NORTH AND NORTH-WEST TASMANIA

SUPPLY CHAIN AND INFRASTRUCTURE

FINAL REPORT

PREPARED FOR

NORTHERN TASMANIA REGIONAL FORESTRY HUB

1 OCTOBER 2020

elogistics RESEARCH GROUP

UNIVERSITY of TASMANIA

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EXECUTIVE SUMMARY

In September 2018, the Australian Government launched the National Forest Industries Plan: Growing a Better Australia – A Billion Trees for Jobs and Growth. The Plan outlines the Commonwealth Government's strategy to drive growth in the renewable timber and wood fibre industry. The Plan aims to deliver a billion new trees over the next decade (including 400,000 new hectares of plantations nationally) to meet a projected fourfold increase in global demand for timber and wood fibre products by 2050.

The North and Northwest Tasmania Forestry Hub (Hub) was setup as part of the Commonwealth's commitment and is one of nine forestry hubs established across Australia. In consultation with stakeholders in industry, community and government the Hub has identified four key priority themes outlined below.

1. Access to land and land use policy for plantation forest investment
2. Supply chain and infrastructure
3. Climate change and carbon policy
4. Culture, skills and training

The eLogistics Research Group (eLRG) at the University of Tasmania was commissioned to prepare an assessment report on priority theme two: ***supply chain and infrastructure***. This assessment report aims to identify challenges and opportunities in the North and North-West of Tasmania relating to this theme.

The Hub has advised that it will consider the opportunities and recommendations identified in this assessment report alongside any recommendations identified in relation to the remaining three priority themes. The Hub has also advised that it will subsequently develop implementation plans commensurate with prioritised opportunities and funding.

Key Objectives of this Report

This report aims to provide insights to assist the Commonwealth in future policy development, infrastructure needs, additional processing potential and other opportunities. More specifically, the objectives of the report are:

a. Report on the current state of forestry supply chains and infrastructure in the Hub area and factors limiting growth for the future;

b. Determine the supply chains and infrastructure-related opportunities and barriers for the forestry and wood products sector in the Hub region; and,

c. Analyse and report on the constraints that affect forestry supply chain and infrastructure productivity and efficiency in the Hub region.

APPROACH

This report adopted an approach that blended quantitative and qualitative data collection and analysis methods. Critically, this involved extensive and detailed consultation with industry stakeholders through an online survey, a half day stakeholder workshop and a series of interviews with key industry representatives.

RECOMMENDATIONS

The recommendations arising from this report aim to directly address perceived supply chain and infrastructure barriers, constraints and potential opportunities to foster the growth of the forestry industry in the North and North-West of Tasmania. These recommendations have been grouped under four themes, with each identifying sets of interrelated actions for consideration. They are:

1. Enhance market access and efficiency
2. Explore forest products value-add and differentiation opportunities
3. Improve supply chain and infrastructure visibility
4. Improve workforce development, skills and career pathways

The recommendations in this report target primarily forestry supply chains in the North and North-West of Tasmania recognising their unique features. Nonetheless, it is acknowledged that some recommendations may be applicable to other areas of the State or State-wide. However, any extension or utilisation of recommendations presented in this report beyond the Hub region should carefully consider the nuances and unique features of supply chains in other parts of the State.

1. ENHANCE MARKET ACCESS AND EFFICIENCY

Given Tasmania's relatively limited local market size, stakeholders highlighted that growth of new or existing products will rely heavily on mainland Australia or international markets. Survey respondents and workshop participants recognised the importance of maintaining a robust supply chain cost profile to be able to compete both domestically and internationally. A key constraint for the potential growth of forestry supply chains in the North and North-West of Tasmania is the level of access and the efficiency of delivery throughput to domestic and international markets. Several challenges make up the dimensions of this market access and efficiency theme:

- *Ensuring that the road network capacity is consistent both on, and between, the main transport corridors and lower rated feeder roads close to forestry resources. This entails situations where the capacity on a route is limited by a pinch point (e.g. bridge weight limits, LGAs restrictions etc.), or by access to local road networks that need to flexibly respond to changing locations of forestry harvesting of distributed resources.*
- *Maintaining high levels of transport equipment utilisation. For example, trucks may be used only for a single 12-hour shift in a 24-hour period and may only run fully loaded on one leg of the journey and be empty for the remainder, highlighting back-hauling cost related issues and under-utilisation of transportation.*
- *Reaching customers in a competitive and consistent manner. The majority of wood products destined for domestic mainland customers are transported to Victoria via Bass Strait shipping services. These services were identified by stakeholders as being relatively expensive, even when considering the Tasmanian Freight Equalization Scheme (TFES). Furthermore, once cargo reaches mainland Australia, it is subject to land-side capacity constraints. Containerised exports may also be subject to shortages of inter-modal containers.*

These challenges create several associated opportunities such as: addressing road transport capacity in an integrated manner by improving transport flows on infrastructure; taking advantage of inter-modality to enhance the utilisation of transport assets; and, expanding existing coastal shipping services to facilitate direct maritime access to other Australian states.

Recommendations to enhance market access and efficiency

The emerging policy recommendations to enhance market access and efficiency are:

R 1. *Consider options for regulatory changes to the TFES to incentivise direct coastal shipping to other Australian states. This should be undertaken with the objective of enhancing the competitiveness of Tasmanian producers/processors in the domestic Australian market by providing logistics flexibility, reducing reliance on Victoria and land-side transport in mainland Australia. The need for action in this regard has become particularly urgent as the major bushfires and current COVID-19 pandemic restrictions have drawn attention to this supply chain bottleneck in relation to existing, and new potential domestic markets, for Tasmanian forestry products.*

R 2. *Investigate the potential economic, social and environmental impacts and barriers of adapting log-trailers to transport inter-modal containers as well as logs (similar to TasRail's log-tainer concept). Adapting log-trailers may provide an opportunity to increase the backhaul utilization of transport assets. These investigations should also link to discussions on investment mechanisms to support haulage fleet upgrades towards higher-productivity vehicles (HPVs).*

R 3. *Prioritise addressing road infrastructure pinch points based on expected benefit in terms of haulage efficiency and social and environmental impacts. Any assessment should also consider the cost of any alternative options. Pinch points in this context represent road capacity reductions along a transport route due to regulatory, infrastructural or other restrictions (e.g. bridge weight limits, LGAs restrictions etc).*

Importantly, improvements in market access and efficiency are likely to contribute to a reduction in the environmental footprint of the transport task that, in turn, may improve perceptions of forest supply chains and stakeholder efforts to enhance their social license.

2. EXPLORE FOREST PRODUCTS VALUE-ADD AND DIFFERENTIATION OPPORTUNITIES

As cost pressures on commodity products in the forest and wood sector increase, one way stakeholders felt that this issue could be addressed is to value-add and differentiate in terms of both existing and new products. Consequently, a key opportunity to foster growth in forestry supply chains in the North and North-West of Tasmania relates to improving the utilisation of the forest resource and particularly to developing and locally manufacturing existing and new

value-adding products. These opportunities are often encompassed under the terms domestic processing, bioeconomy and bioenergy. However, there are several challenges with respect to product value-add and product differentiation:

- *Value-added products, engineered wood products (EWP) and bioenergy from biomass residues were identified by numerous stakeholders. Potential opportunities identified included: value-added products (e.g. bio-composite materials, thermoformable materials, nanocellulose or wood-based fabrics), engineered wood products (glulam, LVL, CLT etc.) and utilisation of biomass residues for bioenergy (electricity, heat, cooling) and transport biofuels. However, it was evident that across the sector, there were highly varied levels of understanding as to how these products could meet emerging market requirements, gain acceptance in specific domestic and/or international contexts and overcome the higher production cost structures in comparison to other parts of the world.*
- *Many forest and wood products are used for residential construction and joinery. While there is willingness from stakeholders in forestry supply chains to develop new products and value-added products, market intelligence with regards to the cost drivers for the residential construction and joinery sectors remains limited. Consequently, the pathways for value-added products and product differentiation into these sectors is not clear and needs further investigation and validation.*
- *The native forest processing sector is experiencing pressures in terms of the size and certainty of supply availability. These pressures have created challenges for processors in securing funding for retooling their facilities in order to enhance the value recovery from the existing resource but more importantly in being able to transition to more effective and efficient processing of hardwood plantation resources.*
- *Numerous stakeholders pointed towards opportunities for the utilisation of biomass residues for bioenergy (electricity, heat, cooling) and transport bio-fuel production. While significant effort continues to be put into understanding the potential costs of these opportunities, stakeholders were less clear on whether the business cases could be substantiated on economic, social and/or environmental value-based evidence. The work of* Australian Renewable Energy Agency *(ARENA) and the clean energy finance corporation was acknowledged as a valuable information source that had not been fully utilised to date.*

The emerging policy recommendations to explore forest products value-add and differentiation opportunities are:

R 4. *Identify and prioritise existing and new product value chains to capitalise on stakeholder and end-customer interest in sustainable forest and wood products, as well as in opportunities for local domestic processing. As the COVID-19 pandemic and associated supply chain disruption have highlighted increasing sovereign manufacturing capacity, reducing over-dependence on international exports of raw materials and enhancing supply chain resilience and value-adding activities are all important priorities.*

R 5. *Identify mechanisms to support existing and new production approaches to shift processing of wood resources as close as possible to their final use form as early as possible in the supply chain. In forest and wood products supply chains this shifting may reduce cost, waste and/or improve efficiency and add value to Tasmanian local processing, milling and framing operations. To contribute to identifying opportunities it would be useful to engage in value chain mapping of the construction and joinery sectors both locally and on the mainland.*

R 6. *Develop policies and/or provide incentives to stimulate local demand and innovation in construction techniques and utilisation of sustainable timber products. The Wood Encouragement Policy could be leveraged in government commitments and government funded and/or supported construction. Examples could include social housing developments. Other major construction projects (such as the University of Tasmania's Northern Transformation Project) could also be identified. Prefabricated construction and engineered wood products from local manufacturers should be considered in this context. This would provide an opportunity for the demonstration and/or further development of Tasmanian building materials, production capacity and stimulate innovation. Local procurement in relation to social developments also has the potential to deliver positive benefits in terms of social license and forest industry branding without recourse to direct advertising.*

R 7. *To stimulate further innovation and rebranding of forestry supply chains, consider novel approaches such as a "hackathon" for local SMEs/inventors to produce ideas for making products out of wood, and to better understand where wood resources may act as*

complementary (or alternative) raw materials in existing production processes or supply chains.

R 8. *Identify support for native forests sawmills to re-tool to improve volume and value recovery from native forests resources, and most importantly to incentivise a sustainable transition towards more efficient and effective processing of hardwood plantation resources.*

R 9. *Continue to explore bioenergy opportunities from the utilisation of biomass residues and to identify and prioritise potential new value chains in this area. On-going analysis of local opportunities in this area has already identified that transport bio-fuel production is one area with potential to use Tasmanian biomass* (NNFCC, 2020). *Aligned to this use of biomass residues, is an opportunity to advance forest industry capacity and credentials in relation to climate change and carbon mitigation, storage and management. This may help position the forest industry more clearly as a contributor to Tasmania's renewable energy strategy. This will also support alignment with policy discussions on energy security and local market needs.*

3. IMPROVE SUPPLY CHAIN AND INFRASTRUCTURE VISIBILITY

Supply chain and infrastructure productivity and efficiency are determined not only by the physical capacity of individual components (e.g. roads, warehouses etc) but also by the alignment of the physical flows with information flows. The typical Tasmanian forestry supply chains, whether for native or plantation products, hardwood, softwood or specialty timbers have a complex and generally rather fragmented structure involving multiple, generally small and medium-sized firms. As activities and processes are fragmented amongst multiple firms, so too is the availability, flow and visibility of information related to them.

In this context, the opportunities identified for fostering growth of existing and new products in the forestry industry were greater supply chain and infrastructure visibility, enhanced communication, improved logistics and production flows traceability and strategic planning. In capturing these opportunities, several challenges were identified as follows:

- *Limited visibility of operations particularly around the North and North-West ports to support responses to truck congestion, work interruptions and throughput monitoring.*
- *Lack of awareness of port operating conditions, management and performance.*

- *Problems related to understanding the impact of constraints in connecting with major transport corridors and existing freight flows.*
- *Challenges in managing communication and information flows with government business enterprises (GBEs), government agencies (Local, State and Commonwealth) and supply chain stakeholders.*
- *Limited understanding of strategic requirements around infrastructure given existing and new forest resource and processing opportunities.*

Recommendations to improve supply chain and infrastructure visibility

The emerging policy recommendations to improve supply chain and infrastructure visibility are:

R 10. *The development of a digital platform to provide real-time visibility and transparency of TasPorts' port operations and performance to improve the responsiveness and adaptability of forestry supply chains. The digital platform could initially target the Burnie port and could be subsequently scaled to cover other ports. Recent work completed by the eLogistics Research Group on port congestion at the Burnie Chip Export Terminal (BCET)* (Neagoe, Taskhiri and Turner, 2018), *highlighted that congestion could be addressed more efficiently by increasing visibility between supply chain actors and the port, rather than through significant infrastructure investment. Increased visibility can enable better supply chain coordination and can be achieved through digital platforms that facilitate information sharing. Importantly, to increase the impact of digital platforms and information sharing, an education component on how to integrate information in decision-making is critical (related to R-15). It is likely that insights from this previous work at BCET could be adapted and applied to other ports in the North and North-West of Tasmania.*

R 11. *Streamline information sharing along the supply chain and advance supply management knowledge. Emphasising information sharing between GBEs, government agencies and supply chain stakeholders and ensuring that stakeholders understand how best to utilise this information to optimise their supply chain operations. These processes need to be addressed simultaneously at several levels: Operationally, through the development of a digital platform to simplify communication between parties; Tactically by building supply chain intelligence across the sector through networking events; seminars; webinars; conferences; and training. Strategically through regular discussion*

groups to better understand existing and potential future issues that can be incorporated into strategic planning.

These recommendations align closely with the Department of State Growth's recent Tasmanian Trade Strategy (2019b).

4. IMPROVE WORKFORCE DEVELOPMENT, SKILLS AND CAREER PATHWAYS

The workforce involved in the operation and management of forestry related assets and technology, as well as those involved in innovation, research and development of new products and services are all an integral part of forestry supply chains and infrastructure. As the industry develops and transforms so do its workforce requirements. The stakeholder consultation process highlighted that a constraint to the growth of forestry and its supply chains in the North and North-West of Tasmania pertained to the availability and development of its workforce, improving skills and providing career pathways. Several dimensions make up the workforce development, skills and career pathways challenges:

- *There is an ageing workforce, particularly in the harvest and haulage sector with relatively limited recruitment. As a result, a major challenge to be faced is that a considerable volume of expertise will leave the harvest and haulage sector through retirement in the next 3-5 years.*
- *The lack of clearly defined and marketed attractive career pathways particularly for young people to consider careers within forestry supply chain management, freight transportation and/or sustainable forestry.*
- *The lack of training and education regarding the elements of modern supply chains and approaches to taking advantage of potential digital tools and techniques. Stakeholders identified that there was limited general awareness of the increasing levels of technical skills required in forestry supply chains, and that changing perceptions about future careers was very important to ensure the industry had personnel available to capitalise on innovation in both existing, and new, products and market opportunities.*
- *Strong competition and appeal of other industry sectors in comparison to forestry.*

The opportunities raised in relation to workforce development, skills and career pathways include: improving marketing and awareness of forestry supply chain jobs and career pathways;

the development and delivery of education and training programmes as well as apprenticeships; and, advancement of support mechanisms for small businesses to engage with up-skilling of existing staff in supply chain and digital literacy. These opportunities are addressed in the recommendations below.

Recommendations to improve workforce development, skills and career pathways

The emerging policy recommendations to improve workforce development, skills and career pathways are:

R 12. *Develop initiatives to advance awareness and marketing of career pathways in forestry and forestry supply chains to directly address challenges related to an ageing forestry workforce. Existing programmes can be leveraged and extended to more clearly identify career pathways both directly in forestry and in emerging domestic processing and value adding supply chains. Raising awareness of emerging careers in precision forestry, innovation in the use of digital technologies (including drones, robotics, AI and image processing etc), advanced materials and manufacturing, and, in emerging value-added products will contribute to improving the brand of forestry as a future career.*

R 13. *Further develop and target training and education for existing and emerging career opportunities in forestry and along forest supply chains in consultation with VET/Tertiary providers and industry. This should include discussions about micro-credentialing, short courses, certificates, diplomas, degrees and post-graduate training. Again, there are opportunities to leverage existing activities and programmes but the focus needs to better encapsulate the supply chain as well as resource management.*

R 14. *Improving training opportunities and/or formal apprenticeships in forestry supply chains. An initial focus could be on haulage and transportation where the ageing workforce will become an obstacle to future logistics of existing and emerging new products.*

R 15. *Development of mechanisms to specifically support existing workers in forestry supply chains to up-skill in both supply chain optimisation and to become more digitally literate so that they are able to leverage and incorporate advances in new technologies more fully into their contemporary work-practices. Engaging with small business operators in the industry will be required to identify what 'on the job' training is feasible and where other types of education and training is more appropriate.*

Some of the workforce related recommendations are aligned with the Department of State Growth's Tasmanian Trade Strategy (2019b) and will require some level of adaptation for a specific focus on forestry supply chains.

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1 INTRODUCTION AND BACKGROUND

In September 2018, the Australian Government launched the National Forest Industries Plan: Growing a Better Australia – A Billion Trees for Jobs and Growth. The Plan outlines the Commonwealth Government's strategy to drive growth in the renewable timber and wood fibre industry. It provides the vision and certainty needed for Australia's forestry industry and supports the sustainable forest industries as long-term growth engines for regional Australia. The Plan ambitiously aims to deliver a billion new trees over the next decade (including 400,000 new hectares of plantations nationally) to meet a projected fourfold increase in global demand for timber and wood fibre products by 2050. This translates to planting the right trees, at the right scale, in the right places.

The Commonwealth Government's strategic direction is underpinned by a smarter use of forest resources oriented towards value extraction from all forest products as well as the development of community support and sustainable practices (Australian Government - Department of Agriculture, 2018).

The North and Northwest Tasmania Forestry Hub (Hub) was setup as part of the Commonwealth's commitment and is one of nine forestry hubs established across Australia. In consultation with stakeholders in industry, community and government the Hub has identified four key priority themes outlined below.

1. Access to land and land use policy for plantation forest investment
2. Supply chain and infrastructure
3. Climate change and carbon policy
4. Culture, skills and training

The eLogistics Research Group (eLRG) at the University of Tasmania was commissioned to prepare an assessment report on priority theme two supply chain and infrastructure. This assessment report aimed to identify challenges and opportunities in the North and North-West of Tasmania relating to this theme.

The Hub has advised that it will consider the opportunities and recommendations identified in this assessment report alongside any recommendations identified in relation to the remaining

three priority themes. The Hub has also advised that it will subsequently develop implementation plans commensurate with prioritised opportunities and funding.

1.1 KEY OBJECTIVES

This report aims to provide insights assisting the Commonwealth in future policy development, infrastructure needs, additional processing potential and other opportunities in the forestry supply chains and supporting infrastructure in the Hub area. More specifically, the objectives of the report are:

a. Report on the current state of the forestry supply chains and infrastructure in the Hub area and factors limiting growth for the future;
b. Determine the supply chains and infrastructure-related opportunities and barriers for the forestry and wood products sector in the Hub region; and,
c. Analyse and report on the constraints that affect the forestry supply chain and infrastructure productivity and efficiency in the Hub region.

For guidance on how the report addresses each of these objectives please refer to Appendix A. The key considerations of the forestry supply chain that are of primary interest can be categorised in four main groups:

Key Stakeholders

- Key supply chain and infrastructure participants

Infrastructure

- Existing infrastructure; ports, rail, and roads
- Limitations of public road network
- Port access, costs, efficiencies; integration of existing infrastructure to key port locations
- North and Northwest ports; equitable access; dredging; rail integration with ports

Legislative and Regulatory Landscape

- Legislation, policy, regulatory and planning constraints
- Transport – National Heavy Vehicle Regulator (NHVR) and Chain of Responsibility (CoR)

Domestic and International Supply and Demand

- Key export markets
- Global and domestic supply and demand across the supply chain and future trends

1.2 REPORT STRUCTURE

To address the report objectives, the report is structured as follows:

- Section 0 briefly presents the three-stage approach of the report. The first stage is a description and synthesis of the current state of Tasmanian forestry supply chains drawing on industry, government, and academic sources. Stage Two comprises a survey which reveals insights into existing challenges and perceived supply chain solutions. Stage Three comprises findings from a workshop held to prioritise development opportunities.
- Section 3 discusses several key concepts and definitions relating to supply chains and infrastructure. The concepts discussed include supply chain integration, resilience, and the use of digital tools.
- Section 4 reports on the current state of Tasmanian forestry supply chains and infrastructure in the Hub area. The section presents an overview of the key stakeholders in the Tasmanian forestry supply chains, the supporting infrastructure, and the legislative and regulatory landscape. The section also provides an overview of forest plantation stock as well as the demand for raw materials for exports and the domestic and international demand for the final use of the processed wood products.
- Section 5 reports on the stakeholder consultation results with regard to the constraints, barriers and factors limiting growth in forestry supply chains in the North and North-West of Tasmania as well as opportunities for further growth and development.
- Section 6 presents the recommendations emerging from this report with regard to efficiency and access to market, value-added and differentiated products, supply chain and infrastructure visibility, and, workforce development, skills and career pathways.

2 APPROACH

This section briefly presents the approach adopted to fulfil the objectives of this assessment report.

This report has adopted an approach that blends quantitative and qualitative data collection and analysis methods. Critically, this involved extensive and detailed consultation with industry stakeholders through an online survey (n=56), a half day stakeholder workshop (n=14) and a series of semi-structured interviews with key industry representatives (n=5). This approach is summarized in the diagram below. Additional detail on the approach is provided in Appendix B.

