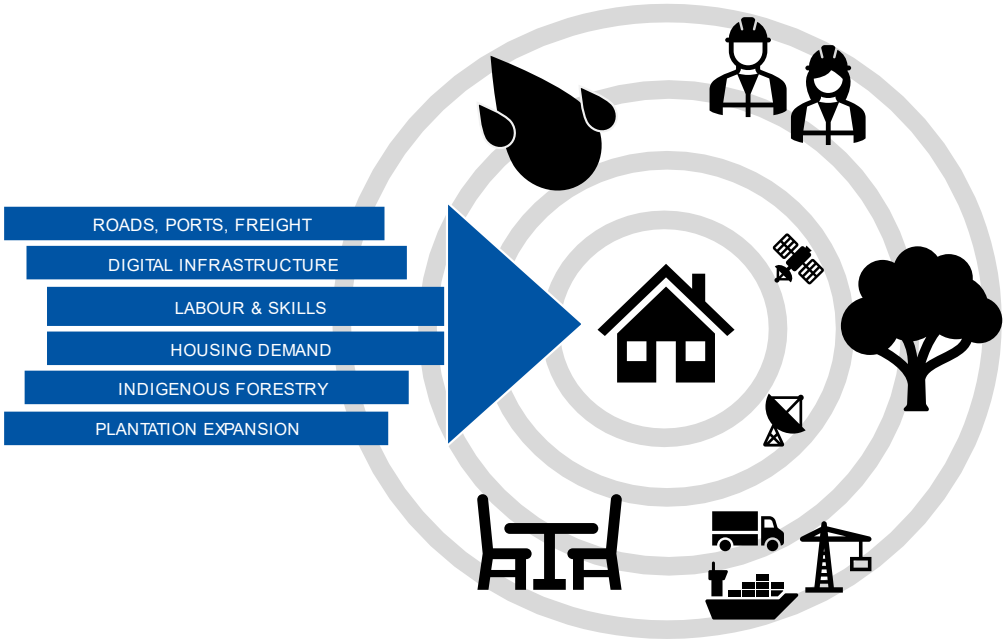
Grow! Process! Build! The future of northern Australian forestry

Supply chain and infrastructure analysis and needs assessment for the Northern Territory and Ord Valley forest industries



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Australian Government
Department of Agriculture, Fisheries and Forestry

NORTHERN TERRITORY GOVERNMENT

Prepared for the Northern Territory and Ord Valley Forestry Hub, NT Farmers and Forestry Industry Association Northern Territory

FORESTRY HUB NORTHERN TERRITORY ORD VALLEY

NT FARMERS

FIANT FORESTRY INDUSTRY ASSOCIATION NORTHERN TERRITORY

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Acknowledgements

IndustryEdge acknowledges the custodians of the lands of the Northern Territory and Ord Valley Forestry Hub region and of the lands on which this analysis was prepared, the Wathaurong people of the Kulin Nation.

Disclaimer

Although great care has been taken to ensure accuracy and completeness in this market review, no legal responsibility can be accepted by IndustryEdge Pty Ltd for any decisions taken by readers of this report.

Snapshot: the journey from 2022 to 2027

The emerging forestry and wood products industry in the Northern Territory and Ord Valley has great potential to deliver sustainable housing, packaging, energy, cultural and other products required in northern Australia, as well as the rest of Australia and the world.

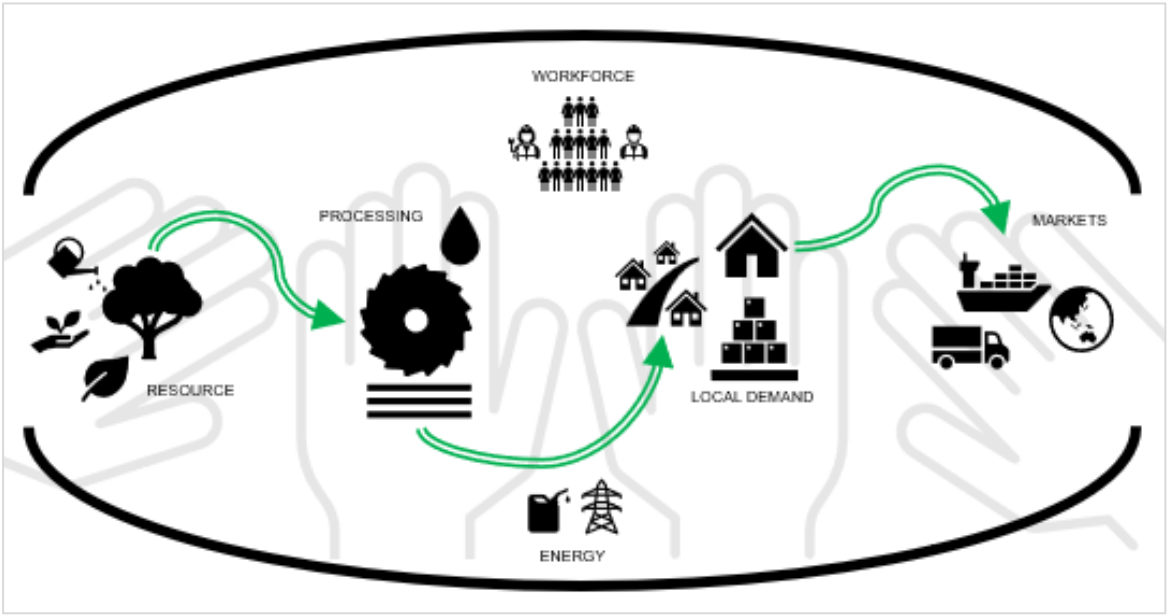
This detailed analysis of the industry's supply chain and infrastructure, its opportunities and needs sets out the potential and the pathway to achieving it.

The current industry, consisting of these major activities, requires **improved linkages and integration** to deliver the identified potential:

- **Sawn timber** produced in East Arnhem Land (Gumatj Corporation) and used to manufacture houses and other structures, with potential to supply sawn timber to other parts of northern Australia, from the region's native forests and is an example of the nature of opportunities in the region;
- Plantations on the Tiwi Islands (Tiwi Plantation Corporation and Plantation Management Partners) currently supply global customers with **fibre for paper and biomass energy production**, with a change in species providing opportunities to expand northern Australia's **solid wood production** for use in the region, nationally and in Asia;
- Plantations of African Mahogany and Sandalwood in the Douglas Daly / Katherine area (African Mahogany Australia and Quintis) that by 2027 will commence harvesting, with potential for **local value-adding for sawn timber and other solid wood production**, as well as **pre-processing of sandalwood** for the global market;
- Sandalwood plantations in the Ord Valley / Kingston area (Quintis and Alphas Santanol) **already supplying high-value products** to the world.

By linking current and potential wood supply to established demand in northern Australia, the rest of Australia and across the world, the local industry can expand its role and value to the region, displacing imports, supplying carbon-friendly building solutions, supporting sustainable economic development in indigenous communities and providing local supply alternatives.

