Cross Laminate Timber Manufacturing Industry Development

Business Case
South Coast Alliance Inc.
March 2022

Develop a Cross Laminate Timber manufacturing presence, drawing on the South Coast region's strengths and existing networks

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Development of a Cross Laminate Timber Manufacturing Industry

The South Coast region has an opportunity to develop a Cross Laminate Timber (CLT) manufacturing presence, drawing on the region's strengths in existing plantation densities, supporting infrastructure and transport networks. CLT is gaining recognition globally as a strong, lightweight, environmental and cost-effective alternative to concrete, brick and steel, with additional benefits in safety for workers and building occupants. There are few existing players in the Australian market and market demand is accelerating rapidly.

PROJECT DESCRIPTION

The opportunity

Cross-laminated timber (CLT), a sub-category of engineered timber products, is a wood panel product made by gluing together layers of solid-sawn lumber, i.e., lumber cut from a single log. Each layer of boards is usually oriented perpendicular to adjacent layers and glued on the wide faces of each board, generally in a symmetric way so that the outer layers have the same orientation.

CLT is an alternative to concrete, brick and steel, with a number of clear advantages such as design flexibility (can be used in walls, roofs or ceilings), eco-friendliness (carbon capture and storage and significantly reduced emission compared to equivalent construction materials), prefabrication (reducing lead times and reducing overall construction costs), thermal insulation (natural wood insulation and limiting gaps for airflow), and lightweighting.

The South Coast region could be well positioned for Cross Laminate Timber industry development, with amongst Australia's highest density of total plantation area, a changing regulatory environment surrounding native forestry, associated industry uncertainty and disruption that can be seen as both a challenge and opportunity (e.g. skill repurposing and job protection), strong road transport networks, access the Port of Albany, and established heavy industrial areas which may be suitable for CLT facility development.
However, the establishment of a CLT industry requires careful planning and clarity around a number of uncertainties, including the need to develop supporting industries / supply chains and the selection of the most appropriate input materials.

Other considerations include the region's current softwood sawlog commitments to Wespine, restructuring of the industry in response to the pending end to native forestry and government appetite at both state and local levels to expand plantation capacity in the area. These and other questions could be addressed through further targeted investigations into the potential for a CLT industry in the South Coast region.

Delivering value for the South Coast region

Developing a regional CLT manufacturing presence would create jobs, build resilience against upcoming changes to the timber industry, and strengthen the regional economy through diversification, output, net import-export position and gross regional product. There is potential to deliver the following impacts for the South Coast region's economy by 2030:

ADDITIONAL
$188 - 369M
TOTAL OUTPUT*

ADDITIONAL
$63 - 127M
VALUE ADDED

ADDITIONAL
371-746 JOBS

ADDITIONAL
$31 - 63M
IN SALARIES & WAGES

An improved regional economy will attract greater private investment, create jobs, attract skilled workers and their families, facilitate expanded education and training options, and improve the region's profile to domestic and international markets. This, along with the developed CLT products and their use in the local construction industry, is particularly relevant to further developing the region's clean and green image.

Many flow-on impacts would occur throughout the supply chain, including road and, potentially, sea distribution channels, storage, milling, plantations, professional services (e.g., architecture and engineering), and CLT building construction.

Source: Remplan, 2022 *Total output includes direct effect, supply-chain effect and consumption effect.

MARKET CONDITIONS & PRECEDENTS

There are clear markets for CLT products, particularly well-established softwood CLT markets, with strong export potential and the ability to improve the region's net export value. An overview is provided below of the key market conditions for CLT, generalised supply chain, selected trends, and specific precedents of relevant ventures or projects.

Demand conditions

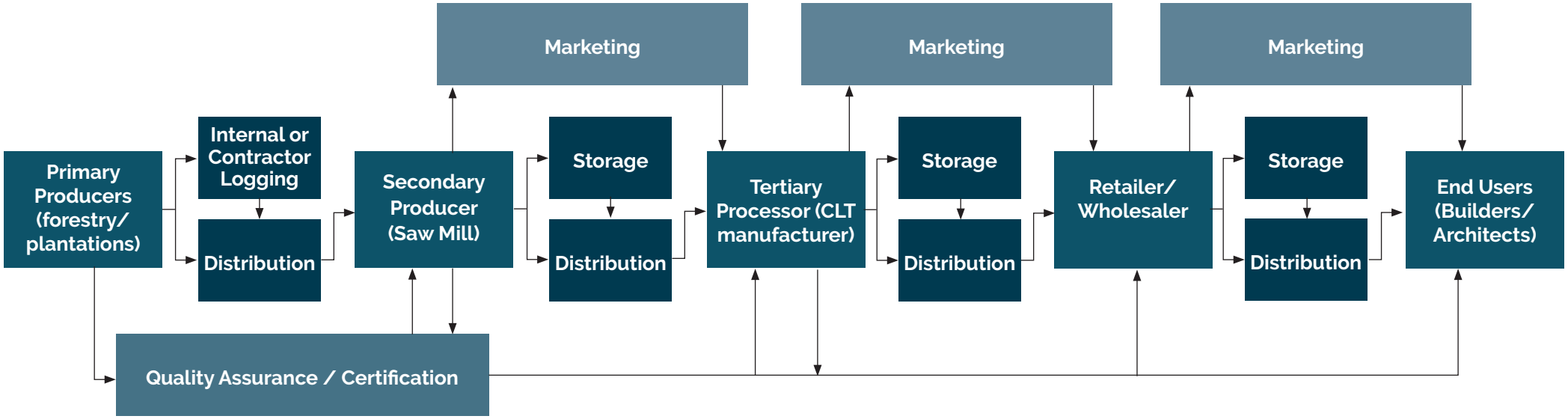
The global CLT market reached a value of US$ 1.07 billion in 2020. Looking forward, the market is expected to grow at a CAGR of 13.2% during 2021-2026. The Australian market is currently at least 50,000 m^3 per annum but is growing quite rapidly (expected to reach 80,000 m^3 by 2022). Current domestic manufacturing capacity provides around 40% of that volume, with the remainder imported. The Australian and New Zealand CLT market is expected to reach a volume of 814,500 m^3 by 2026.

The February 2020 announcement from Timberlink Australia that it would invest in a state-of-the-art Cross Laminated Timber and Glue Laminated Timber facility in the Green Triangle (South Australia) indicates the growing market for engineered wood products. For the increasingly important mid-rise residential building sector in Australia, products like Glulam and CLT provide a range of advantages, including their light weight, ease of installation and cost-effectiveness. As population expansion, urbanisation and sustainable housing options continue to increase, the market is expected to continue to grow.

Supply chain

The image below illustrates a typical supply chain for tertiary wood product processors, demonstrating the diverse range of industries supporting, or supported by, the CLT sector. CLT manufacturers in Australia and globally vary in their approach to managing the supply chain, with many relying completely on external channels, and others managing all or parts of the supply chain internally.

Figure 1. CLT supply chain



Precedents

The precedents in the table below are illustrative of established and planned developments at different stages across Australia.

Table 1 – Examples of CLT developments elsewhere in Australia

PRECEDENT A – CROSSLAM AUSTRALIA	PRECEDENT B – TIMBERLINK	PRECEDENT C – HERMAL GROUP – CLTP TASMANIA
• First manufacturer of CLT panels in Australia. • Established 2013 with first CLT panel produced in 2015. • Manufacturing facility in Yangebup, WA, with majority of lumber sourced from Wespine in Dardenup, WA. • Primary input is softwood – radiata pine sawlogs. • Have internal construction, project management, technical and distribution channels.	• Have existing sawmill (supply some lumber to Crosslam in South Australia). • New CLT and Glulam facility announced in 2020, under construction, and due for completion in 2023. • Will have onsite sawmilling and own distribution network. • Primary CLT input will be softwood – radiata pine sawlogs.	• Facility currently under development in Tasmania. • Investing in research and development methods to utilise environmentally managed plantation hardwood timbers, specifically the species Eucalyptus Nitens (Shining Gum) as a kiln dried timber in the manufacturing of engineered timber products (CLT and Glulam). • New innovative approach to manufacturing juvenile plantation Eucalyptus Nitens into a high-value structural timber elements/systems for the construction industry. • Will grow and mill own timber.

Gaps and barriers

The top five gaps and barriers identified for the sector are listed below. These gaps and barriers are typical of early stage industry development and each has the potential to be addressed through the planned actions and priority funding sources.

1. **Feedstock:** (i) Selection of the most suitable feedstock for CLT manufacture in the region, based on species availability, application and market. While there is a large hardwood resource in the region, 99.9% is currently pulped and hardwood CLT requires further R&D and market establishment to reach maturity. The region's softwood sawlogs are currently predominantly committed to Wespine to supply the established South West industry. However, lower grade sawlogs may be suitable for CLT manufacture and would add significant value beyond their current use in pallets and packaging; (ii) expansion of selected feedstock plantations. The State Government's focus is currently on expansion in the South West and some local governments have policies against plantation development/expansion. However, further work can be focused on identifying appropriate sites for new plantations or the potential for replacing species on existing plantations in the region.
2. **Scale and Market:** There is a need to determine the appropriate scale / volume of manufacture for a potential CLT facility based on existing and projected demand, existing and planned competitor output, availability of supporting industries, etc.