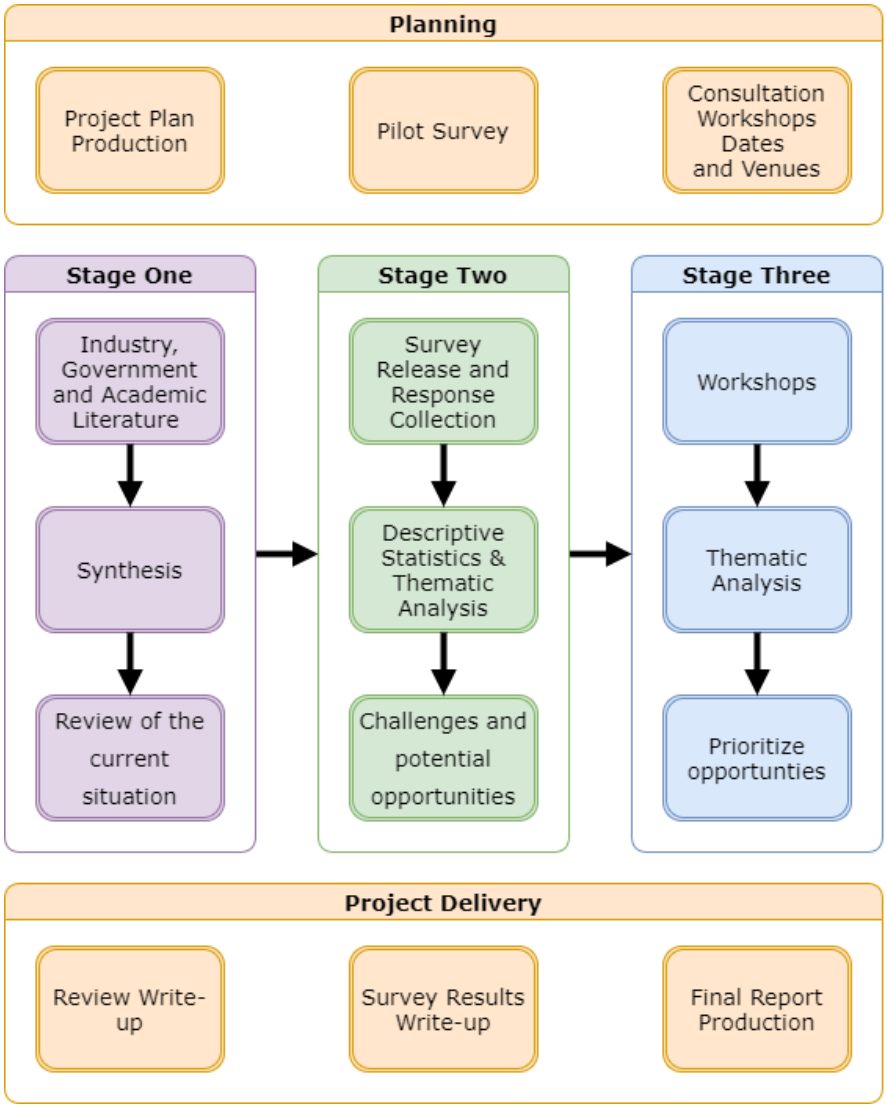

Figure 1 Assessment Report Approach

3 KEY SUPPLY CHAIN AND INFRASTRUCTURE CONCEPTS

This section briefly reviews several key concepts and definitions relating to supply chains and infrastructure to help provide a common vocabulary across the report as well as to highlight the developments in theory and practice on these topics.

This section is structured as follows:

- *Section 3.1 presents a conceptualisation of supply chain activities and their management.*
- *Section 3.2 briefly defines infrastructure (hard and soft) as including physical assets, information flows and social institutions and processes. Logistics is examined as primarily relating to haulage activities taking place using both hard and soft infrastructures.*
- *Section 3.3 discusses the concept of supply chain integration and mechanisms used to achieve it. This section highlights the importance of information integration, organisational relationships, coordination and resource sharing.*
- *Section 3.4 examines the concept of resilience in supply chains and the factors contributing to resilient chains including flexibility, robustness, visibility, collaboration, velocity, and efficiency.*
- *Section 3.5 discusses the role of digital tools in supply chains. Digital tools are ubiquitous in supply chains and play a role in automating tasks, improving decision-making and/or in supporting the redesign of operations.*

The key messages presented in this section are:

- *A supply chain is a broader concept than transportation or logistics. Supply chains encompass procurement, processing, logistics, sales, and distribution of products along individual links towards end-users.* ***End-users are the focal point of supply chain thinking.***
- *Forestry supply chains are diverse and often fragmented. From one raw material, several products can be manufactured, in different proportions, for different markets and uses. However, most Tasmanian timber products currently are high-volume, low margin commodity products. Evidence highlights that the higher the proportion of value-added products resulting from the raw material, the more the viable, resilient and potentially profitable a supply chain is likely to be.*

- *Infrastructure represents the* **physical, informational, and social structures** *on which supply chains operate.*
- **Supply chain integration** *underpins collaboration and coordination of stakeholders across the supply chain to satisfy the needs of the final customer. Just because companies operate in a supply chain does not mean they are working together optimally or understand each other's requirements. Frequently, the needs and wants of the end-customers of wood product supply chains are not well understood within the supply chains leading to inefficiency.*
- *Digital tools have been extensively used in forestry supply chains mainly to* **automate** *activities previously performed by humans. This has led to efficiency improvements but in the longer term is unlikely to generate any sustainable competitive advantage. Most technology tools are readily accessible at a global level. However, forestry supply chains can explore the use of digital tools to* **inform** *decisions – at an individual and supply chain level – and to* **transform** *the precision of their operations and their supply chains.*
- *The* **resilience of supply chains** *has become increasingly relevant given recent events (bushfires, the COVID-19 pandemic). Resilience is frequently only tested by high-impact external events, but it can be managed as part of regular business practices to support a system-wide view of supply chains and moderate an exclusive focus on internal organisational efficiencies. Evidence highlights that driving internal efficiency without attention to the supply chain context may led to negative unintended consequences.*

3.1 CONCEPTUALISING SUPPLY CHAINS AND THEIR MANAGEMENT

The first key step in understanding how to improve supply chains is to understand what they are and what their management entails.

"Supply chain management is the coordination of production, inventory, location, and transportation among the participants in a supply chain to achieve the best mix of responsiveness and efficiency for the market being served." (Hugos, 2018).

It is important to understand that a supply chain is broader than logistics and the focus on end-users is a central point in the supply chain thinking. Logistics primarily relates to the

transportation activities in a supply chain. Supply chains however encompass procurement, processing, logistics, sales, and distribution of products along individual links towards end-users.

Forestry Supply Chains

Forestry supply chains entail the processing of products resulting from different species of trees. Forestry supply chains also contain important components prior to the harvesting and processing of trees relating to species development, tree growing and silviculture etc. However, for the purposes of this report, the forestry supply chain is taken to start in forest coupes when trees are ready for harvest and continues until the end-consumers.

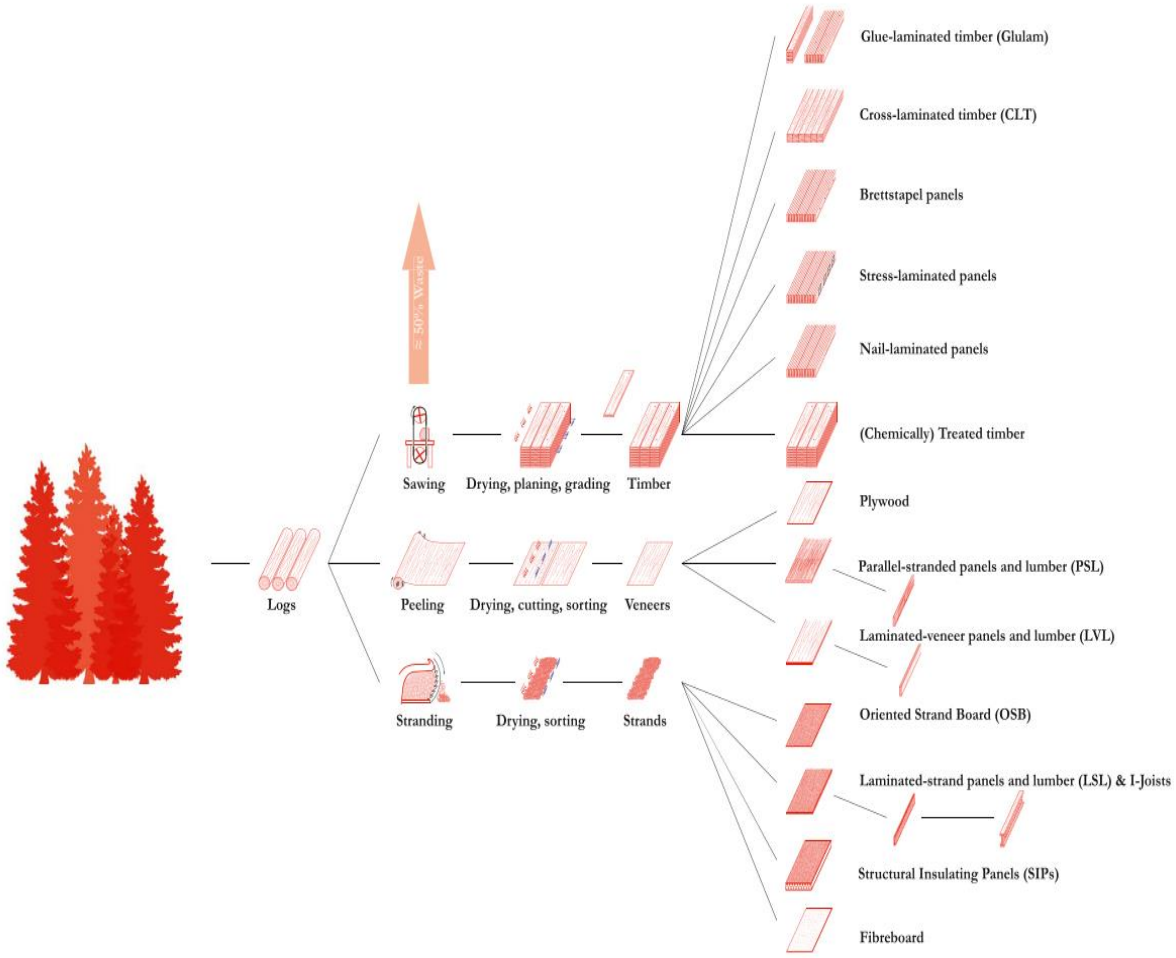

Figure 2 A Range of Products That Can Be Manufactured from Logs

(Source: Ramage et al., 2017)

Forestry supply chains are typically diverse and fragmented. Multiple products can be manufactured from the one raw material, the tree. In many cases, different parts of the tree are suitable for different uses. However, in some cases, the same part of the tree (e.g. bottom log) can be processed into a range of products – each with different associated costs and revenues (see Figure 2). Therefore, the higher the proportion of higher value products resulting from the one tree, the higher the probability that the economic viability of the supply chain will be improved.

3.2 CONCEPTUALISING INFRASTRUCTURE AND LOGISTICS

To assess infrastructure adequately, it is also important to define what qualifies as infrastructure.

Infrastructure can be divided in hard and soft infrastructure. Hard infrastructure (e.g. roads, rail, or ports) primarily consists of physical assets that facilitate the flow of goods and information within a supply chain. The CSCMP provide the following definition "Supply chain infrastructure consists of both the physical and informational assets required to run a supply chain." (CSCMP, 2015). Soft infrastructure consists of the information, governing processes and institutions that support the use of assets.

Therefore, when exploring infrastructure and logistics related issues, both the physical assets as well as the way in which they are utilised is of importance. Therefore, the analysis of infrastructure is intrinsically connected with the logistics flows it supports. In the context of this work, infrastructure consists of logistical structures, informational structures, and social structures (including governance processes, regulations, and training/skills).

3.3 UNDERSTANDING SUPPLY CHAIN INTEGRATION

When companies operate in a supply chain, it does not necessarily mean that they are working together optimally. Supply chain integration emphasises the importance of information integration, organisational relationships, coordination and resource sharing.

The research literature explores three main ways of achieving better integration in the supply chain:

- Information integration: this is comprised of technical hardware and software; information quality and content; and, social aspects of information sharing supported by trust (Prajogo and Olhager, 2012). This is not just about more technology but about recognising the need to create practices that use technology and the information they generate across organisational boundaries in the supply chain.
- Organisational relationship linkages: this involves the development of common objectives amongst stakeholders and agreement around skills and performance measures that are shared and aligned to agreed incentives.
- Coordination and resource sharing: this primarily refers to logistics activities where decisions and resource allocation are aligned and shared within and between organisations (Alfalla-Luque, Medina-Lopez and Dey, 2013).

3.4 UNDERSTANDING SUPPLY CHAIN RESILIENCE

The concept of resilience is a useful lens for analysing decision trade-offs from a system perspective and provides the ability to look beyond performance metrics related to individual organisational efficiency measures.

Resilience thinking is intrinsically linked with the persistence of complex systems under uncertainty, change and disruption (Meerow and Newell, 2016). In supply chains, resilience is often linked with high-impact, low-probability events (e.g. natural disasters). However, other researchers maintain a broader scope with regard to resilience, defining it as "the ability of a supply chain to cope with change" (Wieland and Wallenburg, 2013). In this sense, high impact events only test the supply chain resilience rather than define it.

The concept of resilience has gained increased attention following recent events. including the 2019-20 bushfires and the COVID-19 pandemic. It is therefore useful to define what the characteristics of resilient supply chains are to better understand and use the concept. The academic literature discusses several facets of resilience:

- *Flexibility*: the ability to redeploy capacity that has been previously committed (Bhamra, Dani and Burnard, 2011; Jüttner and Maklan, 2011; Gunasekaran, Subramanian and Rahman, 2015),

- *Robustness*: the redundancy of inventory, capacity and channels in a supply chain (Johnson, Elliott and Drake, 2013; Pires Ribeiro and Barbosa-Povoa, 2018),
- *Visibility*: the level of access and sharing of key or useful information in a timely manner along the supply chain (Ponomarov and Holcomb, 2009; Pettit, Fiksel and Croxton, 2010; Jüttner and Maklan, 2011),
- *Collaboration*: the level of coordinated decision making at the strategic, tactical, and operational levels (Singh and Power, 2009; Jüttner and Maklan, 2011), and
- *Velocity*: the supply chain's reaction speed to events, disruptions, and market changes (Johnson, Elliott and Drake, 2013; Gunasekaran, Subramanian and Rahman, 2015).
- *Efficiency*: This can also be a characteristic of resilient systems (Bhamra, Dani and Burnard, 2011; Gunasekaran, Subramanian and Rahman, 2015). Importantly, efficiency and redundancy appear to be opposing features of resilient systems, as an increased in efficiency can lead to a reduction in redundancy and vice-versa. However, it is important to note that localised improvements in one organisations efficiency may also be partially responsible for system-wide disruptions and negative impacts on the supply chain (Ponomarov and Holcomb, 2009).

3.5 THE ROLE OF DIGITAL TOOLS IN SUPPLY CHAINS

The role of digital tools in supply chains can be distinguished in three broad ways (Brooke and Ramage, 2001) ordered in increasing complexity:

- Tools that **automate** where technology substitutes for human effort;
- Digital tools which **inform**, where human effort is augmented by technology;
- Tools that **transform** and restructure tasks or processes.

Digital tools are playing an ever-increasing role in supply chains. In forestry, a wide range of tools have been introduced to enhance supply chain efficiency and visibility. Examples of digital tools that have been adopted by Tasmanian and domestic companies include:

- E-docket systems: these systems integrate truck geo-positioning with forest growers/management companies' coupe locations to provide a greater visibility of operations;

- Automated assessment of volumes of harvested logs in stockpiles or on trucks for improved accuracy of processed inventory.

Researchers have also sought to enhance the use of digital tools in forestry supply chains using integrated sensors, unmanned aerial vehicles (drones), and advanced non-destructive testing to improve operational efficiency, data quality and information availability.

A significant proportion of digital tools used in forestry supply chains aim to automate and replace human effort in order to reduce labour costs, errors or improve the efficiency of existing operational processes. It is unclear to what extent the information generated by many of the digital tools in use in forestry supply chains is being used to inform decision-making. Anecdotally, there are few examples where information generated by the digital tools is being used optimally and even fewer examples where information is shared between supply chain parties. Nonetheless, forestry supply chains can explore the use of digital tools to inform decisions – at an individual and supply chain level – and can use digital tools to transform their supply chains and individual operations. Extending the current use of digital tools may open up opportunities for new forest products and services.

4 THE CURRENT STATE OF THE FORESTRY SUPPLY CHAINS AND INFRASTRUCTURE

This section provides an overview of the current state of Australian forestry supply chains with a primary focus on the North and North West of Tasmania. This section also briefly considers the domestic and international contexts in which these supply chains and their infrastructure operate. This section also briefly considers some emerging future directions for new products and services.

The structure of this section is as follows. Within each section, the key messages, challenges, barriers, constraints and opportunities are discussed.

- *Section 4.1 explores the existing structure of Tasmanian forestry supply chains including key stakeholders, their roles, sizes, and distribution across the State.*
- *Section 4.2 reviews the physical infrastructure supporting supply chain activities, primarily focusing on road, rail and port infrastructure as well as the associated transport services. This section also presents aspects pertaining to legislation and regulations at a national, regional, and local level that may affect forestry supply chains. These include legislation and regulation on the use of forest resources, chain of responsibility regulations, the Tasmanian Freight Equalisation Scheme as well as other relevant local or state legislation.*
- *Section 4.3 examines the local and national plantation stock as well as the resulting products being produced from harvesting operations. From a demand perspective, the raw material exports at an Australian level are also examined. Recognising that most Australian forest and wood products exports serve as inputs into manufacturing processes, the current domestic and international trends with respect to construction, joinery, paper, and packaging products as well as bioenergy are briefly explored.*

4.1 TASMANIAN FORESTRY SUPPLY CHAINS

This section provides an overview of the existing structure of Tasmania's forestry supply chains including the key stakeholders, their roles, employment size, and distribution of activities across the State.

The key messages of this section are:

- *The typical Tasmanian forestry supply chains, whether for native or plantation products, hardwood, softwood or specialty timbers have a complex and at the same time heavily fragmented structure involving multiple, generally small and medium-sized firms.*
- *Across Tasmania, the direct employment generated by the forest industry is estimated at 3,076 jobs. Tasmanian forestry supply chains generate a significant amount of direct and indirect employment in some regional areas of North and North West Tasmania such as Dorset (9.3% of employment from direct forestry jobs), Circular Head (6.6%), George Town (6.0%), and Waratah/Wynyard (2.2%).*

The key challenges highlighted in this section are:

- *Economies of scale in manufacturing and logistics activities are relatively difficult to achieve as many organisations involved in forestry supply chains are generally small or medium-sized.*
- *As the complexity and fragmentation of supply chains increases, so too do the challenges in managing these supply chains, for two main reasons:*
  a) *Different entities are driven by different, sometimes opposing incentives, such as profit/revenue maximisation; and,*
  b) *As activities and processes are fragmented amongst multiple firms, so too is information available on the activities of these multiple firms.*

4.1.1 SUPPLY CHAIN SETUP AND KEY STAKEHOLDERS

This section briefly describes the setup of the main Tasmanian forestry supply chains and the stakeholders involved in the supply chain stages.

Forest plantations or estates are often owned or leased by global investment funds (such as New Forests or Global Forest Partners), by Tasmanian State agencies or by other private forest

owners. The plantations and estates that are designated for production purposes are managed by firms specialised in managing forest assets (Sustainable Timber Tasmania, Forico, PF Olsen, SFM, Reliance Forest Fibre and others). The forest management companies typically oversee planting, plantation treatment, harvesting and haulage and replanting activities. Any of these activities may be performed internally or outsourced to specialised contractors.

The harvest and haulage task is often outsourced to contractors (e.g. Les Walkden, Orana Enterprises, Padgett Group and more than 130 other, generally small-sized owner operator firms). Most harvesting operations are for log production. Logs are delivered to processing facilities (wood chip mills, sawmills, pulp and paper mills, engineered wood products facilities) as well as directly to the port for export. Logs are most often delivered by truck. However, in some cases logs are also transported by rail by TasRail.

Harvesting activities are heavily mechanised and require large capital investments to deliver the production efficiency required in industrial-scale operations. However, in smaller scale operations, such as those generally present in farm forestry, using large harvesting equipment may be uneconomic. Currently, the minimum operable area varies from around 20 ha down to 5 ha where the forest resource is easily accessible. The availability of suitable harvesting machinery for smaller sized operations is often the most important determinant of the supply viability from these types of smaller operations.

Wood chip mills process the logs into wood chips in 5 mills located in the North and North-West of Tasmania. Apart from the Artec, BBCT and Long Reach wood chip mills which are situated on the wharf and load wood chips directly on vessels, the other facilities (mainly Surrey Hills and Massy Greene) use road transport for their production. Bulk exports of wood chips and logs are mainly managed by marketing agents who maintain contact with international customers.

Other processing facilities include 3 softwood mills (1 with output of over 400,000 m3 and 2 with outputs under 45,000 m3), 19 hardwood mills (1 with an output between 45 and 75,000 m3, 6 between 15 and 45,000 and the remainder generating less than 15,000 m3 per year) and 6 other mills (including plywood, veneers and cross-laminated timbers) (Downham, Gavran and Frakes, 2019). Paper and newsprint are produced in the South of Tasmania in Boyer. The

outputs from these mills – sawn boards, engineered wood products, paper and newsprint – are subsequently transported by truck or rail to their customers, either locally, domestically, or internationally. These wood products are generally transported in trailers or containers and are undertaken either by third-party logistics services providers (such as Toll, Monson or Searoad) or with the transport assets of the wood products manufacturer.

As the complexity and fragmentation of supply chains increases, so too do the challenges in managing these supply chains, for two main reasons:

- Different entities are driven by different, sometimes conflicting incentives, such as profit or revenue maximisation. This creates situations where what is optimal for the supply chain may not be optimal or desirable for one or more companies in that chain.
- As activities and processes are fragmented amongst multiple firms, so too is information available on the activities of these multiple entities. While one entity may have relevant information, it may not be shared across the supply chain, and therefore fail to reach those that can make use of the information to contribute to overall supply chain efficiency.

4.1.2 FOREST INDUSTRY DIRECT AND INDIRECT EMPLOYMENT

This section discusses the direct and indirect employment generated by Tasmanian forestry supply chains, with a focus on the North and North West.

At the Australian level, forestry, logging, and forestry support roles amounted to approximately 10,500 jobs in 2018. Primary and secondary processing (including sawmilling, wholesaling, joinery, and other wood products manufacturing activities) amounted to 8,700 jobs. Nationally, roles relating to pulp and paper manufacturing amounted to 14,900 in 2019 (Australian Industry and Skills Committee, 2020).

Across Tasmania, the direct employment generated by the forest industry is estimated at 3,076 jobs (see Table 1). Of this total, 42% jobs are generated by primary wood and paper processing, while 24% by the harvest and haulage sector and approximately 10% each by growers, nurseries, and secondary wood processing sectors. The North-West and North of Tasmania accounted for 6 in 10 direct jobs in forestry.

Several local government areas in the North and North-West of Tasmania have a relatively high reliance on the direct employment generated by the forest industry. Some examples of such regional areas include Dorset (9.3% of employment from direct forestry jobs), Circular Head (6.6%), George Town (6.0%), Waratah/Wynyard (2.2%). In other areas, the proportion of direct forestry jobs relative to total employment ranges between 1 and 2%. Approximately 1.7% and 2% of jobs in the North-West and respectively North are generated by direct employment in the forest industry. At the Tasmanian level, forest industry direct employment accounts for 1.4% of the employed workforce. Research has also estimated the indirect employment generated by the forest industry, induced by production and consumption to 2,289 jobs, of which 1,120 (49%) in the North and North-West of Tasmania. (Schirmer *et al.*, 2018).

