

Report

The Value of Forestry and Timber Products to Climate Change Mitigation in Gippsland – Carbon Footprint

Prepared for: Gippsland Forestry Hub
13 October 2025





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- Heartwood Unlimited
- HVP Plantations
- Latrobe Forest & Civil
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- Opal ANZ
- Osbourn Aviation
- Parkside Timber
- Radial Timber.

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Executive Summary

The Gippsland forestry and timber sector plays an important role in supporting Victoria’s goal towards Net Zero 2045 via carbon removal and storage. The aim of this “The Value of Forestry and Timber Products to Climate Change Mitigation in Gippsland – Carbon Footprint” study is to assess forestry and timber sector’s greenhouse gas (GHG) emissions, removals, and stored carbon in Gippsland based on available data from participating stakeholders and available literature. The study also identifies opportunities for emissions reduction and provides policy recommendations to support future planning and decision-making.

The sector has been undergoing changes following Victoria’s native forest harvesting ban in January 2024, which has shifted timber production towards plantations completely and increased uncertainty around timber resource supply, with flow-on impacts across processors, contractors, construction, and other related sectors.¹ The industry faces a combination of opportunities and challenges, including biodiversity, environment and community concerns, rising energy and transport costs, reliance on fossil fuels, infrastructure limitations, and skill shortages across harvesting, haulage, and processing roles. Climate-related risks such as bushfires, droughts, and flooding add to these pressures. Demand for sustainable timber and paper products, as well as need for carbon sequestration is growing, but plantation establishment remains slow despite multiple government incentives and initiatives, underscoring the need for coordinated investment and strengthened policy measures.

The estimated GHG footprint of the sector (Table 1) includes emissions from direct operations, purchased electricity, and supply chain activities. Study limitations and result uncertainty stem from incomplete inventory of emissions and removals, modelling assumptions, and inherent uncertainty in emissions factors.

Table 1: Summary of GHG Emissions and GHG Removals for the Gippsland Forestry Industry FY23/24.

Emissions/Removals		GHG Emissions (tCO2-e)
Emissions		1,077,477
	Scope 1 Emissions	226,791
	Scope 2 Emissions	120,795
	Scope 3 Emissions	99,832
	Biogenic Emissions	630,060
Removals		-1,624,449 (±197,878)
	Growth	-995,422 (±197,878)
	Storage	-629,026
Net Balance		-546,971

Findings indicate that forestry and timber sector activities are net negative, considering most upstream, midstream, and downstream activities. The sector activities both generate emissions and contribute significantly to carbon removals through tree plantation growth and the storage of carbon in long-lived wood fibre products such as engineered timber, solid wood, and paper-based products. Current operations are heavily reliant on fossil fuels, with natural gas, diesel and electricity use. Renewable energy uptake, such as green electricity (such as solar), and renewable fuels (such as biogas and biodiesel), remains limited and fragmented.

¹ “Forestry Transition Program”, DEECA, last updated February 17, 2025, <https://www.deeca.vic.gov.au/futureforests/future-forests/victorian-forestry-program>.

The results provide an initial indication of the sector's emissions and removals based on reported and collected data. This is the first whole of sector GHG emissions assessment; further refinement and improved data coverage in future assessments will enhance the accuracy of these estimates.

Key emissions reductions strategies:

This assessment has established a GHG mitigation framework (Table 2) considering GHG reduction principles (avoid, reduce, substitute, and offset) and identified priority emissions reduction options for the key stakeholders. The selected emissions mitigation strategies/actions (Section 5.3) include:

Table 2: GHG Reduction Strategies.

Strategy	GHG Mitigation Hierarchy	Lead Actors
Increase carbon storage through improved forest management and climate-resilient practices	Avoid	Plantation owners Silviculture contractors
Decarbonisation of paper and timber production processes	Reduce / Substitute	Paper mill and sawmills
Expansion of ecologically sustainable plantation areas	Offset	Plantation owners Farmers Landowners
Enhance circularity and resource recovery in harvesting and processing	Avoid / Reduce	All
Decarbonisation of haulage and harvesting operations	Avoid / Reduce / Substitute	Contractors
Climate mitigation and adaptation capacity building: industry and community	Avoid / Reduce / Substitute / Offset	All

Regulatory and policy recommendations:

Finally, to position the Gippsland forestry, timber, and paper sectors to meet future demand, strengthen competitiveness, and support Victoria's net-zero targets, four priority policy recommendations have been identified (Table 3). Building on existing initiatives, these actions aim to enhance circularity, drive decarbonisation, and strengthen markets while delivering broader co-benefits, including regional job creation, housing supply, skills development, and improved economic resilience.

Table 3: Regulatory and Policy Recommendations Summary.

Recommendations	
 Enable circular economy, local processing and market diversification	Enhance investment in value-adding and modern processing technologies (targeting small diameter logs and processing residues in particular), improve recycling infrastructure, and support development of stronger local and export markets for timber and paper products.
 Incentivise and de-risk plantation expansion and on-farm integration	Strengthen existing grant programs and develop streamlined approval pathways to encourage private investment and diversify farm incomes through sustainable agroforestry and plantation expansion.
 Decarbonise energy, heat and transport in forestry and processing	Continue supporting innovation to reduce reliance on fossil fuels, enabling investment in renewable energy, low-emission heat solutions, and efficient transport systems across supply chains.
 Drive industry transformation through standards, targets, and workforce development	Build on existing initiatives by developing clear sustainability standards, setting long-term industry targets, and investing in workforce skills and training to prepare for future market and technology shifts.

1. Introduction

Gippsland Forestry Hub (GFHub) engaged SMEC Australia Pty Ltd (SMEC) to evaluate the value of forestry and timber products to climate change mitigation in Gippsland. This report covers:

- **Policy and Regulatory Review (Section 2):** Summarises key policy and legislation frameworks
- **Case Studies Review (Section 3):** Highlights global examples of successful decarbonisation initiatives relevant to forestry, timber, and paper
- **GHG Footprint Assessment (Section 4):** Estimates emissions and removals across plantations, processing facilities, contractors, and supply chains
- **GHG Mitigation Framework (Section 5):** Sets a GHG mitigation framework and outlines key strategies to reduce emissions and enhance carbon storage
- **Regulatory and Policy Recommendations (Section 6):** Identifies policy recommendations to enable industry transformation and align with Victoria’s net-zero targets.

1.1 Purpose

The purpose of this report is to determine the value of the Gippsland forestry industry for climate change mitigation, determine any opportunities for enhancing climate change mitigation, and highlight any co-benefits along the way for jobs, the economy, education, and climate change resilience.

1.2 Language

The following terms in Table 4 are specifically defined to provide clarity throughout this report and maintain consistency with industry terminology. A full glossary is provided in Appendix A.

Table 4: Terminology.

Term	Definition
The industry	The Gippsland forestry industry, including plantation owners, silviculture operations, other various site operations, harvesting operations, transport operations, processing operations, distribution of goods, advocacy activities, and education and employment associated with Gippsland forestry activities.
Wood fibre products	Products produced by the industry including but not limited to pulp products, sawn timber products, timber posts, pharmaceuticals, and biofuels.
Pulp products	Paper and cardboard products including but not limited to copy paper, packaging cardboard, and food packaging.
Timber	Used to refer to products processed for their solid wood properties such as sawn timber, posts, and engineered lumber.
Forestry	Usually refers to both native forest harvesting and plantation forestry, however in this report refers to only plantation forestry when referring to the Gippsland Industry.

Quotations are used throughout this report in callout boxes. These are included to report notable opinions voiced during site inspections and stakeholder interviews. They are included anonymously as privacy was a condition of data collection and explicit privacy agreements were entered into with some stakeholders.

1.3 Background

GFHub was established as part of the Australian Government's National Forests Industry Plan which was released in 2018.² The purpose of the Plan was to support the forestry industry to meet the Nation's future timber and wood fibre needs. While the forestry industry is facing historically unmatched demand from traditional timber industries, timber and wood fibres are facing significant demand globally from industries that have undergone technological and scientific advancements. The use of tree materials has emerged in a diversity of markets and use-cases including:

- Engineered timber products
- Structural timber as primary structural members in medium and large buildings
- Food additives (cellulose and cellulose derivatives)
- Pharmaceuticals
- Biofuels
- Wood-fibre-based plastics (composites).

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As well as primary production, the forestry industry contributes to the national economy in secondary ways. As a primary industry, fluctuations in forestry productivity equate to productivity fluctuations in downstream industries. This is as far reaching from housing supply to tourism, the manufacturing and furniture industry to energy & fuel industries (biofuels) and logistics & transport industries. Forestry and its downstream industries create jobs (51k direct jobs in forestry alone, which are typically regional) and contribute significantly to the Nation's economic health (\$2.4B annually).^{3,4} Superannuation and other investment funds also turn to forestry as a dependable long-term, primary industry financial investment. The Nation's economic and social wellbeing can be easily impacted by the complex system of forestry, and so too can regional and rural contexts which already face unique challenges.

GFHub's focus is on securing the local forestry industry in Gippsland. GFHub extends through a significant portion of the state, through six Local Government Areas, and a dozen major road corridors (see Figure 1). The Hub is steered by a committee of public and private seats which represents foresters, manufacturers, and education centres in the region. GFHub's priorities, backed by the 30-Year Strategy, are:

- Promote forestry
- Sustainable industry growth (economically and environmentally)
- Support the community (forestry community and wider regional/rural community)
- Champion career opportunities and employment pathways
- Improve public perceptions of forestry.⁵

In line with the Federal Government's Industry Plan, GFHub reduces barriers to expansion through policy, employment, infrastructure, and financial advocacy (locally, state and federally); drives innovation to use resources more efficiently while keeping up with technological and industrial trends; grows community understanding through stakeholder engagement and collaboration; and de-risks the industry through strategic planning.

GFHub has been actively developing various reports and publications supporting its strategic goals. Key publications were reviewed by SMEC which inform this report, and these are summarised in Appendix B.

² "National Forest Industries Plan", DAFF, last updated November 2, 2021, <https://www.agriculture.gov.au/agriculture-land/forestry/national-forest-industries-plan>.

³ "Forest Facts", DAFF, last updated July 8, 2025, <https://www.agriculture.gov.au/abares/forestsaustralia/forest-facts#employment-in-australian-forest-industries>.

⁴ "Forest Facts".

⁵ Greenwood Strategy, *Gippsland Forestry Hub 30 Year Strategy* (Gippsland Forestry Hub 2022), PDF, <https://gippslandforestryhub.com.au/wp-content/uploads/2022/05/9310-GWS-Gippsland-Forestry-Hub-Strategy-LowRes.pdf>.

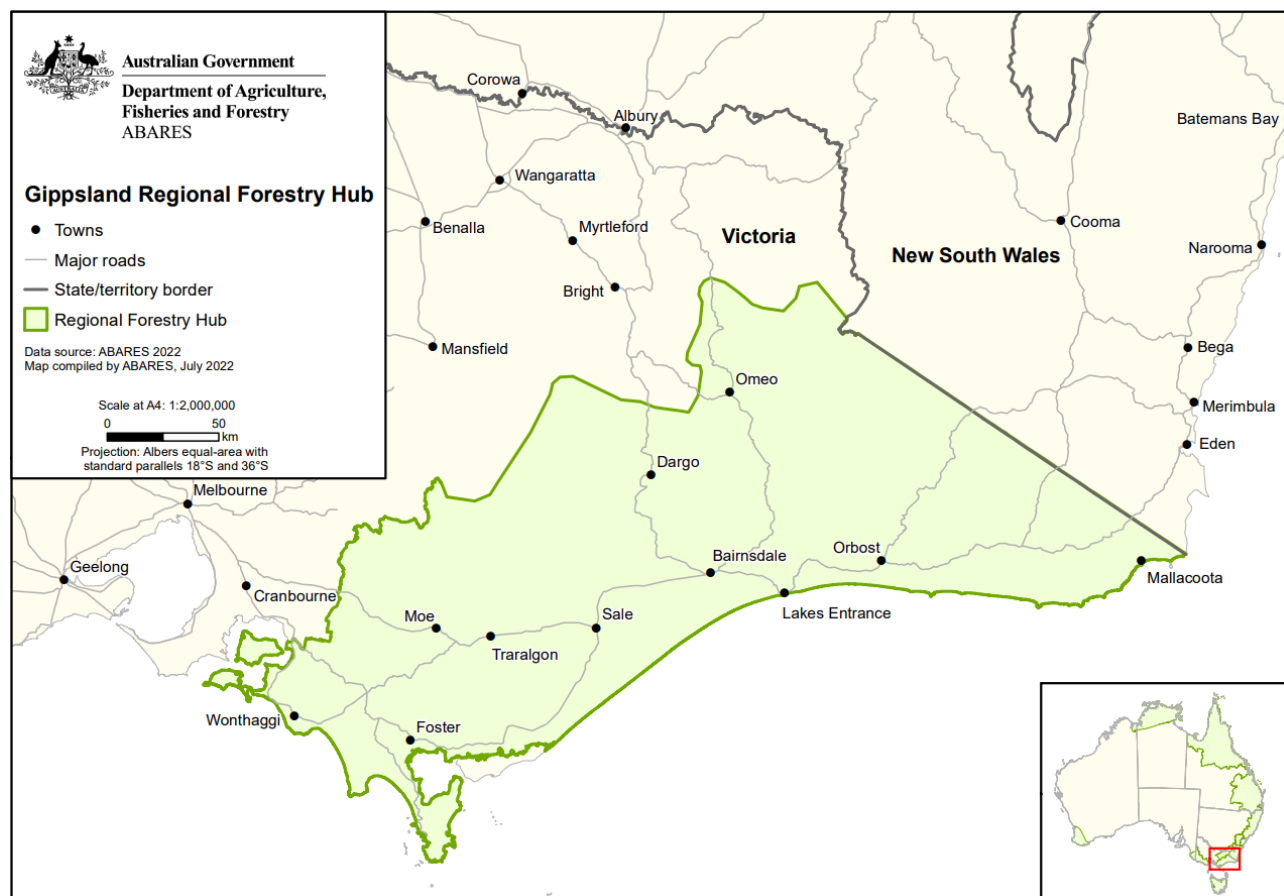


Figure 1: Gippsland Forestry Hub and Study Remit.⁶

Climate Change

The rapid increase in human activity from the industrial revolution to today has released significant quantities of GHGs into the atmosphere.⁷ Trapped heat energy has raised atmospheric and ocean temperatures and disrupted atmospheric and ocean cycles like the water cycle.⁸ This has led to increased intensity and frequency of extreme and destructive weather like bushfire, drought, and flooding.⁹ These impacts have significant impacts on food resources, habitat and biodiversity, water availability and so on. Scientific bodies around the world are calling for radical reduction and cessation of GHG emissions before atmospheric GHG concentrations reach highly consequential and irreversible tipping points.¹⁰

Australia is a signatory to the Paris Agreement – an intergovernmental agreement to limit global warming to below 2°C and targeting 1.5°C.¹¹ The Federal Government has legislated a Net Zero target by 2050, a 43% reduction in emission by 2030 and 62-70% reduction by 2035.¹² In support of the national decarbonisation journey, the Victorian Government has pledged to achieve Net Zero by 2045.¹³ The State has also legislated a legally binding interim target of 75% reduction from 2005 levels of emissions by 2035.¹⁴ Forestry contributes to

⁶ ABARES, *Gippsland Regional Forestry Hub* (DAFF, 2022), PDF, <https://www.agriculture.gov.au/sites/default/files/documents/gippsland-rfh.pdf>.

⁷ Intergovernmental Panel on Climate Change, *Technical Summary of the Working Group I Contribution to the Sixth Assessment Report (AR6)* (Geneva: IPCC, 2021), PDF, https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_TS.pdf.

⁸ CSIRO & Bureau of Meteorology, *State of the Climate 2024* (Commonwealth of Australia 2024), PDF.

⁹ CSIRO & Bureau of Meteorology, *State of the Climate 2024*.

¹⁰ “Dangerous climate tipping points will affect Australia. The risks are real and cannot be ignored”, CSIRO, last updated February 7, 2024, <https://www.csiro.au/en/news/all/articles/2024/february/climate-tipping-points-australia>.

¹¹ “International Climate Action”, DCCEEW, last updated August 11, 2025, <https://www.dcceew.gov.au/climate-change/international-climate-action>.

¹² “Net Zero”, DCCEEW, last updated September 25, 2025, <https://www.dcceew.gov.au/climate-change/emissions-reduction/net-zero>.

¹³ “Climate Action Targets”, DEECA, last updated June 23, 2025, <https://www.climatechange.vic.gov.au/climate-action-targets>.

¹⁴ “Climate Action Targets”.

the State and Federal Net Zero ambitions by removing carbon from the atmosphere. Understanding the effective contribution of the Gippsland Industry in particular is an aim of this study.

1.4 Industry Operations

The Gippsland forestry industry is notably distinct from other Australian forestry industries as it is plantation-only. Following a state government ban on native forest harvesting, the region has transitioned entirely to plantation-based timber production.¹⁵ The shift has driven rapid adaptation throughout the whole value chain. Industry operations include:

- Site selection and preparation
- Planting
- Treatment (fertiliser and fungicide/herbicide if necessary)
- Thinning
- Pruning
- Environmental monitoring
- Harvesting
- Haulage
- Roothing (construction and maintenance)
- Milling (timber and pulp).

The main products that the industry produces are:

- Sawn timber for the construction and manufacturing industries
- Roundwood for posts
- Engineered wood products and laminates
- Pulp for paper and cardboard.

2. Policy and Regulatory Frameworks Review

The Gippsland forestry, timber, and paper sectors operate within a complex policy and regulatory environment governed by federal, state, and local frameworks. These policies influence industry practices, land-use decisions, GHG accounting, and the transition towards a low-emission, climate-resilient economy.

For this study, the following key frameworks were reviewed as they are directly relevant to emissions management, plantation development, sustainable harvesting, and opportunities to enhance carbon storage:

- *Climate Change Act 2017*: Establishes Victoria's legislative commitment to net zero emissions by 2045 and sets interim emissions reduction targets, guiding industry alignment with statewide climate objectives.
- *Victorian Energy Efficiency Target Act 2007*: Drives energy efficiency improvements across industries, supporting reduced emissions through process upgrades and new technologies.
- *Renewable Energy (Jobs and Investment) Act 2017*: Sets renewable energy generation targets and promotes low-carbon energy investments, supporting opportunities for bioenergy, biomethane, and alternative energy solutions within forestry and processing.

¹⁵ "Forestry Transition Program", DEECA, last updated February 17, 2025, <https://www.deeca.vic.gov.au/futureforests/future-forests/victorian-forestry-program>.