Future northern Australian forestry industry and supply chain



Source: IndustryEdge

To reach its potential, the industry, supported by Governments and customer industries, will focus on five themes:

A. Plantation and farm/forestry expansion

B. Value-adding and downstream processing development

C. Transport, shipping, freight and logistics

D. Operating infrastructure, supply chains and research

E. Labour recruitment, development and retention

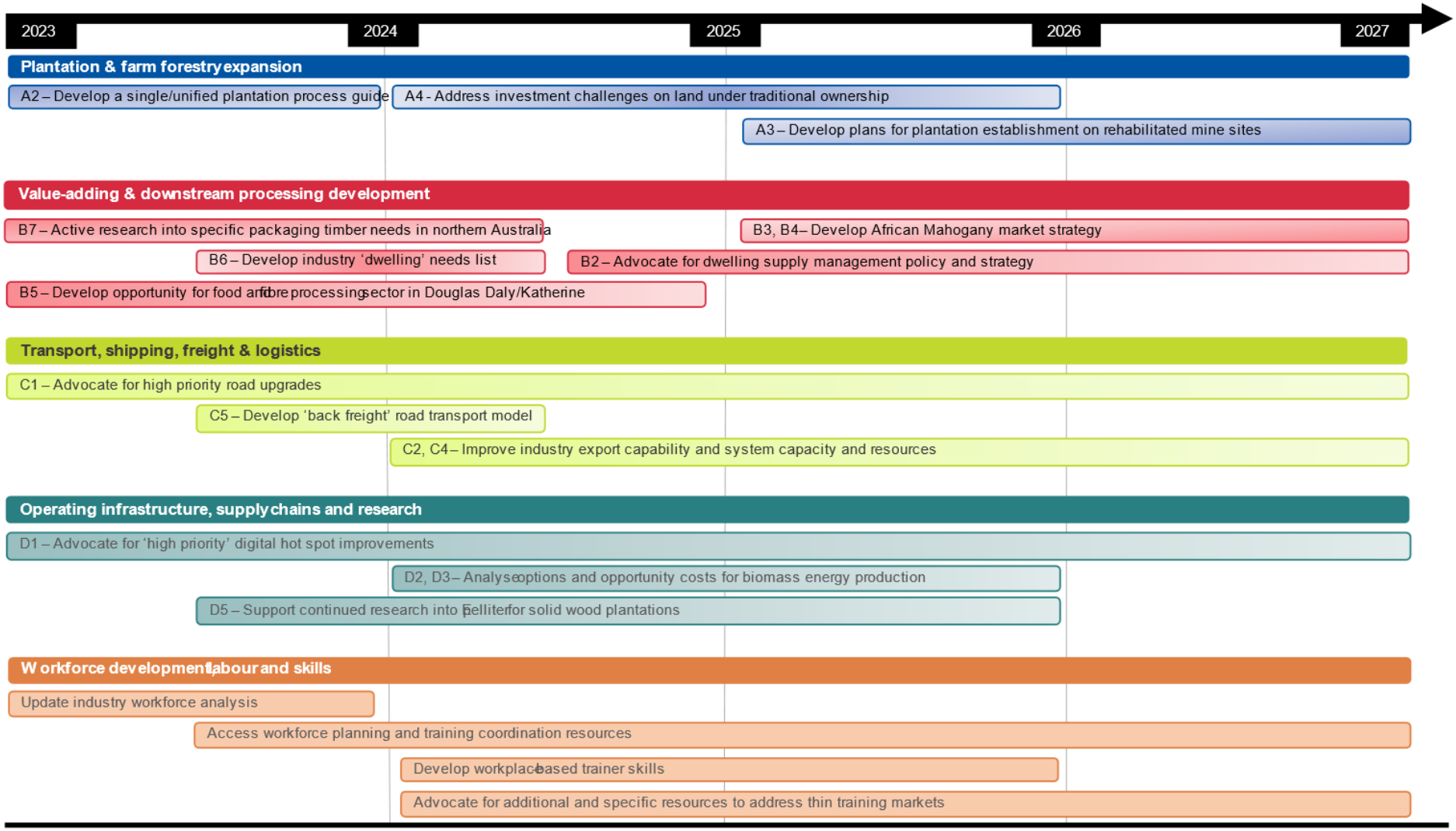
Specifically, the emphasis will be on:

- Resolving supply chain challenges, including addressing critical road infrastructure and transportation efficiencies,
- Recruiting and developing a workforce for the long-term future, whose skills develop in accord with the industry's development,
- Establishing a specific wood processing centre or precinct, to develop capacity and capability for the unique circumstances of northern Australia,
- Focussing attention on local markets in northern Australia, including appropriate opportunities in indigenous communities, in addition to a focus on the rest of Australia and international markets,
- Addressing underlying needs, while actively pursuing downstream and end-market partnerships that support vertical integration.

Consistent with the outcomes of a joint northern Australian forestry hubs' project (underway and yet to report as at March 2023), participants in the value-chain will ensure actions to meet these focal points and emphasis will be undertaken consistent with the principles of formal, prior and informed consent and associated communications protocols.

A qualitative assessment of the recommendations from the Supply chain and infrastructure analysis and needs assessment has been completed. The timeline on the following page sets out the key needs of the Northern Territory and Ord Valley Forest Industries Hub and its members, for improving the supply chain and infrastructure capabilities of the industry.

Northern Territory & Ord Valley Forest Industry: Key Priorities: 2023 - 2027



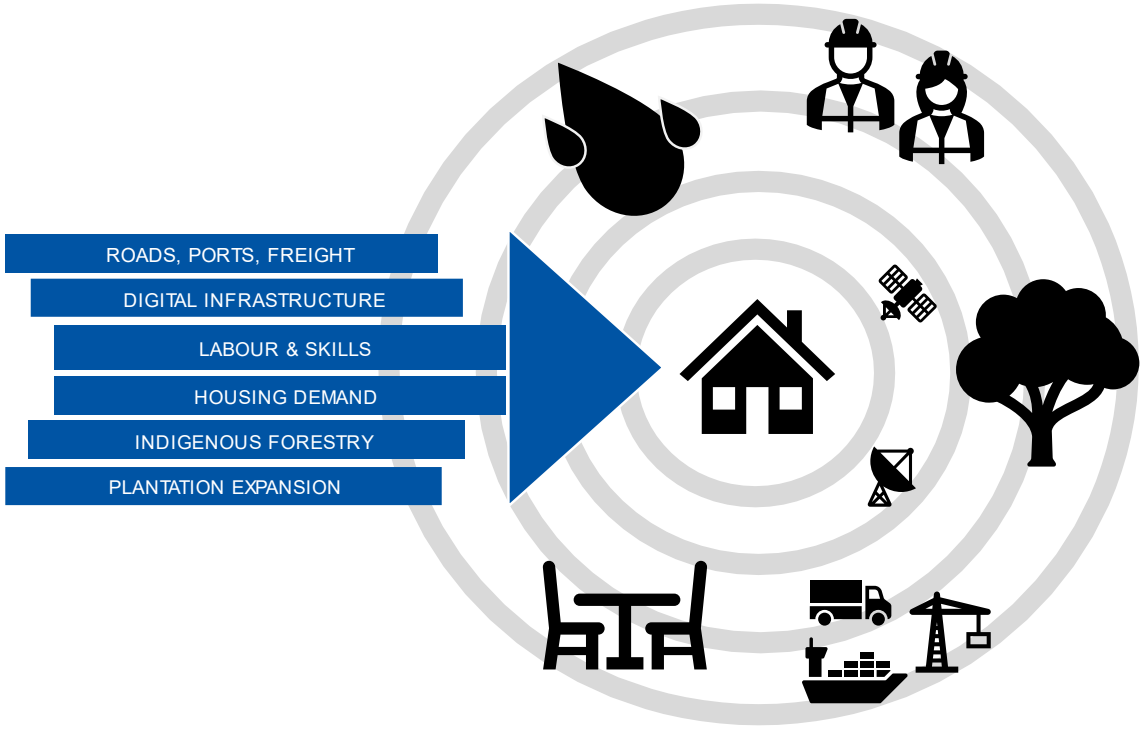
Source: IndustryEdge

Executive Summary

The potential of the Northern Territory & Ord Valley (the region) for forestry and wood products is significant and exceeds the sector's current activity levels, capacities and capabilities.

In a world starved of climate-friendly solutions for its built environment, its packaging and even energy needs, timber from sustainably managed plantations and forests represents one of the most effective means of advancing carbon neutrality and achieving net-zero emissions outcomes.