Table 1 Direct and Indirect Employment Generated by Tasmanian Forestry Supply Chains in 2017

(Adapted from Schirmer et al., 2018)

Industry Sector	North-West	North	South	Tasmania[1]
Growers (forest management companies)	56	119		284
Nurseries, silvicultural & roading contracting businesses	106	97		285
Other (including consultants, equipment sales, training)	18	37	227	101
Harvest & haulage contracting businesses (including in-field chipping)	225	304	222	751
Primary wood and paper processing	249	478	565	1,292
Secondary wood and paper processing	82	112	168	362
Total Direct Jobs	735	1,147	1,182	3,076
Total Direct and Indirect Jobs (production induced, and consumption induced jobs) [e]	**1,105**	**1,897**	**1,903**	**5,365**

[e] estimates

[1] The estimate for Tasmania includes 12 jobs unable to be classified by region, hence the total does not equate to the sum of the individual regions.

4.2 INFRASTRUCTURE, LOGISTICS AND REGULATORY LANDSCAPE

This section provides a brief *review of the physical infrastructure supporting supply chain activities, primarily focusing on road, rail and port infrastructure as well as the associated transport services. This section also presents aspects pertaining to legislation and regulations at a national, regional, and local level that may affect forestry supply chains. These include legislation and regulation on the use of forest resources, chain of responsibility regulations, the Tasmanian Freight Equalisation Scheme as well as other relevant local or state legislation.*

The key message in this section is:

Tasmanian forestry supply chains are connected domestically and international by a web of logistics flows. Therefore, although infrastructure-related decisions may appear to have local consequences, they often shape logistics flows well beyond Tasmanian boundaries. Consequently, it is key to look at alignment between infrastructure and logistics flows along the forestry supply chain to the end-customers.

The challenges discussed in this section are:

- *Most logs and wood chips are hauled by truck from harvesting sites or mills to other processing or export facilities. In most cases, there are limited opportunities to improve truck utilisation through back haulage. This is a challenge particularly for long distance trips (i.e. across the State) where trucks may often return empty.*
- *Trailer sizes particularly for log transport may be limited by the landscape in which the truck operates. Such a limitation will likely carry forward to the destination point, as it is rarely economical to re-handle logs on larger trailers.*
- *Trailer sizes or maximum capacities can also be restricted by infrastructure pinch points. Pinch points may occur due to physical limitations of infrastructure (i.e. heights, widths, weights on bridges) or due to regulatory restrictions set by national and State legislation or local council regulations.*
- *A substantial proportion of the North and North West mills' production of sawn boards or engineered wood products is subsequently transported by road and exported on board the roll-on roll-off (RoRo) services that link Tasmania to mainland Australia. This supply chain*

setup raises compatibility issues between Tasmanian and mainland states regulations, particularly with respect to allowed trailer configurations and sizes.

- *Forest and wood products destined for the domestic market are shipped by sea to Victoria under the Tasmanian Freight Equalisation Scheme (TFES) and subsequently transferred to another transport mode to their destination. The supply chain disruptions and restrictions in Victoria associated with the COVID-19 pandemic have highlighted the resilience risks of having one logistics access point to domestic mainland markets.*
- *In the case of bulk cargo exports, port related logistics costs can play an important role in the overall viability of the supply chain. Three issues appear particularly pressing:*

  1) Aligning port channel and berth depths with requirements of international customers to ensure high vessel utilisation,

  2) The efficiency of vessel loading operations due to available port infrastructure, particularly in Bell Bay and;

  3) Port congestion related both to vessels and trucks. The emergence of port congestion is a function of the interaction between supply chain participants and the capacity of available infrastructure.

  Truck congestion in Burnie port has been explored in recent research work (Neagoe, Taskhiri and Turner, 2018). The outcomes of this work highlighted that one of the most efficient ways to address congestion was by increasing visibility between supply chain actors and the port. Increased visibility can enable better supply chain coordination and can be achieved through digital platforms that facilitate information sharing. *It is less clear what impact port depth and vessel loading efficiency have on the overall supply chain.*

The opportunities discussed in this section are:

- *To ensure that existing and new road infrastructure deliver the maximum benefits for the forest industry, the transport flows on the infrastructure should be considered together with pinch points (such as load limits on bridges).*
- *The encouragement of multimodal transport. Most forest and wood products are transported in high quantities and are often not time sensitive. Especially after primary processing, wood products flow in high volumes to a limited number of destinations. Rail and high productivity vehicles can help reduce the marginal cost of transportation and limit road congestion. Rail transport in particular, may be able to circumvent road infrastructure*

pinch points and benefit from synergy with other cargoes to enhance transport efficiency. Pinch points in this context represent road capacity reductions along a transport route due to regulatory, infrastructural or other restrictions (e.g. bridge weight limits, LGAs restrictions etc).

- *Improve alignment of Tasmanian and other Australian states' truck trailer sizes. Cargo destined for the Australian mainland is often carried on roll-on roll-off (RoRo) vessels. This means that truck trailers are shipped from Tasmania to other states in Australia. If truck trailers are not compliant with the regulations of the destination or transit states, additional logistics costs are likely to be incurred. The Heavy Vehicle Productivity Plan* (NHVR, 2020) *outlines a series of approaches towards facilitating regulatory alignment across jurisdictions. This is likely to require a combination of both legislative changes and trailer size adjustments (over the long term).*
- *Improve port depth alignment through dredging with requirements of international customers for bulk cargo flows. Transport and haulage efficiency play a major role in determining the final costs of many commodity products, including forest and wood products. Ensuring a high utilisation of maritime transport assets can increase the competitiveness of Tasmanian bulk cargo exports on the international market. In this sense, one limiting factor can be the port depth (either at origin or at destination) which limits the amount of cargo that can be loaded on a vessel.*

4.2.1 ROAD

This section provides a brief description of the main road infrastructure in Tasmania and the transport flows generated by Tasmanian forestry supply chains.

The haulage flows of forest and wood products in Tasmania are one of the most significant road freight tasks of the island. The yearly road transport task of logs amounted in 2017 to approximately 4.7 million tons, of which approximately 3.7 in the North and North West regions (mostly hardwood logs), as well as a significant haulage task of wood chips, paper and newsprint and sawn boards and engineered wood products amounting to approximately 2.3 million tons. Wood chips represent the second largest component of the road transport task with approximately 1.6 million tons per year (Department of State Growth, 2017)

Log flows are generated by mills located in relative proximity to the forest coupes such as Britton Timbers and Ta Ann in Smithton, Forico Surrey Hills Timberlink, Neville Smith Forest Products, McKay Timbers Artec, BBCT and Long Reach in the surroundings of Launceston, as well as other companies scattered across the North and North-West of Tasmania. These production facilities generate significant inbound flows of logs as well as outbound flows of processed products. Apart from the Artec, BBCT and Long Reach wood chip mills which are situated on the wharf and load wood chips directly on vessels, most of the other facilities primarily use road transport for their production as well.

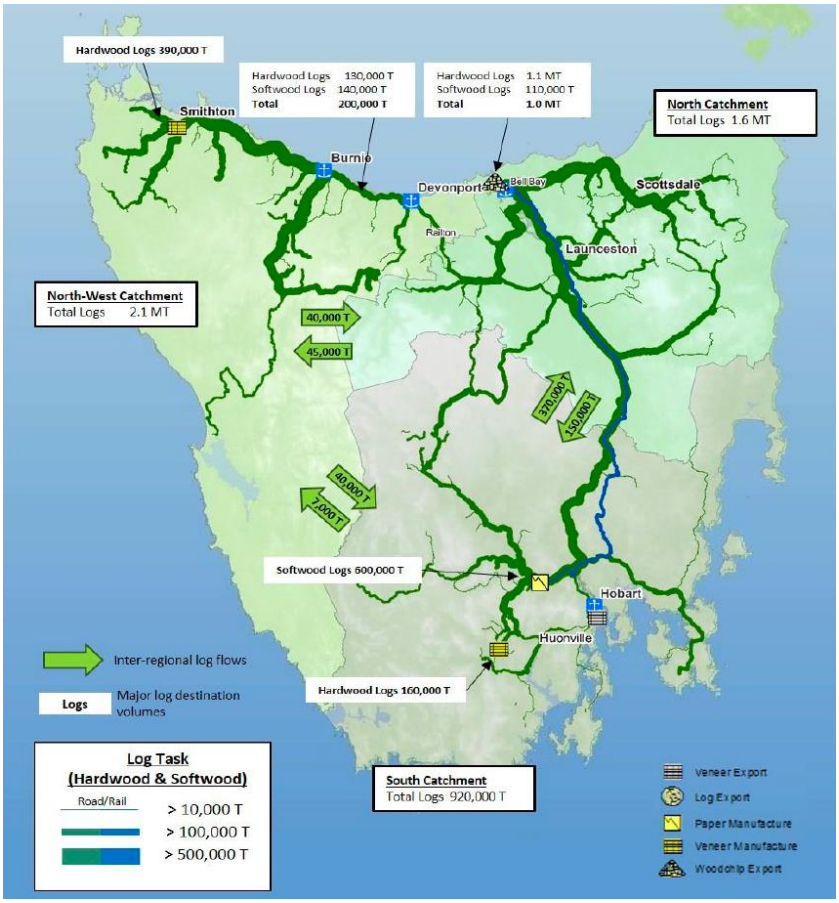

Figure 3 Tasmania's Log Transport Task in FY 2016-17

(Source: Department of State Growth, 2017)

Most log flows are generated directly from harvesting sites. The Tasmanian landscape restricts in some cases the size of the truck trailers which can be used for the transport task. Typically, the same truck will carry logs from the harvesting coupes from the mill. This means that the section of road with the highest levels of restrictions will determine the restrictions of the transport

flows from a particular area. The implications and considerations of this issue are discussed further in Section 4.2.4.

A substantial proportion of the North and North West mills' production of sawn boards or engineered wood products is subsequently transported by road and exported on board the roll-on roll-off (RoRo) services that link Tasmania to mainland Australia (detailed in section 4.2.1). This supply chain setup raises compatibility issues between Tasmanian and mainland states regulations, particularly with respect to allowed trailer configurations and sizes.

The forest and wood products road transport task is highly dependent on the level of forest harvesting and the level of wood products manufacturing. It is anticipated to continue to grow in the coming years. Therefore, to ensure that existing and new road infrastructure deliver the maximum benefits for the forest industry, the transport flow on effects on the infrastructure should be considered together with pinch points (such as load limits on bridges).

4.2.2 RAIL TRANSPORT

This section provides a brief description of the main rail infrastructure in Tasmania and the rail transport services used by Tasmanian forestry supply chains.

The Tasmanian Rail Corporation (TasRail) is a government business enterprise (GBE) which operates and manages both the rail infrastructure and the rail services. The rail infrastructure used by forestry supply chains spans approximately 480 km, from Boyer to Burnie and Bell Bay through the Brighton Inter-modal Terminal. TasRail provides a regular rail shuttle from Boyer to Burnie for transporting approximately 350,000 tons of paper from the Norske Skog mill as well as 6 services/week from the Brighton Inter-modal Terminal to Bell Bay which transports close to 118,000 tons of logs/year (TasRail, 2019).

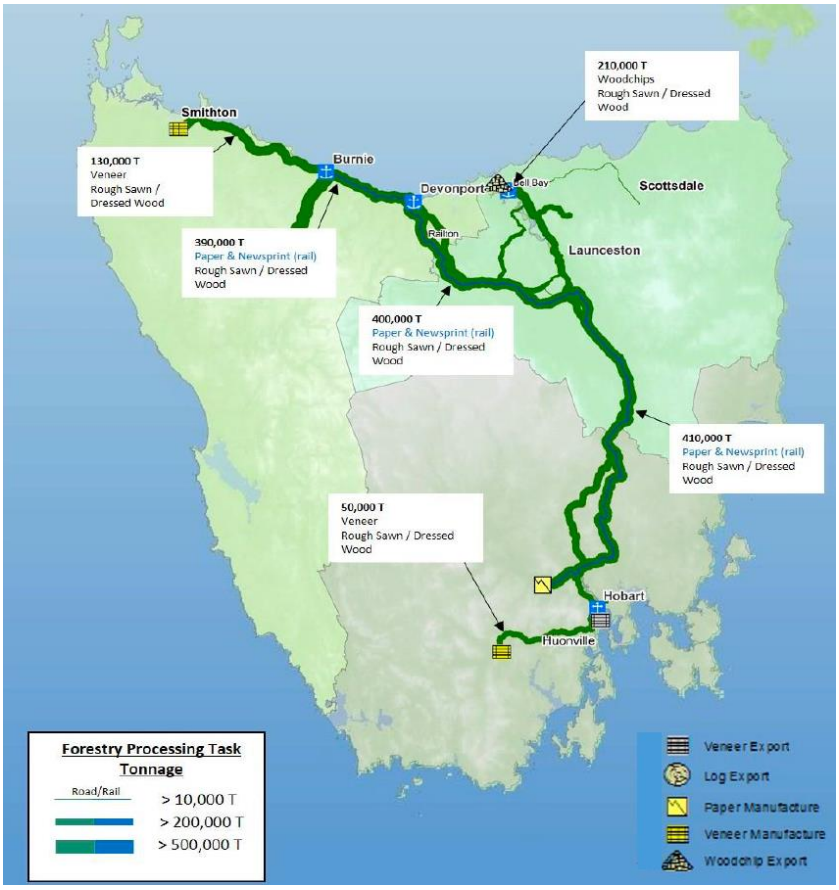

Figure 4 Tasmania's Forest Products Rail Transport Task in FY 2016-17

(Source: Department of State Growth, 2017)

TasRail's rail transport services for logs use log-tainers. Log-tainers are dual-purpose units which can carry both logs and inter-modal containers. This provides an opportunity to improve the utilisation or rail transport equipment and consequently to reduce transport costs. Rail transport typically produces less green-house gases when compared to other land transport modes. Nonetheless, the prevalence of rail transport use in the future is highly dependent on the extent to which the services are aligned with the expectations and needs of the forestry supply chains stakeholders.

4.2.3 PORTS AND MARITIME TRANSPORT

This section explores the main port infrastructure in Tasmania used by forestry supply chains as well as some of the scheduled maritime transport links which operate from these ports and which can be used to transport forest and wood products.

The main maritime infrastructure that connects Tasmania to mainland Australia and internationally consists of five ports: Burnie, Bell Bay, Long Reach, Devonport, and Hobart, all operated by the Tasmanian Ports Corporation (TasPorts), a government business enterprise (GBE).

Burnie port has three berths with operations and services relevant to forestry supply chains:

- No.4 Berth that hosts Toll Shipping 6 day/week roll-on roll-off (RoRo) service to Melbourne Webb Dock. The Toll shipping service was upgraded in 2019 to carry 40% more cargo (approximately 700 twenty-foot equivalent (TEU) capacity, 70 trailers and 70 cars up from 500 TEU, 25 trailers and 40 cars, FreightWaves, 2019).
- No. 6 and No. 7 Berths are used for log vessel loading. No.7 Berth is also connected which the Burnie Chip Export Terminal (BCET) and is equipped with a mobile woodchip loader with a loading capacity of 1,200 tonnes per hour. Vessels from international woodchip customers use this berth.

The BCET is operated by TasPorts and is located next to No. 7 Berth and features 3 stockpiles which are connected to two truck unloaders. The stockpiles provide storage for several types of woodchips (native and plantation) for several customers.
Recent work in relation to port congestion at Burnie port and specifically at the BCET was completed by the eLogistics Research Group in collaboration with TasPorts and major forestry supply chain stakeholders (Neagoe, Taskhiri and Turner, 2018). The outcomes of this work highlighted that one of the most efficient ways to address congestion was by increasing visibility between supply chain actors and the port. Increased visibility can enable better supply chain coordination and can be achieved through digital platforms that facilitate information sharing. Importantly however, to increase the impact of digital platforms and information sharing, and education component on how to integrate information in decision-making is critical. It is likely that, potentially to a lesser extent, these outcomes of the work in relation to BCET can be applicable to other ports in the North and North-West of Tasmania.

The water depth alongside the No. 7 Berth has reportedly decreased in recent years from 11.5 to 11.2 meters. This may in some cases limit international customers' vessel utilisation and therefore increase logistics costs. TasPorts' recently released "Burnie Export Gateway" document

details significant plans for dredging work in Burnie port (TasPorts, 2020). It is yet unclear whether these plans will include dredging work for No.7 Berth. Furthermore, the extent to which the lower-than-expected water depth affects forestry supply chain stakeholders and the impact of increasing No.7 Berth depth alongside to 11.5 meters is also unclear.

A log storage yard near the Burnie berths for the bulk export of logs is also in operation. In the FY 2017-18 approximately 566,000 tonnes have been exported from Burnie (TasPorts, 2019).

Bell Bay has several berths with operations and services relevant to forestry supply chains:

- No. 5 Berth which serves the lift-on lift-off (LoLo) MSC operated container shipping service Noumea Express (the service calls Bell Bay and the main Australian and New Zealand ports on a weekly with vessels of approximately 1,500 TEU capacity. MSC offers a transhipment office through Sydney for international cargo).
- No. 6 Berth which serves the Artec and Bell Bay Chip Terminal (BBCT) wood chip mills is equipped with a fixed woodchip loader. The woodchip loader is fed through a conveyor system which connects directly from the two mills.
- No. 7 Berth is expected to be used as part of Midway's new wood fibre processing facility starting from 2021 (Kelly, 2020).

The efficiency of vessel loading operations due to the existing port infrastructure has been questioned. The wood chip loader in Bell Bay is fixed, meaning that the ship has to be moved alongside the berth to reach each hatch. Loading is suspended during vessel movements, which increases the overall time a vessel spends on berth.

The Bell Bay Advanced Manufacturing Zone (BBAMZ) is in close proximity to the port and offers space for industrial developments. Timberlink and the BBCT are two of the organisations that operate in this zone.

Long Reach currently operates one forestry related berth:

- Long Reach South Berth serves the Forico Long Reach wood chip mill and is also equipped with a fixed woodchip loader.

Devonport also provides services relevant to forestry supply chains:

- No. 1 Berth East hosts the TT-Line operated Spirit of Tasmania daily service which provides passenger and freight transport services and links Tasmania to Victoria. TT-Line has recently announced their move to the Coorio Quay in North Geelong from the Station Pier in Port Melbourne (TT-Lines, 2020)
- No. 2 Berth East hosts Searoad Shipping's daily shipping service to Melbourne. The uses two vessels that can carry up to 455 and 265 TEU respectively.

Although outside the Hub boundary, it is important to note the existence of port infrastructure in the south of Tasmania. The port of Hobart is home to the Southern Export Terminal (SET), a joint venture between TasPorts and Qube which manages the whole wharf export process on behalf of the timber sellers. SET experienced a significant growth in throughput during 2018-19, with exports amounting to over 220,000 tonnes of bulk logs (TasPorts, 2019). Anecdotally, throughput has increased as a result of the log export suspension in New Zealand due supply chain restrictions associated to the COVID-19 pandemic.

4.2.4 LOGISTICS FLOWS AND TRANSPORT MODES INTEGRATION

This section briefly covers aspects on the integration between local, domestic, and international logistics flows, inter-modality, and collaborative transport management.

Although the main focus of this report is on forestry supply chains operating in the North and North-West of Tasmania, it is important to recognise that many of these supply chains continue either on the Australian mainland or internationally. Therefore, issues that may arise when the broader supply chain is considered. In the context of infrastructure and logistics three potential issues may arise:

- The alignment of scheduled transport services (primarily rail and sea) with the location and the requirements of key customers and consumers. Rail and sea transport are typically more cost effective over long distances but entail inter-modal handling costs. Therefore, ensuring that the most effective transport method is used for the largest proportion of the trip and limiting the number of times cargo is handled can improve the cost competitiveness of logistics

- The alignment of Tasmanian and other Australian states' standards truck trailer sizes. Cargo that is destined for the Australian mainland is often carried on RoRo vessels. This means that the truck trailer is transported to other states in Australia. If truck trailers are not compliant with the regulations of the destination or transit states, additional logistics costs are likely to be incurred. The Heavy Vehicle Productivity Plan (NHVR, 2020) outlines a series of approaches towards facilitating regulatory alignment across jurisdictions.
- For cargo exported internationally, the alignment between the inter-modal units or containers in which the cargo is transported domestically and internationally is also an aspect that may add to logistics costs.

The utilisation of transport equipment is one of the key determinants of logistics costs. Often, increased utilisation results in a decreased marginal transport cost. Trucks transporting forest and wood products (such as logs, wood chips etc) often run full on the head haul but empty on the back haul (return trip). Researchers have highlighted that better utilisation of transport equipment can be reached through various techniques including optimisation and collaborative allocation (Zazgornik, Gronalt and Hirsch, 2012; Malladi and Sowlati, 2017).

Several, mainly digitally driven, initiatives to increase the utilisation of transport equipment have also been implemented in Australian forestry supply chains. Such initiatives include the introduction of electronic docket systems (e.g. ForestCorp NSW) as well as centralized dispatch. Theoretically, significant efficiency benefits could be obtained. Anecdotally, some initiatives have generated benefits but have also faced several issues. The lack of publicly available evaluation studies and performance indicators creates some challenges in understanding the real impact of existing approaches to improve transport equipment utilization.

4.2.5 LEGISLATIVE AND REGULATORY LANDSCAPE

This section covers aspects pertaining to legislation and regulations at a national, regional, and local level which may affect forestry supply chains. These include legislation and regulation on the use of forest resources, Chain of Responsibility regulation, the Tasmanian Freight Equalisation Scheme as well as other relevant local or state legislation.

4.2.5.1 Forest Practices System

This section provides an overview of the forest practices system used in Tasmania and some of the requirements this system entails on entities operating in forestry supply chains.

The forest practices system was set up by the Tasmanian Parliament through the Forest Practices Act 1985 and regulates forest practices such as: harvesting of native, plantation forests and tree ferns, clearing and converting forests, construction of roads and quarries in forest areas. The forest practices system combines self-management by industry with monitoring and enforcement by the Forest Practices Authority (FPA). The FPA is the statutory body responsible for administering the forest practices system and also issues, maintains and reviews the Forest Practices Code (FPA, 2020).

Forest practices plans (FPPs) are one part of the forest practices system. FPPs are required for the majority of forest practices undertaken on private and public land. The FPPs should be prepared in accordance to the Forest Practices Code, The Tasmanian Regional Forest Agreement (RFA) as well as other legislation. FPPs detail operational area, transport and access routes, landings as well as areas retained for conservation. FPPs include prescriptions for protection of natural and cultural values, planned harvest systems, and reforestation (FPA, 2020).

Organisation which harvest more than 100,000 tonnes of wood per year must also provide a three-year plan detailing the planned forest practices. These plans include information on the locations where harvesting is planned, estimated harvesting volumes, transport routes and reforestation measures (FPA, 2020).

4.2.5.2 Third-Party Forest Management Certification

Forest owners wanting to access many international markets are required to provide third party certification of forest management and of supply chain. Third party certification adds costs and is an additional requirement to the FPPs. These additional costs may act as a deterrent to smaller landowners to access international markets.

4.2.5.3 National Heavy Vehicle Law (NHVL) and Chain of Responsibility (CoR)

This section briefly discusses the National Heavy Vehicle Law and Chain of Responsibility regulations.