- *Environment Protection Act 2017*: Strengthens environmental performance standards, particularly around waste, emissions, and sustainable resource use, encouraging innovation and compliance across the sector.
- *Circular Economy (Waste Reduction and Recycling) Act 2021*: Establishes Victoria's transition to a circular economy, emphasising waste reduction, resource recovery, and material reuse. The Act is directly relevant to improving timber and paper recycling, enhancing bioenergy pathways, and scaling up circular bioeconomy initiatives in Gippsland.
- *Planning and Environment Act 1987*: Shapes land-use decisions and approvals, influencing plantation expansion, on-farm integration, processing infrastructure, and emerging renewable energy developments within forestry regions.
- *Code of Practice for Timber Production (2014, amended 2022)*: Sets minimum operational standards for timber harvesting and forest management, ensuring sustainable practices, protection of biodiversity, and adherence to environmental and cultural heritage requirements. The 2022 amendments strengthen compliance expectations and align with Victoria's evolving sustainability priorities.

These frameworks reflect the Victorian Government's key priorities:

- Accelerating the transition to net zero, renewable energy and low-emission industries
- Driving a circular economy through waste minimisation and material recovery
- Promoting climate resilience in land management and resource use
- Supporting regional economies, job creation, and industry diversification
- Ensuring sustainable forestry practices and protecting biodiversity.

A more detailed review of these and other relevant policies, strategies, and regulations is provided in Appendix B.¹⁶

3. Case Studies Review

Reviewing international experiences provides insights into the different dimensions influencing decarbonisation in the forestry and timber sectors (such as technology, policy, finance, environment, community, and so on) while also helping identify practical learnings and solutions relevant to the Gippsland context. These learnings help inform this study's aim of understanding the sector's role in carbon removal, storage, and emissions reduction. Table 5 provides a summary of the selected case studies including technologies, policies, and initiatives supporting.

¹⁶ Victorian Regional Forestry Agreements were excluded from the analysis due to the cessation of native forest logging in 2024, rendering the documents irrelevant.

Table 5: Summary of Selected Case Studies Reviewed.

Location Project	Focus Area	Key Action / Outcome	Relevance to this project
 Sweden Scania 80-tonne Battery Electric Vehicle ^{17,18} Sweden Scania 45R – Södra ¹⁹	Timber haulage electrification	Deployed world’s first 80-tonne BEV timber shuttle (2022) and first self-loading BEV crane truck (2024). Cuts ~55 t CO ₂ /year and enables in-forest pickup with 200–320 km range. Södra (Swedish forestry group) has invested in a similar model truck from Scania.	Example that short-haul, high-mass timber movements can be electrified today— analogue for 20–60 km Gippsland shuttles to mills/railheads.
 Germany Hydrogen Trucks ²⁰	Decarbonised logistics	Trial of Mercedes GenH2’s over 225,000km in real-world operations (for Holcim, Amazon, and others) achieved ~1000km of range (carrying 16-34t GCW). Refuels take 10-15 minutes.	Demonstrates hydrogen fuel-cell trucks are approaching performance (range and refuelling condition) of diesel with lower emissions.

¹⁷ “The Silent 70-Tonne Scania Timber Truck”, Scania, last updated April 2, 2024, <https://www.scania.com/group/en/home/newsroom/news/2024/The-silent-70-tonne-Scania-timber-truck.html>.

¹⁸ “Electric Timber Trucks”, SCA, n.d., <https://www.sca.com/en/about-sca/innovation-and-research/forest/electric-timber-truck>.

¹⁹ “Södra’s Electric Wood Chip Truck Hits the Road”, Timberbiz, last updated September 10, 2025, <https://www.timberbiz.com.au/sodras-electric-wood-chip-truck-hits-the-road/>.

²⁰ “Five and a Half Times Around the World: Daimler Truck Fuel Cell Trucks Successfully Complete More than 225,000 Kilometers in Real-World Customer Operations”, Daimler Truck, last updated September 3, 2025, <https://www.daimlertruck.com/en/newsroom/pressrelease/five-and-a-half-times-around-the-world-daimler-truck-fuel-cell-trucks-successfully-complete-more-than-225000-kilometers-in-real-world-customer-operations-53182162>.

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Location Project	Focus Area	Key Action / Outcome	Relevance to this project
 Finland Metsä Kemi Fibre bioproduct mill²¹	Fossil-free mill operations	Achieved fully fossil-free pulp production; mill generates 250% of its electricity needs, exporting surplus renewable energy to grid and neighbouring communities.	Blueprint for deep mill decarbonisation (biogenic energy + efficiency + by-product valorisation)
 Finland VR Group electric roundwood trains to Metsä²²	Low-emissions rail logistics	Fully electrified rail network now moves ~5M m ³ roundwood annually, replacing thousands of diesel truck trips and reducing emissions per tonne-km by over 75%.	Demonstrates emissions savings from shifting forestry freight to electrified rail, applicable to Gippsland's regional log corridors.

²¹ "Kemi Bioproduct Mill", Metsä Group, n.d., <https://www.metsagroup.com/metsafibre/about-metsafibre/pulp-production/kemi-bioproduct-mill>.

²² "Electrically Driven Roundwood Train Transports to Kemi Bioproduct Mill Have Started", VR Group, last updated April 21, 2023, <https://www.vrgroup.fi/en/vrgroup/news/electrically-driven-roundwood-train-transport-to-kemi-bioproduct-mill-have-started-210420231044/>

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Location Project	Focus Area	Key Action / Outcome	Relevance to this project
 Sweden Södra biomethanol from pulp mill²³	By-product fuel/chemicals	Produces 5,250 tonnes/year biomethanol from pulp mill condensates, reducing fossil methanol demand and enabling circular, low-emissions chemical production since 2023.	Demonstrates value-added pathways for by-products, improving mill profitability and lowering Scope 1 and Scope 3 emissions.
 Australia Central West NSW Forestry Hub²⁴	Carbon footprint assessment	Full GHG footprint assessment of plantations and mills including removals and product emissions	Demonstrates focus of other forestry hubs on GHG accounting, decarbonisation and stakeholder engagement.
	Circular economy in sawmills	Converts wood residues into ENplus-certified pellets; biomass boilers and solar panels generate more energy than the site consumes.	Exemplifies full-scale residue valorisation and renewable energy integration—ideal model for energy-positive timber operations.

²³ “Case Study: Purified Methanol Plant Offers Opportunity for Pulp Mills”, Paper360, last updated October 23, 2023, <https://paper360.tappi.org/2023/10/23/case-study-purified-methanol-plant-offers-opportunity-for-pulp-mills/>.

²⁴ Thinkstep ANZ, *Carbon Footprint Report* (Central West NSW Forestry Hub, 2022), PDF, https://cwfh.com.au/wp-content/uploads/2023/07/CWFH-ZP102690-Carbon-Footprint-Report-v1_2.pdf

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Location Project	Focus Area	Key Action / Outcome	Relevance to this project
Belgium IBV's Sawmill ²⁵			
	Forestry finance	\$75 million investment in carbon-positive plantation development, aiming for >1 million tCO ₂ e abatement	Demonstrates how forestry investment can be framed around decarbonisation goals to attract finance in Gippsland.
Australia CEFC New Forests Investment Fund ²⁶			
	Timber use opportunity in urban construction	World's largest mass-timber urban development (~40% less embodied emissions vs concrete)	Showcases the downstream market demand for low-emission timber, validating the need for sustainable Gippsland timber production.
Sweden Stockholm Wood City ²⁷			
	Timber use opportunity in buildings	World's tallest timber building (~85 m), demonstrating carbon-saving engineered wood use	Demonstrates the value of CLT and other engineered products, helping Gippsland processors consider high-value low-emission markets.

²⁵ "IBV's Sawmill, A Perfect Example of Bioenergy's Role in the Circular Economy", Bioenergy Europe, n.d., <https://bioenergyeurope.org/ibv-sawmill-a-perfect-example-of-bioenergy-role-in-the-circular-economy/>.

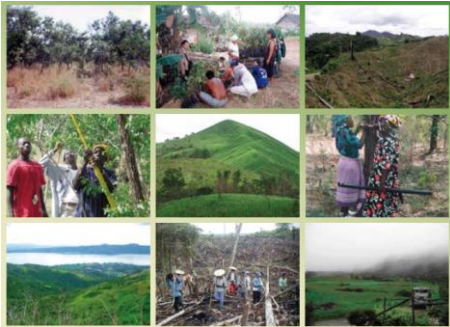
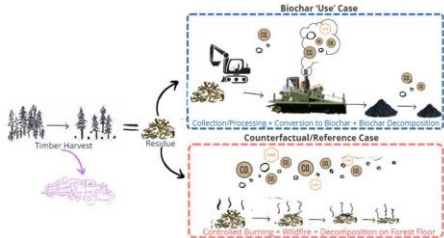
²⁶ "Plantation Forests Deliver Growing Future in Carbon Abatement", Clean Energy Finance Corporation, last updated December 2023, <https://www.cefc.com.au/case-studies/plantation-forests-deliver-growing-future-in-carbon-abatement/>.

²⁷ Maddy Savage, "Sweden is Building the World's Largest City Made Entirely from Timber", *TIME Magazine*, January 18, 2025, <https://time.com/7207873/sweden-stockholm-wood-city-sustainability/>.

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Location Project	Focus Area	Key Action / Outcome	Relevance to this project
Norway Mass timber high-rise ²⁸			
	Agroforestry & community	Agroforestry and community forest management for carbon sequestration and resilience	Offers lessons in community engagement and resilience that could apply to Indigenous partnerships and mixed-use forest landscapes in Gippsland. This is in line with the findings of Gippsland Agroforestry Network case study ³⁰ report (Gippsland Forestry Hub, 2022).
Global CIFOR-ICRAF Community Forestry ²⁹			
	Circular biochar production in forestry	Modelled the carbon impact of mobile pyrolysis to convert thinning-harvest residues into biochar; results show it can achieve net sequestration of 1.22–1.62 kg CO ₂ e per kg biochar compared to decay or burning scenarios	Demonstrates practical, low-impact conversion of forestry residues into long-term carbon sink
USA Modelling carbon impact of mobile Takachar biochar unit ³¹			

²⁸ Rebecca Mead, “Transforming Trees into Skyscrapers”, *The New Yorker*, April 18, 2022, <https://www.newyorker.com/magazine/2022/04/25/transforming-trees-into-skyscrapers>.

²⁹ Daniel Murdiyarso & Margaret Skutsch, eds., *Community Forest Management as a Carbon Mitigation Option*, (Centre for International Forestry Research, 2006), PDF, https://www.cifor-icraf.org/publications/pdf_files/Books/BMurdiyarso0602.pdf.

³⁰ Gippsland Forestry Hub, Gippsland Agroforestry Network, (Gippsland Forestry Hub, n.d.), PDF, <https://gippslandforestryhub.com.au/wp-content/uploads/2022/11/AgroForestry-Case-Study-report2022.pdf>.

³¹ Ryley Burton-Tauzer, Carisee Geronimo, Peter Overholser, Eli Wallach, and Kevin Fingerman, *Life Cycle Climate Impacts of Producing Biochar from Forest Residues via the Takachar Reactor* (Schatz Energy Research Center, 2024), PDF, https://schatzcenter.org/pubs/2024-Takachar-Report_FINAL.pdf.

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Location Project	Focus Area	Key Action / Outcome	Relevance to this project
 Denmark Biomethane from forestry & agro-organics (selected exemplars)	Transition to renewable gas Circular economy	Global sustainable potential is large; primary feedstocks are agriculture residues, municipal organics, and woody/forestry residues; main uses are pipeline injection, process heat/steam, CHP and transport fuel. Examples below show proven aggregation models and grid injection at scale: ~52 million m³/yr - Vinkel Bioenergi, (biomethane to gas grid)³² ~13 million Nm³/yr – GrønGas (multi-farm biomass aggregation; grid injection)³³ ~49 million m³/yr + food-grade CO₂³⁴	Directly applicable to Gippsland: aggregate plantation & mill residues with agro/FOGO streams; pursue grid-injection and transition from natural gas, particularly in the paper mill.

³² “Vinkel Bioenergi”, Agromek, last updated July 5, 2024, <https://www.agromek.com/articles-and-inspiration/case/vinkel-bioenergi>.

³³ “About Us”, GrønGas, n.d., <https://www.grongas.dk/en/about-us/?utm>.

³⁴ IEA Bioenergy, *Production of Food Grade Sustainable CO₂ from a Large Biogas Facility* (IEA Bioenergy, 2020), PDF, <https://www.ieabioenergy.com/wp-content/uploads/2020/11/Case-Story-CO2-recovery-Denmark-November-2020.pdf>.

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4. GHG Footprint Assessment

This section provides an assessment of the Gippsland forestry and timber sector's emissions and removals across plantations, processing facilities, contractors, and supply chains.

4.1 Introduction to GHG Emissions

GHGs are gases that limit the ability for heat energy from the sun that is reflected off Earth's surface to escape Earth's atmosphere. Instead, heat energy is reflected off these gases back down to Earth's surface and lower atmosphere (called 'radiative forcing'). Common GHGs include carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and refrigerant gases (fluorinated gases). The concentration of these gases in the atmosphere is the critical factor for how significant the reflection effect is. Carbon dioxide is the most abundant greenhouse gas after water vapour (clouds). Each GHG has a different potential for causing warming (called global warming potential) as some reflect heat energy better than others.

The current scientific body of knowledge notes that already, irreversible changes to climate cycles have occurred. Withdrawing GHGs from the atmosphere reduces GHG accumulation and the acceleration of climate change. GHG withdrawals currently do not come close to balancing emissions and civilisation remains on a path to rapidly accelerating consequences.

Biogenic (meaning from living organisms and cycles) removals are most common. Some technologies are being developed for directly capturing carbon from the atmosphere or capturing emissions at the emission source for storage underground. However, these technologies are currently expensive, energy intensive, and not as effective as biogenic removals (sequestration).

Biogenic removals capture atmospheric carbon dioxide in the photosynthesis process. Gaseous carbon is converted to solid carbon where it is stored in a stable state. Stored carbon is only rereleased to atmosphere if burned or broken down through bacteria processes and oxidised.

GHG Protocol

Greenhouse Gas Protocol (GHG Protocol) is a partnership between the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD).³⁵ In 2001, WRI and WBCSD developed a standard framework for GHG accounting.³⁶ The standard established the concept of 'scopes' to deal with overlapping or double-counted greenhouse gas emissions. When one organisation measures and reports on their upstream and downstream emissions (their indirect emissions), they are measuring another organisation's direct emissions). GHG Protocol requires emissions to be reported in 'scopes' to ensure that emissions are accounted for across the value chain without double-counting and enabling clearer responsibility and more effective mitigation strategies. The GHG Protocol scopes are defined below and shown visually in Figure 2.

- Scope 1 emissions are direct emissions from core operations that an organisation has direct ownership and control over. Scope 1 specifically excludes emissions from combusted biomass (biogenic carbon emissions). These must be reported separately. Examples include emissions from internal combustion engines (vehicles) and emissions from burning of gas to heat water.
- Scope 2 emissions are indirect emissions from the generation of purchased electricity. These are indirect as the emissions are not generated within the organisational boundary (typically).
- Scope 3 emissions are other indirect emissions. These are emissions that are generated as a consequence of an organisation's activities, but which are not generated within the organisational boundary (upstream and downstream emissions). Examples of Scope 3 emissions include embodied GHG emissions in purchased packaging materials, transportation of purchased goods, and products being sent to landfill at end-of-life.

³⁵ "About Us", Greenhouse Gas Protocol, n.d., <https://ghgprotocol.org/about-us>.

³⁶ "About Us".

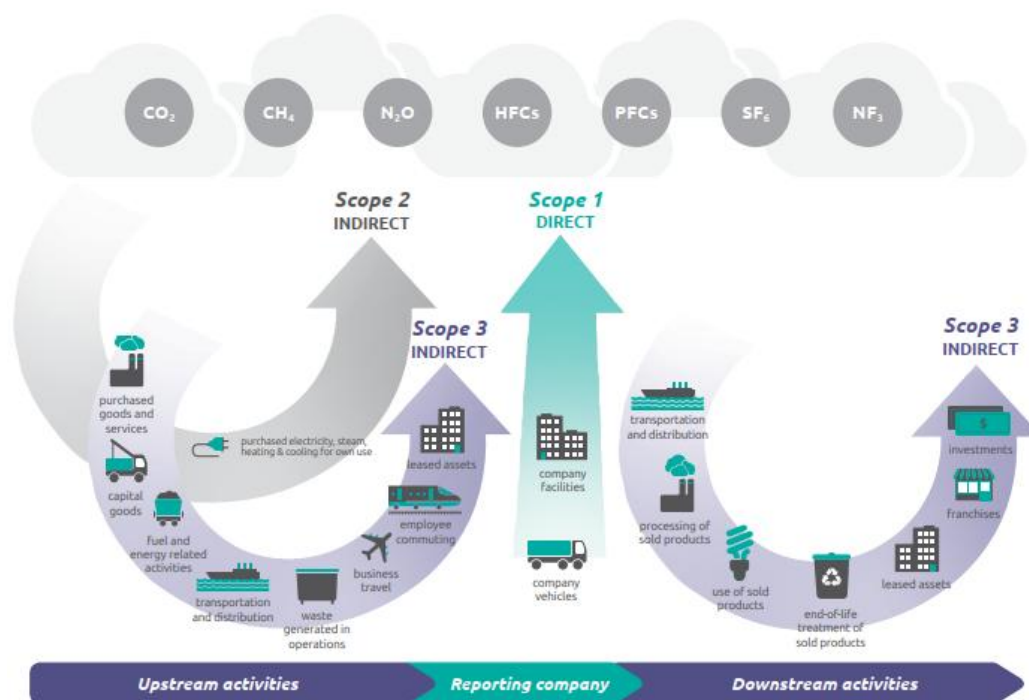


Figure 2: Typical Types of Greenhouse Gas Emissions.³⁷

4.2 GHG Footprint Assessment Methodology

The following section details the methodology used to establish an industry GHG footprint. It steps through the GHG Protocol process of setting a boundary, determining boundary conditions, and establishing an assessment period.

This report applies a best-practice approach to estimate GHG emissions, guided by the GHG Protocol principles. While every effort has been made to use reliable data and consistent methods, results represent best estimates based on information available at the time. The analysis follows these principles: relevance (focusing on significant emissions), completeness (considering all material sources where data allows), consistency (applying comparable methods over time), transparency (clear assumptions and data sources), and accuracy (minimising uncertainties as far as practicable).