3. **Supporting Infrastructure and Capability:** There is a need to determine whether existing regional infrastructure (e.g., sawmills, distribution channels, architects, engineers and builders) is sufficient to support a new CLT industry or whether in-house development of some or all of these supporting sectors is required. There is an established softwood sawmill in the region; however, it is small scale and does not have the capacity to supply the volumes required by a CLT plant. Other infrastructure that focuses on native hardwood milling face an uncertain future due to the pending end to commercial-scale native forestry in WA. There may be opportunities to secure and leverage the skills of the existing workforce; e.g. to transition into CLT sawmilling from plantation timber. Other experts are unlikely to exist in the region, requiring supporting industry establishment/development.
4. **Sites:** Determining site selection criteria and the number and area of sites available without significant regulatory/zoning hinderances. A few existing and planned sites may be suitable in the region.
5. **Competition:** Competition with other Australian CLT manufacturers, particularly Crosslam in WA (manufacturing approximately 50,000m^3 pa primarily from radiata pine sawlogs).

PROJECT RESOURCING, TIMEFRAMES, RISKS AND CONSTRAINTS

Resources and timeframes

The principal action proposed is for a staged investigation into the viability of establishing a CLT industry in the region. This would focus on the key gaps and barriers identified above with a view to establishing a clear route for the industry. Each stage can be considered as a go/no-go decision point (stage-gate), with the order of investigations being building blocks towards the demonstration of viability. For example, if feedstock viability cannot be determined through initial investigations, the scale of a facility or supporting infrastructure is irrelevant. Should all four initial stages demonstrate viability, work would culminate in a final feasibility study to determine the preferred options and the establish route to market.

Table 2 – Proposed approach

ITEM	DESCRIPTION	EST. RESOURCING	YEAR 1	YEAR 2	YEAR 3
Feedstock	Conduct an investigation of the most suitable feedstock for CLT manufacture in the region, based on species availability, application and market. Engage with plantations to understand the capacity of supply and potential commercial arrangements. Investigate the potential for expansion of plantations in the region, or repurposing with different species, including availability of expansion funding for the South Coast and the appetite of local governments to facilitate expansion in support of CLT industry development. Investigate the viability of using lower grade softwood or hardwood sawlogs in CLT (e.g. those destined for pallets, chipping, pulping, etc.), including structural performance, limitations and marketability.	$50,000	$50,000		
Scale and Market quantification	For the most viable feedstocks identified, determine the appropriate volume to manufacture in a potential CLT facility based on existing and projected demand, existing and planned competitor output, availability of supporting industries, etc. Understand what additional infrastructure is required to support industry development and whether this requires public or private intervention (or a combination of both). Determine the financial viability of a project at the identified scale with the identified market opportunity.	$50,000	$50,000		
Supporting Infrastructure and Capability	Review whether existing regional infrastructure (e.g., sawmills, distribution channels, architects, engineers and builders) is sufficient to support the industry, whether there are opportunities for skills repurposing, and/or whether development of some or all of these supporting sectors is required.	$35,000		$35,000	

Table 2 continued

Sites	Conduct investigation of sites appropriate for CLT industry development, considering regulatory/zoning issues, logistics and utilities requirements.	$30,000		$30,000	
Viability Assessment	Draw together the detailed feedstock, scale/market, infrastructure, and sites work into a comprehensive feasibility assessment to determine industry viability, extensive options assessment including identification of the most viable options (if any) for industry establishment, and establishing the best route to market to expand feedstock, develop the supply chain and attract investment.	$45,000			$45,000
	Total resource requirements	**$210,000**	**$100,000**	**$65,000**	$45,000

Risks

The following risks and management strategies have been identified for this project.

Table 3 – Top three risks to the execution of the project

RISK	DETAIL	PROBABILITY	CONSEQUENCE	MANAGEMENT
Competition for funding	Successful application for public funding will be competitive within the region, and across state and nation	Almost certain	Minor	• Engage with funding agencies early so they are aware of project • Invest in writing quality applications to ensure they are competitive
Viable industry	The sites or feedstock or other constraints prevent the industry being viable	Possible	Major	• Don't raise expectations of stakeholders • Ensure any studies and projects are comprehensive so there is no doubt as to results • Advance the work in steps and stages, with adequate resources.
Uncooperative stakeholders	Stakeholders (e.g., site owners, LGAs, planta-tions) may not cooper-ate with SCA	Likely	Moderate	• Engage with stakeholders to build trusted relationships • Work with those who are cooperative and focused on whole industry development

ECONOMIC IMPACT

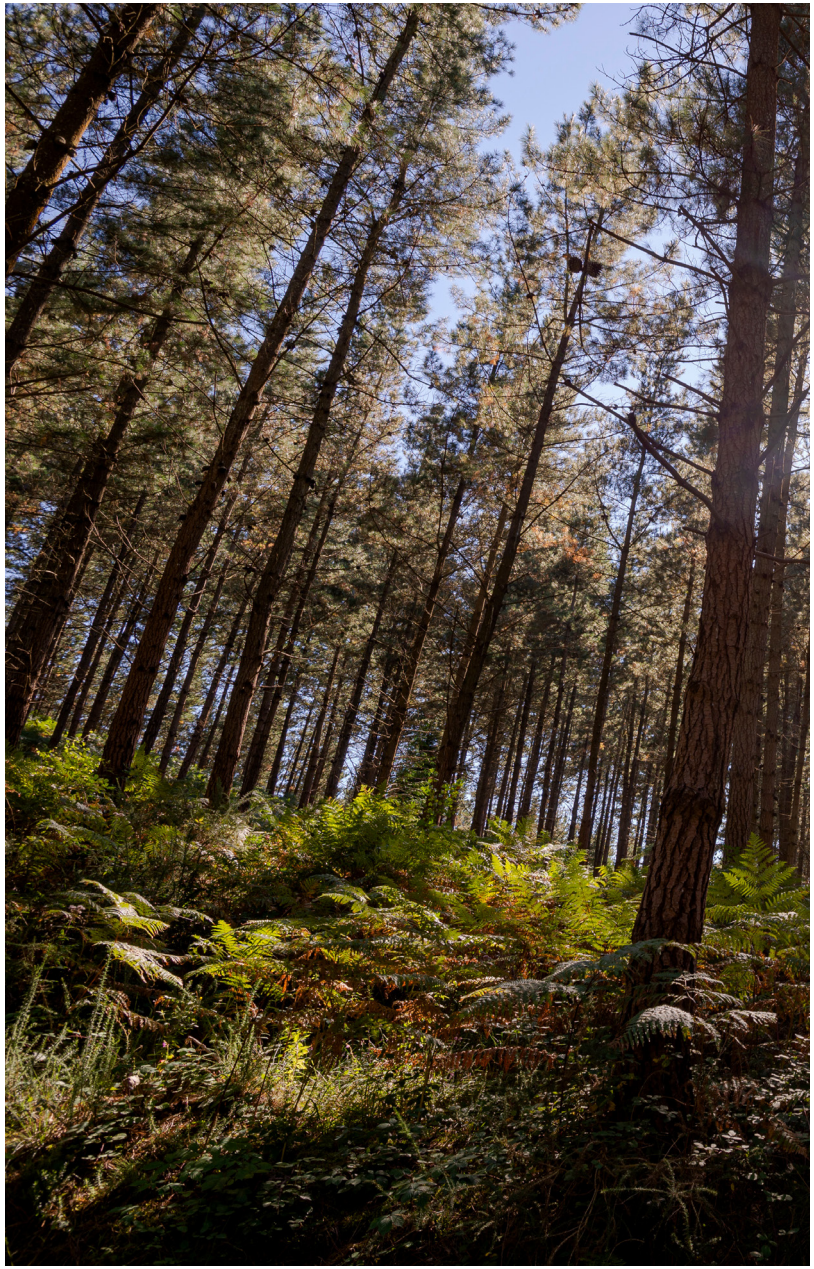
The economic impact and number of direct and indirect jobs created as a result of the project will depend on the total scope of the facility (e.g., whether including saw mill, other supporting infrastructure and services). See Appendix A5.2 for detailed economic impact analysis.

Analysis of opportunities which have the potential for industry establishment in the region indicates the following range of economic impacts of the region by 2030:

Table 4 – Estimated regional economic impact of new CLT production operations by 2030*

IMPACT AREA	DIRECT EFFECT	SUPPLY-CHAIN EFFECT	CONSUMPTION EFFECT	TOTAL EFFECT
Additional Output ($million)	$101-$191	$65-$132	$22-$45	$188-$368
Additional Employment (Jobs)	155-312	153-304	63-130	371-746
Additional Wages and Salaries ($million)	$13-$26	$13-27	$5-$10	$31-$63
Additional Value-added ($million)	$25-$52	$26-$50	$12-$25	$63-$127

Source: Remplan, 2021. *Economic impact analysis utilises the Great Southern Region as a functional economy. Ranges in table describe low and high capital expenditure potential.



FUNDING AND INVESTORS

Positioning

The South Coast region may be well positioned for CLT industry development, with amongst Australia's highest density of total plantation area, strong road transport networks, access the Port of Albany, and established heavy industrial areas which may be suitable for CLT facility development. The changing regulatory environment concerning native forestry and associated uncertainties can be seen as both a challenge and opportunity (e.g. skill repurposing and job protection). However, the establishment of a CLT industry requires careful planning and clarity around a number of identified gaps and barriers.