The National Heavy Vehicle Law (NHVL) is in force in Tasmania as well as other Australian states: Queensland, New South Wales, Victoria, South Australia, and Australian Capital Territory. The NHVL consists of four major sets of regulations: (1) General, (2) Fatigue Management, (3) Mass, Dimension and Loading and (4) Vehicle Standards.

Operating in conjunction with the NHVL is the Chain of Responsibility (CoR) law that aims to share responsibility for compliance and breaches of the NHVL across the supply chain. Companies and individuals operating in supply chains that are named as parties in the chain of responsibility with exercise of control and influence over transport tasks are therefore responsible for ensuring compliance with NHVL.

4.2.5.4 Tasmanian Freight Equalisation Scheme (TFES)

This section provides a brief description of the Tasmanian Freight Equalisation Scheme (TFES) and its role in supporting and directing the flows of containerized goods.

The Tasmanian Freight Equalisation Scheme (TFES) is an Australian Government-funded freight scheme provided which was introduced in 1976. The scheme aims to compensate Tasmanian shipper for the higher cost of shipping across the Bass Strait when compared to the equivalent distance on road and consequently provide a level-playing field for Tasmanians with other Australian producers (Department of State Growth, 2019a).

In its current form, the TFES covers both eligible Northbound goods (exports) and Southbound goods (imports). Eligible Northbound goods must be manufactured in Tasmania for permanent use of sale on the Australian mainland. Eligible Southbound goods must be a raw material/equipment used in a production process or having undergone some manufacturing on the Australian mainland. Both types of goods (Northbound and Southbound) must be transported across the Bass Strait as non-bulk cargo and must incur a freight disadvantage (Services Australia, 2020).

The maximum amount of assistance payable for goods shipped to mainland Australia is $855 per TEU. The maximum amount of assistance payable for goods transhipped is $700 per TEU (Services Australia, 2020). The TFES assistance in Q1 2020 amounted to 41,5 million AUD, parts of which were provided to companies operating in the forestry supply chain such as Norske Skog and Timberlink Australia (DITRDC, 2020).

4.2.5.5 Local and State Legislation

This section briefly covers other relevant local and state legislation that may affect Tasmanian forestry supply chains.

In some cases, local council legislation may impose limits on log and wood chip truck access on certain roads.

Softwood log fumigation treatments using methyl bromide cannot be performed in Tasmania, meaning that log vessels are required to make a stop en-route to their destination to apply the fumigation treatment.

4.3 DOMESTIC AND INTERNATIONAL SUPPLY AND DEMAND

This section examines the domestic and international supply and demand of forest and wood products.

The key message in this section is:

Conventionally, forest and wood products supply chains are analysed from a supply and production perspective. However, the COVID-19 pandemic has highlighted that the global span and interdependence of modern supply chains means that significant emphasis should also be placed on the consumption of products. A large proportion of forest and wood products exported from Australia serve as inputs in manufacturing processes for other goods such as paper and packaging products, joinery, construction or energy generation, making the trends in these sectors and markets important inputs in the contextual analysis of the forest and wood products supply chains.

The key challenges highlighted in this section are:

- *It is unclear to what extent the plantation stock expansion under the National Forest Industries Plan will offset the competing drivers leading to the conversion of plantation land to other uses. Domestic supply of plantation is subject to two opposing forces: on the one hand, plantation supply is likely to significantly expand under the National Forest Industries Plan. On the other hand, plantations represent a relatively long-term investment subject to return uncertainties which may act as a deterrent for re-planting.*
- *The supply of native timber for harvesting, managed by Sustainable Timber Tasmania (STT), was subject to contraction from legislative changes, the 2019-20 bushfires and pressures from environmental groups. STT's yield modelling suggests that in order to fulfil the required 137,000 m3 of saw log required by the hardwood mills, a combination of plantation and native resource will be harvested.*
- *Most timber products, with some exceptions of niche and specialty timber products, are regarded by end-users as commodity products and are therefore price sensitive. Value extraction (whole tree utilisation, adequate grading of logs) from forest resources therefore becomes critical to generating viable economic returns.*
- *Domestic demand can be fulfilled not only by local but also by import products. Import products typically contain a smaller labour costs component therefore increasing the competition and price pressures.*
- *Close to 90% of Australian log exports are destined for ports located in China. The high dependence of Australian log exporters on industrial consumers located in China is likely mirrored by Tasmanian exporters. Australian wood chip exports are slightly less focused on industrial consumers located in China. Nonetheless, close to 85% of Tasmanian wood chip exports were destined for Chinese ports. In the context of global supply chain and travel restrictions associated with the COVID-19 pandemic, this level of dependence can be detrimental to the resilience of Tasmanian forestry supply chains and particularly to their flexibility.*
- *One of the main uses for pulp logs or wood chips is in the manufacturing of paper and packaging products. Paper and cardboard demand are subject to two opposing forces which originate from a similar source, digitisation: on the one hand, digitisation increase means that demand for newsprint decreases as more news is accessible online. On the other hand, the increase in online shopping has led to an increase in the demand for*

packaging products. Globally, the consumption of newsprint declined by 30% between 2012 and 2016 (from 31 to 24 million tons) and the demand for paper declined by approximately 6% in the same period. Conversely, the demand for cardboard in the same period has increased by 10% (from 214 to 235 million tons) (FAO, 2019a). It is unclear what the net impact of the interaction of these two forces will be. However, the net impact will likely impact the demand for logs and wood chips.

- *Forest and wood products are frequently used in construction of residential housing as well as in joinery, floorboards and other applications. The demand for residential housing will likely play a significant role in the demand for forest and wood products, mainly timber framing and engineered wood products. The forecasted contraction of the housing market partially associated with the COVID-19 pandemic is likely to negatively impact both the demand for timber framing, particleboard and MDF boards.*
- *Timber framing for residential construction is competing with other building materials, mainly concrete, steel and masonry. It is likely that the extent to which timber will be preferred over other building materials in residential construction is dependent on the construction costs, convenience of use as well as material quality.*
- *Across Australia, two thirds of the demand for particleboard and medium-density fibre (MDF) boards comes from activities associated with housing construction and renovations. This entails a high level of dependence with the domestic housing market.*

The opportunities discussed in this section are:

- *Forest harvesting residues are a source of raw material which has not been extensively utilised in Tasmania nor in mainland Australia. Nonetheless, a significant amount of residues may be potentially added to forestry existing supply chains.*
- *The 2019-20 bushfires affected a quarter of NSW plantation estate and one third of SA's plantation estate. The resulting gap in Australian supply may entail an increase in demand for Tasmanian forest resource supply.*
- *The macro trend of increased focus on sustainability and the bioeconomy has also brought with it renewed interest in additional uses for wood products and residues. Consequently, opportunities for value-add and product differentiation can emerge from engineered wood products and bioenergy generation.*

- *The COVID-19 pandemic and associated supply chain disruption have brought to the spotlight the idea of sovereign manufacturing capacity, a reduced dependence on international exports of raw materials and an increase in value-adding activities. The forest industry has already noted several opportunities that can drive this vision forward. The current report's intention is to build on those opportunities.*

4.3.1 FOREST RESOURCE SUPPLY

The local and domestic plantation stock as well as the resulting products emerging from harvesting operations are examined in this section.

4.3.1.1 Hardwood and Softwood Plantations

The domestic supply of plantation timber is primarily affected by two major forces: on the one hand, the recent Commonwealth push for increasing Australia's plantation inventory in an effort to increase its bioeconomy and sustainability. On the other hand, the economic imperatives driving land-use are generating competition between plantation (re)establishment and other land uses and are currently leading to a decline in the total plantation inventory.

The National Forest Industries Plan has outlined the need to increase the plantation inventory by approximately 400,000 hectares of new plantations over the next 10 years to meet Australia's demand for wood, in addition to current replanting (Australian Government - Department of Agriculture, 2018). This would equate to an increase of approximately 20% of the Australian plantation inventory.

Currently, the Australian plantation inventory stands at approximately 1.9 million hectares of plantations (see Table 2). Tasmania's plantation area stands at 309,000 hectares, with 240,000 hectares of hardwood plantations (the second largest area after Western Australia) and 76,000 hectares of softwood plantations.

Table 2 Australian Plantation Inventory
(adapted from Downham and Gavran, 2020)

Plantation Inventory ('000 ha)	2008-09	2013-14	2017-18	2018-19
Hardwood	991	963	896	884
Softwood	1,020	1,024	1,037	1,040
Australia Total	2,020	1,999	1,943	1,933

The new plantation areas in Australia, and Tasmania in particular, have been largely stagnant and slowly declining. In Tasmania, new plantation establishment has been extremely limited. In 2018-19, across Australia, more than 14,000 hectares of plantations have been removed, the majority of which from hardwood plantations. Plantation growers and managers have estimated that an additional 4,500 hectares of hardwood and 3,100 hectares of softwood plantations will be converted to other uses in 2020-21 (Downham and Gavran, 2020).

Table 3 Australian and Tasmanian Replanting in 2018-19
(Source: Downham and Gavran, 2020)

Plantation Replanting in 2018-19 ('000ha)	Hardwood	Softwood	Total
Tasmania	7	3.4	10.5
Australia Total	24.6	33.9	58.5

Approximately 58,500 hectares of plantations are replanted every year in Australia. In Tasmania, more than 10,000 hectares have been replanted in 2018-19, 67% of hardwood and 33% of softwood (see Table 3).

Overall, it is unclear to what extent the plantation stock expansion encouraged by the National Forest Industries Plan will offset the existing drivers leading to the conversion of plantation land to other uses.

4.3.1.2 Native Hardwood

Sustainable Timber Tasmania (STT) manages 812,000 hectares as a Permanent Timber Production Zone (PTPZ) dedicated to supplying the local demand for timber. Approximately 46% of the PTPZ comprises of native forests available for wood production and approximately 14% comprise of softwood and hardwood plantations managed by STT or other organisations. The native forest component of the PTPZ has decreased with the implementation of several iterations of the 1997 Regional Forest Agreement, the 2005 Tasmanian Community Forest Agreement, the 2013 Tasmanian Forest Agreement and the extension to the Tasmanian Wilderness World Heritage Area in 2013 as well as other legislative changes (ABARES, 2018). STT must make a minimum of 137,000 m3 of high-quality eucalypt saw logs available to the

industry. STT's yield modelling suggests that it will have the capacity to deliver this amount over the next 90 years from a mixture of native and plantation eucalypt (Sustainable Timber Tasmania, 2017).

STT harvested 5,984 ha of native forest in FY2018-19 and delivered more than 116,000 m3 of saw logs to local sawmills (Sustainable Timber Tasmania, 2019). STT forecasts it will deliver approximately 125,000 m3 of high-quality saw logs in FY2020-2021 along with 172,400 tons of peeler logs, close to 1.2 million tons of pulp logs and other products (Sustainable Timber Tasmania, 2020).

4.3.1.3 Bushfires Impacts on Forest Resource Supply

The 2019-20 bushfires had a negative impact on the availability of native resource in Australia and in Tasmania. Plantation estates in Australia were affected, primarily in NSW and SA. It is possible that the decline in the Australian plantation supply may entail an increase in demand for Tasmanian plantation resources.

The 2019-20 bushfires affected a large proportion of the Australian forest resource supply. Across Australia, approximately 8.5 million hectares of forest were burnt, including 8.3 million hectares of native forest and 130,000 hectares of plantations. Close to 2 million hectares of burnt native forest were designated as multiple use forest and included significant areas designated for harvesting. The burnt plantations estate includes 71,000 hectares of softwood plantations (1/4 of NSW estate), and 33,000 hectares of hardwood plantations (1/3 of SA estate and ¼ of NSW estate).

In Tasmania, approximately 37,000 ha of forest were affected from the PTPZ, the majority of which in the Huon region (approximately 27,000 ha). Bushfires also affected the Southwood Processing Site, leading to several months of operational suspension at the Neville Smith Forest Products and Ta Ann Tasmania mills (Sustainable Timber Tasmania, 2019).

4.3.2 FOREST PRODUCTS SUPPLY

The supply of wood products resulting from harvesting operations can be broadly classified based on the types of major uses for the product: saw and veneer logs, pulp logs and residues. In this sense the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) classifies wood products in two major uses: saw and veneer logs, and pulp logs. Table 4 summarises the Tasmanian harvested log volumes between 2014 and 2018. Across most years pulp log volumes have increased substantially. In comparison, saw and veneer log volumes have seen a moderate growth. Nonetheless, the growth in hardwood plantation volumes for saw and veneer logs is notable with the latest available figures at almost double than hardwood native.

At the Australian level (Table 5) harvested volumes have increased moderately over the past 4 years, with the greatest increase attributable to the growth in pulp logs from hardwood and softwood plantations (approximately 25% from 2014 for hardwood and 29% for softwood).

Table 4 Volumes of Logs Harvested in Tasmania in 2017-18
(adapted from ABARES, 2019)

Logs Harvested in Tasmania ('000 m^3)	Log Type	2014–15	2015–16	2016–17	2017–18
Hardwood Native	Saw & veneer logs	318	383	365	357
	Pulp Logs	760	754	835	896
Hardwood Plantation	Saw & veneer logs	37	68	364	643
	Pulp Logs	1,253	1,956	2,274	2,371
Softwood Plantation	Saw & veneer logs	580	572	715	776
	Pulp Logs	502	553	696	738
Total Tasmania	Saw & veneer logs	935	1,023	1,445	1,776
	Pulp Logs	2,514	3,264	3,805	4,005

Harvesting operations also result in significant amounts of harvesting residues, in addition to harvest production destined for the woodchip market. These residues are currently underutilised across Australia. In most cases, the residues are left on-site after harvesting or burned.

Table 5 Volumes of Logs Harvested in Australia in 2017-18
(adapted from ABARES, 2019)

Logs Harvested in Australia ('000m^3)	Log Type	2014–15	2015–16	2016–17	2017–18
Hardwood Native	Saw & veneer logs	1,786	1,968	2,012	1,873
	Pulp Logs	1,906	1,835	1,965	2,038
Hardwood Plantation	Saw & veneer logs	269	187	478	810
	Pulp Logs	8,190	9,590	10,878	10,452
Softwood Plantation	Saw & veneer logs	9,709	10,155	10,856	10,840
	Pulp Logs	4,900	5,858	6,517	6,347
Total Australia	Saw & veneer logs	11,765	12,310	13,346	13,523
	Pulp Logs	14,996	17,283	19,361	18,836

In Tasmania, it is estimated that between 600-950,000 tonnes of residue are produced every year, most of which are not recovered following harvesting (Paul, 2015). However, work undertaken in the past years has highlighted the potential for harvest residues to be used in engineered wood products and bioenergy production (Paul, 2016).

4.3.3 DEMAND FOR FOREST AND WOOD PRODUCTS

This section first explores the key international export markets for logs and wood chips. As a significant proportion of wood chips and log exports serve as inputs in paper and packaging products production and bioenergy generation these markets are examined next. Finally, the domestic construction and joinery markets which use sawn boards and engineered wood products are discussed.

4.3.3.1 Key Log and Wood Chip Export Markets

This section briefly discusses the log and wood chip exports from the main Tasmanian and Australian ports.

A large proportion of Tasmanian and Australian forestry supply chains are export driven, with logs and wood chips being the primary export products.

Table 6 2018-June 2020 Log Exports from Australia to Main Destinations
(Source Industry Edge/ABS)

Log Exports per Year ('000 m3)	China	Korea	Malaysia	Vietnam	India	New Zealand
2018	3,936	22	209	9	3	5
2019	4,359	3	132	17	2	3
June 2020	1,133	34	31	14	4	2

Close to 90% of Australian log exports are destined for ports located in China. China's imports increased by approximately 10% from 2018 to 2019. In 2020 however, China's imports have dropped significantly (even when considering only the first half of the year). This was likely due to a drop-in demand due to the Chinese New Year, factory closures and subsequent production slowdown due to the COVID-19 response.

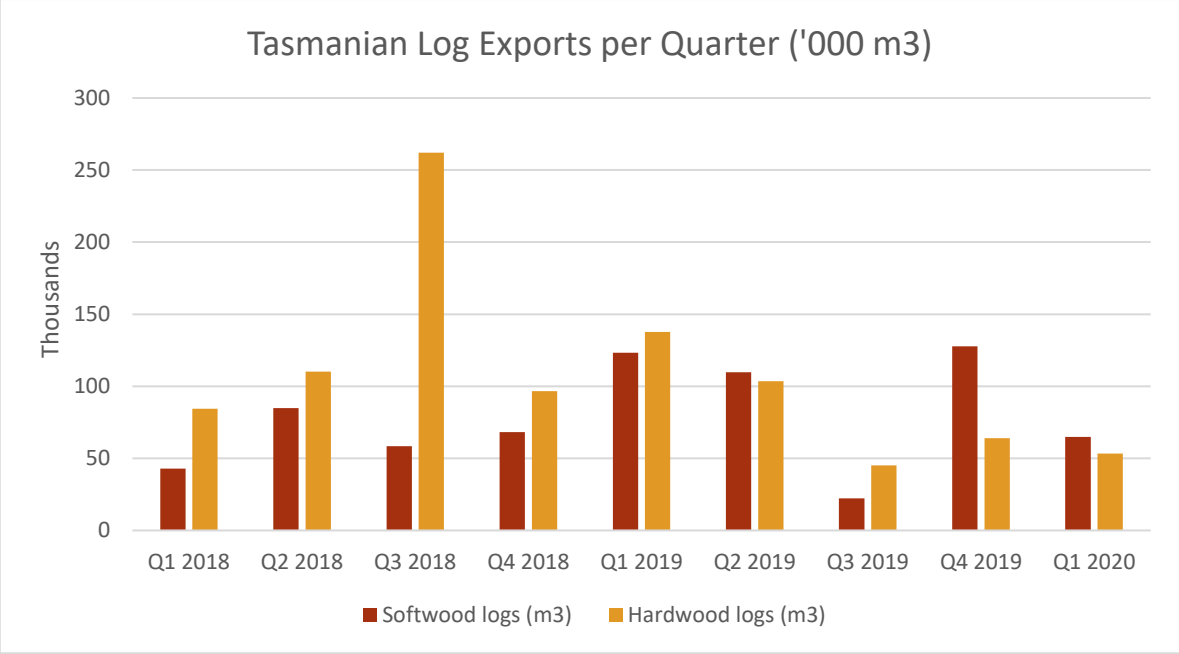

Figure 5 Tasmanian Log Exports per Quarter Q1 2018- Q1 2020
(Source Industry Edge/ABS)

Tasmania exported in Q1 of 2020 close to 120,000 m3 of logs almost evenly balanced between hardwood and softwood (see Figure 5). This value is similar to that in Q1, 2018 but is approximately 45% of that in Q1, 2019. Although not capture in this dataset, anecdotal evidence suggests that log exports from Tasmania have significantly increased as a result of New Zealand's response to COVID-19.

Australian wood chip exports amounted to 2.2 million bone-dry metric tons (BDMT) in the first half of 2020 (see Table 7). Victoria, through the ports of Portland and Geelong were the largest wood chip exporting state with 800,000 BDMT while Tasmania was the second largest Australian exporter with 789,000 BDMT. In 2019, Australian wood chip exports reached close to 6 million BDMT. Victoria was the largest exporter in 2019 with 2 million BDMT and Tasmania was once more the second largest with more than 1.75 million BDMT.

A significant proportion of wood chips and log exports serve as inputs in paper and packaging products production and bioenergy generation.

Table 7 June 2020 Woodchip Exports from Australian Ports to Main Destinations
(Source Industry Edge/ABS)

June 2020 Woodchip Exports (BDMT)		China	Japan	Korea	Taiwan	Total/Port
TAS	Bell Bay	312,569	28,738		28,838	370,145
	Burnie	372,614			46,318	418,932
WA	Albany	95,884	86,416			182,300
	Bunbury	104,833	153,275	46,548		304,656
VIC	Portland	228,921	356,149			585,070
	Geelong	84,549	102,216	28,912		215,677
QLD	Brisbane	46,286	23,139			69,425
NSW	Eden				23,139	23,139
	Newcastle	25,849				25,849
Total		1,271,505	749,933	75,460	98,295	2,195,193

In terms of the major importers of Australian wood chips, in the first half of 2020, China was the largest importer with approximately half of the imports. Japan was second with close to a third of the volumes. Taiwan and Korea jointly represented approximately 8% of the total exports. The distribution of volumes in 2019 was similar to that of 2020 in terms of main importing countries. More than 85% of Tasmanian wood chip exports in 2020 were delivered to customers located in China. In 2019 volumes traded with China from Tasmanian ports amounted to approximately 70% of the two ports' throughputs, while Japan and Taiwan each amounted to close to 15% of throughput (see Appendix C for additional details).

4.3.3.2 Paper and Packaging Products

This section provides a brief overview of the paper and packaging products production levels at an international level and the size of the Australian and Tasmanian contributions to this market.

Across the world, 355 million tons of paper and packaging products were produced in 2018. China was the largest producer of paper and packaging products with more than 104 million tons per year produced in 2018, of which approximately 24 million tons of writing paper and 63 million tons of wrapping and packaging products. The United States produced approximately 72 million tons, of which 12 million tons of writing paper and over 58 million tons of packaging products. Japan produced 26 million tons of paper and paperboard products of which close to 8 million tons of writing paper and more than 12 million tons of packaging products. South Korea produced 11 million tons of paper and packaging products of which 3 million tons of writing paper and 8 million tons of packaging products (FAO, 2019b). In 2018, Australia produced approximately 3.2 million tons of paper and paperboard products, of which approximately 318,000 tons of newsprint, 456,000 of writing paper and 2.2 million tons of wrapping and packaging products (FAO, 2019b). Tasmania contributed to the production of paper and packaging products through the Boyer mill operated by Norske Skog.

4.3.3.3 Bioenergy Products

This section provides a summary of the existing international markets for bioenergy, primarily in the shape of wood pellets, as well as the domestic outlook for the use and development of bioenergy products

Wood pellets are currently one of the ways in which bioenergy can be generated. In the Asia-Pacific region, two of the largest users of wood pellets are Japan and Korea which together consumed approximately 4 million tons in 2017. Together, both countries produced over 1 million tons of pellets and imported from Australia, China, Indonesia, Malaysia and Vietnam (FAO, 2019a). Estimates suggest that the demand for wood pellets is expected to increase, particularly in Japan and Korea, driven by the clean-energy policies of the two countries (FAO, 2019a).

Australia produces under 100,000 tons of wood pellets per year. Tasmania has a relatively small local wood pellet market, however there is significant interest in processing harvesting residues for wood pellet production. (Thran, Peetz and Schaubach, 2017).

Several opportunities for expanding the production and generation of bioenergy in Tasmania, not just for export but also for domestic consumption are being explored such as using harvesting residue and feedstock for energy generation (heating, power and/or cooling) as well as the production of transport fuels and bio-oils.

4.3.3.4 Residential Construction and Joinery

This section reports briefly on the domestic construction and joinery sectors as two of the primary uses for sawn boards and engineered wood products.

Construction and joinery represent two large domestic demand segments. Construction, particularly of residential buildings is one of the major consumers of sawn timber. Joinery relies primarily on engineered wood products such as particleboards and medium-density fibre (MDF).