The following methodology guidelines were followed in this assessment:

- Greenhouse Gas Protocol (GHG Protocol)^{38,39,40,41,42}

³⁷ Greenhouse Gas Protocol, *Overview of GHG Protocol Scopes and Emissions across the Value Chain*, 2011, in Greenhouse Gas Protocol, *Corporate Value Chain (Scope 3) Accounting and Reporting Standard* (World Resources Institute and World Business Council for Sustainable Development, 2011), Figure 1, PDF, https://ghgprotocol.org/sites/default/files/standards/Corporate-Value-Chain-Accounting-Reporting-Standard_041613_2.pdf.

³⁸ Greenhouse Gas Protocol, *The Greenhouse Gas Protocol: An Accounting and Reporting Standard*, Revised Ed. (World Resources Institute and World Business Council for Sustainable Development, 2004), PDF, <https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf>.

³⁹ Greenhouse Gas Protocol, *Technical Guidance for Calculating Scope 3 Emissions*, Version 1 (World Resources Institute and World Business Council for Sustainable Development, 2013), PDF, https://ghgprotocol.org/sites/default/files/standards/Scope3_Calculation_Guidance_0.pdf.

⁴⁰ Greenhouse Gas Protocol, *The Land Use, Land-Use Change, and Forestry Guidance for GHG Project Accounting* (World Resources Institute, 2006), PDF, https://ghgprotocol.org/sites/default/files/2024-11/LULUCF%20Guidance_1.pdf.

⁴¹ Greenhouse Gas Protocol, *The GHG Protocol for Project Accounting* (World Resources Institute and World Business Council for Sustainable Development, 2003), PDF, https://ghgprotocol.org/sites/default/files/standards/ghg_project_accounting.pdf.

⁴² Greenhouse Gas Protocol, *Corporate Value Chain (Scope 3) Accounting and Reporting Standard* (World Resources Institute and World Business Council for Sustainable Development, 2011), PDF, https://ghgprotocol.org/sites/default/files/standards/Corporate-Value-Chain-Accounting-Reporting-Standard_041613_2.pdf.

- National Greenhouse Gas and Energy Reporting (NGER) (measurement) Determination 2008 under the NGER Act, and the data available from National Greenhouse Account Factors (NGAF).^{43,44,45}

4.2.1 Boundary Setting

GHG Protocol is the current best-practice guideline for GHG impact assessments. The Protocol is globally applied. It ensures that assessments are consistent in their approach, making them complete, reliable, and comparable. The GHG Protocol is set up for organisational reporting. This assessment is not specifically for one organisation, but the industry can be treated as a collective organisation for the sake of this study. It is noted that GFHub is not singularly owned but is a collective initiative organisation.⁴⁶

4.2.1.1 Organisational Boundaries

There are two permitted approaches to setting the assessment boundary: the organisational boundary approach and the operational boundary approach. The organisational boundary approach requires all organisational emissions to be included in assessment boundary defined either by either *equity share* (operational emissions are included according to the organisation's proportional share of equity in the operations) or *control* (all operational emissions are included for operations that the organisation has control over, determined either by financial control or operational control).

Given that this study is attempting to measure the GHG emissions of an industry and not a discrete organisation, the control approach was deemed most suitable, and the operational control criterion was used. In practice, this means that all emissions associated with the industry that the industry's operators could influence were included in the assessment.

4.2.2 Materiality Threshold

Materiality threshold is another tool used to set the boundary of an assessment. A GHG emission or removal source is deemed 'immaterial' if it has insignificant impact on the final assessment values. The value of a 'materiality' threshold is contended in the GHG Protocol. This is due to a threshold being unable to be defined until the assessment is complete (materiality paradox) and it often resulting in an underestimation of GHG emissions. To determine what is material and what is not requires a complete picture of the GHG emissions to be known. However, a complete picture often cannot be reached without extraordinary effort. To determine whether something is or is not material also requires the flow to be quantified and the emissions or removals to be known. If that has been completed, there is no value then excluding it from the assessment.

Other industry guides such as British Standard EN 15978:2011 (Sustainability of Construction Works- Assessment of Environmental Performance of Buildings, Calculation Method), which the Infrastructure Sustainability Council references, uses a materiality threshold of 5% in the aggregate, per life-cycle stage (meaning no more than 5% of flows by mass or energy per lifecycle stage can be excluded). This could introduce significant error. A balance between error and effort in the pursuit of granular detail is required.

For this study we have used a critical judgement approach, in alignment with GHG Protocol. We have surveyed all relevant, significant inventory items and drawn on our experience to determine whether an inventory item is material or immaterial, before quantifying it. Our assessment has aimed for no more than 5% error in the complete aggregate. Examples of excluded items include dye, magnesium and other smaller constituents of fertilisers, and banjo oil (herbicide additive).

⁴³ Commonwealth of Australia, National Greenhouse and Energy Report (Measurement) Amendment (2024 Update) Determination 2024, registered June 28, 2024, Federal Register of Legislation, <https://www.legislation.gov.au/F2024L00823/latest/text>.

⁴⁴ DCCEEW, Australian National Greenhouse Accounts Factors (DCCEEW, 2024), PDF, <https://www.dcceew.gov.au/sites/default/files/documents/national-greenhouse-account-factors-2024.pdf>.

⁴⁵ DCCEEW, Australian National Greenhouse Accounts Factors (DCCEEW, 2025), PDF, <https://www.dcceew.gov.au/sites/default/files/documents/national-greenhouse-account-factors-2025.pdf>.

⁴⁶ "Gippsland Forestry Hub", Gippsland Forestry Hub, n.d., <https://gippslandforestryhub.com.au/about-us/>.

4.2.3 Assessment Period

An assessment period of one year was used for this assessment, as is standard practice. Assessors have the option to select multiple years and average their emissions/removals to smooth out any atypical fluctuations. This approach was not necessary for this assessment.

The forestry industry generally keeps fiscal year records as opposed to calendar year. Industry stakeholders were asked to provide data for financial years 2022/23 and 2023/24. Out of the responding stakeholders, all were able to provide data for both years, and both years were relatively similar. Fiscal year 2023/24 was chosen as the assessment period since it was most recent.

4.2.4 Reporting Units

GHG emissions modelling aims to understand the environmental impacts of particular products or operations for their global warming potential on a 100-year timescale, GWP100. This assessment reports greenhouse gas emissions (GWP100) in kg CO₂ equivalent (CO₂-e), as is industry standard. This is synonymous with 'carbon footprint'.

Different substances have different levels of impact for global warming potential and as such, the reference unit of kg CO₂-e (said "*kg of CO₂ equivalents*") is used. For example, 1kg of methane, CH₄, has the same global warming potential as 25kg of CO₂ and its impact is described as 25kg of CO₂-e. Using a reference unit (kg CO₂-e) allows global warming impacts for a variety of substances to be added together, as long as their equivalent global warming potential in mass of CO₂ is known.

4.3 Inputs and Data Sources

This assessment has relied upon external information including visual site inspections, stakeholder requests for information (RFIs), interviews, and published databases. It is important that the inputs to this assessment are transparent, in line with the GHG Protocol principles.

4.3.1 Stakeholders

Best efforts were made to identify the relevant emissions sources and associated entities/stakeholders. Multiple RFIs and interviews were issues to collect the data. The data was provided by stakeholders voluntarily and in confidence. However, a limitation in this study is not having access to some data despite several attempts. This may be due to data requested not being monitored/captured, or a decision by stakeholders not to disclose some data. Stakeholders that were unable to be reached or who opted out of the study were excluded. For transparency, participating stakeholders included:

- 2 x silviculture contractors
- 2 x sawmills
- 2 x roading and civil contractors
- 1 x harvesting contractor.

Reflecting on the missing data from stakeholders above, our results are expected to slightly underrepresent diesel use, electricity use, and emissions from the combustion of biomass, employee commuting emissions, downstream transport emissions, and end-of-life emissions from sawn timber products. However, the exclusion also underrepresents the removals from sawn timber carbon storage and stakeholders included in the model have been conservatively modelled, leading to some slight overrepresentation of GHG emissions. With the resulting ratio of removals to emissions, the recommendations and conclusions in this report are not expected to change significantly if the excluded stakeholders were to be included.

This report is the first attempt for an industry-wide GHG emissions assessment; further refinement and improved data coverage in future assessments will enhance the accuracy of these estimates.

4.3.2 Emissions and Removal Factors

GWP100 (the global warming potential 100 years in the future) was used as the time-horizon for emissions and removals factors. This balances the short- and long-lived greenhouse gases and relative warming potentials and is a United Nations Framework Convention on Climate Change policy convention.

4.3.2.1 Emissions Factors

Emissions Factors were sought and applied in the following hierarchy:

- National Greenhouse Accounts Factors (NGAF)^{47,48}
- Australian National Life Cycle Inventory Database (AusLCI)^{49,50}
- Environmental Product Declarations (EPDs)
- Climatiq database.⁵¹

Where emissions factors were not available, emissions factors were determined using first principles and assumptions where necessary. Inputs were sought and applied in the following hierarchy:

- NGAF
- Government and institutional (e.g., CSIRO) publications
- Manufacturer data sheets
- Similar consultancy reports and whitepapers.

4.3.2.2 Removal Factors

The National Carbon Accounting System Technical Report No. 41 was the primary reference for removal factors.⁵² Table 5 and Table 8 specifically were most useful. For all native Australian species which were not *Eucalyptus globulus*, the *E. globulus* sequestration values in Table 8 were used as a proxy. Limitations are discussed below in Section 4.3.3.2.

Technical Report No. 41 surveyed several plantations for above- and below-ground carbon content, among other data. The report summarises the results carbon content per hectare per year for combined above- and below-ground carbon in 5-year brackets from 0-5 years to 20-25 years for *P. radiata* and 0-5 years to 5-10 years for *E. globulus*.

The values in Technical Report No. 41 are on the higher end of other Australian forestry reports and sequestration rates found but was not the maximum indicating Gippsland's amenable conditions and high productivity at 15.3 tCO₂e ha⁻¹ yr⁻¹. The maximum rate outside of Technical Report No. 41 was noted at 16.5 tCO₂e ha⁻¹ yr⁻¹ and the minimum rate found was 8.7 tCO₂e ha⁻¹ yr⁻¹.⁵³

⁴⁷ DCCEEW, Australian National Greenhouse Accounts Factors (DCCEEW, 2024), PDF, <https://www.dcceew.gov.au/sites/default/files/documents/national-greenhouse-account-factors-2024.pdf>.

⁴⁸ DCCEEW, Australian National Greenhouse Accounts Factors (DCCEEW, 2025), PDF, <https://www.dcceew.gov.au/sites/default/files/documents/national-greenhouse-account-factors-2025.pdf>.

⁴⁹ Australian Life Cycle Assessment Society, *Australian Life Cycle Inventory Database (AusLCI)*, Version 1.42, released May 2023.

⁵⁰ Australian Life Cycle Assessment Society, *Australian Life Cycle Inventory Database (AusLCI)*, Version 1.45, released June 2025.

⁵¹ "Data Explorer", Climatiq, n.d., <https://www.climatiq.io/data>.

⁵² Phil Polglase, Peter Snowdon, 'Tivi' Theiveyanathan, Keryn Paul, John Raison, Tim Grove, and Stan Rance, *National Carbon Accounting System Technical Report no. 41: Calibration of the FullCAM Model to Eucalyptus globulus and Pinus radiata and Uncertainty Analysis* (Australian Greenhouse Office, 2004), PDF, <https://www.dcceew.gov.au/themes/custom/awe/fullcam/Help-FullCAM2020/rep/TR41%20Calibration%20of%20the%20FullCAM%20Model%20to%20Eucalyptus%20globulus%20and%20Pinus%20radiata%20and%20Uncertainty%20Analysis.pdf>.

⁵³ Phil Lacy, *Carbon Profiling Analysis* (PF Olsen for Central West NSW Forestry Hub, 2023), PDF, https://cwfh.com.au/wp-content/uploads/2024/03/CWNSWHub_CarbonProfilingAnalysisReport_PFOlsen.pdf.

4.3.3 Assumptions

The below sections explore the assumptions used for the GHG footprint modelling. Due to privacy and specific agreements entered with some stakeholders, a detailed list of specific line-item assumptions cannot be presented.

4.3.3.1 Emissions

- Some emissions were already calculated by stakeholders for other reporting/declaration purposes. We assumed that the boundaries and modelling approach was consistent with ours.
- Ferric Sulfate is used as a proxy for CCA as no emissions factors were found in publicly available, global databases.
- Only nitrogen, phosphorus, potassium, and zinc elements in fertilisers were modelled. All other constituents were considered immaterial.
- Herbicide was modelled generally. Specific herbicide constituents were not investigated.
- Fuel transport emissions were modelled by searching for the nearest service station to the stakeholders' facility and was assumed to be delivered in bulk.
- Employee commuting was assumed at 20km per day (each way), for 5-days per week, for 46 weeks per year, minus 13 public holiday days. A 2020 Toyota RAV4 was modelled for the commuting vehicle.
- Some upstream transport distances/origins were provided by stakeholders. Gaps were assumed based on basic market research for nearest suppliers. Upstream transport destinations were assumed to be central Gippsland.
- Downstream transport destinations were provided by some stakeholders. Gaps were assumed including volume of distribution to capital cities around Australia. For international transport, international domestic journeys were estimated to be limited to 200km from the receiving port to the distribution warehouse. Origin for downstream transport was assumed to originate in central Gippsland, unless otherwise known.
- Seedling tube mass was assumed to be 350g.
- Recycling rates from Victoria were assumed to be representative of national recycling rates.

4.3.3.2 Removals and Storage

- Conservatively, small-scale forestry was not captured in this study (agroforestry, smallholder forestry, etc.). Collectively, these small estates could be significant, however, this study was limited in its stakeholder engagement. This presents an opportunity for further refinement of results in the future.
- Commercial modelling software (such as FullCAM) was not used for this study as site-treatment, thinning schedules, rotation term, and site conditions vary significantly and are unlikely to yield greater accuracy without significant additional survey and stakeholder engagement. Instead, Technical Report 41 which was used to calibrate FullCAM, was used to inform the removals profile over the life of a plot. Technical Report 41 surveyed the growth of *Pinus radiata* and *Eucalyptus globulus* at several sites to determine the annual change in carbon stocks and presents the results in 5-year bands for each species. This helped the modelling follow the s-curve of growth and carbon accumulation more accurately.
- Planted commercial native species were all modelled as *E. globulus* following the s-curve yielded from Technical Report 41.
- Plots older than 25 years were modelled as a straight-line projection, due to the limitations of Technical Report no. 41.

- No disturbance events were modelled. Some disturbance (wind throw) is inherent in the modelling as data requested includes losses inherently. Bushfire is a critical threat, is a significant emitter of GHGs direct to atmosphere, and effects the sequestration potential of Gippsland's forests. Factors used in this assessment estimate Scope 1 GHG emissions of 2.3tCO₂e per tonne of forest material, and biogenic GHG emissions of 0.9tCO₂e per tonne of forest material. Collectively, that's 3.1t CO₂e per tonne (approximately 1.29tCO₂e per m³ for *P. radiata*) that is lost due to bushfire; however, this varies depending on fire conditions.
- Removals modelling includes harvested wood that continues through the value chain to final product and represents the accumulation of carbon (embodied carbon removals) throughout growth, minus waste. Some of this carbon (4.3% for timber products and 19.6% for pulp products) is released back to atmosphere as several GHGs through the end-of-life decay process, which is captured as an emission, but the remaining carbon is stored long term.

"The impact of bushfires is huge – entire resource bases have been wiped out and tonnes of carbon storage has been lost in a matter of days."

- A plantation staff member

A Note on Confidence

The data collected for this study was collected by volunteering organisations and in some circumstances, needed to be estimated and assumed. The below reporting includes an indication of confidence. High confidence means that the data was measured – compiled from receipts or diligent record keeping. It also indicates that robust emissions factors were used, and data gaps are low/immaterial. Medium confidence means that the results were estimated based on high-confidence data and without significant assumption. It is also used to indicate material data gaps or assumption was required to determine emissions factors. Low confidence means that the data was not provided and needed to be assumed, or significant assumptions were required to determine emissions factors. It is also used to indicate significant data gaps.

4.4 GHG Footprint Results

4.4.1 Scope 1

Table 6 below shows the Scope 1 GHG emissions profile. Figure 3 shows the Scope 1 share of each emission source.

Table 6: Scope 1 Emissions Profile.

Emissions Source	GHG Emissions (t CO ₂ -e)	Uncertainty	Notes
Natural Gas	192,847	Low	Gas use. Measured data direct from stakeholder
Diesel	16,697	Medium	Plant and equipment use. Measured data direct from most stakeholders.
Combustion of Biomass (CH ₄ and N ₂ O only, CO ₂ reported separately)	11,953	High	Includes combustion of biomass for kiln drying and electricity generation and on-site burning of residues for site preparation. Estimated and assumed inputs.
Fertiliser	3,623	Medium	Pellet and spray fertilisers. Measured and calculated inputs.
Wastewater Treatment	1,395	High	Emissions of CH ₄ to atmosphere. Calculated by others.

Emissions Source	GHG Emissions (t CO ₂ -e)	Uncertainty	Notes
Unleaded Petroleum	190	Medium	Plant and equipment use. Measured data direct from most stakeholders.
Jet Fuel	65	Low	Aerial haulage/treatment application.
Emissions Additives	11	Medium	Diesel exhaust fluid for reducing exhaust pollutants to lower potency GHGs – nitrogen based, emitted to atmosphere. Measured data direct from most stakeholders.

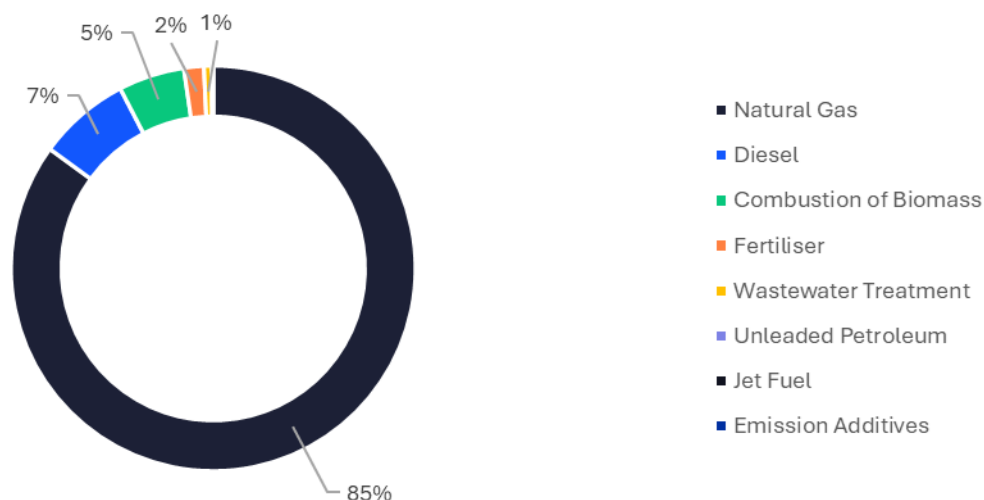


Figure 3: Scope 1 Emissions Profile. Categories without a percentage are <1%.

