTEs per tonne of timber product used.

Source: Synergies.

For some of these activities, separate metrics need to be developed for direct labour and associated expenditure. For example, the labour-intensity and cost associated with harvesting timber from hardwood native forests differs from undertaking the same activity within plantations.

It is important to note that while the drivers of employment may vary by tenure (e.g. private native vs plantation) or type of timber being harvested/processed/used in manufacture (e.g. softwood vs hardwood), the operators are relatively homogenous in terms of their employment requirements and cost structure. Hence, unlike some of the other activities in NSW forests (e.g. sporting, health, and fitness events), it is not necessary to obtain detailed FTE and expenditure data from a large number of service providers for the one activity. Rather, robust FTE and expenditure data sourced from a small number of operators is sufficient to underpin the estimation of robust employment metrics.

Critically for direct employment, the ABS already collects robust employment data for specific timber and wood product activities in NSW, namely, Forestry and logging; Forestry support services; Wood product manufacturing; and Pulp, paper and converted paper product manufacturing. This data will be used to assess the suitability of the metrics for direct employment in these activities.

The development of metrics for indirect employment for these activities is based on expenditure data obtained from industry participants, primarily the quantum of

expenditure associated with a given level of production. Unlike for several of the other activities, there are industry categories in the ABS I-O tables that are relatively well aligned with several of the activities identified above. These include 'Forestry and logging' for timber harvesting; 'Sawmill product manufacturing' for log processing; and 'Other wood product manufacturing'.

The alignment of these industry categories and sub-categories to the timber and wood product activities undertaken in NSW forests means that it was not necessary to source detailed information on the breakdown of the expenditure associated with these activities to derive robust indirect employment metrics.

7.1 Approach to developing employment metrics

7.1.1 Direct employment

As noted above, the ABS Census records information on industry of employment by industry and sub-industry by Local Government Area (LGA). The industry categories relevant to the timber and wood products activities are:

- Forestry and logging
- Forestry support services
- Wood product manufacturing⁴⁷
- Pulp, paper and converted paper product manufacturing
- Timber wholesaling.

Due to the availability of this robust employment data, it is not necessary to derive metrics for direct employment for these activities. Instead, for a given study area, employment data can be sourced on relevant LGA(s) from the most recent ABS Census data,⁴⁸ using the ABS Tablebuilder tool.⁴⁹

It is important to note that this creates the potential for double counting with employment estimated in other sections of the method. For example, FTEs under the 'Forestry support services' industry category are not included, as this employment is captured in the 'forest management' and 'forest management support services' sections

⁴⁷ Includes 'Log sawmilling and timber dressing' and 'Other wood product manufacturing'. It is assumed this includes engineered timber product manufacturing.

⁴⁸ Noting this is reliant upon the results of the 2016 ABS Census.

⁴⁹ <https://www.abs.gov.au/websitedbs/censushome.nsf/home/tablebuilder>

of the method. Similarly, there is also likely to be double counting between Forestry Corporation's forest management activities and the 'Forestry and logging' industry category. This is addressed by netting the estimate for direct FTEs attributable to Forestry Corporation's operations (see above) off the total employment estimates derived from the ABS/ABARES data.⁵⁰

Finally, there are also some categories of direct employment in the timber and wood products sector that may not be reported in these categories. For example, employment related to timber haulage is included in the transport sector, and timber haulage is not able to be separately identified.

7.1.2 Indirect employment

The indirect employment attributable to the activities in the timber and wood products sector is derived in a way that is consistent with other parts of the method (i.e. based on the level of expenditure incurred by industry participants). However, given the ABS I-O tables include relevant industry sub-categories (e.g. timber harvesting, timber haulage, wood and paper product manufacturing), it is not necessary to source detailed expenditure data from industry stakeholders. Instead, the method relies on the industry linkages in the I-O tables to generate the metrics for indirect employment for each activity as detailed below.

7.2 Timber harvesting

Timber harvesting relates to the harvesting of logs from public and private land and from native and plantation forest.

The majority of timber harvesting in NSW is undertaken by timber harvesting contractors engaged by Forestry Corporation.⁵¹ Expenditure on harvesting activities by Forestry Corporation is therefore the best source of information to underpin the development of an appropriate employment metric.

As with all forest-dependent activities, timber harvesting generates both direct and indirect employment. Direct employment relates to the employees of contractors and

⁵⁰ Based on the assumption that all Forestry Corporation staff will be captured in the ABS/ABARES data, either under 'Forestry and logging' or 'Forestry support services'.

⁵¹ Noting that PNF Plan and private plantation companies also contract or undertake timber harvesting activities.

employees of private plantation companies that undertake timber harvesting activities, while indirect employment⁵² relates to the following:

- for native forests and hardwood plantations managed by Forestry Corporation, the employment generated by expenditure incurred by Forestry Corporation in contracting harvesting operations; and
- for private hardwood and softwood plantation companies, the expenditure incurred in relation to timber harvesting operations.

As noted above, one of the categories for which the ABS reports employment at the LGA level is 'Forestry and Logging'. This category will comprise employees of harvesting contractors. However, these employees will also be captured by an employment metric that is developed by Forestry Corporation's expenditure on timber harvesting⁵³ thereby presenting a risk of double counting.

On this basis, the method has been developed including an overall employment metric based on Forestry Corporation's expenditure, noting that further work is required to understand the extent to which there is overlap between this employment and that captured in the ABS 'Forestry and Logging' category.

The key driver of the expenditure incurred in undertaking timber harvesting activities is the type of timber being harvested. Hence, it is necessary to develop metrics for the following categories:

- hardwood timber (from public and private native forest and plantations)
- softwood timber (from public and private plantations).

Firstly, it is necessary to obtain estimates for the volume of timber harvested within the study area for these two categories. For hardwood timber, it is possible to source information on the volume of hardwood timber harvested on public land – from both native forests and plantations – at the LGA level.⁵⁴ This data can be sourced from Forestry Corporation's Biomaterial reports, which provide the volumes of hardwood timber harvested by forest area.

⁵² Noting that direct employment has been captured above through the ABS employment data and this component of the method is intended to capture that employment related to the expenditure on timber harvesting activities that generates employment elsewhere in the economy.

⁵³ Noting that this expenditure relates to the engagement of harvesting contractors, and therefore covers all costs, including direct employment of these companies.

⁵⁴ Biomaterial reports published by Forestry Corporation. See: https://www.forestrycorporation.com.au/_data/assets/pdf_file/0004/1190515/FCNSW_Biomaterial-Report_F19.pdf

For softwood plantations, data on timber harvested is not available at the LGA level. However, the Forest and Wood Products Statistics released by ABARES does contain data on the volume harvested at the State level and, given the uniformity of softwood timber harvesting across the plantation estate, it is reasonable to apply this estimate to the total hectares of softwood plantation in NSW to derive a volume per hectare metric for softwood timber harvested.

In 2019/20, there was a total of 5,691,600 cubic metres of softwood timber harvested in NSW. Given the total hectares of softwood plantations in New South Wales is estimated at 306,000 hectares, this equates to an average of 18.6 cubic metres per hectare.

Unlike for timber harvested from State forests and plantations, there is limited data available regarding the volume of timber harvested on private land. To derive an estimate for these areas the following approach is applied:

- source an estimate of total native hardwood timber harvested in NSW for the relevant period from the ABARES data (944,500 cubic metres in 2018/19);⁵⁵
- subtract total hardwood timber harvested from State forests (766,339 cubic metres in 2018/19),⁵⁶ resulting in an estimate for hardwood timber harvested from private native forest land (178,161 cubic metres);
- divide this estimate by the number of PNF Plans in NSW (sourced from LLS) to derive an estimate for hardwood timber harvested per PNF Plan (636 cubic metres)⁵⁷; and
- apply this metric to the number of PNF Plans within the study area to derive an estimate for native hardwood timber harvested from private forest land.

The table below sets out the expenditure metrics applied by timber type per cubic metre (or tonne) of timber harvested. The method assumes the same expenditure is incurred for hardwood timber harvested on native forest land as on State Forests.

⁵⁵ See: <https://www.agriculture.gov.au/abares/research-topics/forests/forest-economics/forest-wood-products-statistics#download-the-overview-report-and-datasets>

⁵⁶ See: https://www.forestrycorporation.com.au/_data/assets/pdf_file/0004/1190515/FCNSW_Biomaterial-Report_F19.pdf

⁵⁷ Based on estimate obtained from LLS that average number of PNF Plans administered in NSW is approximately 280.

Table 11 Expenditure estimates for timber harvesting by timber type

Timber type	Expenditure per cubic metre
Native hardwood	\$44.54
Hardwood plantation	\$44.54
Softwood plantation	\$32.00

Source: Based on expenditure data obtained from industry stakeholders.

These expenditure estimates were applied to the NSW I-O tables for the 'Forestry and logging' industry category to derive the following employment metrics for timber harvesting.

Table 12 Indirect employment metrics for timber harvesting by timber type

Timber type	FTEs per '000 cubic metres
Native hardwood	0.24
Hardwood plantation	0.24
Softwood plantation	0.19

Source: Synergies modelling.

To derive an estimate for indirect employment attributable to timber harvesting within a study area, these metrics are to be applied to the total volume of timber harvested in relevant LGAs by timber type.

7.3 Log haulage

Log haulage refers to the haulage of harvested logs from forest areas to the location at which primary processing (i.e. log processing or paper and pulp production) is undertaken.

Unlike timber harvesting, log haulage is not included in the employment reported in the ABS industry categories (section 7.1.1). Rather, direct employment for log haulage is captured under industry categories in the transport sector, while indirect employment is distributed throughout the rest of the economy.

However, as with timber harvesting, the majority of log haulage activities are contracted by Forestry Corporation.⁵⁸ Hence, expenditure on this activity by Forestry Corporation represents the best information on which to base an employment metric. This metric will account for both the direct and indirect employment associated with log haulage.

Estimating employment attributable to the haulage of logs from forests to primary processors requires a metric to be derived for expenditure per cubic metre of harvested

⁵⁸ As with timber harvesting, log haulage activities are also undertaken for PNF Plan holders and by private plantation companies.

logs. From stakeholder consultation, it is understood haulage costs differ for hardwood and softwood timber.⁵⁹ Hence, it is necessary to develop separate expenditure estimates and employment metrics for these as follows:

- \$29.81 per cubic metre for hardwood timber⁶⁰
- \$29.00 per cubic metre for softwood timber.⁶¹

I-O modelling was undertaken by applying these expenditure estimates to the Road Freight Transport industry sector. This resulted in the following employment metrics for timber haulage:

- 0.31 FTEs per '000 cubic metre for hardwood timber
- 0.31 FTEs per '000 cubic metre for softwood timber.