The residential construction sector is a large consumer of forest and wood products and primarily of sawn timber. Across Australia, in Q1, 2020, more than 45,000 approvals were given for residential dwelling construction. Close to 30,000 of the approvals were provided in VIC and NSW. Tasmanian dwelling approvals amounted to 778 in the same period, or approximately 1.7% of the residential market (ABS, 2020).

In May 2020, the Master Builders' Association of Tasmania published revised forecasts stating that approximately one quarter of the expected housing construction commencements were not expected to proceed due to the COVID-19 impact and highlighted the need for an intervention to support residential construction (MBAT, 2020). The expectation of decreasing residential construction across Australia was also highlighted by a recent analysis of the Department of Agriculture, Water and the Environment (Whittle, 2020). The Australian Government has subsequently released the Home Builder grants of up to AUD 25,000 for owner-occupiers to build new homes or renovate existing homes to support the residential construction market (Australian Government - Treasury, 2020). The extent to which the newly introduced market

support measures will offset the impact of COVID-19 related socio-economic challenges is however yet to be determined.

Timber framing is also under competition with other building materials. A 2018 study surveyed approximately 330 members of the Housing Industry Association (HIA) across Australia (Australian Construction Insights, 2018). The study results indicated that, although timber remained one of the preferred materials for building houses, the respondents' preferences had slightly drifted away from timber structures for detached houses and class 1 attached dwellings (e.g. semi-detached, townhouses). Timber construction preferences for class 2 dwellings (3 stories or less) had however shifted more significantly away from timber. The competing materials with timber are primarily be concrete, steel and masonry.

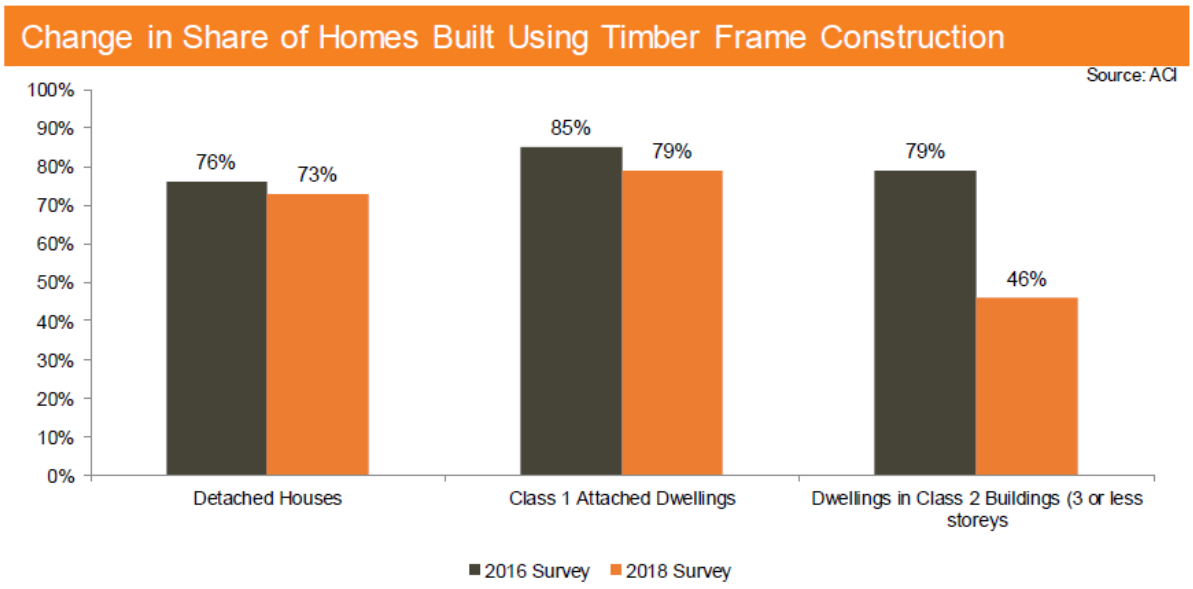

Figure 6 Share of Homes Built Using Timber Frames
(Source: Australian Construction Insights, 2018)

It is likely that the extent to which timber will be preferred over other building materials in residential construction is dependent on the construction costs, convenience of use as well as material quality. At the same time, there is also an element of habitude of builders and architects with certain materials which may lead to a certain degree of inertia in terms of building material choices. The interaction of these factors will determine the extent of the demand for wood products in residential construction.

Table 8 Australian Consumption of Particleboard and MDF in 2016 and use for Residential Joinery

(Adapted from Industry Edge, 2017 estimates)

Wood Product Type	Domestic Production ('000 m3)	Imports ('000 m3)	Total Australian Consumption ('000 m3)
Particleboard	986	84 [a]	1,070
MDF	535	119 [b]	654
Total	1,521	202	1,724

[a] majority from China and Malaysia

[b] majority from New Zealand and the European Union

[c] estimates

When building with timber, wall elements such as frames and trusses were in some case constructed either on/off site. This is particularly the case in Tasmania but also prevalent in other states such as Victoria and South Australia. Such practices would likely entail significant amounts of manual labour input and is unlikely to benefit from economies of scale in production.

While the majority of MDF and particleboard production is catered for with domestic production – approximately 92% for particleboards and 80% for MDF, there remainder was supplied using imports. The vast majority of imports of particleboards originated from China and Malaysia while a significant proportion of MDF imports originated from New Zealand and countries in the European Union. It is unlikely that this proportion has shifted in favour towards domestic production in subsequent years and it is expected that the share of imports will have stayed at similar levels or potentially increased.

Engineered wood products, (such as MDF and particleboards) are also used in conjunction to residential building. Industry Edge (2017) estimate that the typical Australian free-standing home new-build comprises of approximately 2.34 m3 of joinery. Joinery is one of the main uses of Australian particleboard and MDF consumption (30%). Other residential uses include flooring, mouldings and door skins which make up 23.8% of consumption, while furniture makes up 14%. Industrial consumption (joinery, flooring, shelving etc.) make up 27.4%. Residential-related usage amounts to more than half of the Australian consumption of MDF and

particleboard. The evolution of the demand for Particleboard and Medium Density Fibre (MDF) is likely to be tightly coupled with the evolution of the residential construction market as more than two thirds of this demand comes from activities associated with housing construction and renovations.

4.3.4 CHANGING FORESTRY SUPPLY CHAIN CONTEXTS

This section provides a brief overview of some of the contextual forces impacting on the structure of Australian forestry supply chains. These factors include the increased emphasis on local and value-adding manufacturing, the introduction of the forestry development fund as well as the focus on the development of renewable energy and bioenergy.

4.3.4.1 Bioeconomy

Bioeconomy "*encompasses the production, processing or use of biological resources*" (Meyer, 2017). The bioeconomy encompasses activities related to agriculture, forestry, food, textile industry and energy (Ollikainen, 2014). The concept of the bioeconomy has regained attention in recent times. This reinvigoration came about mainly with increasing sustainability concerns and by realising that existing biological resources could play an increasingly important role in the economy as substitutes or complements for existing (mainly non-renewable) raw materials.

In relation to forestry, the bioeconomy plays an important role in establishing a vision for the sector towards environmental sustainability – by reducing pollution and contamination, and in an economic sustainable manner through production diversification, waste prevention, product recycling and reuse and resilience. This also enhances the ability to cope with changing and often turbulent disruptions. Importantly for Tasmania, the bioeconomy discourse centres on two key aspects: economies of scope and production complementarity.

Economies of scope are "*efficiencies formed by variety, not volume*" (Jelinek and Goldhar, 1983). Economies of scope can be achieved through value-adding activities in the non-wood ecosystem resulting from cross-sectoral interactions with the agriculture, food, water or tourism sectors. Tasmania's relatively low population and local economic demand creates challenges in achieving economies of scale (efficiencies through volume) possible in other, more populous parts of Australia or the world. Nonetheless, Tasmania's relatively high attraction as a tourism

destination and its focus on specialised crafts make economies of scope a potentially viable path for delivering value and achieving competitive advantage.

Production complementary refers to providing biomaterials as inputs in supply chains to complement or replace existing (non-renewable) inputs. Opportunities in this space consist in finding novel uses for wood products such as bio-composite materials, thermoformable materials, nanocellulose or wood-based fabrics. In construction, opportunities can arise from the development of modular building systems for housing to complement other materials and increase construction efficiency. Wood products can also be used as a complementary, renewable source for energy generation.

4.3.4.2 Bioenergy

The utilisation of biomass residues for energy, heat, cooling, transport fuels and biogas generation are all related to local and national discussions on bioenergy. These discussions and emerging policy frameworks may help position the forest industry as a contributor to Australia's energy security, and to Tasmania's renewable energy strategy. Nationally, the Australian Renewable Energy Agency (ARENA) through the "Bioenergy roadmap" (ARENA, 2020) aims to accelerate Australia's shift to renewable energy and towards a decarbonized economy. Within these discussions use of forest biomass residues especially in the production of biofuels may be a significant opportunity.

At a Tasmanian level, the potential contribution of bioenergy to the renewable energy generation target set by State Government was recognised in the Draft Tasmanian Renewable Energy Action Plan (Department of State Growth, 2020). Several bioenergy-related projects were supported under the Wood and Fibre Processing Innovation Program. Research projects also focused on the use of timber harvesting residues in energy generation (Woo *et al.*, 2020).

Although promising, bioenergy from timber resources faces several challenges: ensuring that trees are not grown to be burnt and therefore fail to achieve carbon neutrality in energy generation; the identification of appropriate technology and supply scale for bioenergy generation for heating, power and/or cooling (NNFCC, 2020); ambiguity regarding the economic value proposition – this is particularly the case with regards to the participation in the national electricity market of renewable energy in general, and specifically bioenergy. However,

there may be an emerging opportunity in utilisation biomass residues in bio-fuel production that can in-turn be linked to forestry logistics and the utilisation of biofuel in harvest and haulage operations.

4.3.4.3 Local and Value-Adding Processing

The COVID-19 pandemic has highlighted several relevant aspects with regards to the Australian economy and particularly the manufacturing sector. In a recent address to the National Press Club in Canberra, the Minister for Industry, Science and Technology, the Hon Karen Andrews stressed that although manufacturing exports have increased year-on-year compared to 2019, "it's also true that we currently export far too many raw materials that we have the potential to value-add to through processing and manufacturing," (Andrews, 2020). The Minister pointed towards the need "to secure our nation's economic sovereignty by building an even stronger local manufacturing sector."

Domestic processing opportunities and challenges have been recently been explored by The Department of State Growth together with the Tasmanian forest industry in several workshops (Solution, 2020). These workshops highlighted several challenges, including increased supply chain costs, limited understanding of the resource and how end-users could use it, limitations on the markets for existing products, social perception, investment access, limited planning vision, limited availability of skilled workers.

Conversely, the workshops revealed multiple opportunities for domestic processing including biofuels, using existing raw materials to generate new products, improved use of waste products, carbon pricing and storage, provision of highly skilled labour, consolidated Tasmanian forest industry marketing approach.

4.3.4.4 Forestry Recovery Development Fund

In 2020 the Australian Government established the Forest Recovery Development Fund to provide recovery assistance to companies in the forestry industry that were affected by the 2019-20 bushfires. The fund amounted to AUD 40 million which could be accessed by companies to upgrade existing facilities and technology, install new facilities that complement existing activities, make other adjustments or diversification to make their business more resilient (Australian Government - Department of Agriculture, 2020). However, given the scale of the

fires on the mainland and the criteria for accessing funds, it is unclear whether this will offer any significant support to Tasmanian forestry supply chains.

5 STAKEHOLDER CONSULTATION

This section discusses the key results generated through stakeholder engagement via the survey and the workshop.

The structure of this section is as follows. Within each sub-section, the key challenges, barriers, constraints and opportunities are discussed.

- *Section 5.1 presents the survey results in terms of emerging supply chain and infrastructure challenges and opportunities as well as with regards to supply chain resilience with respect to the impact of recent events.*
- *Section 5.2 discusses the outcomes of the stakeholder consultation workshop. Supply chain and infrastructure challenges and opportunities were discussed in greater detail and potential actions for government were identified during the workshop.*

5.1 SURVEY RESULTS

This section presents the survey results. Three main themes of results are discussed: supply chain challenges and potential improvements, infrastructure, logistics and legislative challenges and improvements and supply chain resilience with respect to the impact of recent events. The results of the survey helped reveal additional challenges but also helped highlight some potential areas for improvement. An extensive description of the survey results is presented in Appendix D.

The key challenges emerging from the survey were:

- *Demand-related challenges were one of the main issues highlighted by respondents. Demand-related supply chain challenges represented one in two responses (47%) of all responses, with one in three (34%) responses highlighting the reliance on export demand and export demand fluctuations. Approximately 13% of responses indicated supply chain challenges relating to domestic demand. Demand-related comments pointed towards the lack of local or domestic processing of resources coupled with a high dependence on export markets and consequently port infrastructure.*

- *Port and legislation-related issues concerned close to half of respondents. A quarter of responses indicated that the port infrastructure (13%) or port and export facility access (12%) is a challenge for their supply chains. Legislative constraints, chain of responsibility and regulatory barriers concerning road access were mentioned in approximately 25% of the answers.*
- *The supply chain resilience of the respondents exposed to international markets appear to have been harder hit by the supply chain disruptions associated with the COVID-19 pandemic. Four out of five (78%) of respondents indicated a negative (47%) or somewhat negative (31%) impact on export customers' activity levels. Three out of five (56%) of respondents indicated a negative (17%) or somewhat negative (39%) impact on local or domestic customers' activity levels.*

The opportunities emerging from the survey were:

- *The survey results indicated a strong interest from respondents in developing local demand and manufacturing. One in 5 responses (19%) indicated interest in the development of new products, while 1 in 4 responses (24%) highlighted that the expansion or efficiency improvement in the domestic processing capacity were avenues for supply chain improvements. Twelve percent of responses pointed towards the need to expand local or domestic demand.*
- *Road-related improvements were suggested by more than 40% of respondents. Close to a quarter of responses (23%), indicated that local and State legislative constraints and regulatory barriers for accessing road network could be reduced. Thirteen percent of respondents indicated that allowing higher productivity vehicles on the road network would be one improvement to be prioritised. Close to 1 in 10 responses (9%) indicated that addressing infrastructure pinch points was important.*
- *Close to a third of responses indicated port related improvements were considered a priority. Port infrastructure and efficiency improvements represented in total close to a quarter of the responses (24%). Integration between the different transport modes was considered a priority by 10% of respondents. Interestingly, few opportunities were perceived in relation to rail services.*
- *Interestingly, while 7% of respondents pointed towards short-term contracts as being a supply chain challenge, 14% of respondents indicated that focusing on longer-term contracts*

would be an improvement they would prioritise. This suggests that some challenges potentially arise from uncertainty due to relatively short-term contracts which can be addressed with more secure, longer-term engagements.

5.2 WORKSHOP AND INTERVIEWS OUTCOMES

This section discusses the outcomes of the stakeholder consultation workshop and interviews. The workshops and interviews aimed to confirm representation of supply chain and infrastructure challenges and opportunities highlighted by the survey and provided stakeholders with the platform to respond to and identify additional issues. Issues were discussed in greater detail and potential actions for government were identified during the workshop. *Details on the workshop and interview participants can be found in Appendix E.*

Several themes emerged from the discussions in the workshop and the interviews:

1. Markets access and efficiency
2. Product value-add, differentiation and investments
3. Supply chain and services visibility
4. Workforce planning
5. Social license and branding
6. Integrated forest resource management

Two overall aspects pertaining to forestry supply chains were recognized by participants: first, the commodity nature of products currently being manufactured and sold was recognized and consequently the need to find avenues to value add. The overarching perception was though that irrespective of the value-add avenue, the economic aspects will prevail in determining decision making for consumers. Second, the need for a long-term vision and certainty given the long time it takes to grow trees. Participants also recognized that decisions taken now mature over a long period of time, in some cases, more than 30 years. Certainty and vision were perceived as critical facilitators for the development of the industry.

5.2.1 MARKETS ACCESS AND EFFICIENCY

The efficiency of supply chain components in Tasmania was considered an important aspect by many of the participants. Many of the discussions were directed towards port efficiency and particularly the visibility and understanding of port operations and management. With regards to land-side transportation, participants highlighted the potential efficiency benefits of high-productivity vehicles and the need to ensure that access to the gazetted road network is also of high standard to allow for full asset utilisation.

The land-side transportation discussion also covered integration with rail and the potential use for inter-modal trailers using TasRail's log-tainer concept to reduce modal interface costs, particularly for long-distance road transport. Participants mentioned that work in this area had been completed and that further work is required to understand how and what benefits can be achieved. Interview participants mentioned that access to the domestic market and containerized exports was a critical determinant for their competitiveness.

Currently Tasmanian products incur significantly more logistics costs from the Bass Strait passage than mainland alternatives which limits their competitiveness. Furthermore, during peak times, Tasmanian exporters' access to the domestic land transport network is typically restricted.

5.2.2 PRODUCT VALUE-ADD, DIFFERENTIATION AND INVESTMENTS

Participants recognition of importance of future developments for domestic processing and value-adding. A broad range of general options was mentioned by participants, however establishing the most tangible or valuable opportunity was a challenge. For most opportunities, the potential for cost competitiveness was questions. More specific avenues for value-adding in the sectors using forest and wood products (e.g. construction or joinery) were not immediately apparent.

Participants also discussed bioenergy as a potential value-adding avenue. In this context, given that Tasmania's electricity generation is already from renewable sources, there was limited additional environmental appeal for organizations particularly for behind the meter energy generation. Consequently, sales on national electricity market would be judged on their value proposition (economic, social environmental). On the other hand, other participants highlighted that biomass residues can be utilized on a range of applications including combined electricity, heat and cooling generation as well as the production of transport fuels and bio-oils.

Finally, for native timber processors, the need for retooling and for government support to enhance the value recovery from the existing forest resource but more importantly in being able to transition to processing plantation resources was discussed.

5.2.3 SUPPLY CHAIN AND SERVICES VISIBILITY

The participants also discussed a series of aspects and challenges pertaining to supply chain and services visibility. Further comments on visibility of port management, operations and performance (including congestion), participants also considered communication and information sharing with the different local government areas (LGAs), government business enterprises (GBEs) and government agencies. The large numbers of entities involved meant that considerable time was spent by organizations in dealing with the various layers of government, agencies and enterprises. Conversely however, some GBEs found challenges in information sharing and aggregation to allow better planning of strategic requirements around infrastructure given the existing and new forest resource and processing opportunities.

5.2.4 WORKFORCE PLANNING

In terms of workforce, participants mentioned several key challenges: an ageing workforce, particularly in the harvest and haulage sector with relatively limited expected growth and the challenge of considerable volume of expertise leaving the haulage sector through retirement in the next 3-5 years; the lack of clearly defined and marketed attractive and interesting career pathways for particularly young people to consider careers within supply chains management, freight transportation and/or sustainable forestry; the lack of training and education regarding the elements of modern supply chains and ways of taking advantage of the potential of digital tools and techniques. Participants identified that there was limited general awareness of the increasing levels of technical skill required in forestry supply chains and that changing perceptions about future careers was important to ensure the industry had personnel available to capitalise on innovation in both existing as well as new products and market opportunities.

5.2.5 SOCIAL LICENSE AND BRANDING

The issues of social license and branding were mentioned frequently, particularly in relation to value adding and workforce planning. Participants recognized the need to maintain and improve the forest industry social license and the potential for utilizing the Tasmanian brand as a vehicle to raise awareness and improve public perception.

Although these aspects do not directly pertain to supply chains and infrastructure, potential impacts in terms of social license and branding were discussed in the recommendations emerging from this report.

5.2.6 INTEGRATED FOREST RESOURCE MANAGEMENT

The way in which the forest resource was managed was an important point raised by the participants. In this sense, participants raised issues regarding an integrated management of plantations for non-industrial estates to potentially improve the market access and cost profile for smaller growers, the potential use for natural capital accounting to monetize the environmental benefits of the forest resource.

The processors of native timbers highlighted the importance of maintaining the PEFC/Responsible wood certification for the domestic market and the positive impact on demand for native timbers that the 2019/20 bushfires have generated. The processors suggested that thinning regimes could be applied for native forests increasing yield of solid wood products into the future.

Interestingly, participants also highlighted the potential perverse outcomes of third-party certification. If non-industrial scale landowner are interested in selling native timbers from their property (from shelterbelts or property reconfiguration) and can only do so if the timber is certified, and if certification costs are prohibitive, the most likely outcome is that native timber will not reach neither the domestic nor the international market.

Matters pertaining to integrated forest resource management that emerged from these discussions will likely also be considered in further detail in the other reports commissioned by the Hub.

6 RECOMMENDATIONS

This section presents the key recommendations emerging from this report. The recommendations were shaped through the stakeholder consultation process and aim to directly address perceived supply chain and infrastructure barriers, constraints and potential opportunities to foster the growth of the forestry industry in the North and North-West of Tasmania. These recommendations have been grouped under four themes, with each identifying sets of interrelated actions for consideration. They are:

1. Enhance market access and efficiency
2. Explore forest products value-add and differentiation opportunities
3. Improve supply chain and infrastructure visibility
4. Improve workforce development, skills and career pathways

The recommendations in this report target primarily forestry supply chains in the North and North-West of Tasmania recognising their unique features. Nonetheless, it is acknowledged that some recommendations may be applicable to other areas of the State or State-wide. However, any extension or utilisation of recommendations presented in this report beyond the hub region should carefully consider the nuances and unique features of supply chains in other parts of the State.

6.1 ENHANCE MARKET ACCESS AND EFFICIENCY

Given Tasmania's relatively limited local market size, stakeholders highlighted that growth of new or existing products will rely heavily on mainland Australia or international markets. Survey respondents and workshop participants recognised the importance of maintaining a robust supply chain cost profile to be able to compete both domestically and internationally. A key constraint for the potential growth of forestry supply chains in the North and North-West of Tasmania is the level of access and the efficiency of delivery throughput to domestic and international markets. Several challenges make up the dimensions of this market access and efficiency theme:

- *Ensuring that the road network capacity is consistent both on, and between, the main transport corridors and lower rated feeder roads close to forestry resources. This entails*

situations where the capacity on a route is limited by a pinch point (e.g. bridge weight limits, LGAs restrictions etc.), or by access to local road networks that need to flexibly respond to changing locations of forestry harvesting of distributed resources.

- *Maintaining high levels of transport equipment utilisation. For example, trucks may be used only for a single 12-hour shift in a 24-hour period and may only run fully loaded on one leg of the journey and be empty for the remainder, highlighting back-hauling cost related issues and under-utilisation of transportation.*
- *Reaching customers in a competitive and consistent manner. The majority of wood products destined for domestic mainland customers are transported to Victoria via Bass Strait shipping services. These services were identified by stakeholders as being relatively expensive, even when considering the Tasmanian Freight Equalization Scheme (TFES). Furthermore, once cargo reaches mainland Australia, it is subject to land-side capacity constraints. Containerised exports may also be subject to shortages of inter-modal containers.*

These challenges create several associated opportunities such as: addressing road transport capacity in an integrated manner by improving transport flows on infrastructure; taking advantage of inter-modality to enhance the utilisation of transport assets; and, expanding existing coastal shipping services to facilitate direct maritime access to other Australian states.