4.4.2 Scope 2

Table 7 below shows the Scope 2 GHG emissions profile. Figure 4 shows the Scope 2 share of each emission source.

Table 7: Scope 2 Emissions Profile.

Emissions Source	GHG Emissions (t CO ₂ -e)	Uncertainty	Notes
Electricity (location-based)	120,795	Low	Purchased electricity. Measured and supplied by most stakeholders.



Figure 4: Scope 2 Emissions Profile.

4.4.3 Scope 3

Scope 3 emissions are reported differently to Scope 1 and Scope 2 emissions under the GHG Protocol. Separate guidance is provided by GHG Protocol:

- Technical Guidance for Calculating Scope 3 Emissions (Version 1.0)⁵⁴
- The GHG Protocol for Project Accounting⁵⁵
- Corporate Value Chain (Scope 3) Accounting & Reporting Standard: Supplement to the GHG Protocol Corporate Accounting and Reporting Standard.⁵⁶

The guidance documents provide additional instruction for scoping, allocating, calculating, and reporting Scope 3 emissions. It separates Scope 3 emissions into 15 sub-categories which are sorted into upstream and downstream activities. Table 8 presents the sub-categories and their applicability to this study, as well as minimum boundary requirements. Subsequent sections report on each of the applicable Scope 3 emissions categories.

Table 8: Scope 3 Emissions Reporting Categories and Applicability, Adapted from GHG Protocol.⁵⁷

Category	Description	Minimum Boundary	Applicability
Upstream Emissions			
1. Purchased goods and services	Extraction, production, and transportation of goods and services purchased or acquired by the reporting company in the reporting year, not otherwise included in Categories 2 – 8.	All upstream (cradle-to-gate) emissions of purchased goods and services.	Applicable

⁵⁴ Greenhouse Gas Protocol, *Technical Guidance for Calculating Scope 3 Emissions*, Version 1 (World Resources Institute and World Business Council for Sustainable Development, 2013), PDF, https://ghgprotocol.org/sites/default/files/standards/Scope3_Calculation_Guidance_0.pdf.

⁵⁵ Greenhouse Gas Protocol, *The GHG Protocol for Project Accounting* (World Resources Institute and World Business Council for Sustainable Development, 2003), PDF, https://ghgprotocol.org/sites/default/files/standards/ghg_project_accounting.pdf.

⁵⁶ Greenhouse Gas Protocol, *Corporate Value Chain (Scope 3) Accounting and Reporting Standard* (World Resources Institute and World Business Council for Sustainable Development, 2011), PDF, https://ghgprotocol.org/sites/default/files/standards/Corporate-Value-Chain-Accounting-Reporting-Standard_041613_2.pdf.

⁵⁷ Greenhouse Gas Protocol, *Technical Guidance for Calculating Scope 3 Emissions*, Version 1.

Category	Description	Minimum Boundary	Applicability
2. Capital goods	Extraction, production, and transportation of capital goods purchased or acquired by the reporting company in the reporting year.	All upstream (cradle-to-gate) emissions of purchased capital goods.	Not applicable
3. Fuel- and energy-related activities (not included in scope 1 or scope 2)	Extraction, production, and transportation of fuels and energy purchased or acquired by the reporting company in the reporting year, not already accounted for in Scope 1 or Scope 2.	Varies	Applicable
4. Upstream transportation and distribution	Transportation and distribution of products purchased by the reporting company in the reporting year between a company's tier 1 suppliers and its own operations (in vehicles and facilities not owned or controlled by the reporting company). Transportation and distribution services purchased by the reporting company in the reporting year, including inbound logistics, outbound logistics (e.g., of sold products), and transportation and distribution between a company's own facilities (in vehicles and facilities not owned or controlled by the reporting company).	The scope 1 and scope 2 emissions of transportation and distribution providers that occur during use of vehicles and facilities (e.g., from energy use). Optional: The life cycle emissions associated with manufacturing vehicles, facilities, or infrastructure	Applicable
5. Waste generated in operations	Disposal and treatment of waste generated in the reporting company's operations in the reporting year (in facilities not owned or controlled by the reporting company). <i>Almost all waste (wood, sawdust, paper, etc) that is generated, is fed back into processes as residue input or energy. All other waste categories are immaterial.</i>	The Scope 1 and Scope 2 emissions of waste management suppliers that occur during disposal or treatment. Optional: Emissions from transportation of waste.	Excluded - immaterial
6. Business travel	Transportation of employees for business-related activities during the reporting year (in vehicles not owned or operated by the reporting company).	The Scope 1 and Scope 2 emissions of transportation carriers that occur during use of vehicles (e.g., from energy use). Optional: The life cycle emissions associated with manufacturing vehicles or infrastructure.	Excluded – Immaterial

Category	Description	Minimum Boundary	Applicability
7. Employee commuting	Transportation of employees between their homes and their worksites during the reporting year (in vehicles not owned or operated by the reporting company).	The Scope 1 and Scope 2 emissions of employees and transportation providers that occur during use of vehicles (e.g., from energy use). Optional: Emissions from employee teleworking.	Applicable
8. Upstream leased assets	Operation of assets leased by the reporting company (lessee) in the reporting year and not included in Scope 1 and Scope 2 – reported by lessee.	The Scope 1 and Scope 2 emissions of lessors that occur during the reporting company's operation of leased assets (e.g., from energy use). Optional: The life cycle emissions associated with manufacturing or constructing leased assets.	Not applicable
Downstream Emissions			
9. Downstream transportation and distribution	Transportation and distribution of products sold by the reporting company in the reporting year between the reporting company's operations and the end consumer (if not paid for by the reporting company), including retail and storage (in vehicles and facilities not owned or controlled by the reporting company).	The Scope 1 and Scope 2 emissions of transportation providers, distributors, and retailers that occur during use of vehicles and facilities (e.g., from energy use). Optional: The life cycle emissions associated with manufacturing vehicles, facilities, or infrastructure.	Applicable
10. Processing of sold products	Processing of intermediate products sold in the reporting year by downstream companies (e.g., manufacturers).	The Scope 1 and Scope 2 emissions of downstream companies that occur during processing (e.g., from energy use).	Not Applicable
11. Use of sold products	End use of goods and services sold by the reporting company in the reporting year.	The direct use-phase emissions of sold products over their expected lifetime (i.e., the Scope 1 and Scope 2 emissions of end users that occur from the use of: products that directly consume energy (fuels or electricity) during use; fuels and feedstocks; and GHGs and products that contain or form GHGs that are emitted during use). Optional: The indirect use-phase emissions of sold products over their expected lifetime (i.e., emissions from the use of	Not applicable

Category	Description	Minimum Boundary	Applicability
		products that indirectly consume energy (fuels or electricity) during use).	
12. End-of-life treatment of sold products	Waste disposal and treatment of products sold by the reporting company (in the reporting year) at the end of their life.	The Scope 1 and Scope 2 emissions of waste management companies that occur during disposal or treatment of sold products.	Applicable
13. Downstream leased assets	Operation of assets owned by the reporting company (lessor) and leased to other entities in the reporting year, not included in Scope 1 and Scope 2 – reported by lessor.	The Scope 1 and Scope 2 emissions of lessees that occur during operation of leased assets (e.g., from energy use). Optional: The life cycle emissions associated with manufacturing or constructing leased assets.	Not applicable
14. Franchises	Operation of franchises in the reporting year, not included in Scope 1 and Scope 2 – reported by franchisor.	The scope 1 and scope 2 emissions of franchisees that occur during operation of franchises (e.g., from energy use). Optional: The life cycle emissions associated with manufacturing or constructing franchises.	Not applicable
15. Investments	Operation of investments (including equity and debt investments and project finance) in the reporting year, not included in Scope 1 or Scope 2.	Varies	Not applicable

4.4.3.1 Category 1 - Purchased Goods and Services

This category includes emissions for the *extraction, production, and transportation of goods and services purchased or acquired by the reporting company in the reporting year, not otherwise included in Categories 2 – 8.*⁵⁸ Table 9 presents the Scope 3 Category 1 emissions profile.

Table 9: Scope 3 Category 1 Emissions Profile.

Emissions Source	GHG Emissions (t CO ₂ -e)	Uncertainty	Notes
Treatment Chemicals	26,906	High	Sawn timber, post, and engineered lumber treatment & manufacturing chemicals' embodied emissions. Low availability of emissions factors and significant assumption.

⁵⁸ Greenhouse Gas Protocol, *Technical Guidance for Calculating Scope 3 Emissions*, Version 1 (World Resources Institute and World Business Council for Sustainable Development, 2013), PDF, https://ghgprotocol.org/sites/default/files/standards/Scope3_Calculation_Guidance_0.pdf.

Emissions Source	GHG Emissions (t CO ₂ -e)	Uncertainty	Notes
Packaging	1,227	Low	Strapping, wrapping, etc for wood products. High availability of emissions factors. Measured and supplied by most stakeholders.
Fertiliser	48	High	Embodied emissions in fertiliser production. Some assumptions separating Scope 1 (direct) emissions from Scope 3 (indirect, embodied) emissions.
Herbicide	3	High	Embodied emissions in herbicide production. Low availability of emissions factors and significant assumption.
Emissions Additives	0.01	High	Embodied emissions in emissions additives production. Low availability of emissions factors and significant assumption.

4.4.3.2 Category 3 - Fuel- and Energy-Related Activities (Not Included in Scope 1 or Scope 2)

This category includes emissions for *Extraction, production, and transportation of fuels and energy purchased or acquired by the reporting company in the reporting year, not already accounted for in scope 1 or scope 2, including:*

- *Upstream emissions of purchased fuels (extraction, production, and transportation of fuels consumed by the reporting company)*
- *Upstream emissions of purchased electricity (extraction, production, and transportation of fuels consumed in the generation of electricity, steam, heating, and cooling consumed by the reporting company)*
- *Transmission and distribution (T&D) losses (generation of electricity, steam, heating, and cooling that is consumed (i.e., lost) in a T&D system) – reported by end user*
- *Generation of purchased electricity that is sold to end users (generation of electricity, steam, heating, and cooling that is purchased by the reporting company and sold to end users) – reported by utility company or energy retailer only.⁵⁹*

Table 10 presents the Scope 3 Category 3 emissions profile.

Table 10: Scope 3 Category 3 Emissions Profile.

Emissions Source	GHG Emissions (t CO ₂ -e)	Uncertainty	Notes
LNG	15,078	Low	Well-to-use emissions. High availability of emissions factors.

⁵⁹ Greenhouse Gas Protocol, *Technical Guidance for Calculating Scope 3 Emissions*, Version 1 (World Resources Institute and World Business Council for Sustainable Development, 2013), PDF, https://ghgprotocol.org/sites/default/files/standards/Scope3_Calculation_Guidance_0.pdf.

Emissions Source	GHG Emissions (t CO ₂ -e)	Uncertainty	Notes
Electricity	13,938	Low	Transmission and distribution losses upstream. High availability of location-specific emissions factors.
Diesel	4,514	Low	Well-to-pump emissions. High availability of emissions factors.
ULP	48	Low	Well-to-pump emissions. High availability of emissions factors.

4.4.3.3 Category 4 - Upstream Transportation and Distribution

This category includes emissions for:

- *Transportation and distribution of products purchased by the reporting company in the reporting year between a company's tier 1 suppliers and its own operations (in vehicles and facilities not owned or controlled by the reporting company)*
- *Transportation and distribution services purchased by the reporting company in the reporting year, including inbound logistics, outbound logistics (e.g., of sold products), and transportation and distribution between a company's own facilities (in vehicles and facilities not owned or controlled by the reporting company).⁶⁰*

Table 11 presents the Scope 3 Category 4 emissions profile.

Table 11: Scope 3 Category 4 Emissions Profile.

Emissions Source	GHG Emissions (t CO ₂ -e)	Uncertainty	Notes
Packaging	11	Medium	Upstream domestic transport. Reliant on some assumption. Specific origin inputs received from most stakeholders.
Treatment Chemicals	8	Medium	Upstream domestic transport. Reliant on some assumption. Specific origin inputs received from most stakeholders.
Fertiliser	2	Medium	Upstream domestic transport. Reliant on some assumption. Specific origin inputs received from some stakeholders.

⁶⁰ Greenhouse Gas Protocol, *Technical Guidance for Calculating Scope 3 Emissions*, Version 1 (World Resources Institute and World Business Council for Sustainable Development, 2013), PDF, https://ghgprotocol.org/sites/default/files/standards/Scope3_Calculation_Guidance_0.pdf.

4.4.3.4 Category 7 – Employee Commuting

This category includes emissions for the *transportation of employees between their homes and their worksites during the reporting year (in vehicles not owned or operated by the reporting company)*.⁶¹ Table 12 presents the Scope 3 Category 7 emissions profile.

Table 12: Scope 3 Category 7 Emissions Profile.

Emissions Source	GHG Emissions (t CO ₂ -e)	Uncertainty	Notes
Employees (without fleet vehicles)	1,504	High	High use of assumption (distance travelled and vehicle type).

4.4.3.5 Category 9 - Downstream Transportation and Distribution

This category includes emissions for the *transportation and distribution of products sold by the reporting company in the reporting year between the reporting company's operations and the end consumer (if not paid for by the reporting company), including retail and storage (in vehicles and facilities not owned or controlled by the reporting company)*.⁶² Table 13 presents the Scope 3 Category 9 emissions profile.

Table 13: Scope 3 Category 9 Emissions Profile.

Emissions Source	GHG Emissions (t CO ₂ -e)	Uncertainty	Notes
Products	21,507	Medium	Some use of assumption. Specific destination inputs received from some stakeholders.

4.4.3.6 Category 12 - End-of-Life Treatment of Sold Products

This category includes emissions for the *waste disposal and treatment of products sold by the reporting company (in the reporting year) at the end of their life*.⁶³ Table 14 presents the Scope 3 Category 12 emissions profile.

Table 14: Scope 3 Category 12 Emissions Profile.

Emissions Source	GHG Emissions (t CO ₂ -e)	Uncertainty	Notes
Pulp Products	13,340	Medium	CH ₄ emissions for landfilled product (CO ₂ emissions reported separately). High availability of emissions factors, recycling rates, and landfill chemistry. Some assumption used.
Timber Products	1,698	Medium	CH ₄ emissions for landfilled product (CO ₂ emissions reported separately). High availability of emissions factors, recycling rates, and landfill chemistry. Some assumption used.

⁶¹ Greenhouse Gas Protocol, *Technical Guidance for Calculating Scope 3 Emissions*, Version 1 (World Resources Institute and World Business Council for Sustainable Development, 2013), PDF, https://ghgprotocol.org/sites/default/files/standards/Scope3_Calculation_Guidance_0.pdf.

⁶² Greenhouse Gas Protocol, *Technical Guidance for Calculating Scope 3 Emissions*, Version 1.

⁶³ Greenhouse Gas Protocol, *Technical Guidance for Calculating Scope 3 Emissions*, Version 1.

4.4.3.7 Scope 3 Summary

Table 15 below shows the Scope 3 GHG emissions profile. Figure 5 shows the Scope 3 category share.

Table 15: Scope 3 Emissions Profile.

Category	GHG Emissions (t CO ₂ -e)	Uncertainty	Notes
3. Fuel- and energy-related activities (not included in Scope 1 or Scope 2)	33,578	Low	High availability of robust emissions factors. Electricity and gas usage are metered.
1. Purchased goods and services	28,184	High	Some gaps and use of assumptions.
9. Downstream transportation and distribution	21,507	Medium	Some use of assumption. Specific destination inputs received from most stakeholders.
12. End-of-life treatment of sold products	15,038	Medium	High availability of emissions factors and landfill chemistry.
7. Employee commuting	1,504	High	Significant use of assumptions.
4. Upstream transportation and distribution	21	Medium	Specific origin inputs received from most stakeholders.

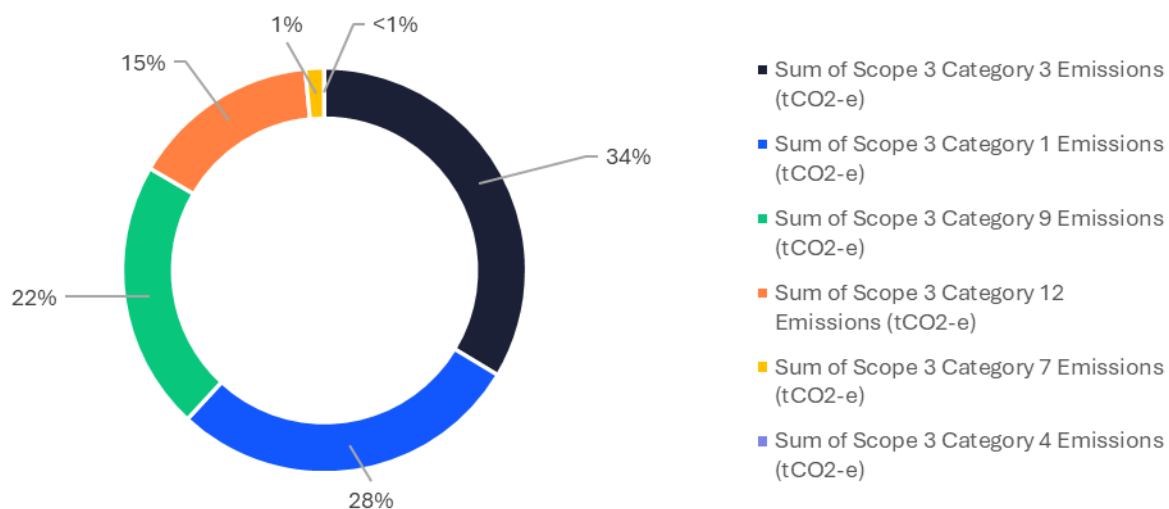


Figure 5: Scope 3 Category Share.

4.4.4 Biogenic Carbon Emissions

Biogenic carbon emissions must be reported separately from the Scopes as per GHG Protocol. These emissions are emission from the combustion or biodegradation of biomass.

Table 16 below shows the biogenic carbon emissions profile. Figure 6 shows the share of each biogenic carbon emission source.

Table 16: Biogenic Carbon Emissions Profile.