These metrics are to be applied to the volume of hardwood and softwood timber harvested within a study area to derive an estimate for employment attributable to log haulage.

7.4 Log processing

Log processing relates to the primary processing of harvested sawlogs and pulp logs at timber mills and wood chipping facilities.

7.4.1 Direct employment

Direct employment attributable to log processing activities is captured under the 'wood product manufacturing' and the 'pulp, paper, and converted paper product manufacturing' ABS employment categories (see section 7.1.1).

7.4.2 Indirect employment

Indirect employment attributable to log processing is generated by expenditure incurred by primary processors in processing logs into wood products, namely, green sawn timber, poles, piles and girders, fencing timber, woodchips, etc. The key driver of the cost of, and hence employment from, log processing is the type of timber that is

⁵⁹ In addition, timber haulage costs also differ based on the distance between the location where the timber is harvested and the processing facility, however it is not feasible to account for this difference in the method.

⁶⁰ IPART (2017). Review of Forestry Corporation of NSW's native timber harvesting and haulage costs.

⁶¹ ABARES (2020). Forestry 2019-2020 GVP Report.

processed, in addition to the quality of the product (i.e. sawlogs into sawn timber or pulpwood into woodchips).

Although these are noted as important drivers, data limitations have constrained the method to the following three categories:

- hardwood sawlogs
- softwood sawlogs
- pulp logs.

There is scope to further differentiate these categories into high and low-quality logs for hardwood and softwood sawlogs, as this is also likely to be a factor in terms of the employment generated by sawlog processing. This could be investigated as part of further work to enhance the specificity of the method.

Estimating the indirect employment attributable to log processing firstly requires estimates of the proportion of harvested timber across each of these categories. The breakdown of hardwood and softwood timber is available from Forestry Corporation at the LGA level. These proportions can be applied to estimates for total volumes of hardwood and softwood timber harvested from a study area.

For pulp logs, the method is as follows:

- for hardwood pulp logs, Forestry Corporation's Biomaterials reports detail the volume of pulp logs harvested by region; and
- for softwood pulp logs, data is available on the total volume of pulp logs harvested from softwood plantations in NSW. This estimate can be combined with the total area of softwood plantations in NSW to obtain a volume per hectare estimate, which can then be applied to the area of softwood plantations within a study area to derive an estimate for volume of pulp logs harvested.

Secondly, it is necessary to develop metrics for the expenditure incurred in the primary processing for hardwood, softwood sawlogs and pulp logs. Due to difficulties encountered in consulting with stakeholders in the wood and timber products industry, it has not been possible to source robust information to develop these expenditure

metrics for log processing.⁶² Addressing these gaps in the method will require targeted engagement with industry.⁶³

7.5 Wood product manufacturing (secondary processing)

Wood product manufacturing involves the secondary processing of primary wood products.

7.5.1 Direct employment

Direct employment attributable to wood product manufacturing is captured under the 'wood product manufacturing' and the 'pulp, paper, and converted paper product manufacturing' ABS employment categories (see section 7.1.1).

7.5.2 Indirect employment

Estimating indirect employment attributable to wood product manufacturing requires an estimate for the quantity of value-added wood and paper products produced for a given volume of green processed timber, as well as metrics for expenditure per tonne of wood and paper products manufactured.

The manufacture of wood products can be categorised as follows:

- Plywood and wood-based panels (e.g. wood panels, weatherboards, cladding)
- Engineered wood products (e.g. Medium Density Fibreboard products, chipboard)
- Preservation treated timber (e.g. poles and piles)
- Structural timber products (manufactured frames and trusses).

Due to the limited data inputs from the wood and timber product sector, it was not possible to gather robust expenditure data to develop the metrics for these categories of wood and timber products. It is recommended that an industry working group tasked with developing robust metrics for the indicative expenditure incurred per unit of production across these broad activities would enable expenditure and indirect employment metrics to be developed for these activities and included in the method.

⁶² While some employment and expenditure data was provided by industry stakeholders, primarily for hardwood sawlog processing, the variance in the estimates provided and lack of specific information has prevented the data being used to derive robust employment metrics for these activities.

⁶³ Noting that for some businesses obtaining this information is complicated due to company confidentiality policies.

7.6 Timber wholesaling

Wholesaling includes all timber products other than firewood.

7.6.1 Direct employment

Direct employment attributable to timber wholesaling is captured by the 'timber wholesaling'⁶⁴ ABS employment category (see section 7.1.1).

7.6.2 Indirect employment

As with the 'Wood product manufacturing' section (see section 7.5.2), it was not possible to obtain robust expenditure data for timber wholesaling activities – this is another key gap for the proposed industry working group to address.

This data could then be used to derive an indirect employment metric for timber wholesaling, which would then be applied to the total volume of timber produced (i.e. green timber) within a study area to estimate indirect employment. The industry working group could also investigate the scope for more granular expenditure and indirect employment metrics to be developed for different categories of timber wholesaling.

7.7 Commercial firewood

Commercial firewood production involves the harvesting of timber, primary processing, and supply of timber for firewood.

No data was available for firewood harvesting on private land. For public land we used data provided by Forestry Corporation. Expenditure incurred, and hence employment generated, in relation to the harvesting and haulage of commercial firewood is the same as the expenditure incurred for the same activities for hardwood timber. Hence, the same metrics have been adopted for commercial firewood as for hardwood timber (0.24 FTEs per '000 cubic metres for harvesting and 0.31 FTEs per '000 cubic metres for haulage).

These metrics are to be applied to the volume of commercial firewood harvested within a study area to derive an estimate for employment attributable to this activity. Forestry Corporation reports the total volume of firewood collected in NSW in its Sustainability Reports. There is also data available on the volume of firewood collected by IFOA region. Hence, for hardwood forest outside of the IFOA regions, a metric can be developed by taking the total volume of firewood collected in NSW, subtracting the total volume

⁶⁴ Includes plywood wholesaling, timber dealing and wholesaling, veneer and wood wholesaling.

collected in the IFOA regions, and dividing this by the remaining area of forest to establish a metric of commercial firewood collected per hectare of non-IFOA forest.

The method therefore involves two steps to derive an estimate for the volume of commercial firewood collected within a study area:

- identifying the relevant IFOA regions within the study area and the corresponding total volume of firewood collected in these regions; and
- applying the metric described above to the total hectares of hardwood forest within the study area that is not within an IFOA region.

Employment related to the processing and supply (wholesale) of commercial firewood is accounted for in the other parts of the method.

8 Recreation and tourism

Definition

Employment directly and indirectly related to forest-dependent recreation and tourism activities in NSW. All tenures under this heading are relevant, that is multiple use, conservation, other crown lands, leasehold, and freehold lands (excludes Department of Defence lands).

Key activities

- Accommodation
- Sporting, health, and fitness events
- Functions and festivals
- Ecotourism operations
- Informal recreation activities
- Recreational hunting.

Key metrics

- FTE metric for accommodation services based on total expenditure
- FTE metrics for sporting, health, and fitness events held within forest areas based on the number of participants/customers
- FTE metrics for tourism operations within forest areas based on the number of participants/customers
- FTE metrics for forest-dependent expenditure by informal recreational and tourism visitors
- FTE metrics for recreational hunting based on number of permitted hunting days in forest areas.

Key findings

- It is difficult to determine whether some recreation and tourism activities are forest-dependent. For example, while it is clear the use of mountain bike trails in forest areas is a forest-dependent activity, there is a level of ambiguity regarding other activities, such as accommodation. In some cases, accommodation facilities may exist primarily due to the services the forest offers, however in other cases, an accommodation facility may be located within a forest area but not be dependent on the existence of the forest (e.g. accommodation facilities for skiing in national park areas). This is a critical issue for the method as there is significant indirect employment attributable to the provision of accommodation services in NSW forests.
- There are major accommodation, recreation and tourism facilities operated within leased areas of National Parks that are likely to make a material contribution to forest-dependent employment (direct and indirect), however, there is limited data available to inform the method.
- While a large number of people visit National Park forest areas in NSW for tourism and recreation purposes annually, not all of the expenditure incurred by these visitors is appropriate for inclusion in the method, as a significant proportion of this expenditure does not relate to forest-dependent activities. Current recording of information and data on informal tourism and recreation activities in forest areas does not allow for the identification of the proportion of visitor expenditure (and hence indirect employment) that is forest-dependent.
- The intensity and nature of recreation and tourism activities in forest areas (including sporting, health, and fitness events) varies significantly throughout NSW, primarily attributable to the activities permitted in different regions (related to land tenure), the characteristics of the landscape in forest areas, and proximity to Sydney and other urban areas.

Key assumptions

- All listed accommodation within 100 metres of an area of forest that is greater than 50 hectares have been categorised as forest-dependent and hence included in the method. It is noted that this approach is limited in that it may include some accommodation facilities that are not forest-dependent and also exclude some expenditure on accommodation in other areas of NSW that is forest-dependent (e.g. interstate travellers to forest areas in NSW may visit accommodation facilities in Sydney before travelling to the forest area). An assumption of 46% has also been adopted for the average occupancy rate for accommodation facilities in regional NSW.
- Where sporting, health, and fitness events are regularly held within forest areas, it has been assumed that the attributes of the forest make sufficient contribution to the event for the event to be classified as forest-dependent.
- The employment metrics for several categories of recreation and tourism activities (e.g. auto-based tours, land-based adventure activities, walking/running tours) were derived based on the total value of the forest-dependent activities due to data limitations.

Key data gaps and limitations

- Deriving robust employment metrics for informal forest-dependent recreation activities requires a detailed breakdown of expenditure by recreational visitors to identify expenditure that is forest-dependent (e.g. accommodation, services accessed within forest areas). This is not currently possible with the visitor expenditure information that is collected and reported by NPWS.
- There is a lack of information regarding the direct employment and expenditure of major leaseholders that operate tourism facilities in National Park forest areas – this would also assist in developing more robust metrics for informal recreation activities.
- As detailed in section 4, difficulties encountered in the stakeholder consultation process meant that it was not possible to obtain direct employment and expenditure information from recreation and tourism operators. As a result, assumptions had to be made regarding the expenditure breakdown in modelling the employment metrics for these activities. A similar issue was observed for most categories of sporting, health, and fitness events.
- It was not possible to source sufficient data from DPI to develop robust metrics for direct and indirect employment related to the forest-dependent operations of the Game Licensing Unit.