Ultimately, this analysis finds the opportunities from a larger, more integrated and local supply focussed forestry and wood products industry will provide the region with a dynamic and useful supply of sustainable building and packaging materials that in turn can provide stable, skilled and long-term employment, while earning the majority of its income from international markets and markets in the rest of Australia.



Northern Australia's potential

Operating across a vast area, northern Australia has, over the longer term, the potential to:

- Sensitively expand Australia's footprint of carbon sequestration in timber plantations,
- Increase the use of wood products in the built environment and for packaging in northern Australia, including to meet the industry's own workforce accommodation needs,
- Contribute supply of value-added wood products into southern and eastern Australian markets and international markets',
- Extract chemical and other organics (eg. oils) from trees in a sustainable manner,
- Increase economic activity across northern Australia in a manner integrated with existing economic activity, including pastoral activity,

- Provide indigenous communities with access to sustainable materials for shelters, to produce traditional wood products and for other culturally appropriate applications, as well as supporting local employment and business development opportunities,
- Create skilled employment opportunities, integrated with existing pastoral, agricultural and other rural industries in the region.

Infrastructure and supply chain needs

To deliver on its potential, the region needs access to improved infrastructure and support for supply chain initiatives that can assist the entire industry, as well as its constituent parts.

The development of a northern Australian forestry and wood products industry supply chain relies on collaboration and coordination, underscoring the importance of the Northern Territory and Ord Valley Forest Industries Hub, the role of industry associations and strategic and integrated support from regional and Commonwealth governments.

At a policy and regulatory level, the industry considers improvements to water access rights and a resolution of the plantation participation rules under the Emissions Reduction Fund, would be of particular assistance in northern Australia.

In addition to these regulatory matters, the opportunity to establish a regional forestry and carbon positive wood processing sector would be enhanced by improved demand management and support in the local housing sector, especially in the main population areas.

A major potential focus for the industry is supply of building products and even entire timber-based buildings, for dwellings in northern Australia, including potentially in remote indigenous communities, where that is appropriate.

Major infrastructure needs

Although presenting differently across the region, the major **infrastructure needs** of the sector are:

- Improved access to all-weather roads, capable of handling log harvesting and haulage vehicles and forestry and plantation management equipment, as well as workforce
- Improved digital infrastructure in key locations;
- Access to reliable and sustainable thermal and electrical energy;
- Urgently increased and improved workforce accommodation.

As it works to establish a **supply chain** with depth and increase both sector and vertical integration, the industry seeks to significantly increase its local processing of wood, to manufacture products needed locally, in Australia and internationally.

Major supply chain needs

Major supply chain efforts to support the future are:

- Development of local and workplace-based training and skills development processes that increase the likelihood of attracting, developing and retaining the skilled workforce required for the future (region wide);
- Establishing a wood processing centre or cluster for African Mahogany resource, Sandalwood resource in conjunction with other industries (Douglas Daly/Katherine);
- Completing research on solid wood options for *Eucalyptus pellita* (Tiwi Islands);
- Establishing (and possibly coordinating) demand for forestry back freight to southern and eastern Australia (region wide);

- Establishing more consistent demand from the local housing sector – including the industry's own demand for accommodation – to encourage investment in carbon positive wood products and meeting local demand for worker accommodation with the development of a coordinated timber-based modular dwelling system.

Labour and skills needs

Specific assessment of labour and skills needs for the northern Australian industry demonstrates attracting and retaining a committed workforce requires promotion of the industry and its opportunities and an emphasis on developing skills locally, including in schools and at the workforce level.

Recognition of the additional costs associated with a widely dispersed and seasonal workforce is required to provide the industry with equitable access to training resources.

Coordination resources are required to facilitate training and skills development activities that can support the attraction, retention and development of a highly skilled long-term workforce across the region. Importantly, developing capability in workplace-based training and skills development is a priority across the northern Australia industry.

In particular, the expansion of indigenous forestry activities – a significant opportunity – will rely on increasing the skills and knowledge of Indigenous landowners, through culturally appropriate processes approved and where possible devised by those landowners, linked to social and economic activities including potentially in remote indigenous communities.

Industry collaboration and coordination

Across northern Australia, the similarities of infrastructure and supply chain needs and challenges come with the reality that geographic and sectoral differences require what are sometimes separate solutions.

Collaboration with the industry across Australia will support the development of capacity in northern Australia and may contribute to efforts to reduce duplications across the country. Coordination of effort and the allocation of limited industry resources is critical to addressing the supply chain and infrastructure needs. Whether through the NTOVFH or industry associations, this effort should now extend to determining joint priorities, including a work plan that addresses each challenge or opportunity in an orderly manner, even where it might apply to only one area, just one sector or even one business.

Utilising the industry's limited resources in a coordinated manner and in respect of land-uses, in a manner consistent with the principles of formal, prior and informed consent, is the most likely means of progressing many of the abundant opportunities presented for northern Australia.

Summary of Recommendations

Topic & Recommendation	Operating Areas					Current Sectors			
	northern Australia (entire region)	Douglas Daly	Tiwi Islands	Ord Valley/Kingston Rest	East Arnhem Land	Hardwood plantations - solid wood	Hardwood plantations - wood fibre	Sandalwood	Indigenous native forestry
A. Plantation and farm/forestry expansion									
A1. Local industry continue to engage with other silvo-pastoral research, development and extension projects and share findings and opportunities within the region, including with NT Farmers and its members.		✓			✓	✓			
A2. NTOVFH and industry associations work with NT Government to develop a single/unified process guide of the pathway/s to establish plantations or other farm forestry activities, regardless of land tenure, using pre-existing resources, as a base.		✓	✓		✓	✓	✓		✓
A3. Industry support landowner activities and projects to consider the establishment of plantations on rehabilitated mine-sites on land owned by Traditional Owners.	✓					✓	✓		
A4. NTOVFH, industry and landowners consider options for addressing investment challenges associated with growing plantations on land owned by Traditional Owners.	✓					✓	✓		
A5. As water rights and allocations are revised by the Northern Territory Government, plantation forestry be afforded the same status as other crops, with access to water by land users available 'as of right'.	✓					✓	✓	✓	
A6. Commonwealth Government continue efforts to incentivise establishment of plantation forestry in northern Australia, by removing remaining impediments to the sector's participation in the Emissions Reduction Fund.	✓					✓	✓		

B. Value-adding and downstream processing development									
B1. NTOVFH and industry associations develop a locally appropriate template for a 'local first, timber first' procurement policy for approval by industry, stakeholders and Traditional Owners, to pursue with Governments, in addition to established 'indigenous first' procurement policy.	✓					✓			✓
B2. NT & Commonwealth Governments engage the housing construction supply chain in discussion to establish the appropriate mix of policies to provide orderly management of dwelling construction to encourage investment, recruitment and skills development, including in the local forestry and wood products industry.		✓	✓		✓	✓			✓
B3. Local industry with potential sawnwood supply, seek support from industry associations to improve linkages and relationships with potential processing partners and market operators across Australia.		✓				✓			✓
B4. Local industry conduct/update a market opportunities assessment and develop an implementation plan for the African Mahogany resource, prior to the commencement of annual harvesting around 2027.		✓				✓			
B5. NTOVFH and members liaise with other industry sectors and with landowners in the Douglas Daly/Katherine to explore options for an economic development / processing centre to be established at a suitable location in the Douglas Daly/Katherine, including a trial wood-processing facility to improve value-adding and enhance access to Australian and international markets.		✓				✓			
B6. Local industry develop a profile and schedule of operationally required dwellings and other structures and jointly consider the extent to which that demand could be met in part, or in full, by locally produced, possibly modular, timber-based buildings.	✓					✓	✓	✓	✓