Emissions Source	GHG Emissions (t CO ₂ -e)	Uncertainty	Notes
Combustion of Biomass (CO ₂ only, CH ₄ and N ₂ O reported separately)	505,725	Medium	Includes combustion of biomass for kiln drying, energy generation (including black liquor), and site preparation. Emissions factors derived from published sources and first principles. Assumptions made regarding on-site burning volumes. Other inputs received directly from stakeholders.
Planted Pine Forests	70,467	Medium	Technical Note 41 notes that pine forests emit more carbon in years 0-5 than is removed from root decay, etc. and relatively little stem growth. Robust emissions factors.
Pulp Products (Landfilling)	47,785	Low	CO ₂ emissions from decay of products in landfill. Robust emissions factors. High availability of emissions factors, recycling rates, and landfill chemistry. Some assumption used.
Timber Products (Landfilling)	6,083	Low	CO ₂ emissions from decay of products in landfill. Robust emissions factors. High availability of emissions factors, recycling rates, and landfill chemistry. Some assumption used.

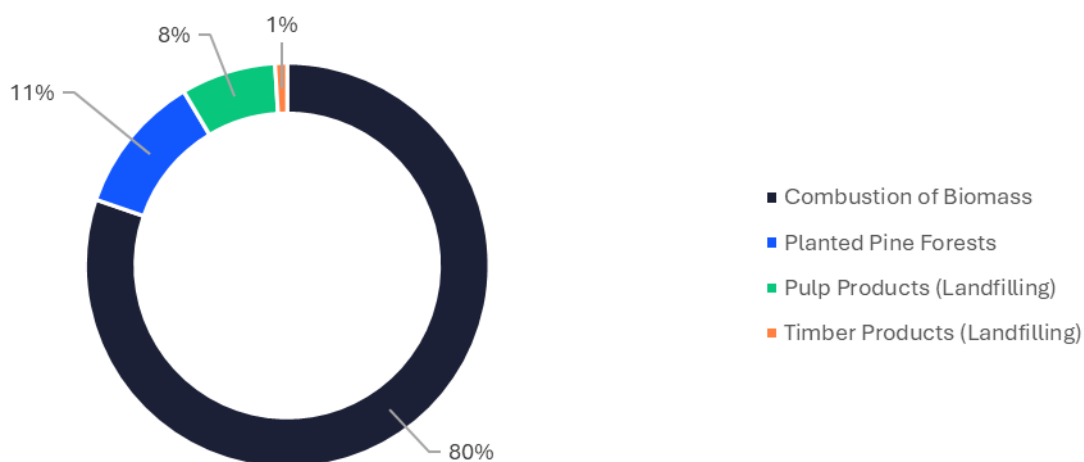


Figure 6: Biogenic Carbon Emissions Profile.

Report

The Value of Forestry and Timber Products to Climate Change Mitigation in Gippsland – Carbon Footprint
Prepared for Gippsland Forestry Hub

Client Reference No. The Value of Forestry and Timber Products to Climate Change Mitigation in Gippsland – Carbon Footprint (executed 1st April 2025)
SMEC Internal Ref. 30043664
13 October 2025

4.4.5 Carbon Removals

Carbon removals must be reported separately from the Scopes, similarly to biogenic carbon emissions, as per GHG Protocol. These removals are removals of carbon from the atmosphere through biomass, technology, land use change, or other means.

Table 17 below shows the biogenic carbon emissions profile. Figure 7 shows the share of each carbon removal source.

Table 17: Carbon Removals Profile.

Removals Source	GHG Removals (t CO ₂ -e)	Uncertainty	Notes
Planted Pine Forests	959,345	Low	Carbon sequestered in pine forest growth for the study year. Informed by Technical Report 41. Stock volume supplied by stakeholders.
Product Storage	629,026	Low	Carbon withdrawn from forest stocks this is stored in products after processing (losses considered). Robust factors used. Products volume supplied by stakeholders.
Planted Commercial Native Forests	36,078	Low	Carbon sequestered in planted native forest growth for the study year. Informed by Technical Report 41. Stock volume supplied by stakeholders.

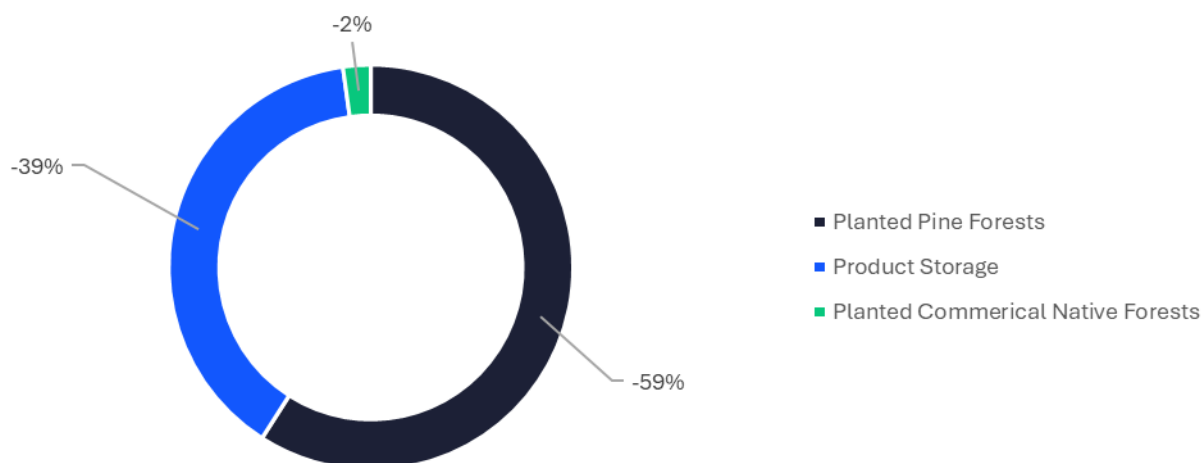


Figure 7: Carbon Removals Profile.

4.4.6 Emissions Footprint Summary

The overall GHG impact of the Gippsland forestry and timber sector was assessed by quantifying total emissions and removals based on reported data and available information. For FY2023/24, total emissions are estimated

at approximately 1,077,477 tCO₂-e, comprising Scope 1 emissions of 226,791 tCO₂-e, Scope 2 emissions of 120,795 tCO₂-e, Scope 3 emissions of 99,832 tCO₂-e, and biogenic emissions of 630,060 tCO₂-e.

The largest contributors to emissions are natural gas, electricity and diesel consumption.

Estimated total removals from tree plantation growth and carbon stored in long-lived wood fibre products range between -1,427,046 tCO₂-e and -1,822,327 tCO₂-e. These removals offset total reported emissions, resulting in a net balance of approximately -546,971 tCO₂-e for the sector in FY2023/24

Table 18 below summarises the total GHG emissions (Scope 1, 2 and 3) and total GHG removals. Figure 8 shows the total GHG emissions profile.

Table 18: Summary of GHG Emissions and GHG Removals for the Gippsland Forestry Industry FY23/24.

Emissions/Removals		GHG Emissions (tCO ₂ -e)
Emissions		1,077,477
	Scope 1 Emissions	226,791
	Scope 2 Emissions	120,795
	Scope 3 Emissions	99,832
	Biogenic Emissions	630,060
Removals		-1,624,449 (±197,878)
	Growth	-995,422 (±197,878)
	Storage	-629,026
Net Balance		-546,971

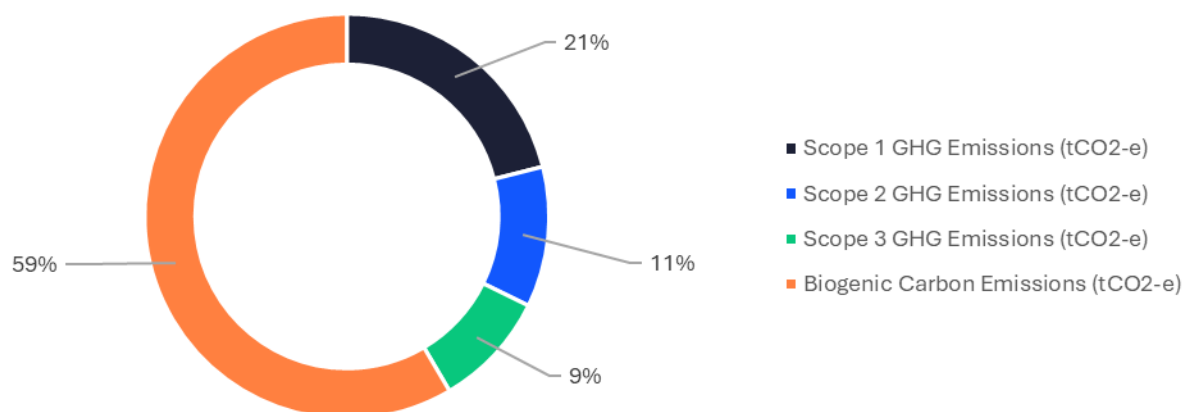


Figure 8: GHG Emissions Scope Breakdown for the Gippsland Forestry Industry FY2023/24.

5. GHG Mitigation Framework

The GHG Mitigation Framework describes the key principles for emissions reduction across the industries in the region. The following sections detail how emissions reduction opportunities are identified and prioritised and presents suggested actions that the industry can take to further improve climate change mitigation.

5.1 GHG Reduction Principles

The GHG Management Hierarchy sets out the guiding principles for prioritising GHG reduction initiatives, from the most transformative and cost-effective at the top to the least preferred at the bottom. Emissions reduction pathways and the screening of strategies should be aligned with this hierarchy.

As illustrated in Figure 9, conservation (avoidance) is typically the most impactful and cost-effective way to reduce emissions, followed by measures that directly reduce process or operational emissions. Next are options for substitution through low-emission energy sources or materials. Finally, purchased carbon credits may be used to compensate for residual emissions that are technically or economically unfeasible to eliminate. These should only be applied as a last resort.

In the forestry sector, however, carbon removals and long-term storage in forests and timber products are not “offsets” but rather core mitigation outcomes of the business model. These activities should be considered primary contributions to emissions reduction, distinct from the external purchase of offsets. A brief description of each principle is provided below.

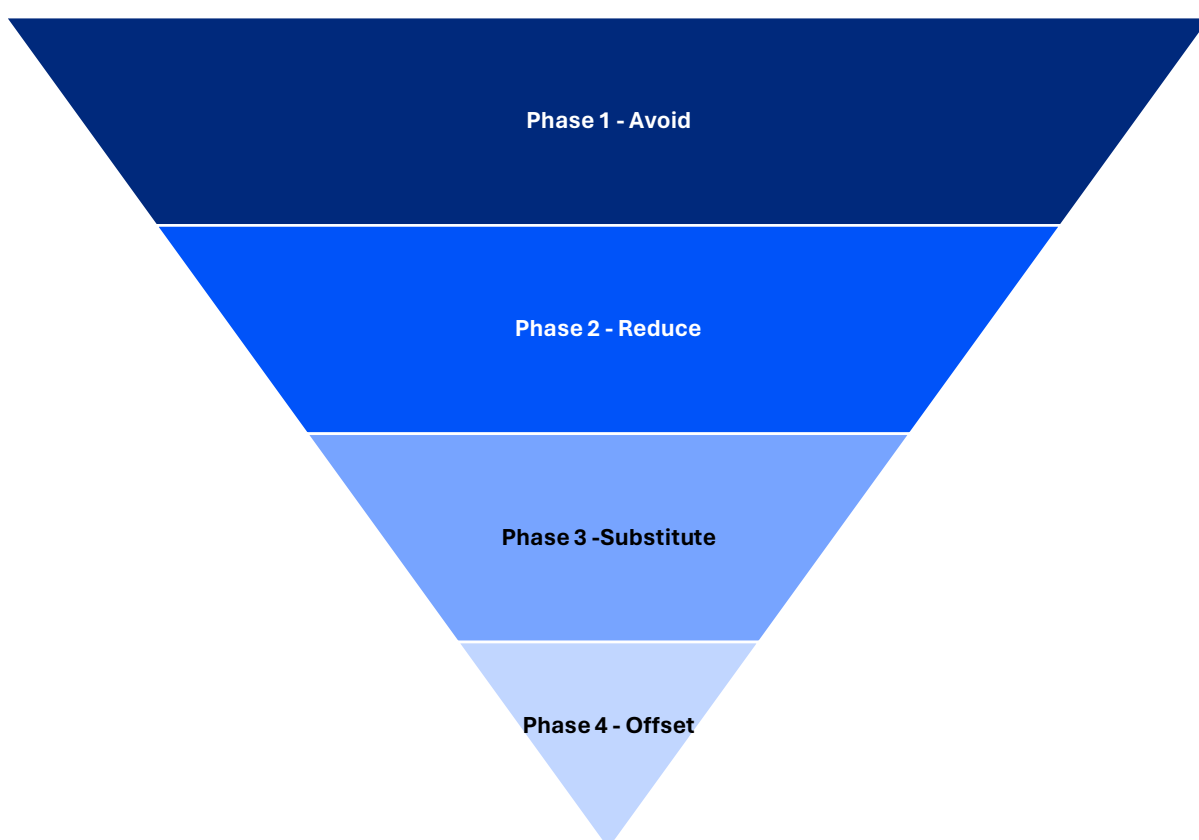


Figure 9: GHG Management Hierarchy.

5.1.1 Avoid

Conservation is the most effective way of reducing GHG impact as it prevents emissions from being generated in the first place. This can include eliminating activities that require energy or fuel use, such as:

- Avoiding waste in the harvesting and processing
- Switching off vehicles, trucks, and equipment when not in use
- Avoiding unnecessary trips or empty running of trucks.

Beyond reducing emissions, avoidance strategies often deliver wider benefits, including lower environmental impacts, reduced resource use, and lower business risk exposure.

5.1.2 Reduce

For operations where conservation measures are not feasible, improving energy efficiency can reduce emission and costs in operations. Energy efficiency measures cover a range of areas. Examples include:

- Increasing sawmill energy efficiency through equipment upgrades or process optimisation
- Reducing fuel use by improving haulage efficiency (e.g. optimised truck loads, rail use, or route planning)
- Minimising residue and waste during harvesting and processing, reducing the need for disposal or burning.

5.1.3 Substitute

After avoidance and efficiency measures have minimised excess energy use, the next step is to substitute remaining demand with low- or zero-emissions alternatives. This may involve installing on-site renewable energy systems, purchasing certified renewable energy, or switching to low- or no-emissions fuels. Examples include:

- Electrification of fossil fuel boilers
- Rooftop solar PV
- Switching transport fleets from diesel to renewable fuels (biodiesel, renewable diesel, or electrification)
- Substitution of fossil fuel sources with bioenergy and biomethane.

It is worth noting energy storage should be viewed as an enabling technology to support renewable energy integration rather than a stand-alone measure, as it typically consumes more energy than it generates.

5.1.4 Offset

Where emissions cannot be fully avoided, reduced, or substituted, compensation measures may be applied. These are commonly referred to as carbon offsets or carbon credits. They can be achieved either by purchasing verified credits or by investing in carbon removal projects, such as reforestation, afforestation, or improved forest management. Offsets should therefore be reserved for addressing residual emissions that are genuinely difficult to abate.

It is worth noting that in the forestry sector, carbon sequestration through forests and timber products represents a primary mitigation contribution rather than a secondary “offset.”

5.2 Circular Economy Principles

The five key circular economy principles are described in the following section which are aligned with Gippsland’s Regional Circular Economy Plan and have direct impact on the emissions footprint.⁶⁴

⁶⁴ DELWP, *Regional Circular Economy Plan: Gippsland* (DELWP, 2022), PDF, <https://www.vic.gov.au/sites/default/files/2022-10/Gippsland-regional-circular-economy-plan.pdf>.

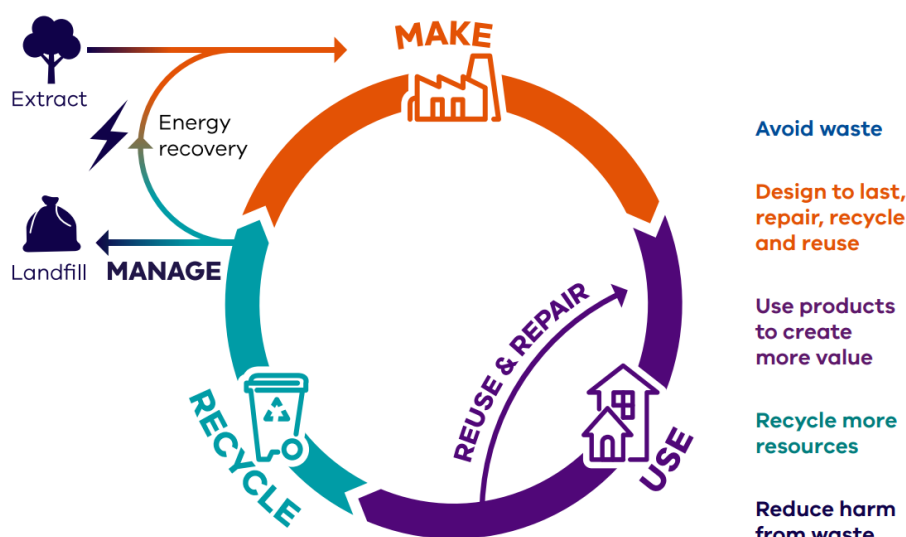


Figure 10: Resource Flows in a Circular Economy.⁶⁵

5.2.1 Avoid Waste

The highest priority is to prevent waste from being created in the first place. This includes designing operations and supply chains to minimise surplus material, avoiding overproduction, and optimising resource use so less ends up as waste.

5.2.2 Design to Last, Repair, Recycle and Reuse

Products, materials, and infrastructure should be designed for durability, repairability, and adaptability. At their end of life, they should be able to be reused, remanufactured, or recycled to extend their value and reduce the need for virgin resources.

5.2.3 Use Products to Create More Value

Maximising the utility of products and materials by keeping them in circulation for longer. This may include repurposing by-products, finding secondary markets for residues, or cascading materials through multiple lifecycles.

5.2.4 Recycle More Resources

Where materials cannot be reused, they should be collected, sorted, and recycled into new products, ensuring that valuable resources such as metals, plastics, organics, and wood fibre remain in use and out of landfill.

5.2.5 Reduce Harm from Waste

For residual waste that cannot be reused or recycled, management should minimise environmental and health impacts. This includes safe treatment of hazardous materials, diverting organics from landfill to reduce methane emissions, and ensuring responsible disposal practices.

“There’s real potential in local, precinct-scale circular economies and electrification. These could reshape how the sector operates and maintain the value chain.”

– GFHub Executive Committee Member

⁶⁵ DELWP, *Resource Flows in a Circular Economy*, 2022, in DELWP, *Regional Circular Economy Plan: Gippsland* (DELWP, 2022), PDF, <https://www.vic.gov.au/sites/default/files/2022-10/Gippsland-regional-circular-economy-plan.pdf>.

5.3 Emission Reduction Strategies and Actions

Considering the above framework and the GHG emissions modelling, a list of emissions reduction strategies is summarised in Table 19.

Table 19: Selected GHG Mitigation Strategies.