Opportunities for addressing gaps and strengthening the method

- NRC work with NPWS to adjust the process for collecting visitor expenditure data to enable the identification of expenditure incurred by visitors on forest-dependent activities (as opposed to recreation and tourism activities and other goods and services that are not dependent on forests).
- NRC liaise with NPWS regarding the potential to source information from recreation and tourism operators that hold lease agreements with NPWS (e.g. direct employment, total expenditure, total turnover).
- When the environment for stakeholder consultation improves, NRC work with participants in the tourism and recreation sector to identify activity-specific metrics for expenditure on forest-dependent activities to improve the robustness of the indirect employment metrics in the method.
- NRC liaise with the GLU to assist in identifying the proportion of GLU officers' workload (and expenditure) attributable to the administering and issuing of recreational hunting permits in forest areas through collection of relevant data on the regulation of recreational hunting in forest areas.

8.1.1 Accommodation

The management and maintenance of accommodation facilities within and directly adjacent to forest areas involves expenditure that generates employment throughout the NSW economy. The highly fragmented nature of the accommodation industry presents challenges for collecting data to inform this method.

To prevent double counting and to ensure the broadest possible coverage of this activity, the method was developed based on the accommodation offerings listed on Airbnb.⁶⁵ The rationale for this was two-fold:

- there is high-quality data available in terms of the location and nature of Airbnb listings – enabling identification of properties and average price per night within an area of interest; and
- it is the most commonly used platform⁶⁶ for the listing of accommodation facilities and is hence likely to capture the greatest number of facilities in and adjacent to forest areas without resulting in double counting.

While this approach does not capture all forest-dependent accommodation listings in NSW, attempting to incorporate other platforms (e.g. Booking.com) into the method would create the risk of double counting accommodation facilities. Furthermore, the quality of data that exists for AirBnB accommodation does not exist for other platforms, which prevents the development of a method that can be practically implemented.

On this basis, it is acknowledged that the method will lead to a conservative estimate for the number of forest-dependent accommodation facilities within a study area, and therefore the estimates of expenditure and employment attributable to the management and maintenance of these facilities.⁶⁷

Applying the method

The first step is to identify the number of Airbnb properties attributable to forest areas within the study area. The 'Airbnb Data Dictionary' provides the user with the ability to identify the number of Airbnb properties within a region based on locational criteria,

⁶⁵ Note: accommodation facilities are listed on several different websites and the same accommodation facility can be listed on multiple websites.

⁶⁶ 'Airbnb wins the battle for Australia's short-term rental market'. Baird, L. DOA: 25 November 2021; See: <https://www.afr.com/property/residential/airbnb-wins-the-battle-for-australia-s-short-term-rental-market-20190410-p51ctw>

⁶⁷ Noting that this conservative estimate will be somewhat countered by the assumption that all accommodation facilities within the geographical envelope are 'forest-dependent'.

which for this method, is properties within 100 metres of an area of forest that is greater than 50 hectares.

Having identified the number of properties, the next step in applying the method is to determine the magnitude of expenditure required to maintain the properties, as this is the driver of employment. To inform this, the 'Airbnb Data Dictionary' also contains information on the nightly rate for the identified properties. From this data, it is possible to derive an estimate for total nightly revenue for the identified properties.

To derive an estimate for annual revenue from the identified properties, it is necessary to apply an average occupancy rate in the study area. As this information is not available in the 'Airbnb Data Dictionary', it is necessary to apply an assumption for the average occupancy rate based on average occupancy rates for seven regional areas in NSW – a rate of 46%.⁶⁸ That is, it is assumed that the Airbnb properties are occupied for 168 nights of the year. Total annual revenue can then be derived by multiplying the total of the per night rates for the identified properties by 168 nights.

Finally, to derive an estimate for total expenditure required to maintain the identified properties, it is necessary to apply a proportion to the total annual revenue estimate. Estimates for the total cost of running an Airbnb property range from 25 to 75 per cent of total revenue. On this basis, the method assumes that expenses incurred by Airbnb property managers is around 50 per cent of total revenue. This estimate is applied to the total revenue estimate derived above.

The FTE metric for expenditure incurred in the management and maintenance of Airbnb properties in NSW forest areas was derived by modelling the impact of \$100,000 of expenditure in the Accommodation sector within the NSW I-O table. This resulted in a metric of 0.99 FTEs per \$100,000 of expenditure.

8.1.2 Sporting, health, and fitness events

A wide range of sporting, health, and fitness events are held within forest areas. These events include motor car and bike rallies, mountain bike races, competitive running and walking events, rock climbing, etc. The activities of the organisers of these events generates both direct and indirect employment that is attributable to forest areas.

⁶⁸ The average occupancy rate of 46 per cent has been derived for seven regions in NSW (see <https://www.openagent.com.au/blog/how-to-run-a-successful-airbnb#>).

The approach to develop the method for these events was to:

- review permit data from NPWS and Forestry Corporation to identify the types of events undertaken within forest areas and permit holders to consult;
- establish categories of events based on the review of the permit data;
- consult with a selection of event organisers across the various categories to obtain employment and expenditure data; and
- establish direct and indirect employment metrics, i.e. FTEs per event for each category of event.

In implementing the method, the metrics are applied to the number of each category of event held within a given study area – noting that this requires permit data for the study area from NPWS, Forestry Corporation, and Crown Lands.

Categories of sporting, health, and fitness events

The following categories of sporting, health, and fitness events were established based on a review of NPWS and Forestry Corporation permit data:

- Walking/trail running events
- Triathlons
- Mountain biking events
- Multisport events/challenges
- Motorsport events (i.e. car rallies)
- Motor cycling events
- Rogaine/Orienteering events.

Direct and indirect employment

Most of the employment to be generated by sporting, health, and fitness events within forests will be indirect employment generated by expenditure incurred in the organisation and operation of these events.

As a result, the approach taken for these activities involves deriving a single metric for all employment attributable to sporting, health, and fitness events as follows:

- collate pricing data was from publicly available information for organisers of sporting, health, and fitness events in NSW forests;

- based on this pricing data, establish an average price per participant for each activity category; and
- estimate the proportion of total revenue per participant from ABS data to then estimate total expenditure for event organisers.

This enables estimates to be derived for the expenditure per participant for each activity. These estimates can then be applied to the total number of participants in events in each category within a given study area to derive an estimate for the total expenditure on sporting, health, and fitness events.

Where possible, data has been obtained from event organisers on the breakdown of the expenditure incurred in managing events. Where detailed expenditure breakdowns have not been able to be obtained from stakeholders, standard I-O tables have been used to derive a metric for total employment per hundred participants by event category.⁶⁹

The sections below detail the metrics for direct and indirect employment for each category of activity identified above.

Walking/trail running events

A broad range of walking and trail running events are held in forest areas throughout NSW. A sample of 40 events that are permitted within forest areas was identified to determine the average price per participant. The average price per participant for these events is \$81.

Two sub-sector industry codes were identified as the relevant for deriving the employment metric for this activity - 'Sports and recreation' (91), and 'Arts and recreation services' (92). These sub-sectors fall under the 'Travel Agent and Tour Arrangement Services' industry (7220). The expenditure was split evenly between the two sub-sectors.

The employment metric derived from the I-O modelling for this activity is 1.5 FTEs per 1,000 participants.

Triathlons

Pricing information was reviewed from six triathlon organisers that hold events in NSW forest areas. The average price per participant across these events is \$131. The 'Sports and recreation' (91) sub-sector was identified as the most relevant sector for this activity.

⁶⁹ It should be noted that the robustness of the modelling underpinning these metrics would be improved by the sourcing of more detailed expenditure data from event organisers.

The employment metric derived from the I-O modelling for this activity is 1.65 FTEs per 1,000 participants.

Mountain biking events

Information on employment and expenditure attributable to the organisation and running of mountain biking events was sourced from one major organiser of these events in NSW forests. Based on the information provided, 1.24 FTEs were attributable to events held in NSW forest areas. The event organiser held a total of nine events in State forests over the past 12 months, resulting in a metric for direct employment of 0.14 FTEs per event.

This metric can be applied to the number of mountain biking events held within a given study area annually to estimate direct employment attributable to this event category.

Based on data received from key stakeholders, estimated average expenditure per mountain biking event held within NSW forest areas is \$16,348. The following expenditure breakdown was also provided:

- Labour – 35.3 per cent
- Equipment – 21.2 per cent
- Consumables – 20.1 per cent
- Regulatory fees and other charges – 13.0 per cent
- Promotion, marketing, and advertising – 9.2 per cent
- Transport – 1.2 per cent.

Based on this breakdown, the expenditure was disaggregated into six sub-sectors.⁷⁰ The indirect employment metric derived from the I-O modelling for this activity was 1.0 for every 10 mountain biking events held in forest areas. This equates to a metric for total (direct and indirect) employment of 2.4 FTEs for every 10 events held.

Multisport events/challenges

Multisport events/challenges relate to adventure challenges, ultra-triathlons, etc such as the 'Great Adventure Challenge' and the 'Max Adventure Race Series'. The nature of these events means there are significant differences in the price per participant. The average price across five events held in NSW forests is \$172 per participant. As with

⁷⁰ 'Sports and recreation services' (91),

triathlons, the 'Sports and recreation' (91) sub-sector was identified as the most relevant sector for this activity. The employment metric derived from the I-O modelling for this activity was 2.2 FTEs per 1,000 participants.

Motorsport events

Several organisers of motorsport events in NSW forests were consulted to identify estimates of the quantum and breakdown of expenditure incurred in organising and running these events. Based on the expenditure data gathered from key stakeholders, three categories have been defined in relation to this activity. The number of participants and level of expenditure associated with each category are detailed in the table below.

Table 13 Categories of motorsport events in NSW forests

Event category	Number of participants	Expenditure per event
Large	Over 60	\$50,000
Medium	30 to 60	\$15,000
Small	Less than 30	\$5,000

Note: Event categories have been determined based on a sample of motorsport events held within NSW forests.

Source: Synergies, based on analysis of data provided by stakeholders.

The following indicative breakdowns of expenditure were established based on limited data obtained from event organisers.