B7. Local growers with potential sawnwood supply make contact with significant food growing and other businesses to determine specific needs and opportunities for timber packaging such as pallets, crates and cases and assess their capacity to supply new packaging, including components for repairs.		✓			✓	✓			✓
C. Transport, shipping, freight and logistics									
C1. NTOVFH maintain for industry, the specific list of major road needs, for each operating area, prioritised for those that would support increased investment in scale or value-adding and for which there is broader community need. The initial road needs are set out in Table 6.	✓					✓	✓	✓	✓
C2. Local industry seek support of industry associations and bodies to create linkages and relationships with existing exporters across Australia, to access information and support as they develop export options.	✓					✓	✓	✓	✓
C3. Governments consider the reintroduction of state-operated coastal shipping services as a means of ensuring supply chain consistency and reliability, thereby encouraging investment for supply of forestry and wood products to the rest of Australia.	✓					✓	✓	✓	✓
C4. NTOVFH develop and maintain for industry, the specific limitations of existing export support services (eg. access to scheduled shipping services, fumigation yards, freight forwarders and adequate port infrastructure) to be used to seek infrastructure and supply chain improvements.	✓					✓	✓	✓	✓
C5. NTOVFH and local industry develop and maintain a back-freight cost analysis and schedules for discussion with road-freight service providers and potentially with other industry associations and bodies.	✓					✓	✓	✓	✓
D. Operating infrastructure, supply chains and research									
D1. NTOVFH collate a specific 'digital hotspots' list of areas that require increased access to digital infrastructure	✓					✓	✓	✓	✓

D2. NTOVFH and members seek support to undertake analysis of options suitable for remote biomass energy utilisation for the production of thermal and electrical energy, drawing on established literature and technologies.	✓								
D3. Local industry develop an 'additional cost' model for shipping diesel to the Tiwi Islands, as a supplement to any biomass energy analysis undertaken for the entire region.			✓				✓		
D4. Local industry develop a business case for a sealed fibre hardstand on Tiwi Islands to share with stakeholders and to seek the support of Government, with the support of the NTOVFH and industry associations.			✓				✓		
D5. Local industry support the continued research and development process for Eucalyptus pellita and NTOVFH support fact-based extension activities to determine the suitability of Eucalyptus pellita to meet local solid wood needs.			✓				✓		
D6. NTOVFH, local industry and associations engage with existing efforts to address urgent accommodation shortages and to develop a housing development strategy with the region, including with Homes West, relevant Government agencies and the Shire of Wyndham-East Kimberley.				✓				✓	
E. Labour and skills – see Section 4.1.5 for details									

Contents

Overview

The potential of the Northern Territory & Ord Valley (the region) for forestry and wood products is significant and exceeds the sector's current activity levels, capacities and capabilities. In a world starved of climate-friendly solutions for its built environment, packaging and even energy needs, timber represents one of the most effective means of advancing carbon neutrality and achieving net-zero emissions outcomes.

As this analysis unfolded, it became apparent it was appropriate to consider supply chain and infrastructure needs from a broad opportunities perspective, not just in the context of the more narrow 'existing state'. Related to that, assessment of opportunities that provide the industry's growth potential point to three different geographies of opportunity:

- Local ~ the region itself
- Australia
- International ~ export markets

This is a more important consideration than might appear to be the case at first instance because each geography has different needs, requires different capabilities and therefore provides different opportunities.

Northern Territory & Ord Valley forest industry potential

Operating across a vast area, the region represents an under-utilised opportunity to:

- Sensitively expand Australia's footprint of carbon sequestration in timber plantations,
- Increase the use of wood products in the built environment and more generally in northern Australia,
- Extract chemical and other organics (eg. oils) from trees in a sustainable manner,
- Increase economic activity across northern Australia in a manner integrated with existing economic activity, including pastoral activity,
- Provide indigenous communities with access to sustainable materials for shelters, to produce traditional wood products and for other culturally appropriate applications
- Increase use of native timbers in the production of high-value furniture and similar products, and some building and packaging products, including for use in the local built environment,
- Create skilled employment opportunities, integrated with existing pastoral, agricultural and other rural industries in the region.

Species, regions and companies

The region is home to extensive native vegetation, including unique tree cover with properties suitable for harsh northern Australian climates. In addition, the region includes three distinct plantation regions, with three distinct plantation species and three separate expectations of end uses in the Australian and global economies.

Table 1: NT & Ord Valley Forestry Activities, Species, Operating Areas and Companies

Hardwood Plantations		**Native Forestry**	**Sandalwood**	
Solid Wood	*Wood Fibre*	*Solid Wood, Traditional Products and Medicines*		
Douglas Daly/Katherine	Tiwi Islands	East Arnhem Land	Ord Valley/Kingston Rest (Kununurra)	Douglas Daly/Katherine
African Mahogany Australia	Tiwi Plantation Corporation Plantation Management Partners / Midway Limited	Gumatj Corporation	Alpha Santanol Quintis Limited	Quintis Limited

Source: IndustryEdge

The main companies currently processing wood products in the region are:

- Gumatj Corporation Limited 's hardwood sawmill in Nhulunbuy, East Arnhem, which provide sawn products from Indigenous owned land to local markets for housing and social projects,
- Tiwi Plantations Corporation/Midway Limited (Plantation Management Partners) woodchip processing and ship loading facilities on Melville Island (the Tiwi Islands), which provides export woodchips for pulp and bioenergy markets,
- Quintis Limited's primary processing facility of Indian Sandalwood logs in Kununurra, which process harvested logs into dry heartwood and woodchips and transports material to the company's oil distillery near Albany in southern Western Australia, (also has Sandalwood plantations in the Douglas Daly/Katherine area) and
- Alpha Santanol's primary processing facility of Indian sandalwood in Kununurra, which dries, sorts and process harvested logs into chips and transport material to the company's oil distillery in Perth in southern Western Australia.

Additionally, African Mahogany Australia has plantations of African Mahogany in the Douglas Daly/Katherine, which will mature to harvest around 2027-28.

Species planted in the region are:

- Indian Sandalwood (Santalum album)
- African Mahogany (Khaya senegalensis)
- Black Wattle (Acacia mangium), noting the plantation growing this species is trialling Eucalyptus pellita as a replacement species

Critically, the native vegetation is home to the robust and termite resistant Darwin Stringybark (Eucalyptus tetrodonta), a species that has proven itself suitable to various solid wood uses, including producing sawn timber and for use as poles, posts, bollards and similar.

The region's distinct operating locations are:

- Ord Valley/Kingston Rest (WA)
- Tiwi Islands (NT)
- Douglas Daly/Katherine (NT)
- East Arnhem land (NT)

Three major end-uses and potential to do more

Unsurprisingly, with three different plantation species and native hardwoods, there are different likely end-use applications.