Strategy

Undertaking further detailed investigation into feedstock, facility scale and market, supporting infrastructure, prospective sites, and engagement with stakeholders (site owners, LGAs, plantations) could strongly facilitate the development of a CLT industry in the region. Through a stage-gate approach, the ultimate output would be a detailed viability assessment that establishes the best route to market to expand feedstock, develop the supply chain and attract investment.

Funding and investment

Commitment of time, and some cash, from local governments would be necessary to attract matching public funding. The SCA and individual local governments could assist through auspicing initial funding applications, contributing matched funding, and providing points of connection between stakeholders.

The top three sources of possible funding are summarised below. See Appendix 5 for the full prioritised list of relevant funding. The list of potential private investors is extensive and is not included below.

Table 5 – Shortlisted funding options

FUNDER*	WHAT THEY FUND / RELEVANCE	$ AVAILABLE	PRIORITY	SUGGESTED NEXT ACTION
Market Led Proposal (MLP)	Market-led Proposals to the Department of Planning, Lands and Heritage provide an opportunity to secure state government support. To meet the scope of the MLP policy, proponents must clearly articulate a strong alignment to the priorities of the government and demonstrate the level of impact the proposal will achieve to assist priorities.	No limit.	H	Discuss project with the MLP Secretariat before being provided with and completing a Stage 1 template and lodging it with the Secretariat. If successful, a Stage 2 proposal process will follow.
Regional Economic Development Grants	Invests in community-driven projects that support efforts to create long-term economic growth and job sustainability in regions. Matched dollar-for-dollar.	Up to $250,000 per project.	M	Engage with GSDC and position for future rounds.
Regional New Industries Fund	Provide grants across the nine regions of Western Australia to support venture creation, accelerate small-medium enterprise growth and seed innovation initiatives.	No maximum, but likely less than $250,000 per project.	M	Engage with DPIRD to position for when new rounds announced.

* Funder names include hyperlinks to relevant websites.

STAKEHOLDERS & CALL TO ACTION

Key stakeholders and potential roles to progress this opportunity are outlined as follows.

Table 6 – Project stakeholders and potential roles in the project

STAKEHOLDER NAME	POTENTIAL ROLE
DPIRD (including Great Southern Development Commission)	• Invest funding into industry development and specific projects through competitive funding rounds • Collaborate on research into sites, feedstock and markets
Department of Planning, Lands and Heritage	• Invest funding into industry development and specific projects through Market-led Proposals
Forest Products Commission	• Collaborate on research, funding applications and advocacy / awareness-raising • Support South Coast industry development through advocacy • Own most pine resources – potential as key industry supplier
South Coast Alliance	• Facilitate or auspice initial funding applications • Act as a convenor or facilitator of key stakeholders during industry development
Local government	• Auspice or co-invest in funding applications • Collaborate with industry and other stakeholders on land-based aspects of projects
Local industry	• Consider opportunities to use CLT within supply chain • Be responsive to opportunities to supply the CLT industry
Local community	• Support industry development where it aligns with (and does not contradict) community vision

Call to action

Cross Laminate Timber (CLT) manufacturing represents an opportunity for a significant new industry on the South Coast. CLT could draw on the region's comparative advantages in existing plantation densities, supporting infrastructure and transport networks while responding to a market (for CLT products) that is growing globally. There are few existing players in the Australian market and market demand is accelerating rapidly. Further detailed investigation into feedstock, scale, markets, supply chain, sites, and the development of a dedicated feasibility study including viable route to market could be a catalyst for industry development and the attraction of large-scale public and private investment.

This business case was prepared for the South Coast Alliance by Keston Economics,
For Blue and FAR Lane.

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For more information about this opportunity, contact the South Coast Alliance Executive Officer: ceo@southcoastalliance.org.au

Appendices List – Development of a Cross Laminate Timber Manufacturing Industry in the South Coast Region

1. Glossary of economic development terms
2. Cross Laminate Timber Overview
3. Supply Chain
4. Further detail on economic impact analysis
5. Additional potential funding sources

Appendix 1 – Glossary of economic development terms

Table 1 – Glossary of Economic Development Terms

Additional Output / Output effect	Additional economic output (i.e. business conducted) in dollars due to changes to a particular industry or business.
Additional Employment	Additional jobs created due to changes to a particular industry or business.
Additional Wages and Salaries	Additional wages created due to changes to a particular industry or business, due to either to new jobs being created, or changes to existing jobs resulting in pay rises due to higher skillsets being required.
Additional Value-added	The increase in value (measured in dollars) that a business or industry creates by improving an input product (for example, adding value to wheat by baking it into bread).
Consumption	The act of goods and/or services bought by people, with value measured in dollars.
Consumption effect	Measures the change in consumption for all goods and services arising from the increase in output (i.e. the increases in good or services being produced).
Direct impact	The impact that directly results from changes to a particular industry or business. Can apply to jobs, output, wages, etc.
FTE (Full Time Equivalent)	The equivalent of one person working full time (for example, two part time employees may make up the hours of one FTE).
Indirect impact / Supply chain effect	Refers to the impact that changes to a particular industry or business create *in*directly on all stages of the supply chain. Essentially a "ripple effect" of the direct impact.
Supply Chain	A network between a company and its suppliers that shows how a specific product or service is made and then distributed to the final consumer.

Appendix 2 – Cross Laminate Timber Overview

A2.1 Definition of Cross Laminate Timber

Cross Laminate Timber (CLT) is a distinct product (subcategory) of the wider Engineered Timber Products (ETP) grouping. ETP, also known as engineered wood, mass timber, composite wood, man-made wood, or manufactured board, includes a range of derivative wood products which are manufactured by binding or fixing the strands, particles, fibres, veneers or boards of wood together with adhesives or other methods of fixation to form composite material.

CLT is a wood panel product made from gluing together layers of solid-sawn lumber, i.e., lumber cut from a single log. Each layer of boards is usually oriented perpendicular to adjacent layers and glued on the wide faces of each board, generally in a symmetric way so that the outer layers have the same orientation. Regular timber is an anisotropic material, meaning that the physical properties change depending on the direction at which the force is applied. By gluing layers of wood at right angles, the panel is able to achieve better structural rigidity in both directions. CLT is distinct from glued laminated timber (known as glulam), which is a product with all laminations orientated in the same way.

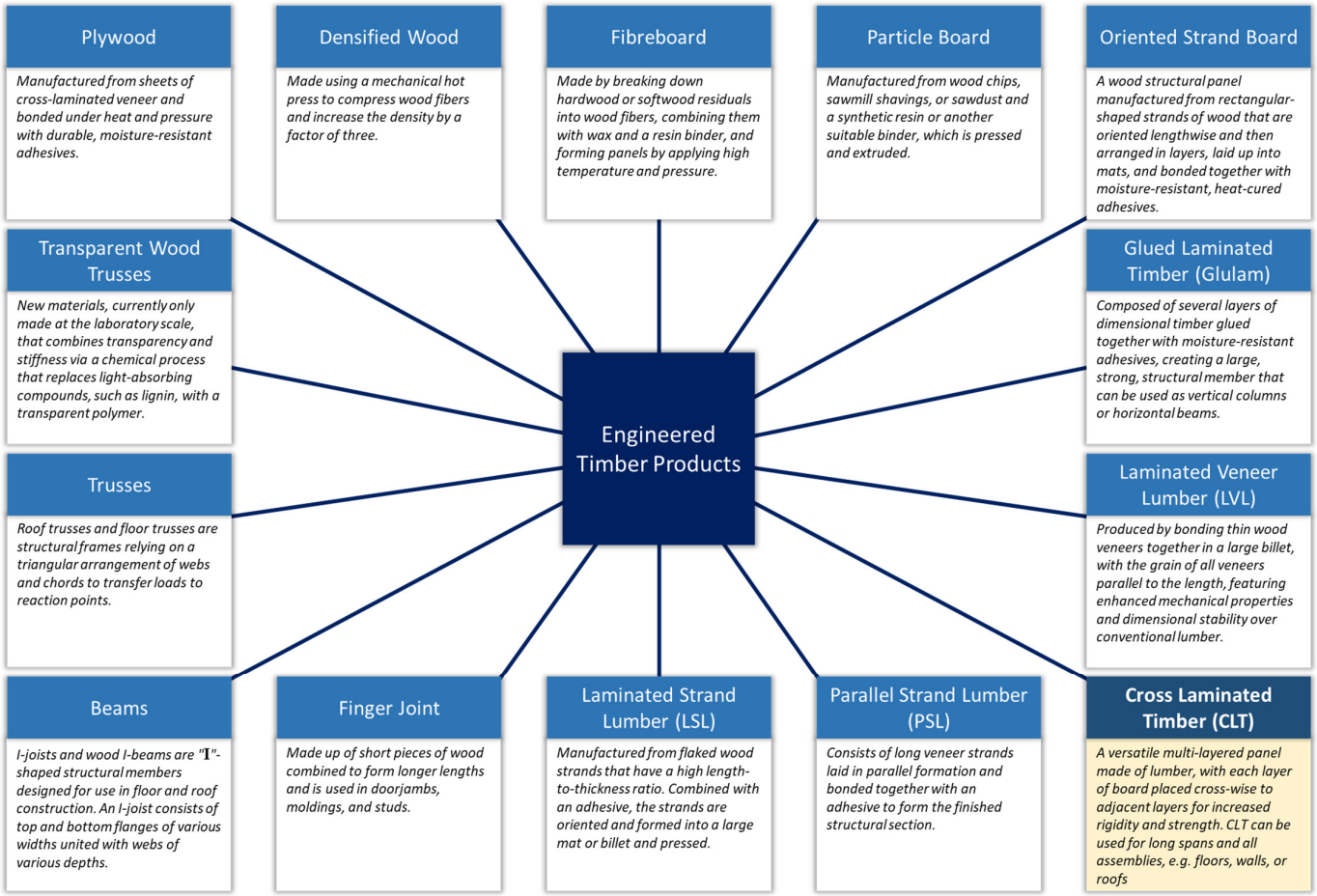


Figure 1 – Engineered timber products family

CLT has some clear advantages as a building material, including:

- **Design flexibility –** CLT has many applications. It can be used in walls, roofs or ceilings. The thickness of the panels can easily be increased by adding more layers and the length of the panels can be increased by joining panels together.