Recommendations to enhance market access and efficiency

The emerging policy recommendations to enhance market access and efficiency are:

R 1. *Consider options for regulatory changes to the TFES to incentivise direct coastal shipping to other Australian states. This should be undertaken with the objective of enhancing the competitiveness of Tasmanian producers/processors in the domestic Australian market by providing logistics flexibility, reducing reliance on Victoria and land-side transport in mainland Australia. The need for action in this regard has become particularly urgent as the major bushfires and current COVID-19 pandemic restrictions have drawn attention to this supply chain bottleneck in relation to existing, and new potential domestic markets, for Tasmanian forestry products.*

R 2. *Investigate the potential economic, social and environmental impacts and barriers of adapting log-trailers to transport inter-modal containers as well as logs (similar to*

TasRail's log-tainer concept). Adapting log-trailers may provide an opportunity to increase the backhaul utilization of transport assets. These investigations should also link to discussions on investment mechanisms to support haulage fleet upgrades towards higher-productivity vehicles (HPVs).

R 3. *Prioritise addressing road infrastructure pinch points based on expected benefit in terms of haulage efficiency and social and environmental impacts. Any assessment should also consider the cost of any alternative options. Pinch points in this context represent road capacity reductions along a transport route due to regulatory, infrastructural or other restrictions (e.g. bridge weight limits, LGAs restrictions etc).*

Importantly, improvements in market access and efficiency are likely to contribute to a reduction in the environmental footprint of the transport task that, in turn, may improve perceptions of forest supply chains and stakeholder efforts to enhance their social license.

6.2 EXPLORE FOREST PRODUCTS VALUE-ADD AND DIFFERENTIATION OPPORTUNITIES

As cost pressures on commodity products in the forest and wood sector increase, one way stakeholders felt that this issue could be addressed is to value-add and differentiate in terms of both existing and new products. Consequently, a key opportunity to foster growth in forestry supply chains in the North and North-West of Tasmania relates to improving the utilisation of the forest resource and particularly to developing and locally manufacturing existing and new value-adding products. These opportunities are often encompassed under the terms domestic processing, bioeconomy and bioenergy. However, there are several challenges with respect to product value-add and product differentiation:

- *Value-added products, engineered wood products (EWP) and bioenergy from biomass residues were identified by numerous stakeholders. Potential opportunities identified included: value-added products (e.g. bio-composite materials, thermoformable materials, nanocellulose or wood-based fabrics), engineered wood products (glulam, LVL, CLT etc.) and utilisation of biomass residues for bioenergy (electricity, heat, cooling) and transport biofuels. However, it was evident that across the sector, there were highly varied levels of understanding as to how these products could meet emerging market requirements, gain*

acceptance in specific domestic and/or international contexts and overcome the higher production cost structures in comparison to other parts of the world.

- *Many forest and wood products are used for residential construction and joinery. While there is willingness from stakeholders in forestry supply chains to develop new products and value-added products, market intelligence with regards to the cost drivers for the residential construction and joinery sectors remains limited. Consequently, the pathways for value-added products and product differentiation into these sectors is not clear and needs further investigation and validation.*
- *The native forest processing sector is experiencing pressures in terms of the size and certainty of supply availability. These pressures have created challenges for processors in securing funding for retooling their facilities in order to enhance the value recovery from the existing resource but more importantly in being able to transition to more effective and efficient processing of hardwood plantation resources.*
- *Numerous stakeholders pointed towards opportunities for the utilisation of biomass residues for bioenergy (electricity, heat, cooling) and transport bio-fuel production. While significant effort continues to be put into understanding the potential costs of these opportunities, stakeholders were less clear on whether the business cases could be substantiated on economic, social and/or environmental value-based evidence. The work of ARENA and the clean energy finance corporation was acknowledged as a valuable information source that had not been fully utilised to date.*

Recommendations for forest products value-add and differentiation opportunities

The emerging policy recommendations to explore forest products value-add and differentiation opportunities are:

R 4. *Identify and prioritise existing and new product value chains to capitalise on stakeholder and end-customer interest in sustainable forest and wood products, as well as in opportunities for local domestic processing. As the COVID-19 pandemic and associated supply chain disruption have highlighted increasing sovereign manufacturing capacity, reducing over-dependence on international exports of raw materials and enhancing supply chain resilience and value-adding activities are all important priorities.*

R 5. *Identify mechanisms to support existing and new production approaches to shift processing of wood resources as close as possible to their final use form as early as*

possible in the supply chain. In forest and wood products supply chains this shifting may reduce cost, waste and/or improve efficiency and add value to Tasmanian local processing, milling and framing operations. To contribute to identifying opportunities it would be useful to engage in value chain mapping of the construction and joinery sectors both locally and on the mainland.

R 6. *Develop policies and/or provide incentives to stimulate local demand and innovation in construction techniques and utilisation of sustainable timber products. The Wood Encouragement Policy could be leveraged in government commitments and government funded and/or supported construction. Examples could include social housing developments. Other major construction projects (such as the University of Tasmania's Northern Transformation Project) could also be identified. Prefabricated construction and engineered wood products from local manufacturers should be considered in this context. This would provide an opportunity for the demonstration and/or further development of Tasmanian building materials, production capacity and stimulate innovation. Local procurement in relation to social developments also has the potential to deliver positive benefits in terms of social license and forest industry branding without recourse to direct advertising.*

R 7. *To stimulate further innovation and rebranding of forestry supply chains, consider novel approaches such as a "hackathon" for local SMEs/inventors to produce ideas for making products out of wood, and to better understand where wood resources may act as complementary (or alternative) raw materials in existing production processes or supply chains.*

R 8. *Identify support for native forests sawmills to re-tool to improve volume and value recovery from native forests resources, and most importantly to incentivise a sustainable transition towards more efficient and effective processing of hardwood plantation resources.*

R 9. *Continue to explore bioenergy opportunities from the utilisation of biomass residues and to identify and prioritise potential new value chains in this area. On-going analysis of local opportunities in this area has already identified that transport bio-fuel production is one area with potential to use Tasmanian biomass* (NNFCC, 2020). *Aligned to this use of biomass residues, is an opportunity to advance forest industry capacity and credentials in relation to climate change and carbon mitigation, storage and management. This may help position the forest industry more clearly as a contributor to*

Tasmania's renewable energy strategy. This will also support alignment with policy discussions on energy security and local market needs.

6.3 IMPROVE SUPPLY CHAIN AND INFRASTRUCTURE VISIBILITY

Supply chain and infrastructure productivity and efficiency are determined not only by the physical capacity of individual components (e.g. roads, warehouses etc) but also by the alignment of the physical flows with information flows. The typical Tasmanian forestry supply chains, whether for native or plantation products, hardwood, softwood or specialty timbers have a complex and generally rather fragmented structure involving multiple, generally small and medium-sized firms. As activities and processes are fragmented amongst multiple firms, so too is the availability, flow and visibility of information related to them.

In this context, the opportunities identified for fostering growth of existing and new products in the forestry industry were greater supply chain and infrastructure visibility, enhanced communication, improved logistics and production flows traceability and strategic planning. In capturing these opportunities, several challenges were identified as follows:

- *Limited visibility of operations particularly around the North and North-West ports to support responses to truck congestion, work interruptions and throughput monitoring.*
- *Lack of awareness of port operating conditions, management and performance.*
- *Problems related to understanding the impact of constraints in connecting with major transport corridors and existing freight flows.*
- *Challenges in managing communication and information flows with government business enterprises (GBEs), government agencies (Local, State and Commonwealth) and supply chain stakeholders.*
- *Limited understanding of strategic requirements around infrastructure given existing and new forest resource and processing opportunities.*

Recommendations to improve supply chain and infrastructure visibility

The emerging policy recommendations to improve supply chain and infrastructure visibility are:

R 10. *The development of a digital platform to provide real-time visibility and transparency of TasPorts' port operations and performance to improve the responsiveness and*

adaptability of forestry supply chains. The digital platform could initially target the Burnie port and could be subsequently scaled to cover other ports. Recent work completed by the eLogistics Research Group on port congestion at the Burnie Chip Export Terminal (BCET) (Neagoe, Taskhiri and Turner, 2018), *highlighted that congestion could be addressed more efficiently by increasing visibility between supply chain actors and the port, rather than through significant infrastructure investment. Increased visibility can enable better supply chain coordination and can be achieved through digital platforms that facilitate information sharing. Importantly, to increase the impact of digital platforms and information sharing, an education component on how to integrate information in decision-making is critical (related to R-15). It is likely that insights from this previous work at BCET could be adapted and applied to other ports in the North and North-West of Tasmania.*

R 11. *Streamline information sharing along the supply chain and advance supply management knowledge. Emphasising information sharing between GBEs, government agencies and supply chain stakeholders and ensuring that stakeholders understand how best to utilise this information to optimise their supply chain operations. These processes need to be addressed simultaneously at several levels: Operationally, through the development of a digital platform to simplify communication between parties; Tactically by building supply chain intelligence across the sector through networking events; seminars; webinars; conferences; and training. Strategically through regular discussion groups to better understand existing and potential future issues that can be incorporated into strategic planning.*

These recommendations align closely with the Department of State Growth's recent Tasmanian Trade Strategy (2019b).

6.4 IMPROVE WORKFORCE DEVELOPMENT, SKILLS AND CAREER PATHWAYS

The workforce involved in the operation and management of forestry related assets and technology, as well as those involved in innovation, research and development of new products and services are all an integral part of forestry supply chains and infrastructure. As the industry develops and transforms so do its workforce requirements. The stakeholder consultation process highlighted that a constraint to the growth of forestry and its supply chains in the North and

North-West of Tasmania pertained to the availability and development of its workforce, improving skills and providing career pathways. Several dimensions make up the workforce development, skills and career pathways challenges:

- *There is an ageing workforce, particularly in the harvest and haulage sector with relatively limited recruitment. As a result, a major challenge to be faced is that a considerable volume of expertise will leave the harvest and haulage sector through retirement in the next 3-5 years.*
- *The lack of clearly defined and marketed attractive career pathways particularly for young people to consider careers within forestry supply chain management, freight transportation and/or sustainable forestry.*
- *The lack of training and education regarding the elements of modern supply chains and approaches to taking advantage of potential digital tools and techniques. Stakeholders identified that there was limited general awareness of the increasing levels of technical skills required in forestry supply chains, and that changing perceptions about future careers was very important to ensure the industry had personnel available to capitalise on innovation in both existing, and new, products and market opportunities.*
- *Strong competition and appeal of other industry sectors in comparison to forestry.*

The opportunities raised in relation to workforce development, skills and career pathways include: improving marketing and awareness of forestry supply chain jobs and career pathways; the development and delivery of education and training programmes as well as apprenticeships; and, advancement of support mechanisms for small businesses to engage with up-skilling of existing staff in supply chain and digital literacy. These opportunities are addressed in the recommendations below.

Recommendations to improve workforce development, skills and career pathways

The emerging policy recommendations to improve workforce development, skills and career pathways are:

R 12. *Develop initiatives to advance awareness and marketing of career pathways in forestry and forestry supply chains to directly address challenges related to an ageing forestry workforce. Existing programmes can be leveraged and extended to more clearly identify*

career pathways both directly in forestry and in emerging domestic processing and value adding supply chains. Raising awareness of emerging careers in precision forestry, innovation in the use of digital technologies (including drones, robotics, AI and image processing etc), advanced materials and manufacturing, and, in emerging value-added products will contribute to improving the brand of forestry as a future career.

R 13. *Further develop and target training and education for existing and emerging career opportunities in forestry and along forest supply chains in consultation with VET/Tertiary providers and industry. This should include discussions about micro-credentialing, short courses, certificates, diplomas, degrees and post-graduate training. Again, there are opportunities to leverage existing activities and programmes but the focus needs to better encapsulate the supply chain as well as resource management.*

R 14. *Improving training opportunities and/or formal apprenticeships in forestry supply chains. An initial focus could be on haulage and transportation where the ageing workforce will become an obstacle to future logistics of existing and emerging new products.*

R 15. *Development of mechanisms to specifically support existing workers in forestry supply chains to up-skill in both supply chain optimisation and to become more digitally literate so that they are able to leverage and incorporate advances in new technologies more fully into their contemporary work-practices. Engaging with small business operators in the industry will be required to identify what 'on the job' training is feasible and where other types of education and training is more appropriate.*

Some of the workforce related recommendations are aligned with the Department of State Growth's Tasmanian Trade Strategy (2019b) and will require some level of adaptation for a specific focus on forestry supply chains.

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APPENDICES

APPENDIX A - ADDRESSING THE OBJECTIVES OF THE ASSESSMENT REPORT

The objectives of this report are:

a. Report on the current state of the forestry supply chains and infrastructure in the Hub area and factors limiting growth for the future;
b. Determine the supply chains and infrastructure-related opportunities and barriers for the forestry and wood products sector in the Hub region; and,
c. Analyse and report on the constraints that affect the forestry supply chain and infrastructure productivity and efficiency in the Hub region.

These objectives are addressed in the report as follows:

Section 4 reports on the current state of Tasmanian forestry supply chains and infrastructure in the Hub area.

Section 5 reports on the stakeholder consultation results with regards to the constraints, barriers and factors limiting growth as well as key opportunities for driving growth, productivity, and efficiency for the forestry and wood products sector

Section 6 presents the recommendations of this report to address challenges, barriers and factors liming growth emerging from the stakeholder consultation as well as taking advantage of opportunities to foster growth in the industry, whether through increased throughput or transformation towards the bioeconomy and domestic processing.

APPENDIX B –ASSESSMENT REPORT APPROACH

This report has adopted an approach that blends quantitative and qualitative data collection and analysis methods. Critically, this involved extensive and detailed consultation with industry stakeholders through an online survey (n=56), a half day stakeholder workshop (n=14) and a series of semi-structured interviews with key industry representatives (n=5). The approach was structured in several stages:

Project Planning

This stage included the development of the pilot survey to refine the answer choices provided to respondents in Stage Two. During this stage, a contact list with potential respondents to the Stage Two surveys as well as potential participants in the Stage Three workshops was compiled.

Stage One. Reviewing the current state of the forestry supply chains and infrastructure

This stage included a review and synthesis local and national industry and government reports, statistical publications pertaining to the forestry supply chain and associated infrastructure and of international literature on global trends in terms of demand.

The aim of this stage was to understand the available infrastructure and existing supply chains in the Hub region. The review of demand and global trends aimed to provide a better understanding of potential development of demand for timber and wood products.

Stage Two. Supply chain and infrastructure Challenges and improvements survey

This stage included a survey of the stakeholders directly and indirectly operating in the Tasmanian forestry industry to contextualise the existing supply chain situation with the requirements of individual stakeholders. The survey generated insights on existing challenges and perceived supply chain solutions which were subsequently discussed in the Stage Three workshop.

The survey was distributed to key stakeholders in the Hub area forestry supply chains including forest growers, processors, transporters, Local, State, Commonwealth governments and peak bodies. It was identified that some supply chain roles (such as harvest and haulage contractors) would likely not have a high response rate and therefore would not be fully represented in the

survey responses. To mitigate against this risk, two strategies were employed: responses were collated in 4 broad categories (Export, Domestic, Logistics, Public Agencies) to include a variety of stakeholders in each broad category of forestry supply chains; the response rates for each category were then monitored and where necessary, conducting telephone interviews were conducted to supplement the sample.

The data emerging from the survey has be explored using descriptive statistics and exploratory data analysis. A total of 57 responses resulted from the survey, 56 of which were valid. The analysis of the survey answers has been performed both within individual questions as well as across the questions.

Stage three. Stakeholder consultation workshop

This stage included **one workshop** (held in Launceston on the 13th of August) and **several interviews** with key industry stakeholders to discuss challenges, potential opportunities and generate. The workshop was undertaken in a face-to-face format.

The workshops aimed to prioritise the potential supply chain and infrastructure solutions based on the needs of the forest industry. The workshops complemented the survey answers, exploring in greater depth the key issues.

More than 30 stakeholders were contacted to attend the workshop. In total, 13 industry stakeholders attended the workshop representing a range of views from forest growers, processors, logistics service providers and government and public agencies and peak bodies. Due to travel and health restrictions at the time of running the workshop, some stakeholders were unable to attend. To ensure that a diversity of views was represented, 5 additional stakeholders were contacted to ensure that their concerns and ideas were represented in this report.

The workshop lasted approximately 3.5 hours. During the workshop, the survey results were presented. Participants were then engaged in a series of guided activities to identify and shape potential solutions and recommendations for government policy. The data and ideas emerging from the stakeholder consultation were analysed using thematic analysis. The resulting themes, ideas and priorities were incorporated in the final report.

Project Delivery

The final report incorporates the information gathered from the literature, a synthesis of the survey results and the outcomes of the workshop and interviews to provide information to assist the Commonwealth in future policy development regarding infrastructure needs, additional processing potential, and opportunities for forestry supply chains and infrastructure in the Hub region.

Table 9 2019 Woodchip Exports from Australian Ports to Main Destinations
(Source Industry Edge/ABS)

2019 Woodchip Exports (BDMT)		China	Japan	Taiwan	Indonesia	South Korea	Total/Port
Tas	Bell Bay	749,576	272,120	118,438		23,409	1,163,543
	Burnie	557,326	46,335	51,094	19,141		673,896
WA	Albany	492,617	233,324				725,941
	Bunbury	199,450	541,243				740,693
	Esperance	145,004					145,004
VIC	Portland	786,765	680,823				1,467,588
	Geelong	326,234	228,358		23,431		578,023
QLD	Brisbane	52,147	69,655				121,802
NSW	Eden	123,562	79,404	53,234	27,951		284,151
NT	Melville	46,782	23,409				46,782
Total		3,479,463	2,174,671	222,766	70,523	23,409	5,970,832

Table 10 2018 Woodchip Exports from Tasmanian and Australian Ports to Main Destinations
(Source Industry Edge/ABS)

2018 Woodchip Exports (BDMT)		China	Japan	Korea	Taiwan	Total/Port
Tas	Bell Bay	557,555	223,418		186,257	967,230
	Burnie	571,544	23,943		74,237	718,060
WA	Albany	446,409	338,086			784,495
	Bunbury	201,026	535,372	81,083		817,481
	Esperance	95,947				95,947
VIC	Portland	978,331	549,955			1,528,286
	Geelong	569,378	150,804			720,182
QLD	Brisbane	75,433	69,957			145,390
NSW	Eden	171,821	125,623		51,094	348,538
NT	Melville	23,409	23,346			46,755
Total		3,690,853	2,040,504	81,083	311,588	6,172,364

APPENDIX D – SURVEY RESPONSES AND ANALYSIS

SURVEY QUESTIONS AND STRUCTURE

The survey aimed to contextualise the participants' experiences in the current infrastructure and supply chain setup and explore the challenges faced by the participants as well as avenues for improvement. The survey questions were:

1. Which activities is your company involved in?

   Checkbox answers provided by the respondent to understand the breadth of involvement in supply chain activities.

2. Which category best describes your company?

   Multiple choice question.

3. Which of the following supply chain challenges do you see as having the biggest impact on your organisation or the Tasmanian forestry supply chains?

   Tick box answers, up to 3 choices.

4. Which of the following infrastructure, legislative and regulatory challenges do you see as having the biggest impact on your organisation or the Tasmanian forestry supply chains?

   Tick box answers, up to 3 choices.

5. Which of the following recent events has affected your operations? (bushfires, the COVID-19 pandemic, economic stimulus packages etc)

6. If any of the recent events have affected your operations, what has been their impact on the operations of your organisation or Tasmanian forestry supply chains in general?

   Multiple answers, multiple choice grid.

7. Which of the following supply chain improvements would you prioritise for the Tasmanian forestry supply chains?

   Tick box answers, up to 3 choices.

8. Which of the following infrastructure, legislative and regulatory improvements would you prioritise for the Tasmanian forestry supply chains?

   Tick box answers, up to 3 choices.

For Questions 3, 4, 6, 7 and 8, a plain-text response field was also available for respondents to capture stakeholders' ideas which may not be covered in the answer choices, provide comments,

additional challenges and potential approaches for improving supply chain efficiency and productivity.

Answers for Questions 3 and 5 helped highlight the challenges and opportunities respectively most frequently considered amongst respondents. Answers for Question 5 helped highlight the experienced or expected impact of the most recent events and allow for the exploration of aspects such as supply chain resilience. Importantly, the alignment between answer choices in the survey questions has also be investigated. If participants highlighted road infrastructure challenges in Question 3, in Questions 7, their choice of opportunities was expected to include improvements in road infrastructure including issues relating to pinch points (such as load limits on bridges). Experiences in recent events (captured in Question 4) helped provide understanding on the mediating effect of these events on the potential improvement opportunities.

RESPONDENTS PROFILE

This section presents a brief profile of the survey respondents.

The survey respondents covered a broad range of activities along and associated with the forestry supply chain (see Figure 7). 36% of respondents indicated that the category that best fits their organisation's description is forest owner, grower or management company, 25% indicated that they are primary or secondary wood processors. 16% indicated their main activity area as wood products marketing retail or use, while 14% categorised themselves as transport and logistics services providers. A smaller proportion of respondents (9%) represented local, state or Commonwealth Government agencies.

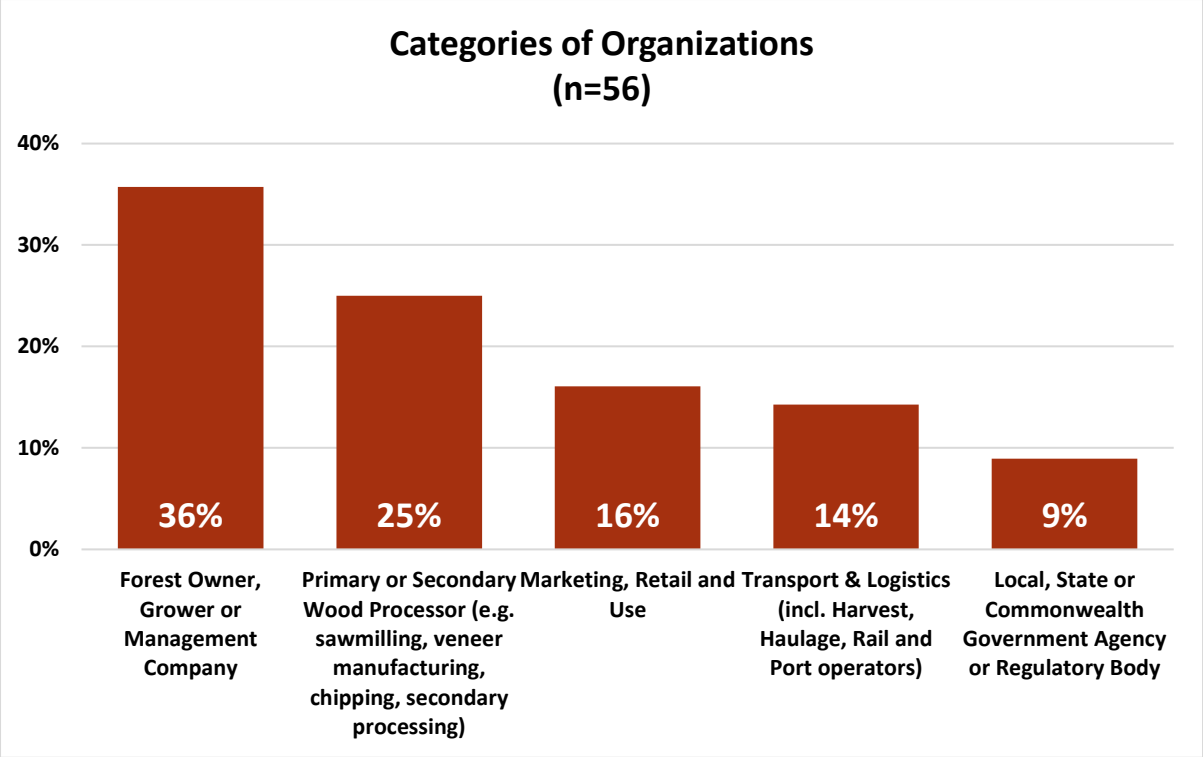

Figure 7 Categories of Respondents' Organisations

The survey design allowed respondents to indicate the supply chain activities in which their organisations are involved in. This helped explore the extent of the respondents in other supply chain activities. The majority of Transport and Logistics organisations generally dealt solely with harvesting, haulage or other logistics services. However, forest owners, growers or managers, primary and secondary processors and wood products marketers and retailers were generally involved in multiple activities in the supply chain.