Table 2: NT & Ord Valley Species, End-Uses and Markets

Species	End-Use Applications	Major Markets^
Indian Sandalwood	Perfumes, aromatics, craftwood and incense	Global
African Mahogany~	Furniture, flooring	Local, Australia, Asia
Black Wattle	Paper, paperboard, biomass	Asia
Darwin Stringybark	Construction materials, posts, bollards, furniture	Local, Australia, Global

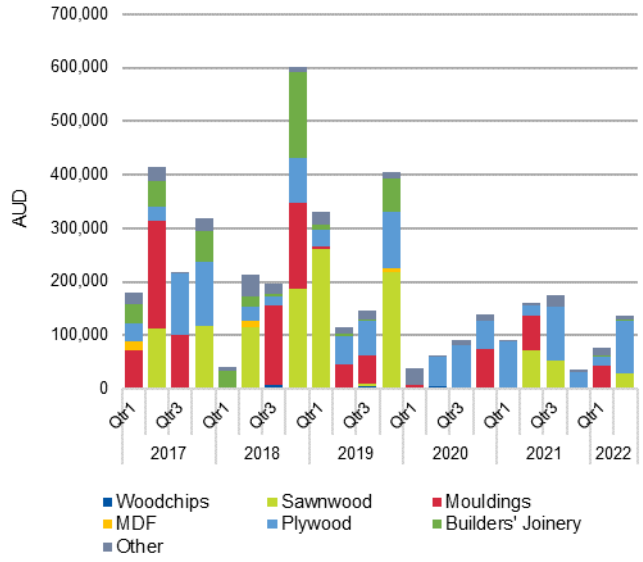
Source: IndustryEdge

^ Local means the Northern Territory & Ord Valley region ~ Not harvesting until 2027-28

Small import trade in forestry and wood products

Consequently, in addition to uncertain supply from other States and Territories, the Northern Territory receives imports form elsewhere in the world. The chart below shows the declining value of ***imports*** over the period since the March quarter of 2017. The decline is considered by industry to be directly linked to the downturn in residual building activity.

Figure 4: Northern Territory Imports of Timber & Wood Products: MQ'17 – JQ'22 (AUD)



Source: ABS and IndustryEdge

AUD & %	2020-21	2021-22	% Change
Woodchips	-	-	-
Sawnwood	72,337	81,113	12.1%
Mouldings	139,145	43,150	-69.0%
MDF	-	-	-
Plywood	242,384	246,687	1.8%
Builders' Joinery	-	5,272	-
Other	28,818	49,928	73.3%
Total	482,684	426,151	-11.7%

The Northern Territory does have occasional exports of timber and wood products, but they are sufficiently varied as to value and type, to be almost unchartable. In 2021-22, exports were valued at AUD253,609.

It is an obvious conclusion that currently, other than volumes of sawn timber and other wood products from elsewhere in Australia for use in the local market, there is currently little or no movement of timber products into or from the Northern Territory, with the exception of the instances stated below.

Aside from a single shipment of sawdust from the Port of Broome in Western Australia, the *northern* ports of that state are not reported as having exported any forestry or wood products (including Sandalwood) in almost six years.

There are however significant exports of woodchips from the Tiwi Islands each year. These are not reported separately by the Australian Bureau of Statistics (ABS) because the data for all Australian woodchip exports is currently subject to confidentiality restrictions. IndustryEdge estimates the annual value of woodchip exports from the Tiwi Islands is around AUD30-35 million per annum, measured on a free-on-board basis.

The current export situation could change rapidly, as plantations come into production (Douglas Daly/Katherine) and value-adding increases (all regions). It is noted any expansion in exports would require immediate improvements to infrastructure, including for road freight, and at and related to ports.

Separate, but similar

In some respect, as a result of the divergence of species, operating locations and end-use applications, the region has developed separate approaches to its forestry and wood products industry, with varying degrees of integration between growing, processing and end-markets.

For the most part, northern Australian wood processing is quite limited, and the application of local forestry and wood products to local needs is even more limited. Although the region has a small population and its markets are therefore limited, it is also a remote Australian region, where the advantages of local supply options must be considered an important opportunity for the development of the forestry and wood products industry.

In particular, the African Mahogany plantations in the Douglas Daly/Katherine will not mature to full harvest for approximately five years. Infrastructure development and supply chain planning activities may make the difference between a local resource being harvested and exported for processing and the realisation of opportunities to undertake more extensive local processing and value-adding in the region, to meet local as well as national and international market needs.

This analysis demonstrates that despite the differences, there are significant similarities in respect of current supply chain limitations and infrastructure needs, in the region. Many of the infrastructure needs are common to most industries operating in northern Australia. However, some of the supply chain challenges are more specific to forestry and wood products sectors.

Infrastructure and supply chain needs

The following summarises the infrastructure and supply chain needs identified in this analysis.

Table 3: Infrastructure & Supply Chain Needs by Operating Area

Region		Douglas Daly / Katherine	Tiwi Islands	East Arnhem Land	Ord Valley / Kingston Rest
Infrastructure	Stable & Sustainable Energy	✓	✓		
	Digital Infrastructure	✓	✓	✓	✓
	Suitable housing and support facilities	✓	✓		✓
	Improved Roads	✓	✓	✓	✓
	Road Transport to southern Australia	✓			✓
	Improved water licencing regulation	✓	✓		
	Port Infrastructure	✓	✓	✓	✓
	Land Use Access			✓	
	Regulation	✓	✓	✓	
	Carbon Plantation Rules	✓	✓	✓	
Supply Chain	Direct Labour	✓	✓		
	Specialist Contractors	✓	✓	✓	
	Skills Development	✓	✓	✓	✓
	Product Research & Development	✓	✓		
	Market Access & Trade Support	✓		✓	
	Commercial Extension Support			✓	
	Recognition of carbon in wood products	✓	✓		
	Reliable housing demand	✓	✓	✓	

Source: IndustryEdge

Recommendations for an integrated future

The recommendations arising from this analysis are set out in the prior section. As a whole, the recommendations focus on achieving a more integrated regional industry, which entails closer relationships across supply-chains, in infrastructure development, labour and skills planning across the sectors and operating areas, but also with other significant industries in the region, not least the pastoral and agricultural industries.

In addition, the recommendations support expanding and extending the industry, to increase the role it plays in meeting the economic, social and ecological interests of northern Australia and its population in the first instance, Australia more generally thereafter and the international economy as part of a wholistic approach to the future.

Clear vision of the future

Driven by the direct input of the region's forestry and wood products industry and recognising the potential of northern Australia more generally, this analysis concludes that with a mix of collaborative and cooperative development activities, the region can have a bright and more significant role in the local economy and society.

Led by the Northern Territory and Ord Valley Forest Industries Hub and its stakeholders, pursuit of improved and integrated infrastructure, more emphasis on meeting specific end-use needs and a focus on bridging local and national supply chain gaps will support increased investment, processing, value adding and employment in the region.

Glossary & Abbreviations

ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
ABS	Australian Bureau of Statistics
AFPA	Australian Forest Products Association
$A	Australian dollars
AUD	Australian dollars
AUDM	Million Australian dollars
FIANT	Forest Industries Association of the Northern Territory
FWPA	Forest & Wood Products Australia
m^3	Cubic metres
MDF	Medium Density Fibreboard
Mm^3	Millions of cubic metres
Mt	Million tonnes
NT Farmers	Northern Territory Farmers Association
NTOVFH	Northern Territory & Ord Valley Forest Industries Hub
%	Per cent
t	Tonnes

1. Background and methodology

The Northern Territory Ord Valley Forestry Hub (NTOVFH), in conjunction with NT Farmers and the Forestry Industry Association of Northern Territory (FIANT), seek to build upon existing studies into the Northern Territory and Ord Valley/Kingston Rest forestry sector to achieve the Hub's mission to "support improved productivity, investment and expansion in the regional forest industry."

This analysis, part of the Hub's total workplan, describes and analyses the current supply chain and the existing and emerging infrastructure needs of the northern Australian forestry industry. In doing so, the analysis examines the regional industry, the areas in which it operates, the species available to it and the end-use opportunities arising from those species, locally, nationally and internationally.

It aims to provide consolidated insights and actionable measures which will:

- Assist government and industry to understand and plan to address supply chain issues and challenges;
- Identify gaps in infrastructure and government support;
- Highlight areas of specific labour and skills shortages.

By engaging directly with industry stakeholders and others, this analysis draws out underlying themes from available data and intelligence, providing insights to both constraints and opportunities, while articulating clear recommendations for action by the Hub, industry participants, associations and governments.

Research and consultation for this report was undertaken from September 2022 to February 2023 inclusive.