Table 14 Breakdown of expenditure incurred in organisation of motorsport events in NSW forests

Expenditure category	Small and medium events	Large events
Equipment	39.0%	39.5%
Consumables	28.0%	14.0%
Regulatory fees and other charges	33.0%	43.0%
Promotion, marketing and advertising	-	3.5%

Source: Synergies, based on analysis of data provided by stakeholders.

The breakdowns enabled allocation of expenditure into the following sub-sectors – 'Manufacturing' (11), 'Wholesale Trade' (32), 'Administrative and Support Services' (72), and 'Sports and recreation services' (91). The following employment metrics were derived from the I-O modelling. The metrics are applied to every 10 events held in NSW forests:

- 0.36 FTEs for small events
- 0.82 FTEs for medium events
- 3.55 FTEs for large events.

These metrics can be applied to data sourced from NPWS and Forestry Corporation regarding the number of each category of motorsport event held within a given study area to derive an estimate for total employment attributable to this activity.

Motor cycling events

There are a limited number of motor cycling events held in NSW forest areas.⁷¹ The employment attributable to these events has been modelled based on the price of 'The Snowy Ride', a major motorcycling event held in the Alpine region. The price per participant for this event is \$60.

I-O modelling was undertaken by applying the above expenditure estimate to the Sports and Recreation Activities sector, resulting in a metric of 0.51 FTEs per 1,000 participants. This metric is to be applied to the total number of participants in motor cycling events within a study area to estimate total employment attributable to this activity.

Rogaine/Orienteering events

The price per participant of Rogaine/orienteering events held in NSW forests is relatively consistent. Based on analysis of a sample of six events, an average price of \$49 has been estimated.

I-O modelling was undertaken by applying the above expenditure estimate to the Sports and Recreation Activities sector, resulting in a metric of 0.35 FTEs per 1,000 participants. This metric is to be applied to the total number of participants in Rogaine/orienteering events within a study area to estimate total employment attributable to this activity.

8.1.3 Functions and festivals

While there are a range of functions and festivals held within national parks, such as private birthday parties, corporate Christmas parties, wine and food festivals, and New Year's Eve events. However, a review of event permit data from NPWS reveals that most of these events do not occur within forest areas.

On this basis, no metrics have been developed for this activity in the method. Rather, the method for estimating employment in a given study area for functions and festivals is as follows:

- review permit data from NPWS and Forestry Corporation to identify whether any functions or festivals are held within the study area;

⁷¹ Based on a review of permit data provided by NPWS and Forestry Corporation.

- consult with the organisers of the events to determine an indicative estimate for the total expenditure attributable to the events;
- determine the estimate for the employment attributable to these events by applying the relationship of 0.86 FTEs for every \$100,000 of expenditure.⁷²

8.1.4 Tourism operations

NSW forest areas also accommodate a range of tourism operations, ranging from cafes and restaurants to ecotourism operations, such as guided and self-guided tours, adventure tours, treetop adventures, white water rafting, commercial accommodation, etc. These operations generate direct employment, via the commercial tourism operators, and indirect employment, through total expenditure incurred in providing the tourism services.

The approach to developing the method for tourism activities was to:

- review permit data from NPWS and Forestry Corporation to identify the types of tourism activities undertaken within forest areas and to consult with permit holders;
- establish categories of tourism activities based on a review of the permit data;
- consult with a selection of tourism operators across the various categories to obtain employment and expenditure data; and
- establish direct and indirect employment metrics (i.e. FTEs per event) for each category of tourism activity.

In implementing the method for a given study area, the metrics are applied to the number of each category of tourism activity held within the forest area – noting this requires permit data from NPWS, Forestry Corporation, and Crown Lands.

Categories of tourism operations

The table below sets out the categories established for tourism and recreation operations within forest areas, based on a review of NPWS and Forestry Corporation permit data.

Table 15 Tourism categories and activities covered

Category	Description of activities
Auto-based tours	Coach and bus tours, 4WD tours, 4WD tag-along tours, motorcycle tours

⁷² Based on I-O modelling conducted by applying \$100,000 of expenditure to the Performing Arts Operations sector.

Category	Description of activities
Land-based adventure	Camping, canoeing, kayaking, abseiling, cycling
Walking/running tours	Guided bushwalking, trail running, bird watching, wildlife observation
Education and training	Team building, bush survival, fitness and bootcamps, yoga, meditation
Cultural experiences	Photography, historic heritage tours, Aboriginal cultural heritage

Direct and indirect employment

As with the sporting, health, and fitness events, most of the employment attributable to tourism operations undertaken within forests will be indirect employment generated by expenditure incurred in organising and operating these activities.

Due to the difficulties in obtaining FTE and expenditure data from tourism operators, the method involves deriving a single metric for all employment attributable to tourism activities as follows:

- collate pricing data from publicly available information for tourism operators that hold permits to operate in NSW forests;
- estimate the average revenue derived from each type of tourism activity per person per day;
- estimate, based on a review of publicly available information, the average number of days for each activity;
- estimate the proportion of total revenue from ABS data to estimate operational expenditure for tourism operators;
- estimate the breakdown of expenditure based on targeted consultation with a selection of tourism operators;
- estimate the total expenditure per person per day based on the information above for each of the tourism activities; and
- conduct I-O modelling to derive metrics for employment attributable to each activity.

The table below details the information that informed the development of the metrics for employment in tourism activities conducted in NSW forests.

Table 16 Employment metrics for recreation and tourism activities

Activity	Average price per day	Days per activity	Revenue per person	Value add %	Expenditure per person	FTEs per '000 people
Auto-based tours	\$352	2.5	\$880	15%	\$748	6.40
Land-based adventure	\$222	2.0	\$444	15%	\$377	3.15

Activity	Average price per day	Days per activity	Revenue per person	Value add %	Expenditure per person	FTEs per '000 people
Walking/running tours	\$386	4.0	\$1,544	15%	\$1,312	9.20
Education and training	\$175	1.5	\$262.50	15%	\$223	3.04
Cultural experiences	\$56	1.0	\$56	15%	\$48	0.40

Note: Sectors for I-O modelling were as follows: Professional Sports Operation for auto-based tours; Sports and Recreation Activities for land-based adventure tours; Administration and Support Services and Sport and Recreation Services (equal proportions) for Walking/Running tours; Adult, Community and Other Education for Education and Training; and Creative and Performing Arts for Cultural Experiences.

Source: Pricing data obtained from company websites; Value add proportions sourced from ABS data; FTE metrics derived by Synergies I-O modelling.

8.1.5 Informal recreational activities

There are also informal recreation activities undertaken within forest areas such as mountain biking, bushwalking, and bird watching.

Expenditure on these informal recreation activities will generate indirect employment. A key challenge in relation to these activities is that while a proportion of expenditure by recreation and tourism visitors to forest areas will be on forest-dependent activities (e.g. expenditure on travel to forest areas, expenditure on services procured within forest areas), a significant proportion will relate to activities that are not forest dependent (e.g. food and beverage while traveling, skiing).

The development of robust metrics for indirect employment attributable to informal tourism and recreation activities requires detailed information on the breakdown of expenditure between forest-dependent and non-forest-dependent activities. While NPWS currently collects visitation and expenditure data, this does not currently extend to gathering information on the drivers and breakdown of this expenditure.

However, these current processes do provide an opportunity for NRC to work with NPWS to include the collection of more granular data on the breakdown of visitor expenditure, which could then be used to derive estimates, potentially by region.

To apply the method, the total number of visitations to a given study area would need to be identified in consultation with NPWS and the metrics applied in terms of forest-dependent expenditure per visitation and FTEs per \$100,000 of expenditure.

Two sub-sector industry codes were identified as the relevant sub-industries for deriving the employment metric for informal recreation – Retail Trade and Accommodation and Food Services. The results of the input-output modelling produce a metric of 1.09 FTEs for every \$100,000 of expenditure on forest-dependent informal tourism and recreation activities.

8.1.6 Recreational hunting

Licensed recreational hunting is permitted within NSW State Forests. Hunters are required to book designated time periods within designated State Forest areas. This activity generates direct employment through the employment required to regulate recreational hunting in NSW forests (this being the responsibility of the Game Licensing Unit (GLU) within DPI) and indirect employment through expenditure incurred by recreational hunters and expenditure incurred by the GLU in undertaking its activities.

The method for developing these metrics is set out in the following sections.

Direct employment

Estimating the number of FTEs attributable to the regulation of recreational hunting in forest areas requires the following information:

- total FTEs in the GLU
- proportion of FTEs attributable to regulation of recreational hunting activities in forest areas.

The resulting estimate can then be divided by the number of recreational hunting permits within NSW forests to derive a direct employment metric for the regulation of recreational hunting within NSW forests (i.e. FTEs per recreational hunting permit). This metric can then be applied to the number of active permits within a given study area to derive an estimate for direct employment attributable to the activity.

The GLU has advised that it is not currently possible to identify the proportion of its activities that are attributable to recreational hunting that occurs within forest areas. It is recommended that NRC liaise with the GLU to identify an approach to identifying this proportion to enable the direct employment attributable to the regulation of recreational hunting in forest areas to be included in the method.

Indirect employment

DPI GLU

The GLU incurs expenditure in relation to the regulation and administration of recreational hunting within NSW forests. As noted above, the GLU is not currently able to identify the proportion of its total expenditure that is attributable to the regulation of recreational hunting on forest land. The allocation of expenditure between the GLU's forest and non-forest activities should be consistent with the allocation of direct employment, as detailed above. Once this proportion is identified, information will also

need to be sourced on the breakdown of the GLU's expenditure to derive a metric for indirect employment per active recreational hunting licence.

Recreational hunters

Based on the 2017 report titled 'Economic impact of recreational hunting in NSW',⁷³ total annual expenditure by recreational hunters in NSW is around \$5,300 per hunter. The report also included a detailed breakdown of this expenditure, which comprised various categories that do not relate specifically to undertaking recreational hunting activities on forest land (e.g. food and drink, vehicles, other expenditure).

Hence, to ensure consistency with other forest-dependent activities, these categories have been excluded from the method. The expenditure per hunter used in the modelling is \$2,968 per hunter (56 per cent of total expenditure).⁷⁴ The breakdown of this expenditure is as follows:

- Equipment – 48 per cent
- Fuel – 23 per cent
- Ammunition – 18 per cent
- Camping and accommodation – 11 per cent.

It is also necessary to derive a metric for the level of expenditure, and hence employment, on a per hunting trip basis. To do this, the method draws on a survey that was conducted of recreational hunters in NSW through the Game Management Council of NSW.⁷⁵ A total of 22 members of the Council responded to the survey, which requested basic information including:

- number of hunting trips per annum
- average length of hunting trips (number of days)
- proportion of hunting trips undertaken on forest land.