#	GHG Mitigation Strategy / Action	GHG Mitigation Hierarchy	Owner / Actor
1	Increasing carbon storage through improved forest management and climate-resilient practices	Avoid	Plantation owners Silviculture contractors
2	Decarbonisation of paper and timber production processes	Reduce / Substitute	Paper mill and sawmills
3	Expansion of ecologically sustainable plantation areas	Offset	Plantation owners Farmers Landowners
4	Enhancing circularity and resource recovery in harvesting and processing	Avoid / Reduce	All
5	Decarbonisation of haulage and harvesting operations	Avoid / Reduce / Substitute	Contractors
6	Climate mitigation and adaptation capacity building: industry and community	Avoid / Reduce / Substitute / Offset	All

5.4 Multicriteria Criteria Analysis of Decarbonisation Strategies

Key criteria for the Multi Criteria Analysis (MCA) of various dimension of the selected decarbonisation strategies and actions are summarised in Table 20.

Table 20: MCA Criteria Description.

Criteria	Description and indicators
Technical readiness & feasibility	Review technical readiness and feasibility, considering factors such as: • Maturity and technical readiness of the strategy (e.g., technology) • Supply chain and skills availability in Gippsland • Ease of integration into existing operations (e.g., into mills, plantations, etc.)
Economic viability	Discuss various factors contributing to economic viability, such as: • Investment attractiveness • Costs • Benefits
Environmental & sustainability impacts	Review potential environmental and sustainability impacts, such as: • GHG emission abatement potential • Biodiversity • Water, soil and air quality

Criteria	Description and indicators
	- Resource use minimisation and circularity benefits - Land use change
Social & community impacts	Review social and community impacts, such as: - Local employment and skills development opportunities - Community acceptance, local values, health, and safety considerations
Policy, regulatory, & market alignment	Review alignment against policy, regulatory and market trends, such as: - Compatibility with Victorian and national decarbonisation policies - Market drivers

The following sections evaluate each of the proposed emissions reduction strategies and identified actions against the MCA criteria. Justification is detailed for their performance.

5.4.1 Increasing Carbon Storage through Improved Forest Management and Climate-Resilient Practices

This strategy focuses on improving plantation and forest management to maximise long-term carbon sequestration while enhancing biodiversity, soil health, and climate resilience. Key actions include extending rotation cycles, selective and improved thinning, using improved seed genetics, and introducing climate-adapted species. A high-level MCA of this strategy and actions is summarised in Table 21.

“We’ve already hit net negative emissions, but we’ve not stopped there. Our goal is to keep reducing every year.”

– A plantation staff member

Table 21: MCA of Increasing Carbon Storage through Improved Forest Management and Climate-Resilient Practices.

Commentary	
Technical readiness & feasibility	- Plantation management techniques like extended rotations, selective thinning, and improved genetics are commercially mature and widely adopted in Australia. - Climate-resilient species and integrated fire-risk management practices are technically feasible and supported by established silviculture research.
Economic viability	Upfront establishment and transition costs are high, but improved growth rates and potential carbon payments strengthen long-term returns.
Environmental & sustainability impacts	- Strong carbon sequestration potential from improved growth rates and extended biomass storage. - Can improve biodiversity and soil health if integrated with sustainable silviculture and fire-risk management practices.
Social & community impacts	- Generates regional employment opportunities - Positive community impact, bushfire management
Policy, regulatory, & market alignment	Supports Victoria’s Net Zero 2045 target and aligns with sustainable forest management frameworks (e.g., DEECA’s Forest Management Plan, FSC, etc.)

5.4.2 Decarbonisation of Paper and Timber Production Processes

Key actions include transitioning away from fossil fuels in paper and timber processing, improving energy efficiency, adopting renewable energy sources, and exploring the use of alternative low-emissions chemicals. A high-level MCA of this strategy and actions is summarised in Table 22.

Table 22: Decarbonisation of Paper and Timber Production Processes.

Commentary	
Technical readiness & feasibility	- Energy efficiency upgrades, renewable electricity integration, and process optimisation are commercially mature and feasible in existing mills. - Shifting from gas to low-emission alternatives for high-temperature heat remains complex and technically challenging, with other alternatives like biomethane, hydrogen, and electrification not currently widely used in Australia.⁶⁶ - Biomass (i.e., black liquor) is already successfully utilised for heat and power generation.
Economic viability	- Significant energy cost savings can be realised through efficiency upgrades - On-site solar PV, power purchase agreements (PPAs), or Greenpower are commercially viable options for renewable electricity supply. - Transitioning from natural gas to alternative fuels in the paper mill requires high upfront capital costs and policy support to enable competitive biomethane or hydrogen pricing.
Environmental & sustainability impacts	- Improving air quality and reducing emissions. - Utilising biomethane produced from agricultural and forestry residues delivers multiple co-benefits, including reducing waste, lowering emissions, and supporting a more circular regional economy.
Social & community impacts	- Securing the long-term viability of the Gippsland paper mill supports hundreds of local jobs and sustains downstream sectors reliant on pulp and paper. - Community acceptance improves with stronger sustainability commitments and alignment with Victoria's broader clean energy transition.
Policy, regulatory, & market alignment	- Aligns with Victoria's Gas Substitution Roadmap and Net Zero 2045 commitments, supporting State and National decarbonisation pathways. - Enhances market competitiveness for low-emission paper products.

5.4.3 Expansion of Ecologically Sustainable Plantation Areas

This strategy focuses on expanding ecologically sustainable plantation establishment and on-farm integration to maximise long-term carbon sequestration while minimising environmental and societal impacts, in alignment with the DEECA's Forest Management Plan (2004) and the Code of Practice for Timber Production (amended 2022).^{67,68} Key actions include planning and identifying the most suitable lands based on terrain, slope, and land capability; conserving biodiversity, cultural heritage, and landscape values; matching tree species to local soil, water, and climate conditions; and adopting diversified plantation models to enhance ecosystem resilience and support sustainable timber production. A high-level MCA of this strategy and actions is summarised in Table 23.

“Do the right thing while no one is looking’ is one of our values”

– A plantation manager

⁶⁶ ITP Thermal, *The Australian Industrial Process Heat Market* (ITP Thermal, 2025), PDF, https://itpthermal.com/wp-content/uploads/2025/04/itpprocess-heat-report_final08042025.pdf.

⁶⁷ Department of Sustainability and Environment, *Forest Management Plan for Gippsland* (Victorian Government Department of Sustainability and Environment, 2004), PDF, https://www.forestsandreserves.vic.gov.au/__data/assets/pdf_file/0034/495691/Gippsland-Forest-Management-Plan-2004_.pdf.

⁶⁸ DELWP, *Code of Practice for Timber Production* (DELWP, amended 2022), PDF, https://www.forestsandreserves.vic.gov.au/__data/assets/pdf_file/0032/573818/Code-of-Practice-for-Timber-Production-2014-as-amended-2022.pdf.

Table 23: Expansion of Ecologically Sustainable Plantation Areas.

Commentary	
Technical readiness & feasibility	• Most technically and commercially ready approach for carbon removal.⁶⁹ • Sustainable plantation establishment practices are well understood with multiple frameworks available. • Integrating diversified plantations with farm forestry and using site-specific species matching is technically feasible with current silvicultural skills. • Resources and tools available – DEECA/GFHub and Victorian Trees on Farm Program.
Economic viability	• Plantation expansion offers two key income streams through timber sales and participation in Australian Carbon Credit Unit (ACCU) schemes. Various financial incentives are available from federal and local governments. • High land prices and competition with agriculture sector require improved incentive models, investor confidence, and long-term processing demand security.
Environmental & sustainability impacts	• Increases carbon removals. • Careful land selection and plantation design are critical to reduce negative impacts on biodiversity, soil health, and water resources. • Pine plantations have higher water demand than native vegetation, which can affect local hydrology if not properly managed. • Large-scale monocultures reduce structural and species diversity, offering limited biodiversity benefits, though this can be acceptable given plantations are designed for timber harvest. • Without appropriate management, plantations may impact fauna habitats and increase bushfire risk due to higher fuel loads.
Social & community impacts	• Concerns around competition with agriculture land, water use and change in landscape. • Supports regional jobs in establishment, management, and processing while creating new income streams for farmers through on-farm forestry. • Requires strong engagement with local communities, landholders, and First Nations to address concerns about water use, land competition, and visual impacts.
Policy, regulatory, & market alignment	• Necessary action to support Victoria's Net Zero 2045 target and provide timber for addressing housing and sustainable timber and paper products demand

5.4.4 Enhancing Circularity and Resource Recovery in Harvesting and Processing

This strategy focuses on maximising resource recovery and reducing waste across forestry, timber, and paper operations. Key actions include improving recycling and reprocessing systems, developing local circular economy hubs, increasing the reuse of harvesting residues, and supporting innovation in bioenergy, biomethane, and engineered timber production. A high-level MCA of this strategy and actions is summarised in Table 24.

⁶⁹ "Australian Carbon Sequestration Potential", CSIRO, last updated August 12, 2024, <https://www.csiro.au/en/research/environmental-impacts/emissions/carbon-dioxide-removal/carbon-sequestration-potential>.

Table 24: Enhancing Circularity and Resource Recovery in Harvesting and Processing.

Commentary	
Technical readiness & feasibility	- Circular economy hubs for local processing of residues into biomethane, engineered wood, and renewable energy are technically feasible but require coordinated infrastructure investment and strong policy support to scale. - Technologies for timber and paper recycling, biomass recovery, and engineered wood manufacturing are commercially mature, but regional integration and scaling remain limited. - Emerging initiatives such as portable biomass processors, waste-to-energy systems, and biochar production show high potential for Gippsland but need demonstration projects and market development to prove viability.
Economic viability	- Better residue recovery reduces waste costs and creates new revenue streams through bioenergy, engineered wood, and recycling markets. - Localising processing reduces freight costs but requires upfront investment in facilities and stable demand supported by procurement policies.
Environmental & sustainability impacts	- Diverting timber and paper residues from landfill avoids methane emissions and enhances circularity. - Reprocessing residues into bioenergy, biomethane, or engineered timber improves GHG outcomes, reduces resource extraction pressures, and supports sustainable land use.
Social & community impacts	- Regional circular economy hubs create local jobs in resource recovery, manufacturing, and renewable energy sectors. - Supports community acceptance by reducing waste, improving recycling outcomes, and enabling transparent resource management.
Policy, regulatory, & market alignment	- Aligns with Victoria's Recycling Victoria Policy, Gippsland Regional Circular Economy Plan and Net Zero 2045 targets. - Expanding markets for recycled timber, paper, and engineered wood products.

5.4.5 Decarbonisation of Haulage and Harvesting Operations

This strategy focuses on reducing emissions from forestry haulage, harvesting, and heavy equipment operations. Key actions include transitioning to low emissions (e.g., hybrid, electric, or hydrogen-powered) trucks, plants, and equipment as technologies mature; adopting fuel-efficient alternatives where available; adopting lower emission fuels (such as biodiesel or renewable diesel); adopting suitable harvesting equipment for harvesting and thinning; optimising planning practices, harvesting schedules, and transport routes using GIS and digital logistics tools to improve efficiency and maximise haulage utilisation rates. It also includes exploring alternative and more effective methods, such as the use of drones and shifting freight to rail transport where feasible. A high-level MCA of this strategy and actions is summarised in Table 25.

Table 25: Decarbonisation of Haulage and Harvesting Operations.

Commentary	
Technical readiness & feasibility	- Electric, hydrogen, and hybrid options for trucks, plant and equipment remain limited in Australia for long-haul and remote operations, however, options are emerging overseas (refer to Section 3); biodiesel and renewable diesel are more readily deployable short-term solutions. - Electric vehicles including utility vehicles and lift trucks are currently available. - Electrification of operations will increase load on the local power network; the infrastructure needs to be upgraded. Also, charging and hydrogen fuel facility would be required.

Commentary	
	- Challenges of existing infrastructure - for example, some roads and terrains cannot accommodate B-doubles. - Route optimisation via GIS and digital logistics tools is commercially mature and can deliver immediate efficiency gains. - Drones are readily available and are currently being used for some tasks such as spraying and monitoring.
Economic viability	- Transitioning to low-emission vehicles and equipment involves significant upfront costs for fleet replacement and charging/refuelling infrastructure. - Fuel efficiency gains and better planning leading to higher utilisation and therefore reducing running costs.
Environmental & sustainability impacts	Significant opportunity to cut Scope 1 emissions from diesel use in haulage, silviculture and harvesting operations.
Social & community impacts	- Improved air quality and lower noise pollution benefits communities near harvesting site and haulage corridors. - Transitioning to low-emission vehicles and equipment can create new local jobs and skills.
Policy, regulatory, & market alignment	Strong alignment with Victoria's Zero Emissions Vehicle Roadmap and Net Zero 2045 commitments.

5.4.6 Climate Mitigation and Adaptation Capacity Building: Industry and Community

This strategy focuses on strengthening industry capability and community awareness to accelerate decarbonisation and climate resilience. Key actions include integrating sustainable procurement frameworks into industry operations and tendering processes, delivering training and awareness programs on climate mitigation and adaptation, embedding climate moments into project discussions (similar to safety moments), preparing and implementing sustainability management plans, and improving data, monitoring, and reporting for emissions and removals. A high-level MCA of this strategy and actions is summarised in Table 26.

“Forestry doesn’t have that family-run legacy like farming. Building that could really boost public understanding, transparency, and support like agriculture has.”

– A plantation staff member

Table 26: Climate Mitigation and Adaptation Capacity Building: Industry and Community.

Commentary	
Technical readiness & feasibility	- Integration of sustainable procurement frameworks can be tailored to the need of each entity and supported by established tools and certifications (e.g., FSC, Responsible Wood). - Training, awareness programs, and inclusion of climate moments in projects are low-barrier initiatives that leverage existing safety-based engagement models.
Economic viability	- No significant Capex or Opex impact. - Training and reporting investments are low-cost relative to potential gains.
Environmental & sustainability impacts	Improves sustainability management, emissions reduction and climate resilience.

Commentary

Social & community impacts	Upskilling industry workers and improving community awareness strengthens social licence for forestry and climate action initiatives.
Policy, regulatory, & market alignment	- Strong alignment with Victoria's Net Zero 2045 Strategy and the Recycling Victoria Policy, which promote sustainable procurement and GHG transparency. - Supports national and international trends towards mandatory sustainability reporting.

5.5 Stakeholder Engagement and Outreach Plan

The Stakeholder Engagement and Outreach Plan aims to foster active collaboration among plantation owners, timber processors, silviculture contractors, local councils, industry bodies, Traditional Owners, and the broader community. It builds upon existing GFHub initiatives and recent community engagement efforts to support decarbonisation strategies and enable the transition towards climate-resilient forestry and timber value chains.

5.5.1 Engagement Approach and Objectives

This high-level plan integrates two-way communication and capacity-building activities so that that key stakeholders and communities are involved and engaged. Key objectives include:

- Collaborative partnerships: Collaborative solutions with industry, community and Traditional Owners.
- Education and capacity building: Upskilling workforce and community on low-emissions forestry practices.
- Targeted outreach: Sector-specific focus groups, surveys and technical workshops.
- Transparency: Publish annual progress updates on GFHub platforms.
- Incorporating meaningful input: Stakeholders contribute to refining assumptions, knowledge and data.
- Building a shared understanding: The engagement process improves awareness of decarbonisation efforts.
- Leveraging existing frameworks: Integrating insights from the First Nations Engagement Framework and the Gippsland Community Survey and Analysis. The engagement approach is also informed by the International Association for Public Participation (IAP2) Spectrum.

5.5.2 Key Stakeholders

Table 27 outlines key stakeholder groups and their potential roles in supporting emissions reduction strategies.

Table 27: Key Stakeholders.

Stakeholder Group	Role in Decarbonisation
Plantation owners	Manage forests, implement carbon storage practices
Silviculture contractors	Operational efficiency, improved practices
Paper mills & timber processors	Process innovation, decarbonisation of production
Local councils & planning bodies	Policy alignment, infrastructure support
Traditional Owners & First Nations groups	Cultural heritage integration, land management partnerships
Landowners & Farmers	Support plantation expansion and on-farm integration of forestry, adopt sustainable land management practices
Local communities & workforce	Awareness, training, social acceptance
Research bodies	Technical insights, emissions factors and modelling methods

Stakeholder Group	Role in Decarbonisation
State and federal government agencies	Funding, policy alignment, compliance

5.5.3 Key Risks and Mitigation Strategies

Table 28 provides a summary of key stakeholder-related risks associated with implementing the decarbonisation strategies and outlines potential mitigation measures.

Table 28: Key Risks and Mitigation Strategies.

Risk	Impact	Mitigation
Stakeholder fatigue / low engagement	Medium	Phase activities and offer diverse channels for input
Conflicting priorities between groups	High	Use neutral facilitation, seek collaborative solutions
Limited awareness of decarbonisation benefits	Medium	Run targeted educational campaigns and skill-building workshops
Lack of funding or policy alignment	High	Early engagement with state/federal agencies for support

5.5.4 Engagement Activities and Tools

Table 29 outlines suggested engagement activities and tools, including the target audience and recommended frequency.

Table 29: Engagement Activities and Tools.

Activity / Tool	Purpose	Audience	Frequency
Stakeholder focus groups	Share updates, gather feedback	Key stakeholders	Biannual
Technical workshops	Build skills on low-emission practices and case studies	Contractors, mills, plantation owners	Quarterly
Community information sessions	Raise awareness on climate mitigation and adaptation, including posters, factsheets and infographics	Local communities	Annual
Online engagement tools	Webinars, surveys, and project dashboards using key messages	Broad audience	Ongoing
Targeted one-on-one sessions	Resolve specific issues, enable partnerships, gather feedback	High-priority groups	As needed

5.5.5 Moving Forward Together

GFHub's decarbonisation and climate resilience goals are best achieved with active participation from all stakeholders. While this plan provides a shared framework for engagement, GFHub could tailor its engagement to suit each stakeholder group, with an approach tailored to their unique operations, interests, responsibilities, and capacity.

Success relies on a mutual commitment to:

- Collaborative decarbonisation and climate action across forestry and timber industries
- Improved forest management and emissions reduction strategies that deliver environmental, economic and social benefits

- Supporting regional jobs, community resilience and industry competitiveness throughout the transition.

Evaluation and continuous improvement are foundations of GFHub’s engagement approach. At engagement milestones, GFHub could evaluate engagement effectiveness by:

- Measuring, monitoring and reporting on stakeholder views/perceptions and feedback
- Monitoring webpage visits, information session attendance and survey results
- Measure the level of stakeholder participation in the engagement process.

GFHub could then close the ‘feedback loop’ with stakeholders by demonstrating how feedback has been considered and incorporated, and how it will influence GFHub’s approach moving forward.