- **Eco-friendly –** CLT is a renewable, green and sustainable material, since it is made out of wood. It can sequester carbon, but differences in forest management practices translate into variations in the amount of carbon sequestered.
- **Prefabrication –** Floors or walls made from CLT can be fully manufactured before reaching the job site, which decreases lead times and could potentially lower overall construction costs.
- **Thermal insulation –** Being made out of multiple layers of wood, the thermal insulation of CLT can be high depending on the thickness of the panel.
- **CLT is a relatively light building material –** Foundations do not need to be as large and the machinery required on-site are smaller than those needed to lift heavier buildings materials. These aspects also provide the additional capacity to erect CLT buildings on sites that might otherwise be incapable of supporting heavier projects, and eases infilling projects where construction is especially tight or difficult to access due to the pre-existing buildings around the site.

CLT also has some disadvantages, including:

- **Higher production costs –** Being a relatively new material, CLT is not produced in many locations. Also, the production of CLT panels requires a considerable amount of wood and other materials compared to regular stud walls. Although the cost of the material is high, factors such as shorter construction time, greater quality control, and cleaning should be considered.
- **Limited track record –** CLT is a relatively new material, so it has not been used in many building projects. A considerable amount of technical research has been undertaken on CLT, but it takes time to integrate new practices and results into the building industry because of the building industry's path-dependent culture which resists deviating from established practices.
- **Acoustic performance –** In order to achieve acceptable acoustic performance, more CLT panels must be used. According to the CLT handbook, two CLT panels with mineral in-between achieves the international building requirement for sound insulation in walls.

A2.2 CLT Background and Uses

Popularised in Europe and gradually gaining attention in the rest of the world, CLT stands out for its strength, appearance, versatility, and sustainability. It is a sustainable material because it is composed of wood, a renewable resource (usually from plantations/reforestation) and does not require the burning of fossil fuels during its production. It has been used for infrastructure and support in large construction sites, as forms for concreting bridges, or even as bases for tractors in unstable terrain during the construction of dams. Its potential for small constructions has been noted because of its interesting appearance and structural strength. Currently, there are even skyscrapers being built with CLT parts.

CLT panels can function as walls, floors, furniture, ceilings, and roofs; CLT's thickness and length can be adaptable to the demands of each project. Generally, panels made of CLT are assembled and cut in their production, already foreseeing the joints, openings, and drills specified in the design. The parts are then transported to the site, and then assembly takes place there. In projects with CLT, construction on site does not last more than a few days. It is a quick and dry process, with very little waste generation.

Although, at present, virtually all CLT structures are manufactured using softwoods, there is growing interest in the possibility of manufacturing CLT panels made from hardwoods. Hasslacher, a forest products company in Austria, built a single-family home in St. Magdalena, Austria with CLT made from Birch. Today, Hasslacher's material is commercially available with certification according to EN 1995-1-1 (European Standards 2004). The American Hardwood Export Council (AHEC) has promoted CLT made from yellow poplar (Liriodendron tulipifera), because it is abundant, inexpensive, has good mechanical properties compared to softwoods and is strong. AHEC, together with cooperating companies, has built two demonstration objects to advance the use of hardwood CLT, i.e., "Endless Stairs" and "The Smile". Therefore, while research into

hardwood CLT is sparse, results confirm that it is suitable for use and that the production of hardwood CLT is technically feasible.[1] Hardwood CLT projects are still in research and development phases for various reasons: (i) glue-line performance: since hardwood lumber has a more complicated cellular structure than softwood lumber this could present challenges with adhesion, (ii) some hardwoods are stiffer than softwoods and this might require additional pressure or pressing time and chemicals in the hardwood lumber which could also prevent an optimal glue-line in-between the panels.

Whilst plantation softwood is an acknowledged timber material for construction, significant volumes of sawn softwood are considered out-of-grade and sold at a loss (e.g. lower value product manufacture such as pallets). Cherry *et al* (2019)[2] stress that new approaches and methods need to be implemented to add value to out-of-grade timber and increase structural yield from existing plantations. In their study of the strengths and weaknesses of out-of-grade pine timber as a structural building material, they find that CLT is a prime example of a building system with good capacity to incorporate high volumes of out-of-grade timber. This provides an opportunity for the maximum utilisation of sawn pine by effectively incorporating this renewable and sustainable material resource into innovative building systems and technologies. More investigation is required into the viability of low grade timber in CLT, including its structural performance, limitations and marketability.

A2.3 CLT Market

The global CLT market reached a value of US$ 1.07 Billion in 2020. Looking forward, IMARC[3] Group expects the market to grow at a CAGR of 13.2% during 2021-2026. CLT is an engineered wood product that is rapidly gaining popularity across the globe as a sustainable alternative to concrete and steel construction in commercial and multi-residential applications. During 2008-2015, the global production of CLT grew at a CAGR of around 26% with Europe accounting for most of this market. Austria is currently the world's biggest producer of CLT. Other major producers include Germany, Czech Republic, Italy, Spain and Switzerland.[4]

Timber-ONLINE[5] state that in 2020, worldwide CLT production was expected to amount to over 2 million m³ due to numerous large-scale projects. Central Europe continues to produce significantly more than half of this amount. Growth rates of the global CLT industry continue to exceed the 10% mark. With a plus of 15%, production in the DACH region (Germany, Austria and Switzerland), Italy and Czech Republic which together increased to more than 810,000 m³. In 2021, the output is expected to gain another 12%, totalling over 920,000 m³. This growth is primarily due to production increases of large-scale producers with existing plants that have been optimised for this very purpose in the past few years.

Worldwide CLT output of 2019 from 60 registered production lines will amount to roughly 1.44 million m³, according to surveys by an Oregon State University team (in part based on Timber-Online data). If, on top of that, known production sites are included for which no current output data are available, it is estimated that the global production output will amount to 1.6 to 1.8 million m3/yr. Given the big number of additionally planned production lines, it is expected that a global annual output between 2 and 2.5 million m³ will be reached by the end of 2020.

Key global industry drivers are identified as:

[1] R. Edward Thomas, Urs Buehlmann, Using Low-Grade Hardwoods for CLT Production: A Yield Analysis
[2] Rebecca Cherry, Allan Manalo, Warna Karunasen, Geoff Stringer, Out-of-grade sawn pine: A state-of-the-art review on challenges and new opportunities in cross laminated timber (CLT), Construction and Building Materials, Volume 211, 30 June 2019, Pages 858-868
[3] https://www.imarcgroup.com/cross-laminated-timber-manufacturing-plant
[4] http://www.crosslamaustralia.com.au/clt-market-study/
[5] https://www.timber-online.net/wood_products/2019/11/100000-m3-cross-laminated-timber-factories-as-default.html

- The structures built with CLT require shorter period of construction time than traditional construction materials such as concrete and bricks. This is largely attributed to its light weight nature and easy and fast installation. Due to the faster construction time and cheaper built up costs, CLT offers a cheaper alternative over other popular construction material such as precast concrete to the building industry.
- CLT can be used for an entire building or any combination of wall, floor/ceiling and roof applications. Its light weight and other characteristics make it highly adaptable to different types of projects, designs and site conditions like soft soils or tight proximity to neighbouring buildings. CLT elements can also be combined with other building materials which provides more flexibility in design, style and finish architecture. Moreover, any change in CLT can be made on site with simple tools.
- CLT since its inception has been largely confined to Europe. However, due to the increasing awareness about its advantages over other traditional construction material, architects and other stakeholders in the building industry in several markets such as China, Japan, United States, Canada, Australia, NewZealand, etc., are now considering CLT as a building material for their projects.
- CLT, over the years, has been mainly used as a building material in constructing low to mid rise buildings which mainly includes educational institutes and residential buildings. However, due to recent technical advancements, now structures up to 10 storeys can be built using CLT. Therefore, due to this technical advancement coupled with the aesthetic value that CLT adds to a structure, several construction companies are considering this product to build large commercial spaces.

Looking more closely at Australia, *IndustryEdge*[6] describe that the February 2020 announcement from Timberlink Australia that it would invest in a state-of-the-art CLT and Glue Laminated Timber (Glulam) facility in the Green Triangle (South Australia and Victoria) indicates the growing market for engineered wood products.

For manufacturers, CLT and Glulam provide an opportunity to redirect wood resources that would otherwise generally be used to manufacture lower value sawn wood products. Engineered wood products step timber up the value chain, supporting investment and creating jobs. In Timberlink's case, by 2023, that could be as many as 50 new manufacturing jobs.