The key results of this survey are as follows:

- average of 9.8 hunting trips per annum

⁷³ Game Licensing Unit DPI (2017). Economic impact of recreational hunting in NSW – Final Report.

⁷⁴ Includes the following categories: ammunition; hunting guide fees; fees to landowners; other hunting equipment; firearms, bows and other firearm equipment; firearm licences; hunting dog expenses; training; hunting club memberships; hunting clothing; general hunting equipment; fuel; camping and accommodation.

⁷⁵ The survey was run using the SurveyMonkey tool and distributed directly to members of the Game Management Council of NSW.

- average length of hunting trip of 4.3 days.

On this basis, the total number of days of hunting undertaken by recreational hunters in NSW is estimated at an average of 42.14. This equates to a per day expenditure estimate of \$70.

This estimate can be applied to the number of days of recreational hunting undertaken within a given study area on an annual basis, based on an analysis of licensing data administered by the GLU.

I-O modelling conducted based on these expenditure estimates and breakdown results in an indirect employment metric for recreational hunting activities of 0.48 FTEs per 1,000 hunting days. This metric is to be applied to the number of days of recreational hunting within a given study area.

9 Non-timber forest products

Definition

Employment directly and indirectly attributable to the production of non-timber forest products within forest areas in NSW. All forest areas are relevant for this activity category, including multiple use, conservation, other crown lands, leasehold, and freehold lands.

Key activities:

- Apiary
- Seed and plant collection and other extractive activities
- Ecosystem services, such as biodiversity offsets.

Employment metrics

- Direct and indirect employment related to apiary and carbon sequestration on forest land.

Key findings

- The production of non-timber products within forests is currently relatively limited in NSW forests, with apiary and biodiversity offsets the only activities generating significant forest-dependent employment.
- There are 3,247 apiary permit sites on public land in NSW.

Key assumptions

- Several activities were excluded based on the method criteria, specifically grazing, telecommunications, quarrying, solar farming, wind farming.
- The employment associated with payments made by the BCT to private landholders under biodiversity offset agreements has been accounted for in the 'forest management support services' section of the method.
- DPI is responsible for administration of all apiary permits across forest tenures.

Key data gaps and limitations

- The estimates of expenditure on the operation of an apiary permit on forest land have been made based on a small number of apiarist survey responses (19 in total across NSW) – noting that this accounts for over 30 per cent of total apiary permits held in NSW according to NSW DPI data.
- There was limited data available on the scale and intensity of seed and plant collection from NSW forests which has prevented the development of employment metrics for this activity.
- Data relating to the payments made by developers for biodiversity offsets.

Opportunities for addressing gaps and strengthening the method

- NRC investigate whether there is a need to conduct a survey of employment related to the collection of plant and seed material in forested areas, noting that stakeholder consultation indicated this is unlikely to generate material forest-dependent employment.
- NRC, with support from members of the NSW Forest Steering Committee continue to monitor and consult on the production of non-timber forest products to determine whether it is appropriate to expand the method into new activities.
- NRC to consult with EES regarding biodiversity offset market data that can be made available.

The sections below set out the steps required to derive an estimate for the direct and indirect employment attributable to non-timber forest product activities.

9.1.1 Apiary

Apiary is a common non-timber forest product activity conducted in NSW forests. Apiarists are required to secure approval and a permit or license from DPI to operate within any forest tenures. As with all commercial activities, apiary generates direct employment through the FTEs required for the apiary operation and indirect employment through expenditure on production inputs and services. The activity also generates direct and indirect employment as a result of the regulatory functions, which are the responsibility of DPI.

Direct employment

Apiarists

A survey was administered to obtain information from apiarists in NSW regarding their employment and expenditure attributable to the operation of apiary permits within forest areas. There was a total of 19 responses to the survey. These respondents account for 1,012 of the apiary permits held on public land in NSW, which is over 31 per cent of the total permitted sites (3,247) according to data provided by NSW DPI. Of these permits, 54 per cent (546) were within forest areas. Respondents also reported that of the apiary permits held in forest areas, an average of only 61.2 per cent (334) were operational in any given year.

The total employment reported by survey respondents was 48 FTEs. When divided by the total number of permits held, this results in a metric of 0.047 FTEs per permit (4.7 FTEs per 100 operational permits). This metric can be applied to the number of apiary permits within forest areas to derive an estimate for direct employment attributable to apiary operations within NSW forest areas.

DPI

DPI issues permits and regulates the activity of apiarists operating within NSW forests. DPI has indicated that this regulatory activity does not account for a material amount of forest-dependent employment in NSW.

Indirect employment

Apiarists

Respondents to the apiary survey were asked to provide estimates of their annual operational expenditure per apiary permit. There was significant variability in terms of the estimates provided. Removing the high and low outliers from the survey responses resulted in an average estimate for annual expenditure of \$1,608 per operational permit.

As noted above, survey responses indicated that 61.2 per cent of the apiary permits held in forest areas are operational in any given year. Hence, this expenditure estimate (\$1,608) can be applied to 61.2 per cent of the apiary permits within a study area to identify total annual expenditure attributable to apiary operations.⁷⁶

Survey respondents also provided indicative breakdowns of operational expenditure. This data was analysed to produce the following expenditure breakdown:

- Transport – 33.0 per cent
- Consumables – 19.5 per cent
- Capital equipment – 17.9 per cent
- Regulatory and other charges – 13.75 per cent
- Construction – 5.5 per cent
- Promotion, marketing, and advertising – 2.5 per cent
- Other – 7.85 per cent.

Input-output modelling undertaken based on this expenditure breakdown produced an estimate for the metric for indirect employment attributable to apiary operations of 0.027 FTEs per operational permit (i.e. 2.7 FTEs per 100 operational permits).

DPI

As with the direct employment, there is insufficient expenditure incurred in administering apiary permits for this activity to make a material contribution to indirect employment in forest areas in NSW.

⁷⁶ For example, if there are 1,500 apiary permits within a study area, applying the proportion from the survey data would indicate that 918 are operational on an annual basis. Applying the estimate for expenditure per operational permit (\$1,608) would result in an estimate for total annual expenditure of \$1,476,144.

9.1.2 Grazing

Grazing activity mostly occurs within NSW forests on land that is privately owned and contains an area of private native forests. Grazing activity can also be undertaken on public land – Crown Land – that contains forest areas. Graziers must obtain permits where they seek to undertake grazing operations on Crown Land.

While it is possible to attribute a proportion of the employment generated by grazing to forest areas,⁷⁷ this activity has been excluded from the method on the basis that grazing in forest areas occurs purely as a supplementary activity. That is, the commercial viability of grazing requires graziers to have access to cleared pastures, with cattle only grazing in forest areas where forest is located adjacent to the grazing property. As such, the employment attributable to grazing activities are not attributable to the forest areas.

9.1.3 Extractive industries

In addition to timber harvesting, there are a range of extractive activities undertaken within forest areas. In most cases, these activities are not forest-dependent. For example, quarrying is undertaken within forest areas to extract mineral sands and other materials for construction. These activities are driven by the commercial profitability of extracting the underlying material, with these deposits being coincidentally co-located with forest land. That is, the extraction of these materials would occur regardless of the existence of the forest. Hence, employment associated with these activities is not forest-dependent.⁷⁸

However, there are some extractive activities (other than the extraction of timber) that occur within forests and are considered forest-dependent, such as plant and seed collection. As with the other non-timber commercial activities that occur within forests, these activities generate direct and indirect employment.

Stakeholder consultation for the method revealed that commercial plant and seed collection operations are infrequent in forest areas and are hence unlikely to represent a material contribution to forest-dependent employment. Hence, the method proposes to deal with this activity on a case-by-case basis, as follows:

- conduct an initial scan of the study area to identify whether there are commercial plant and seed collectors (or other forest-dependent extractive activities) operational in the area. This should involve consulting with NSW DPI, NPWS,

⁷⁷ Hassall & Associates Pty Ltd (1998). Report on the Profile and Economic Evaluation of Grazing in State Forests: Upper and Lower North East CRA Regions.

⁷⁸ Noting there is evidence of a preference for some extractive industries to locate in forest areas that are remote from human habitation.

Crown Lands, and Forestry Corporation, as the primary forest land responsible for granting permits and approvals for these activities;

- where an activity is identified, engage with the relevant entity to understand the direct employment attributable to the activity (i.e. the number of FTEs engaged in the forest-dependent activity);
- obtain an estimate, either from the relevant entity or other data sources (if available), of the level of expenditure incurred in undertaking the identified activity; and
- apply the metric of 0.41 FTEs per \$100,000 of expenditure to determine the indirect employment attributable to the forest-dependent activity.⁷⁹

9.1.4 Ecosystem services

Ecosystem services relate to activities such as carbon and biodiversity offset projects. Currently, the key ecosystem service relevant to forest land is the activities associated with biodiversity offset agreements managed with private landholders by the BCT. These activities have been accounted for in the 'forest management support services' section of the method.

⁷⁹ I-O modelling conducted by applying \$100,000 of expenditure to the Gravel and Sand Quarrying sector, on the basis that this is likely to be the most prominent extractive industrial activity to occur within forest areas.