5.6 Monitoring and Reporting Framework

5.6.1 Monitoring and Evaluation

Monitoring and evaluation provide the evidence needed to track progress, identify gaps, and adjust strategies over time. For the Gippsland forestry and timber sectors, the framework should capture both emissions reductions and carbon removals (including stored carbon).

Performance should be assessed against clear Key Performance Indicators (KPIs), such as:

- Energy use (PJ of gas and electricity, litre of diesel) and direct emissions (tCO₂e) from harvesting, milling, and transport
- Density (tCO₂e per ha) and volume (tCO₂e) of carbon removals through reforestation, afforestation, and long-lived timber products
- Efficiency gains in processing (e.g., yield per cubic metre of timber processed)
- Value enhanced by-products such as wood veneer, biochar, residues for bioenergy or secondary markets.

Assessment of these indicators should be aligned with recognised methods (e.g. NGERs, Australian National Greenhouse Accounts Factors and GHG Protocol) to ensure credibility. Progress should be reviewed annually against the organisation’s GHG reduction pathway, with adjustments made if performance falls short of the trajectory. Monitoring should also consider broader sustainability outcomes such as biodiversity, soil health, and community benefits.

5.6.2 Reporting and Communication

Transparent reporting builds trust, accountability, and raising sector-wide awareness. GFHub members should report progress annually, either within existing financial or sustainability reports or as part of a collective sector report. Annual reporting should capture:

- Actual emissions and removals compared with baselines
- Achievements and innovations in GHG emissions reduction
- Key risks, opportunities, and lessons learned.

Every year, GFHub could prepare a regional progress report to benchmark the sector in line with national (such as NGER and Australian Accounting Standards Board – Sustainability Standard 2: Climate-related Financial Disclosures (ISSB S2)). This report could also provide the foundation for future GHG assessments.

Each business unit should maintain an implementation plan with defined actions, timelines, and responsibilities. Plans should also assess delivery risks and opportunities, recognising that technology, policy, and markets will continue to evolve.

6. Regulatory and Policy Recommendations

The forestry sector, including in Gippsland, is critical to Australia and Victoria's net zero emissions goals, as highlighted in several recent sources.^{70,71,72} Sustainably managed forests provide one of the most proven pathways for carbon removal and long-term storage through standing biomass, harvested timber, and wood and paper products. At the same time, demand for renewable, low-emission materials is rising, with timber and paper products increasingly used in housing, packaging, and to replace less sustainable products like plastics and steel.

Four key regulatory and policy recommendations for local, state, and federal governments to enable, coordinate, and support industry-wide actions that accelerate decarbonisation of the Gippsland forestry and timber sectors are discussed in Table 30 to Table 33 below.⁷³

6.1 Enable Circular Economy, Local Processing and Market Diversification

Table 30: Enable Circular Economy, Local processing and Market Diversification.

Enable Circular Economy, Local processing and Market Diversification

Current state:

A large share of harvesting offcuts, thinning and mill waste is not utilised because the cost of haulage often outweighs the market value. While end markets exist for firewood, poles, and sawdust, and there are emerging initiatives underway in veneer, biochar, and bioenergy, these remain small-scale, fragmented, and lack coordinated rollout plans or stable market support. The current rate of timber log utilisation (or recovery rate) in sawmills is between 40-50% based on stakeholders' inputs and supported by other sources.⁷⁴ Local processors face high transport costs as some timber is imported from interstate. There are limited financial incentives to modernise and tap into creating more circular products (such as biochar, recovered timber products, etc). Most current circular economy initiatives in Gippsland timber processing are mostly self-funded.

Recovery of paper and timber products remains well below their technical potential (56% for paper and cardboard and 25% for wood), despite near-complete recyclability.^{75,76,77} While paper and cardboard are already widely recovered through kerbside systems, contamination levels remain high, limiting end-use potential. In contrast, timber is typically not recovered via kerbside and is more commonly collected through municipal transfer stations, hard waste collections, or construction and demolition recovery facilities. Commercial cardboard recycling demonstrates a circular example with established end markets (such as Visy) offering a model that could be extended to timber products.⁷⁸

⁷⁰ "Climate Action Targets", DEECA, last updated June 23, 2025, <https://www.climatechange.vic.gov.au/climate-action-targets>.

⁷¹ Dominic Davis, Maria L. Peralta, Rod Keenan, Richard Eckard, and Michael Brear, *Downscaling – The Role of Forestry in Enhancing the Australian Land CO2 Sink* (Net Zero Australia, 2023), PDF, <https://www.netzeroaustralia.net.au/wp-content/uploads/2023/04/Downscaling-The-role-of-forestry-in-enhancing-the-Australian-land-CO2-sink.pdf>.

⁷² DELWP, *Land Use, Land Use Change, and Forestry Sector Emissions Reduction Pledge* (DELWP 2021), PDF, <https://www.climatechange.vic.gov.au/victorian-government-action-on-climate-change/LULUCF-sector-pledge-accessible.pdf>.

⁷³ Where available, references have been provided; however, some of the insights presented below are drawn from informal interviews with a diverse range of stakeholders and observations made during site visits conducted for this study.

⁷⁴ "ABARES National Wood Processing Survey", DAFF, last updated October 22, 2024, <https://www.agriculture.gov.au/abares/research-topics/forests/forest-economics/national-wood-processing-survey>.

⁷⁵ "Resource Recovery and Waste Materials Analysis", DCCEEW, last updated December 12, 2024, <https://www.dcceew.gov.au/environment/protection/waste/publications/national-waste-resource-recovery-reporting/resource-recovery-waste-material-analysis-2024>.

⁷⁶ "Victoria's Waste Performance and Projection Model Dashboard", Recycling Victoria, last updated August 29, 2025, <https://www.vic.gov.au/victorias-waste-projection-model-dashboard>.

⁷⁷ Using Victoria as a proxy for national wood recovery rates.

⁷⁸ "Recycling", VISY, 2024, <https://www.visy.com/services/recycling>

Enable Circular Economy, Local processing and Market Diversification

Victoria's broader circular economy policy under Recycling Victoria: A New Economy strongly supports improved recycling and reuse across materials — particularly through initiatives like the Paper and Cardboard Circular Economy Opportunities program.^{79,80} However, incentives and targeted support for timber-specific circular economy pathways remain comparatively underdeveloped.

Recommendations:

- **Stronger support for the development of value-adding and modernised processing technologies to enable regional circular economy hubs** to scale up local processing of forestry residues and paper waste into higher-value products such as various engineered timber streams, bioenergy, biomethane, biochar and more. Small diameter log material in particular has significant potential to improve carbon storage outcomes by using small diameter logs for higher-value, longer-lasting solid wood products. This builds on Victoria's momentum in circular economy and renewable energy by extending it to timber and paper supply chains. Circular economy hubs located close to plantations cut transport emissions as local material can be processed locally.
- **Strengthen market signals and demand certainty** by embedding clear targets for engineered timber, recycled timber and paper, and other low-emissions content into procurement, building, and infrastructure projects. Support the development of small log markets (e.g., logs extracted from thinning). Recognise and incentivise the co-benefits of various products such as biochar, which delivers durable carbon storage and agricultural benefits. Provide stronger policy support for bioenergy and biomethane as renewable energy sources that can displace natural gas and enhance Gippsland's energy transition.
- **Improve recycling and recovery systems**, especially for timber products, through more consistent statewide recycling and recovery frameworks, including a dedicated streams for timber, paper and cardboard recovery from commercial and industrial sources. Prioritise by expanding collection infrastructure, improving sorting quality, and ensuring stronger end-markets for recovered fibre.
- **Enable innovation and local value-adding** by providing effective funding, supporting collaboration between forestry, agriculture, and manufacturing, and promoting knowledge sharing. This can accelerate new product development while encouraging residues to be channelled into renewable energy and biochar production.

Why this helps:

Investment in circular economy solutions supports Victoria's and Australia's net zero goals by reducing emissions while continuing to supply essential timber and paper products. This would keep far more timber and paper products in circulation rather than becoming waste, reduce pressure on virgin resources, and help meet growing demand for sustainable materials. Developing local bioenergy and biomethane facilities using agriculture and forestry feedstocks in Gippsland leverages the region's existing energy infrastructure, helping to fill the gap left by coal plant closures while generating renewable, dispatchable energy. Increasing timber log utilisation and recovery in sawmills. Expanding recycling and engineered timber production also addresses timber demand in the housing sector, boosts local manufacturing, reduces transport emissions, and keeps more value in the region. Products and investments in Australia add value by stimulating the domestic economy instead of foreign import economies, which could deliver multiple co-benefits to the forestry industry and local communities.

⁷⁹ "Transforming Recycling in Victoria", Sustainability Victoria, last updated January 30, 2024, <https://www.sustainability.vic.gov.au/about-us/state-government-strategic-plans/transforming-recycling-in-victoria>.

⁸⁰ "Paper and Cardboard Circular Economy Opportunities", Sustainability Victoria, last updated January 8, 2025, <https://www.sustainability.vic.gov.au/grants-funding-and-investment/invest-in-victorias-circular-economy/invest-in-materials-and-infrastructure/paper-and-cardboard-circular-economy-opportunities>.

6.2 Incentivise and De-Risk Plantation Expansion and On-Farm Integration

Table 31: Incentivise and De-Risk Plantation Expansion and On-Farm Integration.

Incentivise and De-Risk Plantation Expansion and On-Farm Integration
Current state: Plantation expansion in Gippsland remains challenging despite increasing demand for timber, engineered wood products, and the need to boost carbon removals. Programs such as Gippsland Plantations Investment Program (GPIP), the Victorian Trees on Farm Program (VToF), the Victorian Plantation Support Program (VPSP), and the Commonwealth Support Plantation Establishment Program (SPE) currently provide incentives (up to \$1,000 and \$2,000 per hectare respectively), but uptake has been slow due to some barriers, including high land prices, competition with dairy and cropping, fragmented planning frameworks, and community concerns about water use and landscape impacts.^{81,82}
Recommendations: • Provide greater certainty for growers and investors by linking plantation expansion to processing capacity, carbon market opportunities, and long-term timber demand to provide greater certainty for the sector. The state and local governments should establish clearer and more streamlined pathways for plantation development, reducing regulatory risk for landholders and investors.⁸³ • Provide tailored and effective incentives for both small-scale on-farm plantings, and larger plantations in suitable locations, ensuring integration with local land uses, nature restoration for carbon storage and community priorities. Provide policy support with clear ownership of actions and an implementation plan. • Enhance Research and Development (R&D) support to advance improved seed genetics, climate-resilient species, nature restoration, sustainable forest management, silvicultural practices, and bushfire risk management. • Strengthen engagement with local communities, landholders, and First Nations to build trust, address concerns, and co-design plantation strategies that deliver shared benefits.
Why this helps: Expanding sustainable plantations and integrating farm forestry is critical to meeting Victoria's and Australia's net zero goals by boosting carbon sequestration while ensuring a stable, long-term supply of timber.^{84,85,86} In Gippsland, this creates new income streams for farmers, strengthens regional processors, and reduces dependence on imported timber and engineered wood products. By improving landholder confidence and social license, these measures can deliver co-benefits such as biodiversity protection, improved soil health, and greater resilience to climate change and bushfire risks. Aligning plantations with local processing also supports job creation, regional investment, and Gippsland's transition to a climate-smart, low-emissions economy.

⁸¹ "Victorian Plantations Support Program", Agriculture Victoria, last updated August 18, 2025, <https://agriculture.vic.gov.au/crops-and-horticulture/farm-forestry/victorian-plantations-support-program>.

⁸² "Support Plantation Establishment Program", DAFF, last updated August 18, 2025, <https://www.agriculture.gov.au/agriculture-land/forestry/industries/support-plantation-establishment-program>.

⁸³ For example, in New South Wales, this is achieved through a single-application system under the Plantations and Reafforestation Act 1999, providing integrated approvals, environmental certainty, and certainty of harvest for plantation operators.

⁸⁴ "Climate Action Targets", DEECA, last updated June 23, 2025, <https://www.climatechange.vic.gov.au/climate-action-targets>.

⁸⁵ Dominic Davis, Maria L. Peralta, Rod Keenan, Richard Eckard, and Michael Brear, *Downscaling – The Role of Forestry in Enhancing the Australian Land CO2 Sink* (Net Zero Australia, 2023), PDF, <https://www.netzeroaustralia.net.au/wp-content/uploads/2023/04/Downscaling-The-role-of-forestry-in-enhancing-the-Australian-land-CO2-sink.pdf>.

⁸⁶ DELWP, *Land Use, Land Use Change, and Forestry Sector Emissions Reduction Pledge* (DELWP 2021), PDF, <https://www.climatechange.vic.gov.au/victorian-government-action-on-climate-change/LULUCF-sector-pledge-accessible.pdf>.

6.3 Decarbonise Energy, Heat and Transport in Forestry and Processing

Table 32: Decarbonise Energy, Heat and Transport in Forestry and Processing

Decarbonise Energy, Heat and Transport in Forestry and Processing

Current state:

The GHG emissions assessment results (see Section 4.4) and finding of this study show, despite the sector being net negative overall, Gippsland's forestry, timber, and paper industries remain heavily reliant on fossil fuels, with natural gas being the dominant energy source, particularly in the paper mill where it is used for hard-to-abate, high-temperature (circa 200°C) heat. While biomass (i.e., black liquor) is already successfully utilised for renewable heat and power generation at the paper mill, shifting from gas to low-emission alternatives for high-temperature heat remains complex and technically challenging, with other alternatives like biomethane, hydrogen, and electrification not currently widely used in Australia.^{87,88}

Electricity is the second-largest source of emissions widely used across the sector — for milling at both the paper mill and sawmills, offices, and emerging fleet electrification — but the uptake of renewables like PPA, Greenpower, on-site solar, batteries, and biomass remains limited and fragmented. Diesel is another source of emissions, primarily used for harvesting, haulage, and contractor operations. Decarbonising transport and supply chains faces significant challenges. Long-haul electric and hydrogen trucks are not yet commercially viable at the scale required for forestry operations in Gippsland, particularly given the distances between plantations, processors, and markets. Similarly, remote harvesting equipment and heavy plant machinery lack cost-effective electric or low-emission alternatives. These gaps limit the sector's ability to transition without coordinated infrastructure investment and innovation support.

Recommendations:

- **Support the transition away from natural gas** in the paper mill by incentivising renewable fuels, co-funding feasibility studies, demonstration projects, and early adoption of renewable heat technologies.
- **Invest in enabling infrastructure** such as EV charging stations, hydrogen refuelling hubs, and biomethane injection points along key forestry freight and processing routes to support low-emission operations.
- **Develop local bioenergy and biomethane markets** by creating clear regulatory pathways, integrating forestry residues into Gippsland's energy system, and enabling offtake agreements to unlock private investment.
- **Accelerate low-emission transport and efficiency** through route optimisation, shared logistics, digital tools, and supporting R&D for electric and hydrogen trucks, remote harvesting equipment, and electrification of vehicle fleets.

Why this helps:

Decarbonising Gippsland's forestry and paper supply chain could enhance the sector's reputation and strengthen community and stakeholder confidence. Leveraging Gippsland's forestry residues for bioenergy and biomethane can deliver renewable, dispatchable energy and reduce reliance on fossil gas, especially in the paper mill. At the same time, improving logistics, investing in low-emission transport, and enabling infrastructure upgrades reduce costs, cut emissions, and build long-term supply chain resilience. Together, these actions position Gippsland as a leader in clean energy innovation, supporting regional jobs, energy security, and a smooth transition from coal-fired generation to a low-emissions economy.

⁸⁷ ITP Thermal, *Renewable Energy Options for Industrial Process Heat* (ITP Thermal, 2019), PDF, <https://arena.gov.au/assets/2019/11/renewable-energy-options-for-industrial-process-heat.pdf>.

⁸⁸ ITP Thermal, *The Australian Industrial Process Heat Market* (ITP Thermal, 2025), PDF, https://itpthermal.com/wp-content/uploads/2025/04/itpprocess-heat-report_final08042025.pdf.

6.4 Drive Industry Transformation Through Standards, Targets, and Workforce Development

Table 33: Drive Industry Transformation Through Standards, Targets, and Workforce Development.

Drive Industry Transformation Through Standards, Targets, and Workforce Development

Current state:

Gippsland's forestry and timber sector is undergoing significant change, particularly following the bringing forward of Victoria's native logging ban, which has increased pressure on plantation resources and local processors. At the same time, media narratives, biodiversity concerns, bushfires, and perceptions around tree harvesting have undermined the sector's public value, despite its critical role in regional economies, housing supply, and carbon storage.

Unlike Scope 1 and 2 emissions, where reduction pathways are better understood, Scope 3 emissions from embodied carbon in timber, paper, and wood products are still emerging, with no consistent standards or targets currently in place. There is also a shortage of robust data on carbon removals and emissions throughout the supply chain. Tools such as Environmental Product Declarations (EPDs) are essential to demonstrate the environmental value of the sector and quantify its contribution to net zero targets.

The sector also faces workforce challenges, with a heavy reliance on seasonal labor and working holiday visa holders, limiting long-term skills development and industry stability.

Recommendations:

- **Promote and reposition the forestry and timber sector** by highlighting its role in delivering low-emissions construction materials, housing solutions, carbon removals, and renewable bio-based products, addressing negative perceptions and biodiversity concerns through evidence-based messaging and site transparency.
- **Improve data, transparency, and increasing public awareness** by funding industry-wide baseline studies, supporting consistent reporting tools, and increasing public awareness of the value of the sector.
- **Set embodied emissions standards and Scope 3 targets** for timber and paper products to align the sector with emerging sustainability frameworks, supported by EPDs and verified GHG emissions accounting.
- **Strengthen market development and demand signals** by embedding low-emissions timber and recycled paper requirements into procurement policies, infrastructure projects, and housing initiatives.
- **Support workforce development and retention** through regional training programs, industry partnerships, and pathways that reduce reliance on temporary and seasonal labour, including upskilling in bioenergy, engineered timber, and climate-smart forestry practices.

Why this helps:

This approach addresses current challenges while positioning Gippsland's forestry sector for growth and long-term sustainability. By improving public awareness, setting clear Scope 3 and embodied emissions targets, and promoting verified sustainability credentials, the sector can demonstrate its role in supporting Victoria's net zero goals and meeting growing housing and infrastructure demands. Improved data and certification strengthen market confidence and investor trust, while workforce development ensures Gippsland communities benefit from secure, skilled jobs. These actions ensure the sector's value is fully recognised, helping it adapt to policy changes and play a central role in Victoria's climate transition. Supporting workforce development also helps lower barriers to entry, further catalysing industry growth.