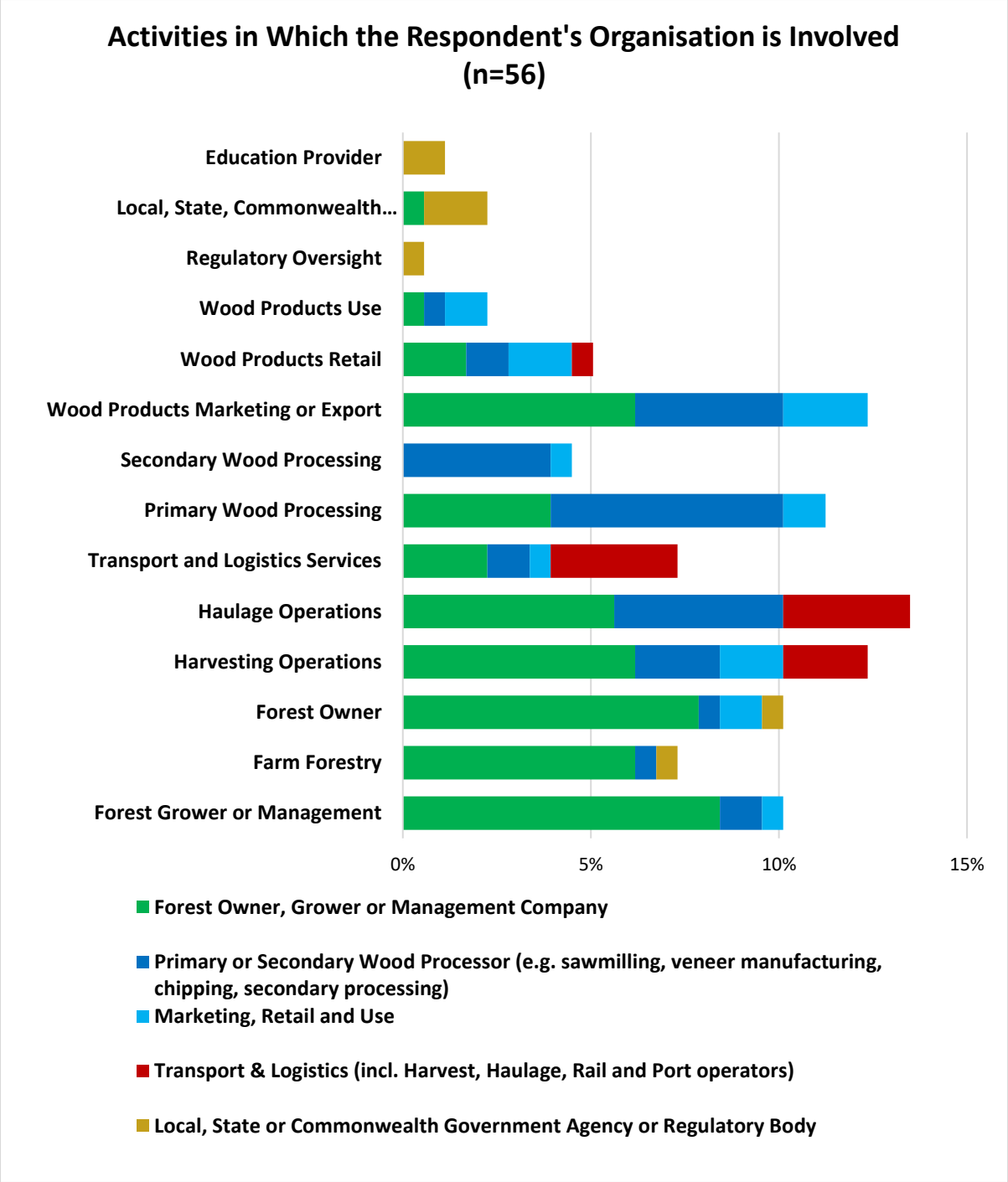

Figure 8 Activities in Which the Organisations Are Involved

SUPPLY CHAIN CHALLENGES AND OPPORTUNITIES

This section briefly discusses the supply chain challenges and potential improvement opportunities revealed by the survey. Both the quantitative responses to the survey questions are analysed as well as the respondents' comments.

To identify **supply chain challenges**, respondents were asked to indicate from a list of 12 options, which 3 options they consider to most impacting for their supply chains. The summary of the survey responses to this question is displayed in Figure 9. The respondents also had the possibility to provide some comments regarding supply chain challenges.

Demand-related supply chain challenges represented 47% of all responses, with approximately 34% responses highlighting the reliance on export demand and export demand fluctuations. Approximately 13% of responses indicated supply chain challenges relating to domestic demand – uncertainties and market size. The respondents' comments regarding demand challenges generally pointed towards the lack of local or domestic processing of resources coupled with a high dependence on export markets and consequently port infrastructure.

Supply-related challenges represented 15% of responses. Ten percent of responses indicated that an uncertain or fluctuating level of supply was a supply chain challenge. The respondents' comments generally pointed towards a shrinking plantation and native resource base with relatively limited market or government incentives for expansion.

Close to 10% of responses indicated that competitiveness with lower cost regions is one significant challenge as well. 8% of responses highlighted challenges relating to the competitiveness of domestic transport services.

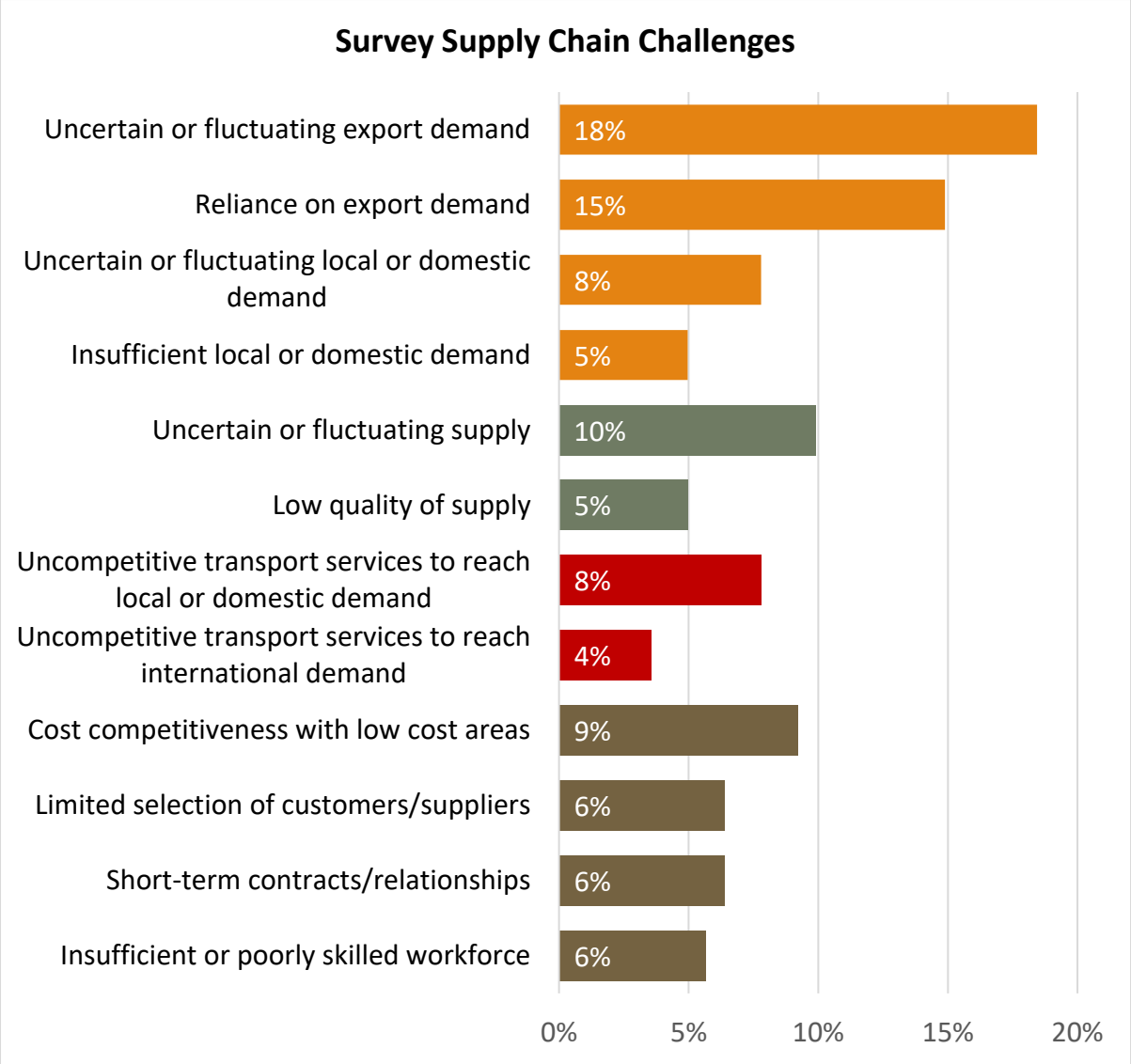

Figure 9 Highest Impact Supply Chain Challenges

Some respondents' comments also pointed towards more general supply chain challenges, such as the lack of a common vision for the forestry supply chains:

> "There is a need for an overarching vision for the forestry sector, likely including carbon mitigation, circular economy, bioeconomy (bioenergy) that the forestry sector can contribute to. If the industry positions itself to be assisting with these types of initiatives it is likely to increase its social licence as it will position itself as a solution to challenges important to society. This will develop the industry and that in itself will assist with supply chain challenges."

To identify potential **supply chain opportunities and improvements**, the respondents were asked to indicate from a list of 10 options, which 3 potential improvements they would prioritise to address supply chain issues. The summary of the survey responses to this question is displayed in Figure 10. The respondents also had the possibility to provide some comments regarding supply chain improvements.

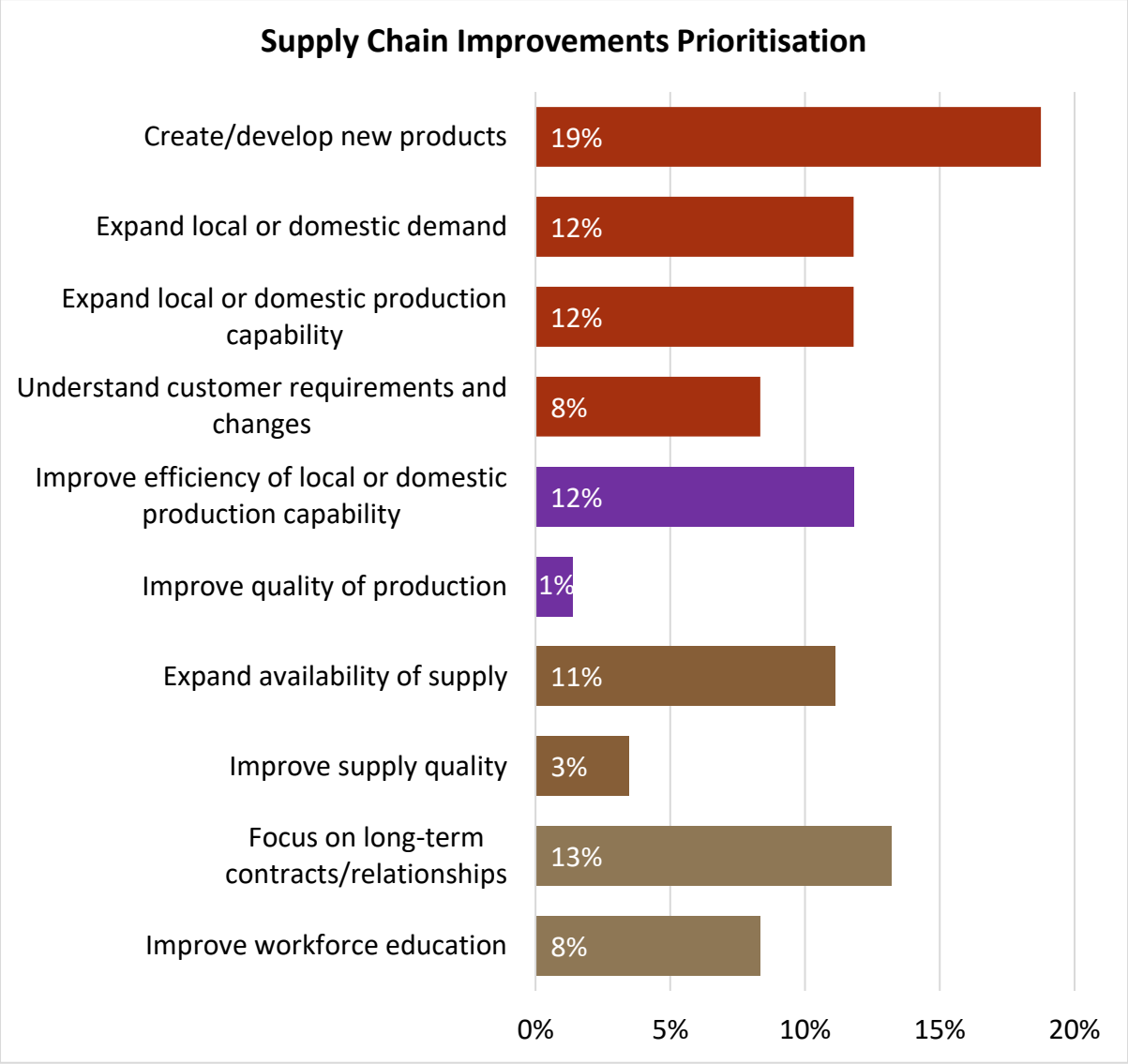

Figure 10 Supply Chain Improvements Prioritisation

Approximately one in five responses (19%) indicated interest in the development of new products, while one in four responses (24%) highlighted that the expansion or efficiency improvement in the domestic processing capacity were avenues for supply chain improvements. Approximately 12% of responses pointed towards the need to expand local or domestic demand.

The quantitative aggregation of responses to the supply chain improvements question provided a strong sense of interest in the development of new products and an expansion of the local processing sector. Some of the respondents' comments echoed this view, particularly pointing towards opportunities in the circular and bioeconomy sectors:

> "Encourage the use of the whole tree and secondary processing to produce higher value products. Seek carbon mitigation (e.g. engineered wood) circular economy and bioeconomy visions for the forestry sector. A rising tide lifts all boats…."

However, other comments shed doubt on the view that local manufacturing could be viable by pointing towards the relatively higher cost structure of processing resources domestically:

> "Improve export opportunities. Tasmania cannot compete on the international stage in manufacturing, we are too expensive. We can grow good trees and provide good high-level services, but we are too high cost to do the secondary manufacturing processes."

Approximately 14% of responses indicated that an expansion of the resource supply would be an avenue for supply chain improvements, while another 14% of respondents pointed towards the need to focus on longer-term contractual relations.

INFRASTRUCTURE, LOGISTICS AND LEGISLATIVE CHALLENGES AND OPPORTUNITIES

This section briefly discusses the infrastructure, logistics and legislative challenges and potential improvement opportunities revealed by the survey. Both the quantitative responses to the survey questions are analysed as well as the respondents' comments.

To identify the infrastructure, logistics and legislative challenges, respondents were asked to indicate from a list of 13 options, which 3 options they consider to most impacting for their supply chains. The summary of the survey responses to this question is displayed in Figure 11. The respondents also had the possibility to provide some comments regarding infrastructure, logistics and legislative challenges.

Approximately a quarter of responses indicated that the port infrastructure (13%) or port and export facility access (12%) is a challenge for their supply chains. 13% of responses related to addressing road infrastructure whether pinch points or network coverage and 5% related to challenges with rail infrastructure. Importantly however, 13% of responses also indicated challenges in integration between transport modes. One of the comments made by respondents on this question encapsulates many of the challenges relating to transport and export infrastructure and indicates the importance of integrated thinking with regards to logistics and transportation:

> "Require efficiency in integrating with the national freight network. Importance of trailerised freight to our supply chain. Require adequate container capacity access. Certainty in TFES longevity. Rising Port of Melbourne costs. Ongoing improvement of bridge strengths and regional road quality to align with demand for larger vehicle classes."

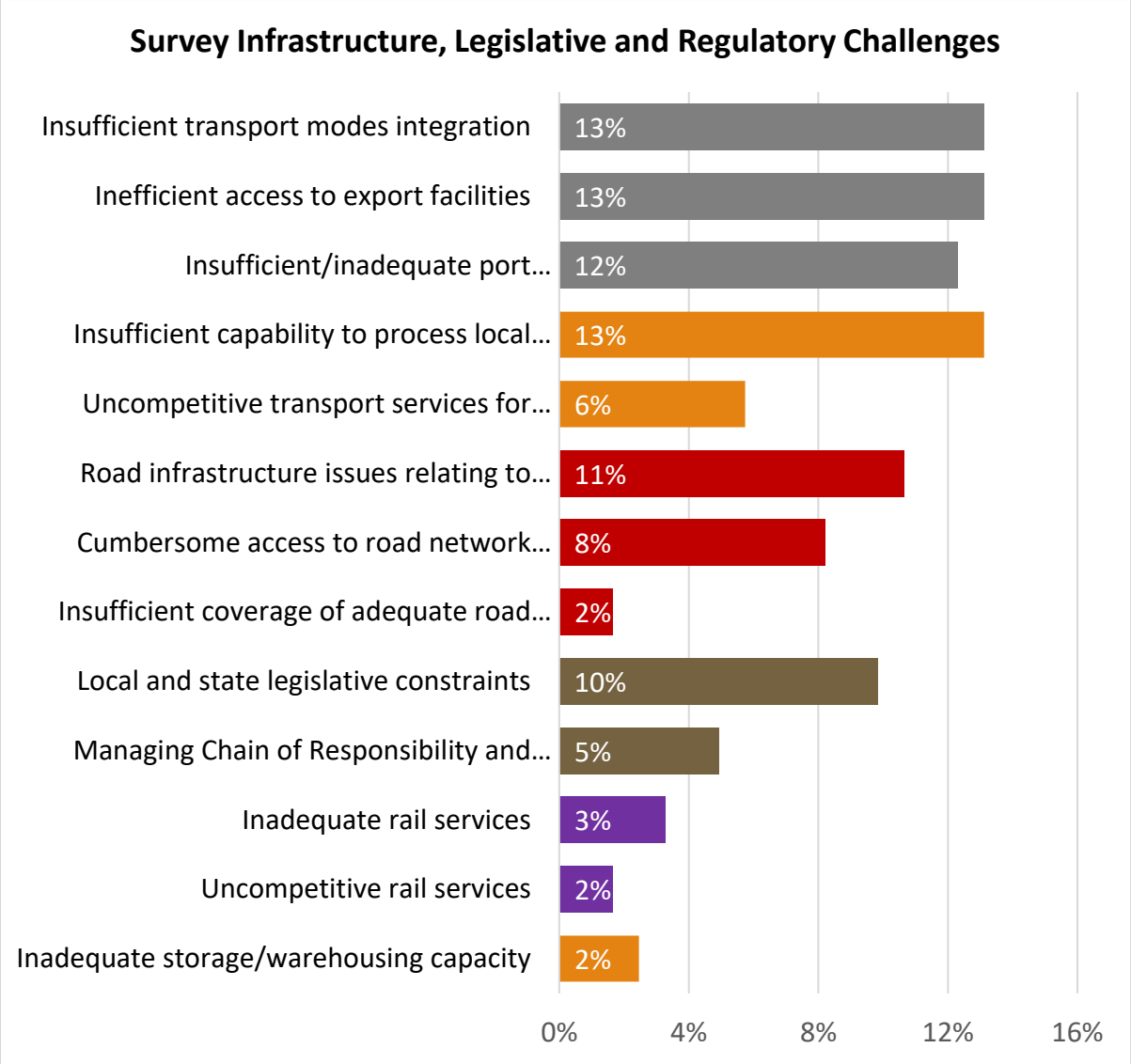

Figure 11 Highest Impact Infrastructure, Legislative and Regulatory Challenges

Legislative constraints, chain of responsibility and regulatory barriers concerning road access were mentioned in approximately a quarter of the answers. The respondents also expressed a range of views on regulatory challenges from managing truck congestion under Chain of Responsibility to the required level of regulation in society overall. The comment below illustrates this point:

> "There can always be better integration of regulatory requirements however, there is also a base level of regulation that is demanded by society."

To identify the infrastructure, logistics and legislative opportunities, respondents were asked to indicate from a list of 12 options, which 3 options they consider to most impacting for their supply chains. The summary of the survey responses to this question is displayed in Figure 12.