A. Full list of employment metrics

Summary of employment metrics

Activity	Description of metric	Metric
Forest management		
NPWS direct employment	FTEs per '000 ha	0.06-3.33 ^a
NPWS indirect employment	FTEs per '000 ha	0.01-2.13 ^a
Forestry Corporation direct – hardwoods	FTEs per '000 ha	0.14
Forestry Corporation direct – softwoods	FTEs per '000 ha	0.84
Forestry Corporation direct – common	FTEs per '000 ha	0.03
Forestry Corporation indirect – forest access	FTEs per 100,000 m ³	1.045-4.85 ^b
Forestry Corporation indirect – fire suppression	FTEs per 100,000 ha	1.3
Forestry Corporation indirect – fire mitigation	FTEs per 100,000 ha	2.401
Forestry Corporation indirect – weed control	FTEs per 100,000 ha	1.4-2.38 ^b
Forestry Corporation indirect – pest animal control	FTEs per 100,000 ha	0.611-1.44 ^b
Forestry Corporation indirect – plantation establishment	FTEs per 100,000 ha	1.722-2.531 ^b
Forestry Corporation indirect – corporate overheads	FTEs per 100,000 ha	6.79
Crown Lands direct employment	FTEs per '000 ha	0.013
Crown Lands indirect employment	FTEs per '000 ha	0.045
Local Land Services direct employment	FTEs per PNF Plan	0.057
Local Land Services indirect employment	FTEs per PNF Plan	0.048
Forest management support services		
DPI direct – forest policy	FTEs per '000 ha production forest	0.005
Local Land Services direct – forest policy	FTEs per PNF Plan	0.0107
Natural Resources Commission direct – forest policy	FTEs per million ha	0.31
DPI indirect – forest policy	FTEs per '000 ha production forest	0.005
Environmental Protection Agency indirect – forest policy	FTEs per '000 ha native hardwood forest	0.004
Natural Resources Commission indirect – forest policy	FTEs per '000 ha	0.0002
DPI direct – regulation and compliance	FTEs per '000 ha plantation forests	0.016 softwoods 0.047 hardwoods
DPI indirect – regulation and compliance	FTEs per '000 ha plantation forests	0.009 softwoods 0.025 hardwoods
DPI direct – forest science and research	Total FTEs	16.8 ^c
DPI indirect – forest science and research	FTEs per \$100,000 expenditure	0.565
Biodiversity Conservation Trust indirect	FTEs per \$100,000 expenditure	0.766
Wood and timber products^d		
Timber harvesting – indirect	FTEs per '000 cubic metres harvested	0.19 softwoods 0.24 hardwoods
Log haulage – indirect	FTEs per '000 cubic metres harvested	0.31
Commercial firewood indirect – harvesting	FTEs per '000 cubic metres harvested	0.24
Commercial firewood indirect – haulage	FTEs per '000 cubic metres harvested	0.31

Activity	Description of metric	Metric
Recreation and tourism		
Accommodation	FTEs per \$100,000 expenditure	0.99
Walking/trail running events	FTEs per '000 participants	1.5
Triathlons	FTEs per '000 participants	1.65
Mountain biking events – direct	FTEs per event	0.14
Mountain biking events – indirect	FTEs per 10 events	2.4
Multisport events/challenges	FTEs per '000 participants	2.2
Motor sport events	FTEs per 10 events	0.36 (small) 0.82 (medium) 3.55 (large)
Motor cycling events	FTEs per '000 participants	0.51
Rogaine/Orienteering events	FTEs per '000 participants	0.35
Functions and festivals	FTEs per \$100,000 expenditure	0.86
Auto-based tours	FTEs per '000 people	6.40
Land-based adventure tours	FTEs per '000 people	3.15
Walking/running tours	FTEs per '000 people	9.20
Education and training	FTEs per '000 people	3.04
Cultural experiences	FTEs per '000 people	0.40
Informal recreational and tourism activities	FTEs per \$100,000 expenditure	1.09
Recreational hunting	FTEs per '000 hunting days	0.48
Non-timber forest products		
Apiary – direct	FTEs per operational permit	0.047
Apiary – indirect	FTEs per operational permit	0.027
Extractive industry – indirect	FTEs per \$100,000 expenditure	0.41

B. Desktop review and gap analysis

B.1 Currently available data and information

The table below provides a summary of the availability of data across the forest tenures and key focus areas. The green dots indicate minimal data gaps that it is expected will be easy to address in the development of the method; the orange dots indicate there is some data available to inform the development of the method however material gaps to be addressed; and the red dots indicate limited information is available with significant gaps to be addressed by the method.

Tenure	Tenure detail	Title	Key Stakeholders	NSW area of forest ('000 hectares) ^a	Timber and Wood Products	Non-timber forest products	Forest Management	Forest Support Services	Recreation and tourism
Crown Land	Multiple-use public forest	Native Forest, Hardwood plantations, Softwood plantations	Forest Corporation, Tourism operators	2,138	●	●	●	●	●
Crown Land	Nature conservation reserve	World Heritage areas, Wilderness areas, National Park, Conservation and nature reserves	NSW National Parks and Wildlife Service, Tourism operators	5,570	N/a	N/a	●	●	●
Crown Land	Other crown land	Defence	Commonwealth, Forest Corporation	757	N/a	●	●	●	N/a
Crown Land	Leasehold forest	Privately managed	Harvest and Haulage contractors, Mill operators	4,249	●	●	●	●	N/a
Freehold	Private forest	Privately managed	Harvest and haulage contractors, Mill operators	7,572	●	●	●	●	N/a

^a Forest area is based on ABARES State of Forest Report 2018

^b Unresolved tenure is land where there is insufficient data to determine land ownership

Note: Tenure type based on National Forest Inventory by ABARES

The table below identifies, for each key focus area, data and information sources that could provide inputs into the method for estimating forest-dependent jobs in NSW.

Data	Description	Frequency	Source
TIMBER AND WOOD PRODUCTS			
Number of employees in the timber and wood industries	Industries include: <ul style="list-style-type: none"> • Forestry & Logging • Log sawmilling & timber dressing Tourism operators • Other wood product manufacturing • Total paper & paper product Note the data does not distinguish between forest tenures.	Yearly	Department of Primary Industries, 2019 https://www.dpi.nsw.gov.au/about-us/publications/pdi/2019/forestry
Employment in forestry subsectors, 2016	Employment for forestry subsectors in 2016: <ul style="list-style-type: none"> • Forestry and logging: 6,027 • Forestry support services: 2,957 • Wood product manufacturing: 29,035 • Pulp, paper and converted paper product manufacturing: 13,962 • Total forestry sector 51,983 Note the employment data is based on ABS census	Every 5 years	ABARES (2018) Australia's State of Forests Report. Available at: https://www.agriculture.gov.au/abares/foresta/sofr/sofr-2018
Current and future employment projections to May 2024	ANZSIC 3 digit industry, employment projections to May 2024 <ul style="list-style-type: none"> • 030 Forest and Logging • 051 Forestry Support Service ANZSCO, selected occupations, employment projections to May 2024 <ul style="list-style-type: none"> • 7211 Agricultural, Forestry and Horticultural Plant Operators • 8413 Forestry and Logging Workers • 2341 Agricultural and Forestry Scientists 	Yearly	Department of Employment 2019, Employment Projections

	<ul style="list-style-type: none"> • 7113 Paper and Wood Processing Machine Operators • 8419 Other Farm, Forestry and Garden Workers 		
Employment, 2000 to 2018	ANZSIC 3 digit industry: <ul style="list-style-type: none"> • 030 Forestry and Logging • 051 Forestry Support Services 	Yearly	ABS, <i>Employed persons by Industry group of main job (ANZSIC), Sex, State and Territory</i> 6291.0.55.003 – EQ06
Employment in the timber and wood industries of relevant VET occupations proportion breakdown	<u>Forestry and logging</u> Agricultural Forestry and Horticultural Plant Operators 15.3% Forestry and Logging Workers 14.9% Agricultural and Forestry Scientists 8.6% Truck Drivers 8.4% Paper and Wood Processing Machine Operators 3.6% <u>Forestry support services</u> Other Farm Forestry and Garden Workers 25.4% Environmental Scientists 11.9% Forestry and Logging Workers 6.5% Gardeners 5.7% Agricultural and Forestry Scientists 5.6%	Every 5 years	National Industry Insights, AISC Australian Bureau of Statistics 2017, 2016 Census – employment, income and unpaid work, TableBuilder
Volume and value of logs harvested in NSW 2016 ^a	Volume: 5.59 million cubic metres Value: \$458.14m	Every 5 years	ABARES State of forest
Harvest			
Volume of logs harvest by log type in Australia 2016	Native Forest: 4.13m cbm Plantation hardwood: 9.78m cbm Plantation softwood: 16.18m cbm	Every 5 years	ABARES State of forest
FIREWOOD COLLECTION			

Number of licenses	Not publicly available	Yearly	Forestry Corporation
Employment breakdown in NSW			Australian Bureau of Statistics 2017, 2016 Census – employment, income and unpaid work, TableBuilder
NON-TIMBER FOREST PRODUCTS			
APIARY			
Number of permits	6,799 registered beekeepers in NSW	Yearly	NSW Apiarists Association Forestry Corporation
Employment in NSW for Beekeeping (ANZSIC level 4)		Every 5 years	Australian Bureau of Statistics 2017, 2016 Census – employment, income and unpaid work, TableBuilder
CATTLE GRAZING			
Number of permits	Not publicly available	Yearly	Forestry Corporation
Employment in NSW for Beef Cattle Farming (ANZSIC level 4)		Every 5 years	
EXTRACTIVE INDUSTRIES			
Number of licenses	Not publicly available	Yearly	NSW Department of Planning, Industry and Environment
Employment in NSW for Other Non-Metallic Mineral Mining and Quarrying (ANZSIC level 4)		Every 5 years	Australian Bureau of Statistics 2017, 2016 Census – employment, income and unpaid work, TableBuilder
FILMING AND PHOTOGRAPHY			

Number of permits	Not publicly available	Yearly	Forestry Corporation
Employment in NSW for Professional Photographic Services (ANZSIC level 4)		Every 5 years	Australian Bureau of Statistics 2017, 2016 Census – employment, income and unpaid work, TableBuilder
RESEARCH			
Number of licenses	Not publicly available	Yearly	Forestry Corporation NSW National Parks and Wildlife Service
Employment in NSW for Scientific Research Services (ANZSIC level 4)		Every 5 years	Australian Bureau of Statistics 2017, 2016 Census – employment, income and unpaid work, TableBuilder
TELECOMMUNICATIONS			
Number of telecommunications towers in NSW forests	Not publicly available	Years	Forestry Corporation NSW National Parks and Wildlife Service
FOREST MANAGEMENT (INCLUDES MANAGEMENT OF PUBLIC AND PRIVATE NATIVE FORESTS AND FOREST MANAGEMENT SUPPORT SERVICES)			
Number of FTEs working in Forestry Corporation	51 consultants 532 full-time staff • 315 office-based staff • 217 field-based staff • 100 seasonal firefighters	Yearly	Forestry Corporation Annual Report 2019 https://www.forestrycorporation.com.au/data/assets/pdf_file/0019/1190026/annual-report-201819.pdf
Number of FTEs working in Rural Fire Service NSW	936 full time staff	Yearly	Fast Facts about the NSW Rural Fire Service

			https://www.rfs.nsw.gov.au/about-us/fast-facts
Number of FTEs working in NSW National Parks and Wildlife Service	1,818 full time staff	Yearly	EPA NSW Forestry Snapshot Report 2017-18
Number of FTEs working in the Department of Primary Industry Forestry Unit	36.5 FTE <ul style="list-style-type: none"> • 22 in DPI Forests Science team • 5.5 staff involved in administering the Plantations and Reforestation Act • 4 staff in management • 5 staff in policy and industry development roles 	Yearly	EPA NSW Forestry Snapshot Report 2017-18
Number of FTEs in Local Land Services	7.8 FTE administered the PNF program <ul style="list-style-type: none"> • 4.8 private native forestry operations staff • 3 staff in policy roles 	Yearly	EPA NSW Forestry Snapshot Report 2017-18
Number of FTEs in Environmental Protection Authority	687 total staff <ul style="list-style-type: none"> • 181 in regional areas • 506 in Sydney metropolitan area <p>Note that EPA has a forestry branch, though the exact staff numbers are not publicly available.</p>	Yearly	EPA NSW Forestry Snapshot Report 2017-18 https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/whoweare/19p1970-epa-annual-report-201819.pdf
Private forest investment and management sector			
Number of staff – New Forests	Total of 56 staff based on it's website, noting that support and admin staff may be excluded. Staff breakdown: <ul style="list-style-type: none"> • Executive Team: 7 • Funds Management (Aus and NZ): 19 • Investor Services: 7 • Finance: 8 		New Forests https://newforests.com.au/#who-we-areTarget