2. Overview of Australian forestry and wood products industries and consumption

No matter how isolated, remote or self-sufficient a region may be, the context of its forestry and wood products industry includes national and global industries, markets and supply chains. The northern Australian situation is no different.

From a supply chain and infrastructure perspective, Australian experience provides guidance and presents opportunities, as well as providing context.

2.1 Australian forestry and wood products industry

Australia's mature forestry and wood products industry harvested 27.1 million m^3 of logs valued at a calculated $A1.887 billion in 2020-21.

The total harvest supplies the significant majority of the total domestic supply chain and its needs. However, trade – both imports and exports – are significant in volume and are important.

At a national level, in recent years, the three largest log-using sectors were sawnwood and plywood (around 63% of the total), paper and paperboard (around 24%) and wood panels such as MDF and particleboard (around 9%).[1]

The table here sets out calculated and estimated domestic and import market-shares for the major wood products.

Table 1: Australian Wood Products Apparent Consumption by Selected Main Product: 2021-22 (Mm^3, Mt or AUDM)

Product	Domestic Supply	Import Supply	Consumption
	Production net of Exports (%)	Proportion (%)	Mm^3
Sawn softwood timber	77%	23%	4.5
Sawn hardwood timber	85%	15%	0.7
Wood panels (eg. MDF, Particleboard)	65%	35%	1.1
Pulp (for paper, paperboard and cement board^)	82%	18%	1.7 Mt
Paper and paperboard	68%	32%	2.8 Mt

Source: FWPA, ABS, ABARES, company reports and IndustryEdge

^ imported pulp is used as the stabilising and strength agent in cement board products

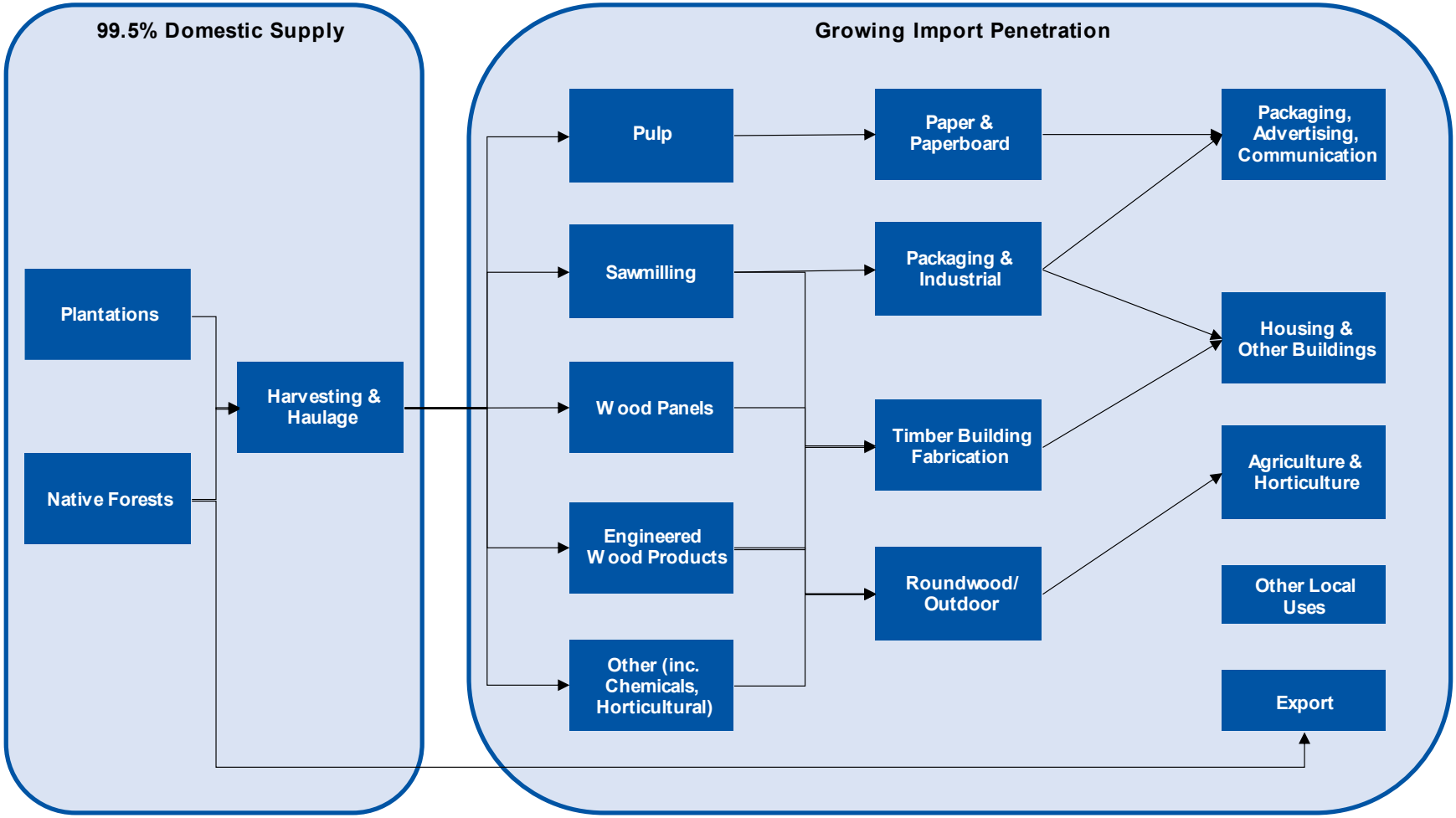
The Australian supply chain delivers wood products to many sectors, but most critically, it supplies materials for the **built environment** (especially dwellings), for **packaging** (both paper and paperboard for corrugated boxes, cartons, bags and sacks and solid wood products like pallets, crates and cases), **outdoor applications** around dwellings and in **agriculture and horticulture** and for **printing and communication papers** (eg. copy paper), along with a myriad of other uses.

Despite the robust domestic industry, there are significant imports of sawn timber, engineered wood products and some grades of paper and paperboard. It is widely agreed in the Australian industry that import substitution – in part or in whole – is an opportunity to increase the value of the domestic supply chain.

A simple depiction of the Australian supply chain is set out on the following page.

[1] ABARES, 'Australian Forest & Wood Products Statistics' [multiple editions], Canberra, 2020 to 2022

Figure 1: Simplified Australian Forestry & Wood Products Supply Chain



Source: IndustryEdge

3. Northern Territory and Ord Valley forestry and wood products industry in 2022

This section describes the region, the industry, its existing supply chain and major businesses and business activities, as well as each of its operating areas and the constraints, needs and opportunities of each, as well as for the total region.

3.1 Overview

Although vast, northern Australia has a small and dispersed population, consisting of a calculated 250,400 people in March 2022.[2] The absence of a critical mass of people is a constraint on local demand for products and on labour resources.

It is tempting to view the northern Australian forestry and wood products sectors as an integrated industry. However, the reality is that there are currently four distinct industries, from both an operating location and specific activities perspective.

For all that there are distinct regions and sectors and each has its own needs, there are needs that are similar between the regions and the sectors.