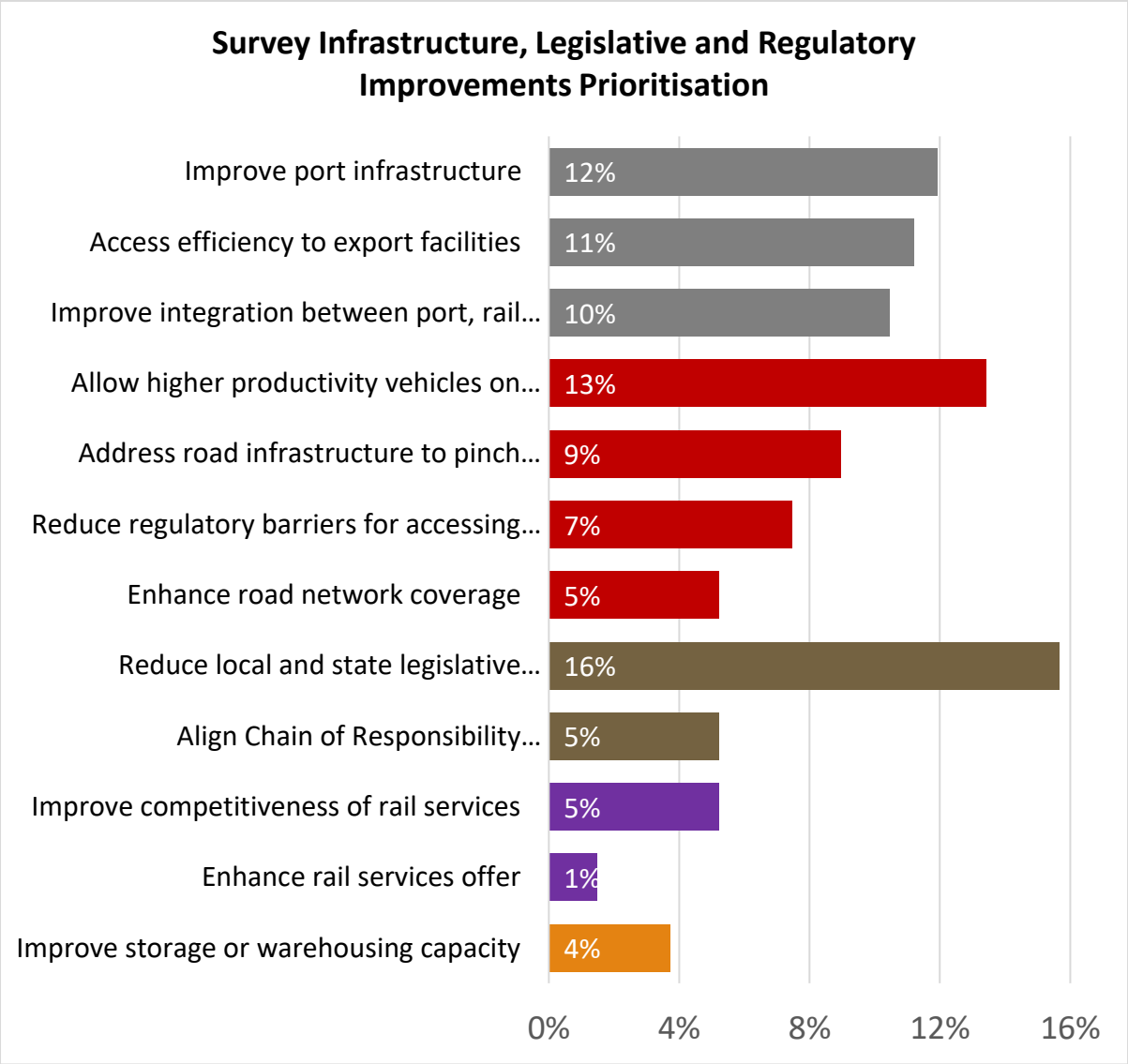

Figure 12 Infrastructure, Legislative and Regulatory Improvements

Close to a quarter of responses (23%). indicated that local and state legislative constraints and regulatory barriers for accessing road network could be reduced. 13% of respondents indicated that allowing higher productivity vehicles on the road network would be one improvement to be prioritised. Close to 1 in 10 responses (9%) indicated that addressing infrastructure pinch points was important.

Port infrastructure and efficiency improvements represented in total close to ¼ of the responses (24%). Integration between the different transport modes was considered a priority by 10% of respondents. Interestingly, few opportunities were perceived in relation to rail services. It is unclear whether this is due to the relatively limited use when compared to road transport or due to the high quality of service.

The respondents' comments primarily centred on export and port infrastructure. There were a range of views expressed with regards to the operation of these assets, from integrating TasRail and TasPorts operations into one organisation to privatising TasPorts. Other comments pertained specifically to port infrastructure and congestion issues:

> "Renew ageing port infrastructure, and possible redesign to mitigate against congestion at the port during busy periods. Consider viability of interaction with rail....."

SUPPLY CHAIN RESILIENCE AND THE IMPACT OF RECENT EVENTS

The survey also sought the better understand the impact of recent events, particularly the COVID-19 pandemic, the 2019-20 Bushfires and the Commonwealth Stimulus Package on Tasmanian forestry supply chains and their resilience. Respondents were asked to indicate which of the recent events had impacted their supply chains and could choose one or more options. The responses to this question are summarized in Figure 13.

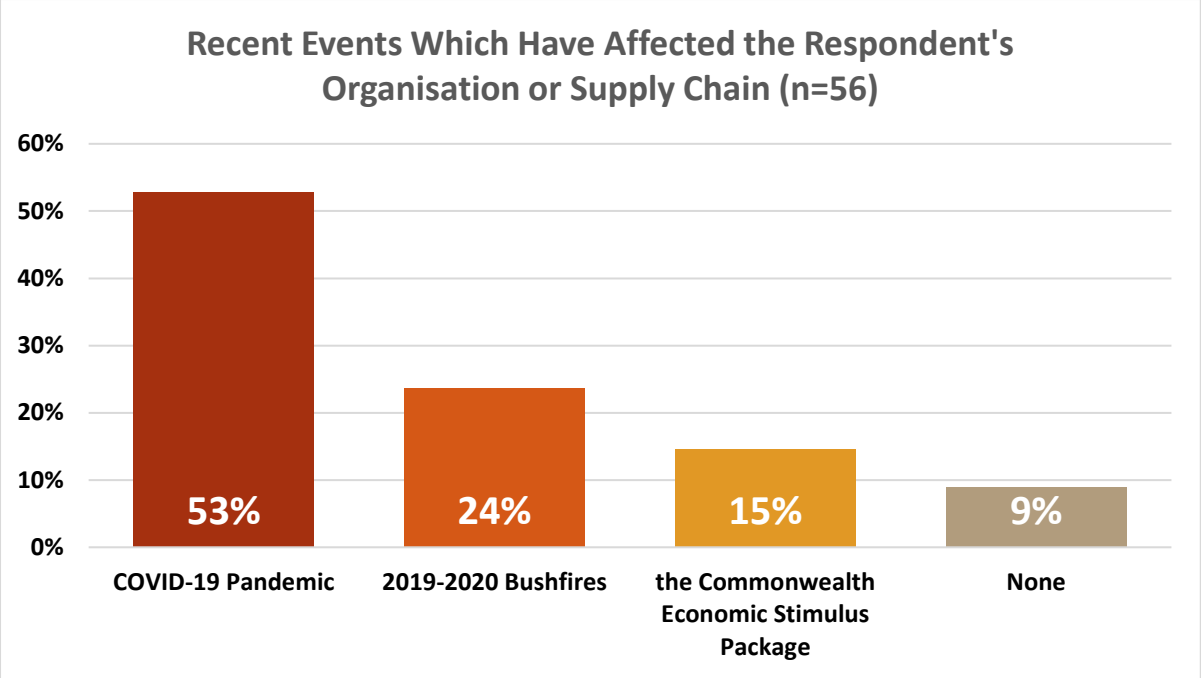

Figure 13 Recent Events Which Have Affected the Respondent's Organisation or Supply Chain

Slightly more than half of the respondents indicated that the COVID-19 pandemic and the associated supply chain and socio-economic disruptions had impacted their operations. Close to a quarter of respondents indicated that the 2019-20 bushfires had some impact on their operations while 15% of respondents indicated that the Commonwealth Stimulus Package had some impact on their operations.

The impacts of recent events on the respondents' demand, supply and access to transport infrastructure and logistics services will be examined.

Supply Chain Demand

The negative impact of recent events on demand appears to be more pronounced for export customers (Figure 14) than for local or domestic customers. Four out of five (78%) of respondents indicated a negative (47%) or somewhat negative (31%) impact on export customers' activity levels. Three out of five (56%) of respondents indicated a negative (17%) or somewhat negative (39%) impact on local or domestic customers' activity levels. The negative impacts on demand levels appear more pronounced for export customers rather than domestic not only in terms of number of organisations affected but also in magnitude.

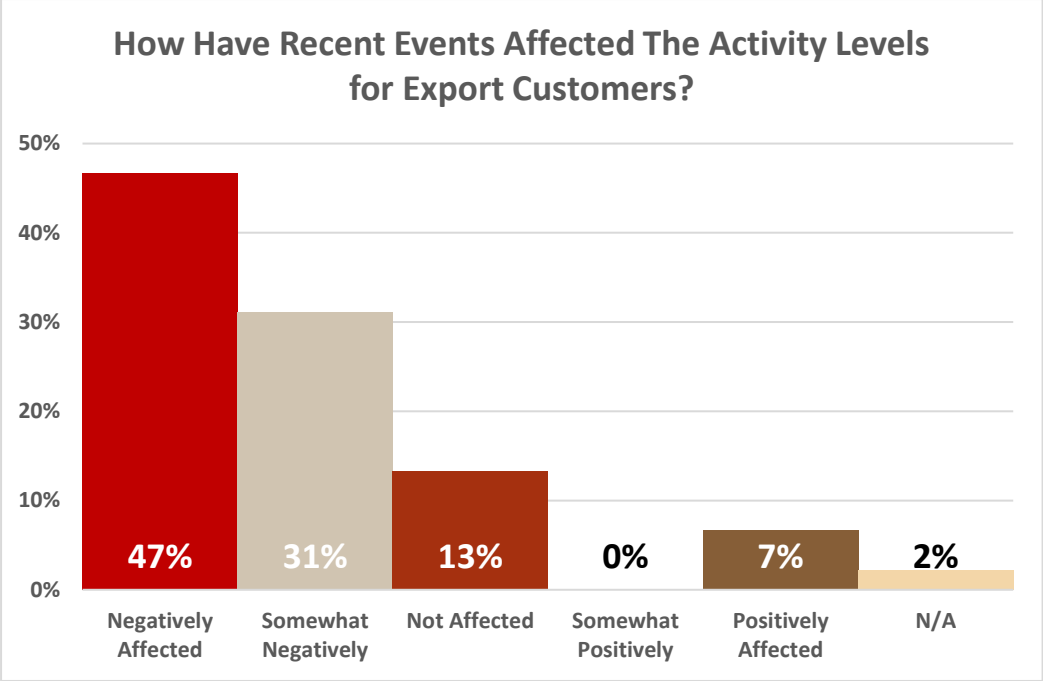

Figure 14 Effect of Recent Events on Activity Levels of Export Customers

It seems that supply chains which are less reliant on export demand have been less affected by recent events. One comment relating to export demand distils this idea:

> "Reliance on export has devastated our business over the last 10 months, this has been directly related to China. We need to downstream process and value add to our State's products and potential investors will need the confidence to invest... Overseas ownership of our forests has also had major impacts. Our population needs to understand forestry is one of very few truly renewable resource"

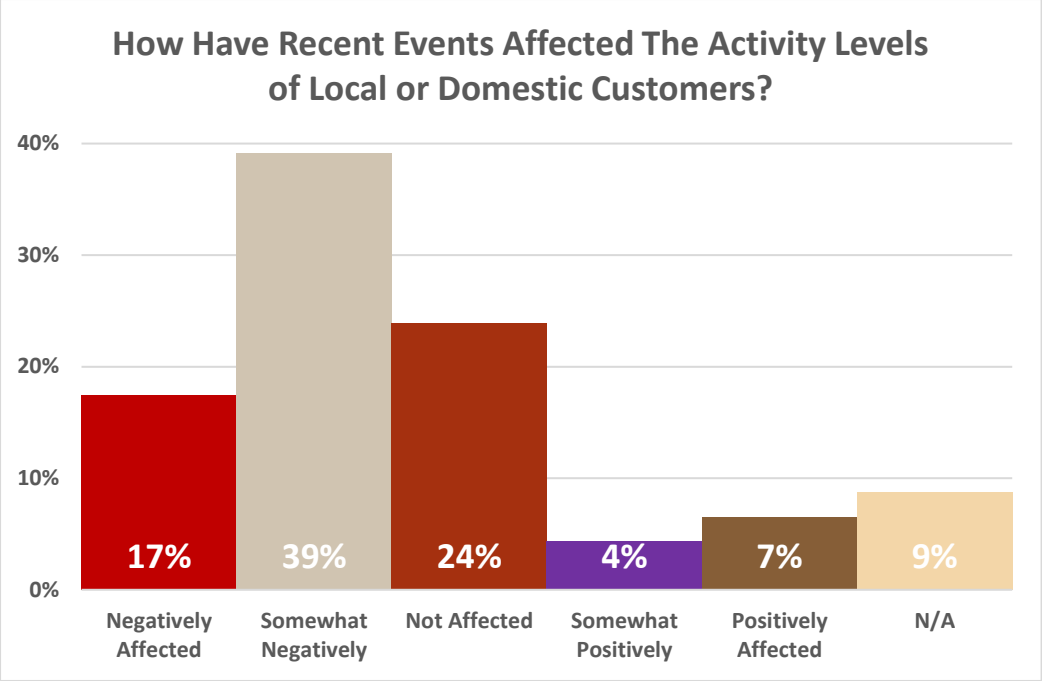

Figure 15 Effect of Recent Events on Activity of Local or Domestic Customers

Raw Material Supply

Although negative, the impact on raw material supply availability (Figure 16) appears to be less pronounced. Three out of ten (29%) of respondents highlighted a negative and somewhat negative impact on the availability of raw material supply while close to three out of five (58%) indicated that their raw material supply has not been affected by recent events.

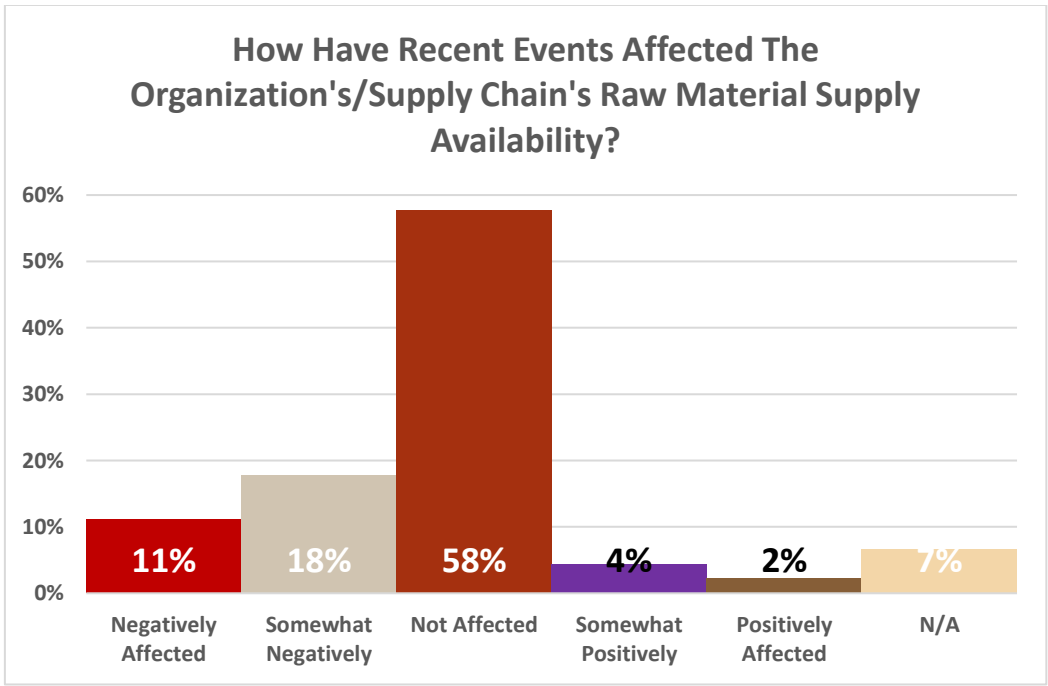

Figure 16 Effect of Recent Events on the Raw Material Supply Availability

Infrastructure and Logistics Services Access and Availability

The impact on the access to export facilities (Figure 17) and transport and logistics services access and availability is remarkably similar and is likely correlated with the fact that a large proportion of the forestry supply chains' production accesses export facilities. Approximately 3 out of 10 respondents (29% and 35% respectively) indicated that their access to export facilities and logistics services has been negatively and somewhat negatively impacted while close to half of the respondents (46% and 51% respectively) indicated that their access and availability had not been affected by the recent events.

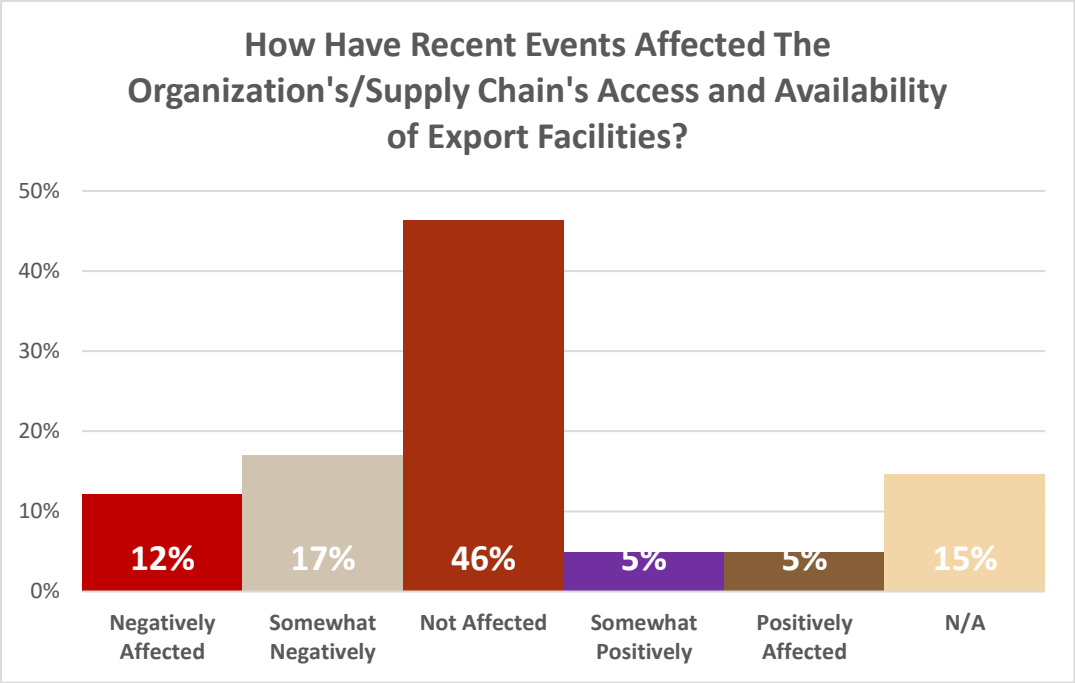

Figure 17 Effect of Recent Events on the Access and Availability of Export Facilities

Some comments have highlighted that changes in demand patterns as well as the effects of the 2019-20 bushfires timber processing capacity have had an impact particularly on port congestion:

> "Closure of NSFP and Ta Ann Tasmania Southwood mills, and slowdown of Norske Skog Boyer mill and export woodchip markets has resulted in increased log traffic at Port of Hobart. This congestion is causing CoR and fatigue management issues for log transport service providers. Probably results in lost sales and increased costs for transport contractors."

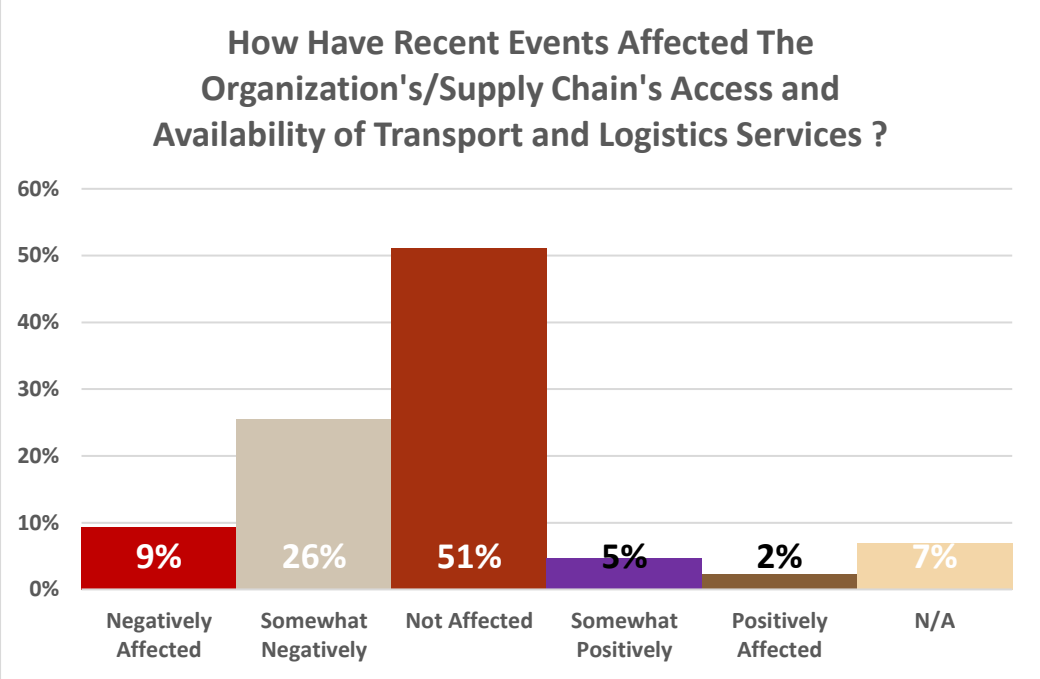

Figure 18 Effect of Recent Events on the Access and Availability of Transport and Logistics Services

SURVEY COMMENT RESPONSES

Following Questions 3-7 in the survey, the respondents were provided the option to add comments relating to the questions. These comments have been taken into account in the development of this Assessment Report.

APPENDIX E – WORKSHOP AND INTERVIEW PARTICIPANTS

Thirteen participants attended the workshop on the 13th of August 2020 in Launceston. Five stakeholders who were unable to attend the workshop were interviewed to ensure that their opinions were represented in this report, and to ensure that there was a representative cross-section of all key stakeholder groups. Workshop and interview stakeholders are listed below.

Name	Organization	Stakeholder Category	
Darren Davis	Forico	Major Grower	Processor/Exporter
Jim Wilson	Forico	Major Grower	Processor/Exporter
Willem Mulder	Forico	Major Grower	Processor/Exporter
Greg Hickey	Sustainable Timber Tasmania	Major Grower	
Heath Blair	Reliance Forest Fibre	Major Grower	Processor/Exporter
Gareth Watson	Timberlink	Processor	Exporter
Phil Doyle	Timberlink	Processor	Exporter
Phil Lloyd	Timberlink	Processor	Exporter
Shawn Britton	Britton Timbers	Processor	Exporter
Andrew Wye	Wood Based Products	Exporter	Haulage
Darrell Clark	TasPorts	Transport Provider	GBE
Neale Tomlin	TasRail	Transport Provider	GBE
Oliver Padgett	Padgett Group	Harvest	Haulage
Stephen Clarke	Private Forests Tasmania	Statutory Association	State Government
Mitch Williamson	State Growth Tasmania	State Government	
Shaun Suitor	State Growth Tasmania	State Government	
Graeme Wood	Department of Agriculture	Federal Government	Observer

Monika Winston	Northern Tasmania Forestry Hub	Other	Observer
Therese Taylor	Tasmanian Forests and Forest Products Network	Industry Association	Observer

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