	<ul style="list-style-type: none"> • Corporate Services: 13 • New Forests Timber Products: 2 <p>Linkedin indicates 51 -200 employees)</p>		
Number of staff – Stafford Timberland	16 staff from website by location – Asia Pacific Linkedin indicates 51 – 200 employees		Stafford Timberland https://www.staffordcp.com/by-location
Private revegetation and conservation managers			
Register of projects that involve activities to achieve emissions reductions	Based on the Emissions Reduction Fund Register, there are currently 237 vegetation-based emissions reduction projects in NSW. Top scheme participants include: <ul style="list-style-type: none"> • Terra Carbon Pty Ltd (92) • Carbon Estate Pty Ltd (6) • Greenfleet Australia (5) • CO2 Australia (5) • Department of Planning, Industry and Environment (4) 	Yearly	Emissions Reduction Fund
Number of staff working in Green Collar (Terra Carbon Pty Ltd)	39 staff based on their website		Green Collar https://greencollar.com.au/our-team/
Number of staff working in Greenfleet Australia	22 staff and 11 advisors based on their website		Greenfleet Australia https://www.greenfleet.com.au/About-us/Meet-our-team
Number of staff working in Greening Australia	20 staff based on their website		Greening Australia https://www.greeningaustralia.org.au/our-people/
Number of staff working in CO2 Australia	13 staff based on their website		CO2 Australia https://www.co2australia.com.au/our-people-2/

Number of staff working in Climate Friendly	38 staff based on their website	Climate Friendly https://climatefriendly.com/our-team/
Number of staff working in Bush Heritage	Website indicates it employs over 100 staff around the country	Bush Heritage https://www.bushheritage.org.au/who-we-are/people
Environmental non-governmental organisations		
Number of staff working in Wilderness Society	13 staff based on their website	Wilderness Society https://www.co2australia.com.au/our-people-2/
Number of staff working in World Wildlife Fund (WWF)	16 staff based on their website	WWF https://www.wwf.org.au/about-us/meet-the-team#gs.9lgb28

RECREATION AND TOURISM

TOURISM			
Expenditure profiles, number of visitors, average nights stayed, by activity type for 13 tourism regions in NSW	Data provided for each of the 13 tourism regions in NSW (South Coast; Sydney; Snowy Mountains; Capital Country; The Murray; Riverina; Central NSW; Hunter; New England North West; Outback NSW; Central Coast; Blue Mountains; North Coast NSW. Tourism activities included: <ul style="list-style-type: none"> • Fishing activities • Visiting national parks • Bush walking activities • Botanic gardens activities • Wildlife parks activities. 	Yearly	Tourism Research Australia

Tourism employment for the 13 tourism regions in NSW	Employment numbers for each tourism-related industry including: <ul style="list-style-type: none"> • Accommodation • Cafes, restaurants and takeaway food services • Clubs, pubs, taverns and bars • Rail Transport • Road transport and transport equipment rental • Air, water and other transport • Travel agency and tour operator services • Cultural services • Casinos and other gambling services • Cultural services • Casinos and other gambling services • Other sports and recreation services • Retail trade • Education and training • All other industries 	Yearly	Tourism Research Australia
FOSSICKING			
Number of permits	Not publicly available	Yearly	Forestry Corporation
FOREST EVENTS AND ACTIVITIES			
Number of permits	Not publicly available	Yearly	Forestry Corporation NSW National Parks and Wildlife Service
HUNTING			
Number of permits	Not publicly available	Yearly	Forestry Corporation ^p

a Forest Corporation annual report might be more detailed for the tenure they administer. Local land services for private property.

https://www.forestrycorporation.com.au/_data/assets/pdf_file/0019/1190026/annual-report-201819.pdf

b Noting that hunting licences/permits may not actually be issued by Forestry Corporation, however Forestry Corporation is informed when licences/permits are issued.

B.2 Gap analysis

The table below sets out the key gaps identified in the review of the currently available data on forest-related employment in NSW.

Key data and information gaps by key focus area

Focus Area	Data Gaps
Timber and wood products	<p>Based on ABS census data and other various sources, there is a reasonable amount of data for timber and wood product industries. However, some data gaps include:</p> <ul style="list-style-type: none"> • Timber-related transport jobs are unknown as these numbers are reported in the transport industry • Lack of information of employment in the Firewood industry • Lack of detailed information of employment by tenure (private vs public) • Lack of detailed information on jobs created based on type of wood (softwood vs hardwood)
Non-timber forest products	<p>There is generally a lack of data for non-timber forest-related products, although employment data for the whole non-timber product industries can be found from ABS census data. Data gaps include:</p> <ul style="list-style-type: none"> • Lack of amount of activity in private forests, noting that there is licensing data for forests managed by Forestry Corporation • Lack of information on employment for all non-timber forest-related products. • Data gaps on the forward and backward supply chains for each non-timber industry.
Management of public native forests	<p>Although not publicly available, forest agencies' employee numbers for staff, contractors and consultants could be drawn upon to understand employee numbers for public forest management. However, there is a lack of information and understanding of the flow-on effects and indirect employment from the management of forests.</p>
Management of private native forests	<p>There is a lack of information on management of private forests as well as a lack of information on the flow-on effects of such employment to other industries.</p>
Forest management support services	<p>Management support services are mainly government agencies including Environment Protection Authority, NSW National Parks and Wildlife Service, Rural Fire Service and Primary Industries, Fisheries. It is likely these services may span across different</p>

Focus Area	Data Gaps
Recreation and tourism services	<p>industries so some understanding of time spent on forests would be needed to estimate the forest-related employment figure for support services.</p> <ul style="list-style-type: none"> • TRA provides information for each NSW tourism region on employment. However, there is a lack of information on what proportion of this employment is forest-related for each of the regions. TRA provides detailed information on expenditure, visitor numbers and nights stayed by tourist activities by the visitor such as visiting national parks, bush walking and wildlife parks activities. • There are a number of recreational activities held in Forests. Although Forest corporation has information on permits for recreational activities, though there is still a lack of understanding on the number of recreational activities held each year, the impact of these activities to employment.

B.3 Relevant studies

In addition to the data and information sources detailed above, several past studies and publications were identified in the review that, while not able to be included in the method due to the data not being periodically updated, may contain information that may assist in the development of the method. These studies and publications are summarised in the table below.

Relevant Data	Description	Source
TIMBER AND WOOD PRODUCTS		
Economic value and direct/indirect employment in NSW	Employment generated directly and indirectly by the commercial softwood plantation industry in the South West Slopes and Central Tablelands regions of New South Wales in 2016.	Schirmer J, Gibbs D, Mylek M, Magnusson A and Morison J (2017). Socio-economic impacts of the softwood plantation industry – South West Slopes and Central Tablelands regions, NSW.
Economic value and direct/indirect employment in QLD	Employment generated directly and indirectly in 2017 by the forest industry in Queensland.	Schirmer J, Gibbs D, Mylek M, Magnusson A, Peel D and Morison J (2018). Socio-economic impacts of the forest industry – Queensland (2nd edition).

Economic value and direct/indirect employment in VIC	Employment generated directly and indirectly in 2017 by the forest industry in Victoria (excluding the Green Triangle region).	Schirmer J, Mylek M, Magnusson A, Yabsley B and Morison J (2018). Socio-economic impacts of the forest industry – Victoria (exc. the Green Triangle).
Economic value and direct/indirect employment in WA	Employment generated directly and indirectly in 2017 by the forest industry in Western Australia.	Schirmer J, Mylek M, Magnusson A, Yabsley B and Morison J (2017). Socio-economic impacts of the forest industry – Western Australia.
Economic value and direct/indirect employment in Green Triangle	Employment generated directly and indirectly in 2017 for Green Triangle region.	Schirmer J, Mylek M, Magnusson A, Yabsley B and Morison J (2017). Socio-economic impacts of the forest industry – Green Triangle.