Massive timber construction, in confluence with the rising demand for green buildings, is driving the CLT market growth in Australia and New Zealand. In addition to this, owing to the dimensional stability, versatility, strength, and secure and faster installation of CLT, it is increasingly being used in the non-residential construction of storage facilities and factories. Moreover, technological advancements, such as the introduction of computer-controlled machining equipment to facilitate the prefabrication of wooden building components, are impelling the market growth. Besides this, the Wood Encouragement Policy (WEP) initiated by the Australia government is promoting the utilisation of timber in the country, which in turn is catalysing the demand for the CLT in the country.[7] Another key driver for the Western Australian market will come through the Mark McGowan Government's state budget plan to ban the logging of native forests in WA, encouraging greater impetus for the state's plantation timber. Plantation timber in WA is likely to rapidly accelerate to support all markets, including CLT.

Detailed analysis of the current CLT market in Australia leads *IndustryEdge* to the view that the Australian market is currently at least 50,000 m^3 per annum, but growing quite rapidly. *IndustryEdge* estimate that current domestic manufacturing capacity provides around 40% of that volume, with the remainder imported. To date, known imports of CLT have all come from three countries: Austria, Germany and Italy. In 2018-19, detailed analysis of the import data indicates that 20,000 m^3 of CLT was definitely imported. Up to 20,000 m^3 of additional imports was also received that year. IMARC[8] predict the Australian and New Zealand CLT market will reach a volume of 814,537m^3 by 2026.

[6] https://industryedge.com.au/new-cross-laminated-timber-facility-in-australia/
[7] https://ipsnews.net/business/2021/03/10/australia-and-new-zealand-cross-laminated-timber-clt-market-report-2021-industry-trends-share-size-demand-and-future-scope/
[8] https://www.imarcgroup.com/australia-newzealand-clt-market#:~:text=The%20Australia%20and%20New%20Zealand,XX%25%20during%202021%2D2026.

As noted by *IndustryEdge*[9], as at 2020 the Australian market for CLT is still in its infancy (a few years old). Global, particularly European, demand and frequent new CLT manufacturing facility developments demonstrate strong market potential for Australia. *IndustryEdge* analysis of the latest trade data suggests the market will grow by more than 25% in 2019-20. On its current trajectory, the market is expected to be more than 80,000 m^3 by the end of 2022.

A2.4 Impacts and Benefits

CLT promises a number of significant benefits, particularly for industry (e.g. construction), environment (carbon emissions reduction and sequestration), and job creation. In Australia, CLT meets all the engineering conditions required for it to be used instead of concrete, steel and brick.

Environmental Benefits

Various environmental benefits are noted from CLT, including:

- Timberlink state that every cubic metre of CLT panel it makes removes 699 kg of CO_2 from the atmosphere[10]; every hectare of pine forest extracts 10 tons of CO_2 from the atmosphere every year[11,12].
- The Australian Forest Product Association has calculated that even a very modest increase in timber construction would sequester 11 million tonnes of additional greenhouse gases over the coming decade[13].
- No carbon emissions from the manufacture of goods that the CLT replaces, for example where concrete/cement production is the world's single biggest industrial cause of carbon pollution, responsible for 8% of global emissions[14].
- Good insulation properties with low rates of thermal conduction. Wood is already a good insulator of heat, but the precise nature of the manufacturing process gives CLT buildings an additional thermal benefit by preventing air leakage within the building envelope. This generates stabilised temperatures within the building, which in turn lowers heating and cooling usage and costs.

Industry and Economic Benefits

Various industry and economic benefits are noted from CLT, including:

- Greater value and savings from constructing lighter buildings, beyond the higher cost of manufacture compared to other material when considering the whole product lifecycle.
- Structures that are less vulnerable to seismic activity, reducing building damage and associated costs, protecting building contents and occupants, etc.
- Better fire protection from the use of solid wall, floor and roof slabs. CLT is naturally fire resistant because it chars. In the event of a fire, this char on the outside forms a protective layer while retaining strength. CLT's fire safety is backed up by rigorous fire testing in Canada and around the world. With or without gypsum board

[9] https://industryedge.com.au/new-cross-laminated-timber-facility-in-australia/
[10] https://www.timberlinkaustralia.com.au/
[11] Myers, N and Goreau, T: Tropical Forests and the Greenhouse Effect: A Management Response; 1991, in Climate Change, 19:215-26.
[12] http://www.crosslamaustralia.com.au/about/
[13] https://ausfpa.com.au/carbon-storage-potential-of-timber-buildings-highlighted-by-labors-climate-plan/
[14] https://bze.org.au/research_release/rethinking-cement/#:~:text=Cement%20production%20is%20the%20world's,as%20the%20global%20car%20fleet.

protection, CLT demonstrates significant fire resistance, beyond three hours in some cases. Additional fire protection can be added by encapsulating the CLT with a protective layer, as is required in the anticipated changes to the building code for taller wood structures.[15]

- Robust solid wall and floor sections, able to replace heavy concrete slab and can act as structural panels without the need for additional beams. As stated by XLam, at 20% of the density of concrete, wood offers more density per area than any other construction material, allowing for taller vertical extensions and greater quantities of material on softer ground.
- Product stability and good manufacturing tolerances.
- Ease of installation using CLT's modular building and prefabrication process, and associated cost savings from faster building. For example, XLam state that their projects incorporating prefabricated CLT typically reduce construction time by up to 30%.
- Lighter building leading to cost savings in site works and footing costs.
- Lighter panels to reduce need for heavy and bulky moving equipment, with associated significant reductions in crane costs.

Social Benefits

Various social benefits are noted from CLT, including:

- A moderately sized facility can generate a significant number of jobs in the regional economy; for example, Timberlink is expected to create 50 direct new manufacturing jobs for its South Australian CLT facility by 2023. Many indirect jobs will be created in distributions, warehousing/storage, plantation forestry, and other supporting industries.
- Safer working conditions when moving panels, due to their lightweight compared to other equivalent materials used in construction, and a reduction in the need for bulky and heavy moving equipment.
- Cleaner building sites with little or no wet trades.
- Work and living spaces that are healthier and more comfortable within CLT buildings (thermal properties, disinfectant properties, carbon capture, etc.).
- Positive community awareness of CLT as an ecological and sustainable building product.

A2.5 CLT in Australia

Key Players

The following tables summarise key activity in Australia. CLT in Australia is still in its infancy, with few existing players.

Table 2 – Key Australian CLT industry players

Company	CROSSLAM Australia
Location	HQ - Leederville, Western Australia Manufacture – Yangebup, Western Australia
Establishment	2013, with first panel produced 2015
Size	<25 employees; $5M revenue

[15] https://www.naturallywood.com/products/cross-laminated-timber/

Production Capacity	Unclear (<60,000m^3 pa)
Resource	100% local Australian products sourced from sustainable forests (no imports). Pine is core resource. Majority originating from Western Australia, e.g. Wespine Industries – Dardanup, WA (softwood saw miller, specialising in the production of Pinus radiata plantation timber). Timberlink sawmills also utilised (South Australia/Tasmania).
Core Expertise	Constructing multistorey buildings. In-house design and engineering services for using CLT products in client plans. Smart production techniques and patented treatment technologies.
Core Products	CLT
Core Services	Integration and engineering; construction details; fire engineering; project quoting; supply and installation; transport to site; construction; supervision/project management.
Other Information	First manufacturer of CLT panels in Australia. 100% Australian owned company. Design and test in Australia for Australian conditions and Australian standards.

Company	XLam
Location	New Zealand and XLam plant in Wodonga, Victoria, Australia
Establishment	~2011
Production Capacity	60,000m^3 pa
Resource	Pinus radiata plantation timber as core resource. Sydney operations use radiate pine from Tumbarumba NSW Hyne timber mills.
Core Products	CLT and Glulam (GLT).
Core Services	Manufacture, supply, technical expertise, and support.
Other Information	Hybrid approach to conventional construction, combines steel and concrete with XLam mass timber CLT panels to enhance sustainability, increase construction speed, improve site safety, and deliver improved project ROI. Supply more M^3 of mass timber than any other organisation in local Australian markets.

Company	Timberlink
Location	South Australia
Establishment	Facility under construction (announced February 2020)
Resource	Pinus radiata plantation timber as core resource. Timberlink owned sawmills in Tarpeena (South Australia) and Bell Bay (Tasmania).
Core Expertise	Saw milling.
Core Products	Timber and woodchip. Addition of CLT and GLT when facility completed.
Core Services	Saw milling; timber supply; woodchip supply. Addition of CLT and GLT when facility completed.
Other Information	Timberlink's own national distribution network support its milling operations, with centres in Adelaide, Melbourne, Perth and Sydney, and a sales team in Bell Bay.

Company	Hermal Group – CLTP Tasmania arm
Location	Wynyard, Tasmania, Australia
Establishment	Facility under development.

Resource	Invested in research and development methods to utilise environmentally managed plantation hardwood timbers, specifically the species Eucalyptus Nitens (Shining Gum) as a kiln dried timber in the manufacturing of engineered timber products.
Core Expertise	New innovative approach to manufacturing juvenile plantation Eucalyptus Nitens into a high value structural mass timber elements/systems for the construction industry.
Core Products	CLT and Glulam once facility developed.

USE of CLT in Australia

Architecture & Design[16] and Make it Wood[17] note the nation's key success story as the now widely publicised Forté in Melbourne, which was the first building in Australia to utilise CLT panels. Delivered by Lend Lease, the project made global headlines after it became the tallest timber high-rise apartment building in the world at 10 storeys. Another more recent project by Lend Lease is The Library at The Dock, a three storey community hub and library in Melbourne designed by Clare Design and Hayball.