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Appendix A

Glossary

Term	Definition
ACCU	Each Australian Carbon Credit Units represents one tonne of carbon dioxide equivalent net abatement (through either emissions reductions or carbon sequestration) achieved by eligible activities.
BEV (Battery Electric Vehicle)	A vehicle powered entirely by rechargeable batteries and electric motors, producing zero tailpipe emissions; increasingly relevant for decarbonising forestry haulage and logistics.
BESS (Battery Energy Storage System)	Large-scale battery systems used to store renewable energy, often integrated with solar PV or wind, supporting energy security for mills and processing facilities.
GHG Footprint	The total GHG emissions associated with forestry activities, timber processing, energy use, and transport, expressed in mass of CO ₂ -equivalents (CO ₂ -e).
Carbon Sequestration	The process by which forests and plantations absorb CO ₂ from the atmosphere and store it in biomass and soils.
CE (Circular Economy)	A system where forestry and timber by-products (e.g. sawdust, bark, residues) are reused or recycled to minimise waste and maximise resource efficiency.
CLT Timber (Cross-Laminated Timber)	Engineered wood panels made by gluing layers of timber at right angles, offering high strength and lower embodied emissions than steel or concrete.
CoP (Code of Practice for Timber Production)	Victorian regulatory framework guiding sustainable forestry and timber production to ensure environmental compliance and biodiversity protection.
CO ₂ -e (Carbon Dioxide Equivalent)	A standard unit of measurement that expresses the combined impact of all greenhouse gases relative to CO ₂ .
CSIRO (Commonwealth Scientific and Industrial Research Organisation)	Australia's national science agency conducting research on forestry, carbon, climate change, and sustainable resource management.
DCCEEW (Department of Climate Change, Energy, the Environment and Water)	Australian Government department responsible for national climate policy, emissions reduction, and sustainability programs.
DEECA (Department of Energy, Environment and Climate Action)	Victorian Government department overseeing forestry, energy, climate, biodiversity, and environmental regulation.
EPD (Environmental Product Declaration)	A standardised, verified document providing data on the environmental impact of products, including timber, across their full life cycle.
FOGO (Food Organics and Garden Organics)	Waste streams often used for composting or bioenergy generation; increasingly relevant in forestry bio-circular economy initiatives.
FSC (Forest Stewardship Council)	International certification ensuring sustainable and responsible forestry practices and timber supply chains.
FullCAM (Full Carbon Accounting Model)	Australian Government model used to estimate emissions, sequestration, and carbon stock changes in forests and plantations.
GHG (Greenhouse Gases)	Gases such as CO ₂ , CH ₄ , and N ₂ O that trap heat in the atmosphere, contributing to climate change.
GHG Protocol	Internationally recognised framework for measuring, reporting, and managing greenhouse gas emissions across all scopes.

Term	Definition
GIS (Geographic Information Systems)	Mapping and spatial analysis tools used for land-use planning, plantation modelling, and optimising timber haulage logistics.
GPIP (Gippsland Plantations Investment Program)	A Victorian Government initiative, delivered with HVP Plantations, to significantly increase plantation forestry in Gippsland by establishing 16 million trees over the next decade.
GWP (Global Warming Potential)	A metric that measures the relative warming impact of different greenhouse gases compared to CO ₂ over a specific time horizon.
IAP2 (International Association for Public Participation)	A global organisation providing frameworks and best practices for stakeholder engagement and community consultation.
IPCC (Intergovernmental Panel on Climate Change)	United Nations body providing scientific assessments on climate change, emissions pathways, and mitigation strategies.
KPI (Key Performance Indicator)	Quantifiable measures used to track GFHub's decarbonisation progress, such as emissions reductions, plantation expansion, or bioenergy uptake.
LULUCF (Land Use, Land Use Change, and Forestry)	Category used in GHG inventories to account for GHG emissions and removals from land-based activities, plantations, and forestry operations.
NGA Factors (National Greenhouse Accounts Factors)	Australian Government emission factors used in forestry and timber sector GHG accounting and reporting.
NGER (National Greenhouse and Energy Reporting)	Australian framework for reporting GHG emissions, energy consumption, and production data for large facilities.
PEFC (Programme for the Endorsement of Forest Certification)	Global forest certification system promoting sustainable management and supply chain transparency.
PPA (Power Purchase Agreement)	A long-term energy supply contract, often involving renewable energy projects, relevant to transitioning to clean electricity.
Solar PV (Photovoltaics)	Solar PV (Photovoltaics)
UNFCCC (United Nations Framework Convention on Climate Change)	UNFCCC (United Nations Framework Convention on Climate Change)

Appendix B

Background Document Review

Document	Report Purpose	Summary and Relevant Notes
<i>30-Year Strategy.</i> Gippsland Forestry Hub, 2024.	Set a strategic direction for the Hub to achieve the Hub's vision and ambitions.	Fire resilience remains a core challenge. Following the ban on native forest harvesting, industry must adapt rapidly. Planning and policy frameworks need refinement to enable innovation. Significant gaps exist in skills and knowledge, requiring investment in education and training. Opportunities include surging demand for sustainably sourced fibre, monetising carbon offsets, versatile land-use integration (agriculture and silviculture), and leveraging existing infrastructure and expertise in Gippsland. There's strong potential to elevate product value through quality enhancement, explore novel fibre products, and capitalise on the National Institute for Forest Products Innovation. Strengthening partnerships with Traditional Owners, synergy with adjacent transformations across other sectors, and cross-industry collaboration (agriculture, tourism, recreation) could generate employment and broader regional benefits.
<i>30-Year Strategy: Implementation Plan.</i> Gippsland Forestry Hub, 2024.	Translate the Strategy into 2024–27 actions and responsibilities	The plan clearly outlines phased deliverables, assigns responsibilities, and formally integrates Traditional Owner engagement. It embeds stakeholder-driven research, community needs assessments, and GHG considerations into planning. Funded through to 2027, it operationalises the 30-Year Strategy via measurable milestones and ensures accountability across themes like governance, innovation, and inclusivity.
<i>Carbon Farming Guide.</i> Gippsland Forestry Hub, 2022.	Help landholders engage with plantation-based carbon farming under the ACCU scheme.	Demystifies the 2022 Plantation Forestry Method, clarifying compliant project steps, mapping techniques, monitoring and reporting protocols. Guides landholders through credit retention vs. market sale strategies, emphasising alignment with “net-zero” ambitions amid growing interest in carbon farming.
<i>Steps Towards a Greener Future.</i> Gippsland Forestry Hub, 2024.	Outline the role of forestry in decarbonising the built environment.	Highlights how using wood in construction significantly reduces emissions in housing, aligning with broader green building goals. It positions forestry as central to decarbonisation and stimulates collaboration among industry, academia, and government to drive uptake.
<i>Innovation & Infrastructure.</i> Gippsland Forestry Hub, 2022.	Diagnose innovation capacity gaps and infrastructure needs in Gippsland's forestry industry.	The report warns that findings rest on assumptions that may shift as markets and policies evolve, cautioning against over-reliance on static conclusions. Key recommendations include fostering stronger industry collaboration; positioning Gippsland as an innovation hub; embracing digital technologies; integrating agroforestry; diversifying fibre sources; and establishing a local manufacturing base.
Investing in Gippsland's Sustainable Forestry Future. Gippsland Forestry Hub, 2022.	Examine opportunities for plantation expansion, fibre security constraints, and market needs to	- Regionally strong forestry base: Gippsland is highly productive for tree growth, with 95% of commercial forests independently certified as sustainably managed. - Processing capacity risks: Cessation of native forest logging threatens local scale and competitiveness because native

Document	Report Purpose	Summary and Relevant Notes
	support the 30-Year Strategy.	forest products can't be replaced by existing softwood plantations. - Heterogeneous regional challenges: Strategies must be tailored, since Gippsland is not uniform—local solutions aligned with specific communities and landscapes are essential. - New market potential with caveats: Integrating carbon and biodiversity value into plantations can boost returns—if the value chain is transparent and conversations are framed “landholder centric” (“what’s in it for them?”). - Landholder opportunity despite costs: Plenty of private land suitable for plantations exists; working with current landowners (including institutional investors) could enable expansion, even though land costs are high. - Need for centralized engagement and information: Ongoing stakeholder engagement, backed by a communications/marketing plan and a central, trustworthy information hub, is vital for building shared vision and industry cohesion.
Gippsland Community Survey and Analysis. Gippsland Forestry Hub, 2022	Capture community sentiment and communication needs around forestry	Reveals high community interest in innovation and sustainability. Emphasises urgency for clear messaging and well-resourced hub operations to maintain trust. Better outreach and inclusive engagement are key to legitimacy.
First Nations Engagement Framework. Gippsland Forestry Hub, 2024	Establish a pathway for authentic engagement with Traditional Owners	A “living” document, it commits to evolving practices and transparent reporting (from 2024-25 onward). It complements the Healthy Country program and ensures that Traditional Owner voices, rights, and aspirations are embedded across strategy, implementation, and evaluation.
A History of Plantation Species in Gippsland. Gippsland Forestry Hub, 2024.	Document the history and evidence base on plantation species to guide future species selection and commercialisation in Gippsland.	Species choice is fundamental — plant the right tree in the right place with a clear commercial intent. In Gippsland, only <i>P. radiata</i>, <i>P. pinaster</i>, <i>E. globulus</i>, <i>E. nitens</i>, and <i>E. regnans</i> are fully commercialised into active markets. Historically, <i>P. radiata</i> became dominant; reforestation of the Strzeleckis and later boutique/species-diversification phases broadened trials but often lacked market focus. Extensive 1986–89 trials (12 sites; 36 eucalypt species; 140 seedlots) found <i>E. globulus</i> generally best performing; many demonstration plantings exist but records are thin. A species–location matrix highlights current vs. novel areas; notes form issues (e.g., <i>E. botryoides</i>, <i>E. bosistoana</i>) and species with potential (<i>E. benthamii</i>, <i>E. botryoides</i>, <i>E. muellerana</i>, <i>E. smithii</i>, and <i>C. maculata</i>). Recommendations: professionally manage and map legacy trials, include sunset clauses, develop a regional plan, provide evidence-based advice, undertake wood-property sampling and processing/recovery trials, and build public productivity mapping (GIS). Overall, past efforts often planted species

Document	Report Purpose	Summary and Relevant Notes
		without proven markets, reinforcing the need for targeted, market-aligned species programs.
Mid Rotation Management for Small-Scale Plantations. Gippsland Forestry Hub, 2024.	Explore how small-scale owners can make thinning economically viable.	Finds that mid-rotation operations in smaller plantations are currently cost-prohibitive due to high haulage and harvest costs, terrain limitations, and contractor scarcity. Identifies scattered small estates (~2,400 ha) with steep terrain challenges, limited market diversity, and equipment mismatches. Recommends short-term subsidies (for haulage and thinning) and long-term development of local markets and supportive contractor investment strategies.
Gippsland Agroforestry Network. Gippsland Forestry Hub, 2022.	Showcase how farmer-led networks, incentives, and partnerships accelerate agroforestry adoption and integration across Gippsland's landscapes.	Agroforestry in Gippsland delivers multiple benefits: improved farm productivity, diversified income streams, enhanced biodiversity, and natural resource protection. The GAN program, led by landholders, demonstrates that peer-to-peer learning and locally tailored advice are the most effective ways to encourage tree planting on farms. The case study highlights GAN's successes: • Supported >700 members, delivering practical training and demonstration days. • Co-designed farm plans optimising trees-for-shelter, erosion control, and carbon storage. • Partnered with agencies and research institutions to link farmers, markets, and carbon opportunities. • Demonstrates that collaboration between landholders, industry, and government accelerates adoption of sustainable tree-growing practices. Key insights stress the need for flexible funding models, improved extension services, and a central information hub to scale agroforestry and integrate it into broader regional forestry and carbon strategies.
Training, Education and Skills Development. Gippsland Forestry Hub, 2022.	Assess the training landscape, workforce capability, and opportunities to strengthen skills pipelines in Gippsland's forestry and timber sectors.	The review identifies significant gaps in local training pathways for forestry and timber processing, alongside fragmented access to accredited courses. Key findings include: • Skills shortages across harvesting, haulage, mill operations, and emerging carbon and sustainability roles. • Current training delivery is fragmented, relying heavily on out-of-region RTOs and on-the-job learning. • A dedicated forestry training hub is recommended to consolidate pathways, align content with industry needs, and improve delivery efficiency. • Emphasises stronger partnerships between GFHub, TAFEs, RTOs, industry, and government to build career pipelines. • Calls for integration of technology and innovation skills, responding to digitalisation, low-emissions technologies, and sustainability reporting demands.

Document	Report Purpose	Summary and Relevant Notes
		Highlights the need to improve career visibility through community engagement, promoting forestry as a diverse and high-value career choice.
Skills, Employment and Education Report. Gippsland Forestry Hub, 2021.	Provide a baseline assessment of workforce challenges, labour market trends, and educational pathways for Gippsland's forestry sector.	The report establishes a workforce profile, revealing ageing demographics, critical labour shortages, and an urgent need for upskilling to meet growing fibre and sustainability demands. Key insights include: - Native forest harvesting phase-out amplifies the need to retrain displaced workers into plantation forestry and value-added timber roles. - Lack of structured pathways between schools, TAFEs, universities, and industry limits recruitment and retention. - Identifies opportunities to integrate forestry careers into secondary education outreach, increasing student awareness of diverse roles. - Recommends a regional workforce strategy involving GFHub, government, RTOs, and employers to address structural gaps. - Encourages industry-wide collaboration to attract younger workers, support diversity, and establish apprenticeships and traineeships aligned with emerging technologies. - Stresses stronger alignment of education and policy settings to long-term industry transformation goals.
Climate Change Act 2017.	Foundation for Victoria's climate governance and response mechanisms.	Sets emissions targets and planning duties that influence forestry policy, carbon projects, and resilience planning
Victorian Energy Efficiency Target Act 2007	Legal basis for VEET/Victorian Energy Upgrades	Builds incentives for energy efficiency, relevant to mill and processing infrastructure.
Renewable Energy (Jobs and Investment Act) 2017	Frame renewable energy targets and investment pathways.	Critical for grid decarbonisation, which supports electrification of forestry infrastructure and operations.
Environmental Protection Act 2017	Introduce general environmental duty across industries.	Establishes preventative regulatory obligations around pollution and waste — essential for forestry operations, harvesting, and transport.
Planning and Environment Act 1987	Governs land use and development approvals.	Influences plantation siting, infrastructure development, and land-use integration.
Australian Carbon Credit Unit (ACCU) Scheme	National framework for carbon credits and methods.	Underpins plantation forestry ACCU methods, supports evolving carbon revenue models.

Document	Report Purpose	Summary and Relevant Notes
Forest Management Plan – Gippsland Forest Management Area (2004)	Provide a long-term framework for managing state forests in the Gippsland region, balancing environmental, social, cultural, and timber production objectives.	The plan sets out forest zoning, management objectives, and operational priorities for Gippsland’s forests. It identifies key areas for timber harvesting, biodiversity conservation, catchment and water protection, cultural heritage, and recreation access. Developed through scientific research, stakeholder consultation, and public submissions, it ensures that forestry practices align with sustainability and environmental legislation. The plan defines zones such as Special Protection Areas, Special Management Areas, General Management Zones, and Reference Areas to guide forest use. It also addresses fire management, pest control, soil and water safeguards, and monitoring frameworks to support adaptive management. While released in 2004, it continues to guide decisions, although updates were planned by DELWP/DEECA to reflect policy shifts and the phase-out of native forest logging by 2024
Code of Practice for Timber Production (2014, amended 2022)		The Code provides mandatory standards and operational guidelines for commercial timber harvesting across both public and private land, including plantations. It integrates principles of ecological sustainability, requiring timber production to minimise impacts on soil, water, biodiversity, and cultural values. The 2022 amendments strengthen obligations for harvest planning, habitat protection, regeneration, and compliance monitoring. Key features include: • Defined operational standards for roading, coupe planning, and site rehabilitation. • Protection requirements for streams, water catchments, and threatened species habitat. • Integration of Traditional Owner values into harvest planning. • Clearer reporting and compliance processes for operators and regulators. • Transition of VicForests’ operational responsibility to DEECA (from July 2024) after policy reforms ending native forest harvesting. This Code underpins sustainable forest practices and is critical for aligning industry operations with state climate, biodiversity, and resource goals.
National Waste Policy Action Plan (DCCEEW, 2019) & Circular Economy Advisory Group Interim Report (2024)	Establish Australia’s national transition towards a Circular Economy (CE), aligning waste, recycling, and resource recovery strategies.	Introduced CE principles into national waste planning. The April 2024 interim report provides insights shaping Australia’s first CE Framework (expected 2025). Supports coordinated reforms across federal, state, and local levels to improve recycling systems and reduce landfill reliance.
Victoria’s Circular Economy Policy – Recycling Victoria:	A 10-year policy to overhaul Victoria’s waste and	Four statewide targets: 80% landfill diversion, 15% waste reduction per capita, 50% cut in organics to landfill, and universal household organics recycling. Supported by the

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A New Economy (2020)	recycling system, setting clear 2030 targets and pathways for circular economy adoption.	Circular Economy (Waste Reduction & Recycling) Act 2021, which mandates a four-stream waste separation system (glass, FOGO, mixed recyclables, landfill). Drives stronger regulation, improved resource recovery, and infrastructure planning.
Circular Economy (Waste Reduction & Recycling) Act 2021	Establish a legislative framework to implement Victoria's CE policy and regulate the waste and recycling sector.	Introduces uniform standards for councils and households across Victoria, supports investment in new recovery facilities, and aligns waste policies with state CE targets. Positions Victoria for statewide implementation of a consistent, integrated recycling system by 2030.
Bass Coast Community Vision 2041 & Climate Action Plan 2020-2030	Long-term sustainability and climate strategy for Bass Coast Shire Council, focusing on net-zero emissions and a just transition.	Vision: connected, zero-emissions community by 2030. Prioritises managing recycling and waste through education and CE principles. Climate Action Plan sets a 10% landfill waste reduction by 2030, emphasising renewable energy, environmental protection, and community-led emissions reductions.
Gippsland Regional Circular Economy Plan (2022)	Regional framework supporting Victoria's CE policy, tailored for Gippsland's resource recovery and waste management systems.	Outlines aspirations to 2030: CE embedded in daily life, strong partnerships, local markets aligned with resource processing, expanded organics processing, and infrastructure readiness. Identifies 31 priorities, including investment strategies, processing and storage facilities, advanced sorting/cleaning technologies, and regional reprocessing capacity to enable an integrated circular economy.

Report

The Value of Forestry and Timber Products to Climate Change Mitigation in Gippsland – Carbon Footprint
Prepared for Gippsland Forestry Hub

Client Reference No. The Value of Forestry and Timber Products to Climate Change Mitigation in Gippsland – Carbon Footprint (executed 1st April 2025)
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