The distinct regions are:

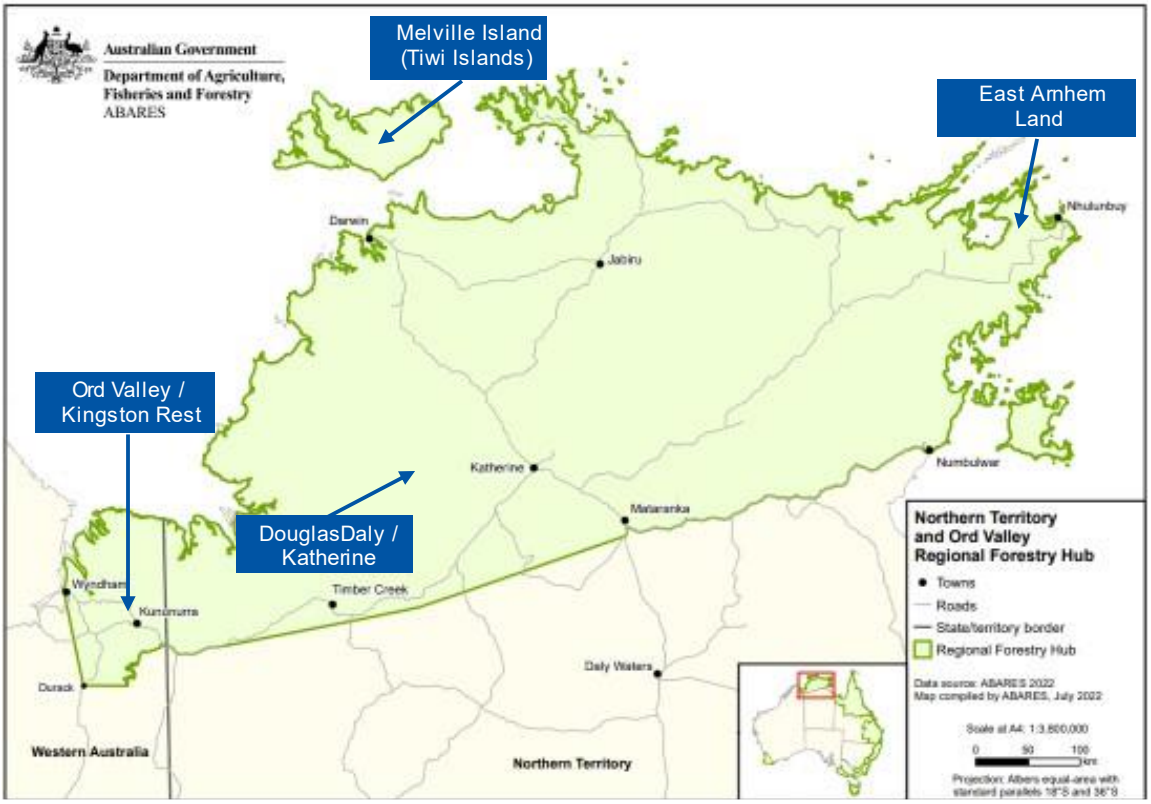
- Ord River Valley inclusive of Kingston Rest (WA),
- Douglas Daly/Katherine/Daly River (NT)
- Tiwi Islands (NT)
- East Arnhem Land (NT)

The proportional extent of northern Australia's forest estate is somewhat misleading as the vast majority is not appropriate for forestry activity or is too remote and sparse to be of particular use. Recent assessment indicated that 23% of total native forest in northern Australia was suitable for commercial activity and just 0.8% was of moderate or higher commerciality.[3]

The portion of northern Australia within the jurisdiction of the NTOVFH is home to 27.291 million hectares of native forest and 61,000 hectares of plantations, including Sandalwood plantations. (Stephens et al, 2020)

[2] ABS, '3101.0 National, state and territory population, TABLE 4. Estimated Resident Population, States and Territories', 2022
[3] Stephens, M., Woods, T., Brandt, C., Bristow, M., Annandale, M. 2020 *'Northern forestry and forest products industry situational analysis'*, CRCNA, Brisbane.

Map 1: NT & Ord Valley Forestry Hub Region and Operating Locations



Source: ABARES

The matrix below sets out the distribution of sectors and activities falling within each of the operating locations.

Table 2: NT & Ord Valley Forestry Activity, End-Uses, Operating Locations and Main Companies*

Hardwood Plantations		Native Forestry	Sandalwood	
Solid Wood	*Wood Fibre*	*Solid Wood Traditional Products and Medicines*		
Douglas Daly/Katherine	Tiwi Islands	East Arnhem Land	Ord Valley/Kingston Rest (Kununurra)	Douglas Daly/Katherine
African Mahogany Australia	Tiwi Plantation Corporation Plantation Management Partners / Midway Limited	Gumatj Corporation	Alpha Santanol Quintis Limited	Quintis Limited

Source: IndustryEdge

* excludes natural oil production occurring in Darwin, all informal native forest harvesting and secondary manufacturing

3.2 Supply chain and business activity

Although northern Australia constitutes approximately 48% of Australia's total forests, the regional forestry and wood products industry contributes a relatively small $80 million of economic activity per annum. Previous analysis demonstrates this could more than triple by around 2030, to reach $300 million per annum.[4]

Recent analysis indicates the regional industry includes approximately 50 businesses, with the majority operating in the plantation growing (15 businesses) and management support (6 businesses) sector.[5] Only one company can be said to be engaged in continually manufacturing timber roof trusses and frames. There are reportedly four businesses with 'jigs' able to manufacture these timber building components.[6]

A Small number of businesses manufacture furniture, mainly from local timber species. The most prominent is Manapan Furniture, based on Milingimbi Island in Arnhem Land. Notably, Manapan has a supply and processing arrangement with another Arnhem Land operator, Gumatj Corporation.[7]

Though not the subject of this analysis and despite it being an opaque activity, IndustryEdge recognises that there are long-established traditional solid wood and medicine extraction processes undertaken by indigenous communities, in a variety of settings and for multiple purposes. Some of this activity includes income earning potential that is unable to be reflected adequately in this form of analysis.

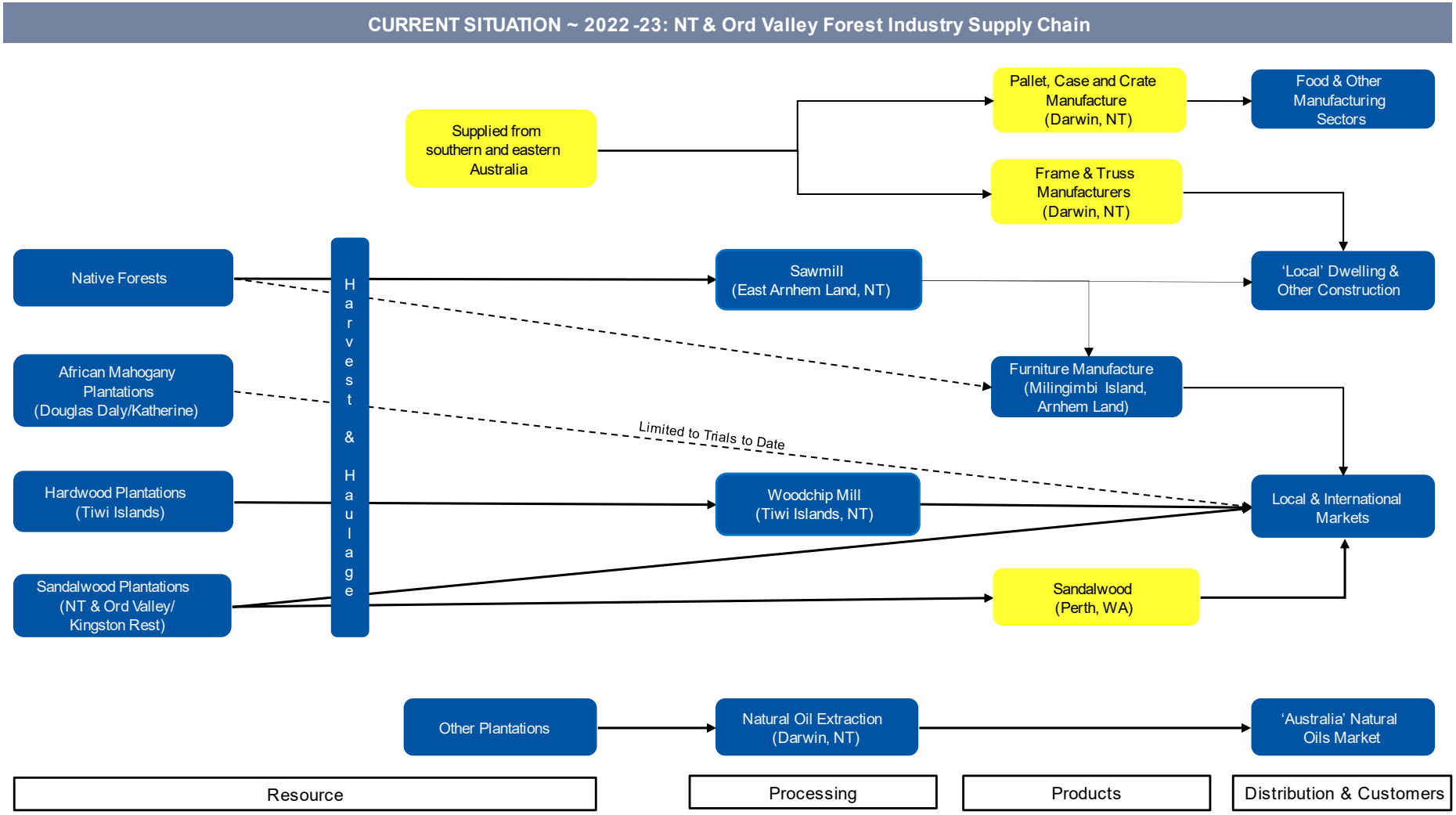
The number of businesses and employees in the industry is therefore quite small.