Forté stands at 32.17 metres tall. By using CLT, Forté, reduces CO_2 equivalent emissions by more than 1,400 tonnes when compared to concrete and steel - the equivalent of removing 345 cars from the roads.

As the first public building in Australia to be constructed with CLT, the $23 million Library on The Dock project features a combination of engineered timber and reclaimed hardwood applied to the upper floor slabs, roof, columns, beams and core wall construction. Glulam beams were also used during construction.

The initial drivers for the Forté and Dockland library projects were the weight and efficiency of CLT. For the same structural performance, the weight of the structure is only a fraction of what it would be with steel and concrete, meaning there is huge savings on foundations. And because CLT can be prefabricated and erected very quickly, there can also be large savings on the cost of erection. For The Library on The Dock, these benefits have translated into the minimisation of remediation works on the existing wharf structure, therefore allowing the building to be constructed right on the waterfront; just eight metres from the edge.

Standards for CLT

There is currently no Australian standard that covers CLT manufacturing or installation. However, softwood CLT meets all the engineering conditions required for it to be used instead of concrete, steel and brick.

There are also no current manufacturing or installation standards for CLT panels manufactured in Europe. The approval process includes preparation of a European Technical Approval Guideline (ETAG) that contains specific characteristics/requirements of the product as well as test procedures for evaluating the product prior to submission to the European Organisation for Technical Approvals (EOTA). The ETA allows manufacturers to place CE (Conformité Européenne) marking on their products. Most CLT suppliers have independently evaluated design property information available to designers. This information can be used by Australia designers to meet building regulation through an 'Alternative Solutions' compliance path.[18]

[16] https://www.architectureanddesign.com.au/features/product-in-focus/cross-laminated-timber-clt-australia-s-rising-star#
[17] https://makeitwood.org/exemplar-projects/Forte.cfm
[18] R. Edward Thomas, Urs Buehlmann, Using Low-Grade Hardwoods for CLT Production: A Yield Analysis - https://www.fs.fed.us/nrs/pubs/jrnl/2017/nrs_2017_thomas_001.pdf

The North American timber industry has, however, developed a national manufacturing standard covering the manufacturing, qualification, and quality assurance requirements for CLT. The development of this American National Standard has been achieved by following procedures approved by the American National Standards Institute (ANSI). The US CLT standard, ANSI/APA PRG-320, does not admit hardwood lumber yet; a major hurdle for hardwood lumber to become an accepted CLT raw material.[19] Similar impediment is possible for the Australian market.

Carbon Capture and Storage

Australian Forest Products Association (AFPA)[20] reports that, despite timber's acknowledgment as far more environmentally friendly than steel and concrete alternatives, there is no methodology allowing timber construction to bid for carbon credits through the Carbon Farming Initiative (CFI). It is possible, however, that this will change in coming years.

Federal Labor's Climate Change Action Plan has highlighted the enormous potential of Australian timber to help meet national emissions reduction targets set out by all Parties. The ALP plan includes $40 million for the development of new Carbon Farming Initiative (CFI) methodologies, and a methodology for timber construction should be at the top of any queue according to AFPA's CEO.

Timber has always been an excellent building material, but advances in technology, including the development of CLT and other timber building solutions accompanied by building code updates, have opened many more doors for renewable timber to be used more widely in construction. The building construction code now allows fire protected timber buildings up to 25 metres.

[19] https://sim.sbio.vt.edu/?p=2423
[20] https://ausfpa.com.au/carbon-storage-potential-of-timber-buildings-highlighted-by-labors-climate-plan/

Appendix 3 – Supply Chain

The CLT manufacturing supply chain can be broadly summarised as displayed in the following figure.

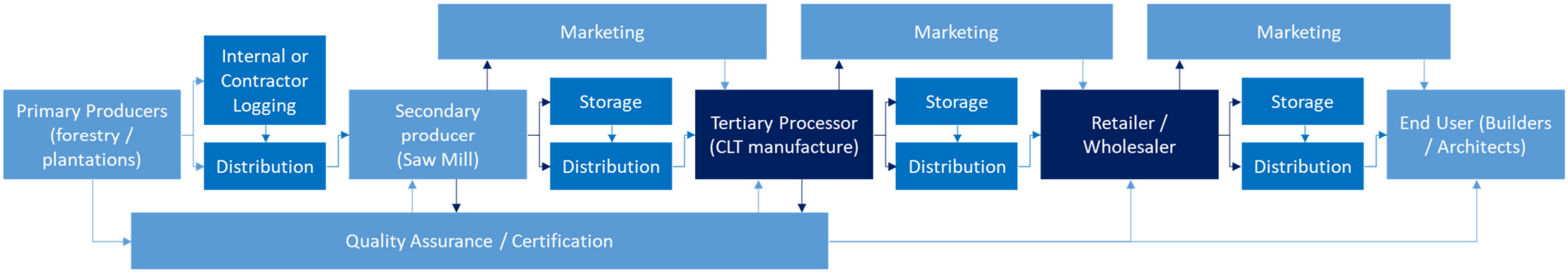


Figure 2 – CLT supply chain

A3.1 Base Feedstock and WA Positioning

Western Australia, particularly the South West and the Great Southern, is well positioned for CLT industry development/expansion, with amongst Australia's highest density of total plantation area.

As shown in Figure 3, all but one current and planned CLT manufacturing operation in Australia takes place in the highest density areas (200,001 – 400,000 ha of total plantation area), clearly demonstrating the importance of ready access to timber plantations. This includes, Crosslam in Australia (Dardanup, South West), Timberlink's planned new facility in Green Triangle (South Australia), and Hermal Group's planned development in Tasmania.

New Zealand owned XLam is the only CLT manufacturing operation in Australia outside a zone with the highest plantation density (Murray Valley, VIC/NSW). However, this area is still in the category for second highest density of plantation area (100,001 – 200,000 ha of total plantation area).

Other key statistics from the 2021 Australian Plantation Statistics and Log Availability Report[21] are provided in Figure 4.

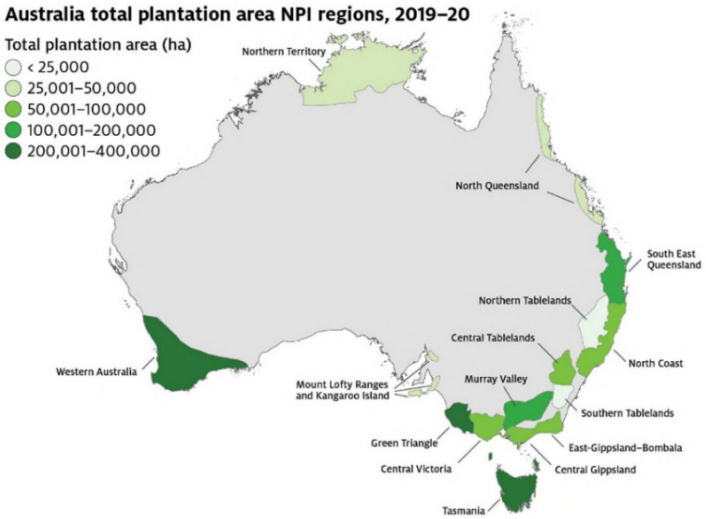


Figure 3 – Australia total plantation area NPI regions, 2019-20 (source: Australian Government Department of Agriculture, Water and the Environment)

[21] Peter Legg, Ian Frakes and Mijo Gavran , Research by the Australian Bureau of Agricultural and Resource Economics and Sciences, Australian Plantation Statistics and Log Availability Report 2021, Australian plantation statistics and log availability report, October 2021