RECREATION AND TOURISM

Economic value and employment of National Parks and Protected Areas from Visitors and Park Management Expenditure in NSW	<p>Includes direct expenditure, regional value added, household income and employment for 5 NSW regions. For example, estimated employment for the 5 NSW regions:</p> <ul style="list-style-type: none"> • North East NSW: Park management (265 jobs), Visitors (1,650 jobs) • Far South Coast NSW: Park management (108 jobs), Visitors (813 jobs) • Western Pastoral Region: Park management (101 jobs), Visitors (102 jobs) • Wheat-sheep Belt: Park management (138 jobs), Visitors (157 jobs) • Greater Shoalhaven: Park management (208 jobs), Visitors (3,219 jobs) 	Sustainable Tourism Cooperative Research Centre (2015). The economic value of tourism to national parks and protected areas in Australia. Available at: https://sustain.pata.org/wp-content/uploads/2015/02/100047-Tech-Report-Econ-Value-Tourism-to-National-Parks-WEB.pdf
Direct / indirect employment and economic GRP contribution due to	<p>National Landscape areas include:</p> <ul style="list-style-type: none"> • Greater Blue Mountains (NSW): Direct Jobs 7,618, Indirect Jobs 4,238, GRP \$1,047.1m • Australia's Green Cauldron (NSW/QLD): Direct Jobs 6,107, Indirect Jobs 2,627, GRP \$775.5m 	Tourism and Transport Forum Australia (2017). Unlocking our great outdoors. Available at: https://www.ttf.org.au/wp-content/uploads/2017/08/TTF-Unlocking-our-Great-Outdoors-August-2017.pdf

tourism, by national landscape area 2016

- Australia's Coastal Wilderness (NSW/VIC): Direct Jobs 2,398, Indirect Jobs 817, GRP \$264.9m

Activities engaged in when visiting forests

Most common activities engaged when visiting forests:

- Walking/jogging
- Having BBQs or picnics
- Nature watching and visiting historical, heritage and educational sites
- Swimming/canoeing/paddling
- Camping
- Fishing
- Bike riding
- Performed spiritual or cultural activities
- Collected firewood
- Four-wheel driving or dirt biking

Schirmer, J., Mylek, M. and Clayton, H. (2019) NSW forest monitoring project: Stakeholder and public views about forest monitoring September 2019. Available at: <https://www.canberra.edu.au/research/institutes/health-research-institute/files/regional-wellbeing-survey/reports/natural-resource-management/Forest-Monitoring-Program-stakeholder-and-public-views.pdf>

NON-TIMBER FOREST PRODUCTS

Employment and economic impact of recreational hunting in NSW

There is an estimated total of 226,000 people who hunt in NSW consisting of:

- 19,000 NSW game hunting licence holders
- 167,000 hunters who hold a firearms licence
- 40,000 hunters who hunt non-indigenous animals on private land without a firearm (i.e using a bow or dogs)

Estimated economic impacts:

- Game licence holders (19,000): \$119m, 860 Jobs
- Non-game licence holders (207,000): \$548m to \$1,612m, 3,932 to 11,572 jobs

RMCG (2017) Economic impact of recreational hunting in NSW – Final Report. Prepared for Game licensing Unit, Department of Primary Industries. Available at https://www.dpi.nsw.gov.au/_data/assets/pdf_file/0007/723454/economic-impact-of-recreational-hunting-in-nsw.pdf

C. Input-output analysis

The approach to estimating the indirect employment attributable to activities that occur within forest areas is based on the Input-Output (I-O) modelling framework. I-O tables are published by the Australian Bureau of Statistics (ABS) and provide a representation of all supply chains in an economy. I-O relationships between industries are described by a combination of backward and forward linkages. Attachment A provides an overview of I-O modelling and its application in economic analysis.

Indirect employment is estimated within I-O models through the application of employment multipliers, which disaggregate the total employment impact of economic activity in the impacting sector into direct employment and additional employment created elsewhere in the economy. Two types of multiplier may be calculated:

- Type I Multiplier – $(\text{Direct Effect} + \text{Indirect Effect}) / (\text{Direct Effect})$
- Type 2 (SAM) Multipliers⁸⁰ – $(\text{Direct Effect} + \text{Indirect Effect} + \text{Induced effects}) / (\text{Direct Effect})$.

These multipliers measure how the creation or destruction of output or employment in a particular industry translates into wider employment changes throughout the economy. They are calculated on two different bases:

- per employment numbers in an industry, for example, the impact on the rest of the economy by the employment (or loss) of 100 employees in the impacting industry; or
- per each \$1 million shift in final demand by the impacting sector(s).

Data availability often leads to most emphasis being placed upon the shifts in final demand spending, however, due to different instances of labour productivity (normally resulting from different levels of capital intensity) it is advisable to cross check (where possible) between the expenditure method and the direct employment shift method.

The multiplier types differ over the inclusion of induced impacts, or impacts derived from the consumption activities of income earned within the direct and indirect activities. Gamage and West (2006) state that the consumption (induced) aspects of a multiplier are likely to be the most important in terms of generating jobs.⁸¹ A number of economists, data permitting, have attempted to further disaggregate the jobs impacts

⁸⁰ SAM refers to Social Accounting Matrix.

⁸¹ See, West, G and Gamage, A (2001) "Macro Economic effects of Tourism in Victoria: A Non-Linear Input Output Approach" *Journal of Travel Research* (40) 100.109.

into a number of sub categories.⁸² For example, indirect jobs are often referred to as ‘industrial effect jobs’ and induced jobs are referred to as ‘consumption effects jobs’.

The United States Department of Labour uses the terms ‘supplier jobs’ to refer to indirect jobs, which they are others classify as ‘backward linkages’.⁸³ They often then attempt to make the distinction between private sector induced jobs and public sector induced jobs, but this requires detailed information generally not available in specific industry studies. In this study, 2A or SAM multipliers are used in the calculation of indirect job aspects, these jobs will result from income spending generated by the expenditure patterns of activities in NSW Forestry and the resultant expenditure of suppliers to those activities.

⁸² For example, indirect jobs are often referred to as “industrial effect jobs” and induced jobs are referred to as “consumption effects jobs” The US Department of Labour uses the terms “supplier jobs.

⁸³ Supplier jobs can be further broken down into materials supplier jobs and capital supplier jobs.

D. Stakeholders

The following is a list of the stakeholders contacted throughout the development of the method:

- Forestry Corporation
- National Parks and Wildlife Services
- Crown Lands
- Local Land Services
- Environmental Protection Agency
- Department of Primary Industries
- Department of Primary Industries (Game Licensing Unit)
- Department of Primary Industries (Forest Science)
- Department of Primary Industries (Plantations)
- Department of Primary Industries (Apiary)
- Department of Primary Industries (Policy, Research and Development)
- Rural Fire Service
- Department of Defence
- Natural Resources Commission
- Forest and Wood Products Australia
- NSW Timber Development Association
- Forest Works
- NE Forestry Hub
- Nature Conservation Council of NSW
- Timber NSW
- Institute of Foresters Australia/ Australian Forest Growers
- Australian Forest Products Association
- South East Timber Association

- Timber Communities Australia
- Hunter Farm Forestry Network
- Subtropical Farm Forestry Network
- PF Olson
- GHD
- Margules Groome
- Clean Energy Regulator
- GreenCollar
- Corporate Carbon
- Climate Friendly
- Niche Consulting
- Greening Australia
- Motor Sport Australia
- Narooma Motor Sport Event
- Kempsey Sporting Car Club
- Rally of the Bay
- Rocky Trail Entertainment
- Mountain Bike Australia
- Trail Riding Australia
- Australian Climbing Instructors' Association
- Bushwalking NSW
- Kowalski Brothers - Trail works
- Tree Top Adventures
- Break Loose Adventure
- Game Management Council of NSW
- NSW Apiarists' Association

- NSW Farmers' Association
- Screen NSW
- NSW Resources & Geoscience
- Boral
- Gem and Lapidary Council of NSW
- Hume Forests
- Snowy Mountains Forest Estate
- AKD Softwoods
- Highland Pine Products
- Hyne Timber
- Hurfords
- Notaras
- Coffs Harbour Hardwoods
- Newell's Creek
- Engineered Wood Products Association of Australasia
- Weathertex
- Koppers
- Southwest Timber Sales and Hardware
- Sydney Timber Supplies
- Visy Paper
- Oji Fibre Solutions
- Pentach
- Crawfords
- Firewood Association of Australia
- Gelletly Red Gum Firewood
- Ironwood

- Swadlings
- Bioenergy Australia
- ARENA.

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E. Forest management activities

This attachment provides an overview of the forest management activities undertaken by the entities responsible for managing forest land in NSW (i.e. Forestry Corporation, National Parks and Wildlife Services, Crown Lands, private plantation management companies). The expenditure metrics derived for forest land management cover these activities.

E.1 Managing forest access

One of the key responsibilities for forest land managers is the management of access to forests (i.e. roads, fences, gates). Noting that the metrics for direct employment will capture a proportion of the jobs generated by this activity, the majority of employment related to forest access management activities is generated by expenditure on road maintenance works undertaken within forest areas.

E.2 Fire prevention and protection

Fire prevention and protection is a core activity for entities responsible for the management of forest land. Noting that the direct employment related to these activities will be included in the metrics developed for direct employment for forest management activities (see section **Error! Reference source not found.**), the following sections detail the approach to developing metrics for indirect employment for each entity responsible for undertaking fire prevention and protection activities within NSW forest areas. As noted above, due to the data available from NPWS, no activity-based metrics for indirect employment have been derived for NPWS's forest-related activities.

E.3 Nature conservation

Nature conservation relates to activities required for biosecurity protection within forest areas. This relates primarily to weed and pest (feral animal) control. The following sections detail the approach to developing metrics for indirect employment related to these activities for the relevant entities. While nature conservation activities account for a significant proportion of NPWS's forest-related activities, no indirect employment metric has been developed for NPWS, as per the discussion in section 5.1.1.

E.4 Cultural heritage

NSW forests contain several Aboriginal and historic cultural heritage sites. The management of these sites are the responsibility of the entity responsible for the management of that area of forest. The following sections detail the approach to

developing metrics for indirect employment related to this activity for the relevant entities. While a large number of the Aboriginal and historic cultural heritage sites within forest areas are managed by NPWS, no individual metrics have been derived for NPWS in relation to the management of these sites, as per the discussion in section 5.1.1.

E.5 Plantation management

Plantation management refers to the establishment, maintenance, and regulation of plantations. Plantations are separated into two distinct categories – hardwood and softwood. The employment intensity associated with the management of these categories of plantation can differ significantly. The following sections detail the approach to deriving metrics for indirect employment for hardwood and softwood plantations.

E.6 Management of recreational facilities

Forestry Corporation and NPWS maintain a network of visitor information and ranger centres across their respective forest areas. In addition to the direct labour required for the operation and management of these centres and facilities, the expenditure incurred in servicing and upgrading these centres and facilities also generates indirect employment in other sectors of the economy. As detailed in section 5.1.1, the approach to estimating employment attributable to NPWS's activities means it is not necessary to estimate employment attributable to specific activities, such as visitor management.

There are day-use recreational facilities located throughout extensive areas of NSW forests. These facilities typically include facilities such as public toilets, picnic tables, BBQs, sheltered areas, walking trails, etc. As with visitor information and range centres, the management, particularly maintenance, of these facilities generates employment.

Day-use recreational facilities are located on forest land under the management of three government entities:

- Forestry Corporation
- NPWS
- local governments.

In addition to day-use recreational facilities, forest land managers are also responsible for managing and maintaining accommodation facilities. These facilities range from camping grounds to facilities containing built structures such as wood cabins. The entities responsible for managing these facilities within forests are the same as those identified above in relation to day-use recreational facilities.