A3.2 Major plantation species

Hardwood plantation species

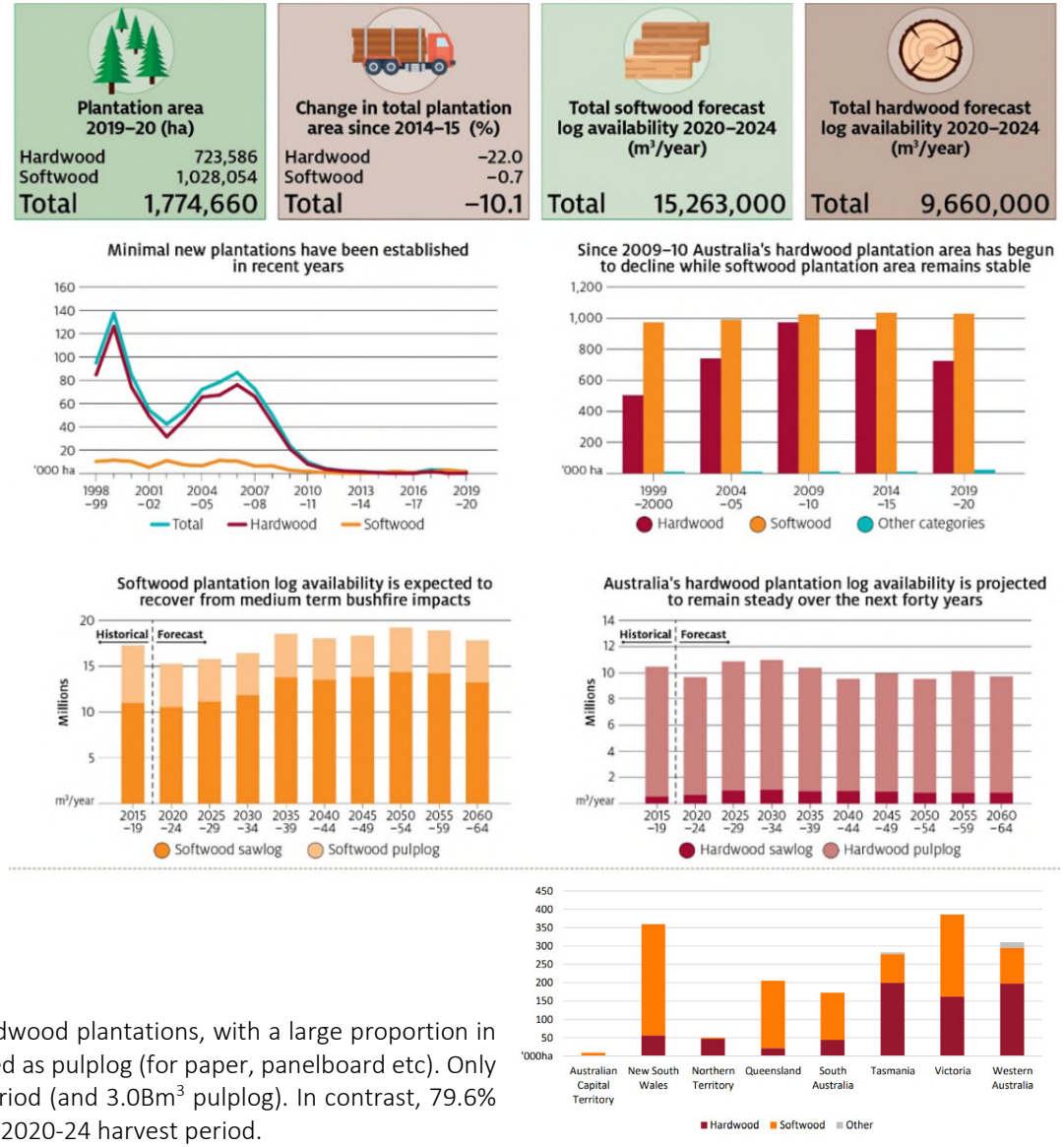
In 2017–18 the Australian hardwood plantation estate was dominated by Tasmanian blue gum (51.1 per cent) and shining gum (26.1 per cent), both of which are managed primarily for pulplog production. These proportions are similar to those reported in previous years. Most Tasmanian blue gum plantations are located in Western Australia (50 per cent) and the Green Triangle (South Australia/Victoria) (32 per cent). Most shining gum plantations are in Tasmania (89 per cent).

Other hardwood plantation species include Dunn's white gum, which is managed primarily for pulplog production in the North Coast (New South Wales) (59 per cent) and South East Queensland (41 per cent) regions (Table 9). Most blackbutt and flooded gum plantations are in the North Coast (New South Wales) region (93 per cent) and most spotted gum plantations are in the North Coast (New South Wales) (50 per cent) and South East Queensland (43 per cent) regions. Blackbutt, flooded gum and spotted gum are all managed primarily for sawlog production.

Softwood plantation species

In 2017–18 the softwood plantation estate was dominated by radiata pine (74.5 per cent) and southern pines (15.1 per cent), both of which are managed for sawlog production (Table 10). These proportions are similar to those reported in previous years. Most radiata pine plantations are in the Murray Valley (New South Wales/Victoria) (24 per cent), Green Triangle (South Australia/Victoria) (23 per cent), Central Tablelands (New South Wales) (11 per cent) and Tasmania (10 per cent) regions. Most southern pine plantations are in the South East Queensland region (74 per cent). Other regionally-important softwood species are maritime pine in Western Australia and hoop pine in South East Queensland.

Figure 4 – Other key plantation statistics, Australia, 2019-20 (source: Australian Government Department of Agriculture, Water and the Environment)



Western Australian Plantations

Western Australia accounted for the largest proportion of Australia's hardwood plantations, with a large proportion in the Great Southern region. However, 99.9% of WA's hardwood is processed as pulplog (for paper, panelboard etc). Only 2 million m^3 of hardwood sawlog is projected for the 2020-24 harvest period (and 3.0Bm^3 pulplog). In contrast, 79.6% (899.7 million m^3) of softwood is projected to processed as sawlog for the 2020-24 harvest period.

Table 3 – Existing hectares of plantation in Western Australia by species and plantation type

Plantation Type	Common Species	Area (ha)
Hardwood	Tasmanian blue gum	166,409,814
	Other eucalypt	18,837,265
	Other hardwood	1,069,875
	Total Hardwood	**186,316,954**
Softwood	Radiata pine	53,712,959
	Maritime pine	30,816,814
	Other Softwood	359,531
	Total Softwood	**84,889,304**
Other/Mixed/Unknown	**Other**	**38,613,569**

South Coast Plantations

The vast majority of existing softwood plantation sawlogs are already committed to Wespine. There may be opportunities to utilise lower grade timber that is currently chipped or used for lower value purposes (e.g. pallet construction); however, the viability of lower grade timber in CLT needs to be investigated further. The literature supports the principle (see A2.2), but its real-world application and market appetite needs to be confirmed. Regardless, even a smaller scale facility would likely require expansion of the existing softwood plantation stock in the region.

Hardwood plantations in the area are mostly chipped or pulped, as for the broader Western Australia. There are opportunities to add greater value to hardwood plantations, encouraging hardwood sawlog production. However, the viability of hardwood in CLT needs to be investigated further, as to for its real-world application and market appetite for the product.

A3.3 Sawmills

The Great Southern region is serviced by two high volume sawmills, Redmond and Minorba. Redmond Sawmill, located in Drome, Albany, specialises in railway and heavy structural products, firewood, garden sleepers, furniture and joinery timber, Jarrah and Wandoo flooring, structural timber and Jarrah decking. Redmond predominantly mill Jarrah and other hardwoods (e.g. Marri and Wandoo), which are not commonly used for CLT production. There is an opportunity to safeguard jobs and utilise existing skills if a new industry is available for transition (e.g. hardwood CLT / new CLT facility onsite sawmill operations). The region does have some Jarrah and hardwood timber plantation resources and hardwood plantation penetration is also likely to increase in the coming years to offset a loss of native forestry, particularly for hardwood sawlog. Minorba, located in Narrikup, supply treated pine and fencing products to the region and its surrounds. Minorba products are more closely aligned with CLT industry needs. However, this is a relatively low capacity mill that would not be suitable to support a medium to large scale CLT operation.

Given the above, it is likely that a purpose-built sawmill would need to be constructed to support a new CLT industry in the region (e.g. as part of the supply chain or on-site as part of the CLT operation. There are some prospects to utilise existing industry skills in the region and safeguard jobs threatened by current and pending regulatory

changes. However, more investigation is needed into the viable scale of CLT operations in the region, as well as the type of feedstock to be used, applications for produced CLT, and the market size for project outputs.

The Great Southern is currently not considered a forest industry hub; however, dedicated investigations that demonstrate viability and the establishment of supporting CLT industry/infrastructure could reclassify the area and develop impetus for expansion within the South Coast region. As identified in the Softwood Industry Strategy for WA[22], the forest industry hub model envisages a group of closely located businesses that are connected through their value chains, use of resources, technology, products and workforce needs. Establishing industry hubs centred on integrated markets for sawlogs and residues will encourage collaboration, innovation, and improve productivity, profitability and competitiveness.

The South Coast region has significant potential for CLT for a number of reasons, including its density of plantations, a changing regulatory environment surrounding native forestry and associated uncertainty concerning the native hardwood sector (that can be seen as both a challenge and opportunity (e.g. skill repurposing and job protection)), strong road transport networks, access the Port of Albany, and established heavy industrial areas which may be suitable for CLT facility development.

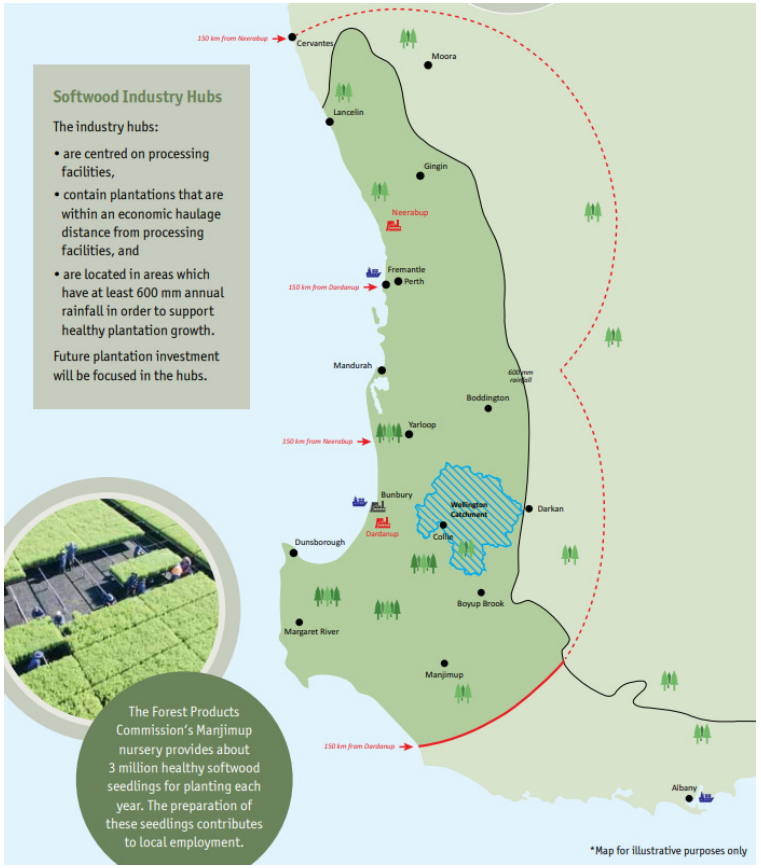


Figure 4 – Other key plantation statistics, Australia, 2019-20 (source: Australian Government Department of Agriculture, Water and the Environment)

A3.4 Core Manufacturing Process / Requirements

All of the above research has led to clear indications of the types of requirements for establishing a CLT manufacturing facility within the South Coast region to effectively compete in the Australian market. All of the following points need to be be considered for any development.

Site Requirements

- Identification of the most suitable location within the region (e.g. proximity to supporting infrastructure and industries).
- Identification of a suitable site with appropriate zoning / defined industrial area.

Imperative Facility Requirements

- A small to medium size CLT plant processing between 30,000 and 50,000 cubic meters per year.
- Quality control, sorting and monitoring equipment (e.g. production monitoring and high speed scanners for flaws and defects).
- High quality glue – providing long term durability and fire resistance.

[22] Forest Products Commission Western Australia, Softwood Industry Strategy for Western Australia: Six steps for a vibrant, clean and green industry in regional WA

- High pressure press units.
- CNC, for pre-cutting windows and supply line openings as required.
- Waste processing – e.g. woodchipping for defective wood and associated supply chain, saw dust processing, etc.

Optional Facility Features / Infrastructure

- Onsite sawmill.
- Storage.
- Distribution network.
- Own design, engineering and technical support.
- Own construction teams.
- Additional production of Glulam (similar process and equipment).

Appendix 4 – Further detail on economic impact analysis

A4.1 Job Creation

The number of direct and indirect jobs created as a result of the project will depend on the total scope of the facility (e.g. whether including saw mill, other supporting infrastructure and services). Two tables have been developed below to determine likely jobs created through the project. The first considers the project would only involve the CLT manufacturing, with no additional infrastructure or services (outsourced). The second considered a CLT facility with all possible additional services included (in-house).

Table 4 – Job creation for CLT manufacturing only

	Direct	Indirect	Total	Notes
Facility Construction (FTE Years)	128	153	281	Based on Timberlink capital costs and WA Dept. Treasury guidelines
CLT Manufacture	50	29	79	Based on Timberlink facility
Sawmill	0	100	100	Based on Timberlink facility, reduced scale
Distribution	0	20	20	Standard industry multipliers
CLT Product Construction	0	10	10	Standard industry multipliers
Professional (Architecture, Engineering, Technical)	0	5	5	Standard industry multipliers
Plantations	0	50	50	Standard industry multipliers
Total (excluding capital construction)	50	214	264	-

Table 5 – Job creation for CLT manufacturing with additional infrastructure and services

	Direct	Indirect	Total	Notes
Facility Construction (FTE Years)	128	153	281	Based on Timberlink capital costs and WA Dept. Treasury guidelines
CLT Manufacture	50	29	79	Based on Timberlink faciltiy
Sawmill	100	15	115	Based on Timberlink facility, reduced scale
Distribution	20	14	34	Standard industry multipliers
CLT Product Construction	10	128	138	Standard industry multipliers
Professional (Architecture, Engineering, Technical)	5	9	14	Standard industry multipliers
Plantations	0	50	50	Standard industry multipliers
Total (excluding capital construction)	185	244	429	-

A4.2 Economic Assessment

Economic impact analysis conducted utilised a 'goal seek' approach to identify the potential impacts of investment in CLT across a range of capital expenditure assumptions. The analysis drew on available information regarding:

- Potential capital expenditure required to develop a CLT initiative; and

- Potential new jobs enabled by the initiative.

This information was analysed by a regional input-output model to produce potential additional output, employment, wages and salaries and value add to the regional economy by the year 2030. While this project is focused on the four South Coast Alliance councils, economic impact analysis utilises the Great Southern region as a functional economy, recognising that impacts and supply chains are likely to involve other centres throughout the Great Southern region. In addition, potential funders are likely to recognise the Great Southern region as a functional economy and utilise aligned data for their own assessment and impact reporting.

Table 6 – Inputs utilised for impact assessment

	Direct jobs	Indirect jobs	Low-range Capex ($)	High-range Capex
CLT Manufacturing	50	214	60,000,000	150,000,000

Source: Keston Economics 2021.

Table 7 – Impact summary - Job creation

Impact Summary	Direct Effect	Supply-Chain Effect	Consumption Effect	Total Effect	Type 1 Multiplier	Type 2 Multiplier
Output ($M)	$40.74	$21.20	$6.65	$68.58	1.52	1.684
Employment (Jobs)	50	52	19	121	2.04	2.42
Wages and Salaries ($M)	$4.58	$3.33	$1.48	$9.40	1.728	2.051
Value-added ($M)	$7.38	$8.94	$3.77	$20.10	2.211	2.722

Source: Remplan 2022.

Table 8 – Impact summary - $60M Capex

Impact Summary	Direct Effect	Supply-Chain Effect	Consumption Effect	Total Effect	Type 1 Multiplier	Type 2 Multiplier
Output ($M)	$60.00	$44.30	$15.30	$119.59	1.738	1.993
Employment (Jobs)	105	101	44	250	1.962	2.381
Wages and Salaries ($M)	$8.87	$9.33	$3.41	$21.62	2.052	2.436
Value-added ($M)	$17.67	$16.59	$8.68	$42.93	1.939	2.43

Source: Remplan 2022.

Table 9 – Impact summary - $150M Capex

Impact Summary	Direct Effect	Supply-Chain Effect	Consumption Effect	Total Effect	Type 1 Multiplier	Type 2 Multiplier
Output ($M)	$150.00	$110.74	$38.24	$298.98	1.738	1.993
Employment (Jobs)	262	252	111	625	1.962	2.385
Wages and Salaries ($M)	$22.18	$23.33	$8.53	$54.04	2.052	2.436
Value-added ($M)	$44.1644	$41.47	$21.70	$107.34	1.939	2.43

Source: Remplan 2022.

Table 10 – Total impact summary ($60M Capex and Jobs)

Impact Summary	Direct Effect	Supply-Chain Effect	Consumption Effect	Total Effect
Output ($M)	$100.74	$65.49	$21.95	$188.17
Employment (Jobs)	155	153	63	371
Wages and Salaries ($M)	$13.45	$12.67	$4.90	$31.02
Value-added ($M)	$25.05	$25.53	$12.46	$63.03

Table 11 – Total impact summary ($150M Capex and Jobs)

Impact Summary	Direct Effect	Supply-Chain Effect	Consumption Effect	Total Effect
Output ($M)	$190.74	$131.93	$44.89	$367.56
Employment (Jobs)	312	304	130	746
Wages and Salaries ($M)	$26.76	$26.67	$10.01	$63.44
Value-added ($M)	$51.55	$50.41	$25.48	$127.43

Appendix 5 – Additional potential funding sources

Table 12 – Additional potential funding sources

Funder	What they fund / relevance	$ available	Priority	Suggested next action
Market Led Proposal (MLP)	Market-led Proposals to the Department of Planning, Lands and Heritage provide an opportunity to secure state government support. To meet the scope of the MLP policy, proponents must clearly articulate a strong alignment to the priorities of the government and demonstrate the level of impact the proposal will achieve to assist priorities.	No limit.	H	Discuss project with the MLP Secretariat before being provided with and completing the Stage 1 Template and lodge it with the Secretariat. If successful, a Stage 2 Proposal process will follow.
Regional Economic Development Grants	Invests in community-driven projects that support efforts to create long-term economic growth and job sustainability in regions. Matched dollar-for-dollar.	Up to $250,000 per project.	M	Engage with GSDC and position for future rounds.
Regional New Industries Fund	Provide grants across the nine regions of Western Australia to support venture creation, accelerate small-medium enterprise growth and seed innovation initiatives.	No maximum, but likely less than $250,000 per project.	M	Engage with DPIRD to position for when new rounds announced.
Expanding WA's softwood timber plantations	The McGowan government announcement of an investment of $350 million to expand Western Australia's softwood plantation timber industry (mostly in the South West).	Unclear	M	Strong feasibility study / business case to encourage investment beyond the South West.
Coles Nurture Fund	Help producers, farmers and manufacturers to innovate and grow their business. Focused on differentiation, sustainable practices, extending growing seasons, improving productivity and reducing imports.	Up to $500,000 per application	M	Position for when new rounds announced.
Export Market Development Grants	Helps grow their exports in international markets through marketing and promoting their goods and services globally.	Up to $150,000 per year, for up to three years	M	Position for when new rounds announced.
Regional Growth Fund	The Regional Growth Fund will provide grants of $10 million or more for major transformational projects which support long-term economic growth and create jobs in regions. Last released in 2018, it is unclear when or if a new round will be announced.	Over $10 million per project	L	Position for when/if new rounds announced.
Manufacturing Collaboration Stream	The Manufacturing Collaboration Stream provides funding for a small number of large, transformational projects.	From $20 million to $200 million per project.	L	Position for when new rounds announced.