Analysis of formal employment in the industry shows there are approximately 1,240 direct jobs and 1,860 indirect jobs across northern Australia.[8] Analysis of raw 2021 Census data[9] suggests the industry's Northern Territory employment totalling just 280 people. This is likely to be unrealistically low.

A simple, graphical depiction of the region's current supply chain is set out on the next page.

[4] STEPHENS et al, 2020
[5] FORESTWORKS. 2022 'Skills Gap and Training Needs Analysis, The Northern Territory and Ord Valley Forestry Region', Melbourne
[6] Industry Interview, January 2023
[7] MANAPAN FURNITURE. Website, https://manapan.com.au/
[8] Stephens et al, 2020
[9] ABS. 2022 '2021 Australian Census Data Tools'. Canberra

Figure 2: Northern Australian Forestry & Wood Products Supply Chain: 2022

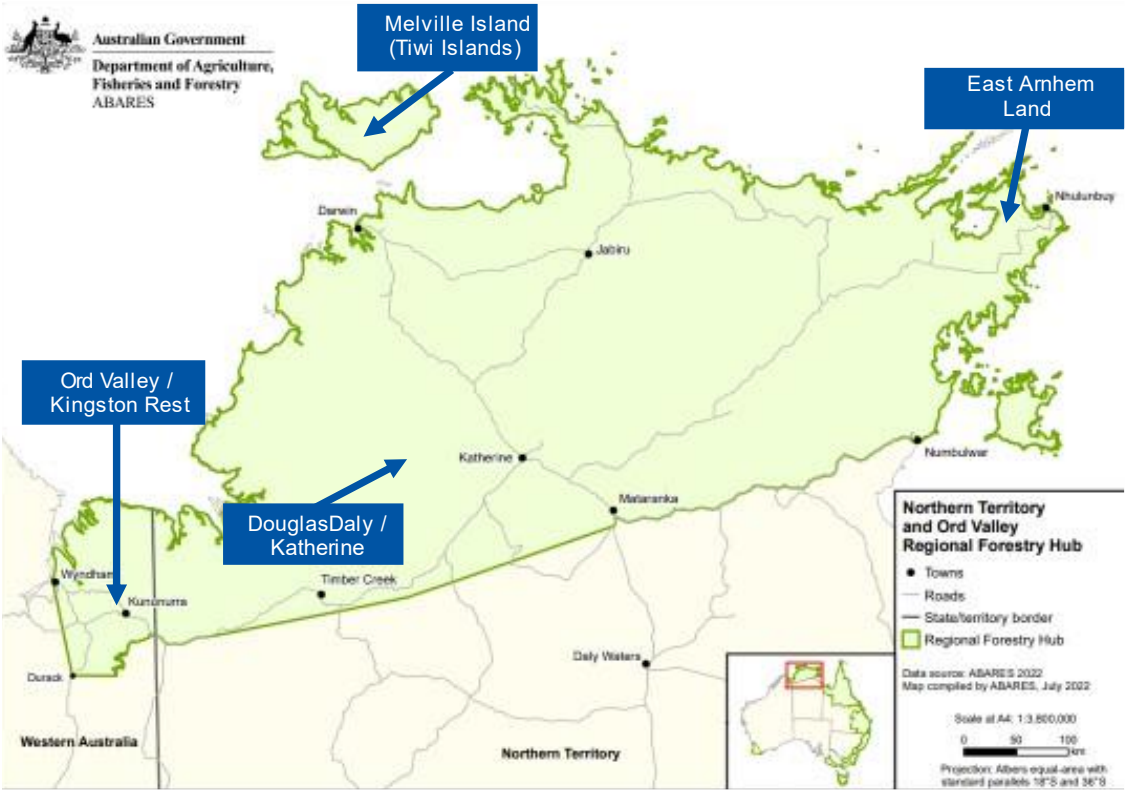


Source: IndustryEdge

3.3 Regions and operating locations

Within the Northern Territory and Ord Valley Forestry region, there are four major operating locations, overlaid on the map below.

Map 2: NT & Ord Valley Forestry & Wood Products Industry Major Regions



Source: ABARES

3.3.1 Douglas Daly/Katherine

Overview

In this region, to the South and West of Darwin, the well-established plantations of high-value African Mahogany (Khaya senegalensis) will come to maturity commencing in approximately five years time – around 2027. Thereafter, harvest will be continuous, with replanting an expectation.

TABLE 3: Douglas Daly/Katherine Forest Industries Opportunities, Constraints, Needs & Recommendations

Opportunities	Constraints	Needs
Expand the plantation base for economies of scale and to attract continuing investment	Insufficient and inadequate accommodation to support the required workforce	Specific emphasis on defining, planning for and meeting actual general housing needs across northern Australia
	Very poor roads and road infrastructure	Improvements as set out in recommendations
	Insufficient and inadequate phone and internet access	Improvements as set out in recommendations

Develop the most value-added local processing options, leading to sawn timber products from the African Mahogany resource being available to supply local, national and international built environment needs, recognising the opportunities may be different in the Northern Territory, compared to the rest of Australia and different again internationally. An introduction to local processing could include 'squaring' of logs, for shipping to end-processors, and pre-processing Sandalwood to reduce the need to transport lower value resource	Incomplete research and product development for the African Mahogany resource	Completion of research and development, including a local production pilot, consisting of initial sawing and potentially drying of some products
	Incomplete end-product and market opportunities assessments	Market opportunities assessment to guide infrastructure development and supply chain activities
	Limited commercial linkages between the local grower and the Australian market	Improved linkages with the national industry and pathways to domestic markets, including with established partners
Utilising sawn residues and potentially specifically sawn material for repairs to timber packaging (eg. pallets) and potentially for specific packaging production	Packaging materials market is small, with most timber packaging shipped into the region with goods	Liaison with local packaging users to trial local sawn timber options for packaging
Establishment of a wood processing centre or cluster in or close to the Douglas Daly/Katherine, in conjunction with other industries (eg. cotton, horticulture) to provide a centralised location for improved access to infrastructure, including energy, freight and export services	Poor energy and other infrastructure, arising from a lack of critical mass of industry activity	Improved access to energy and other infrastructure necessary to advance beyond growing and into processing
Export of African Mahogany logs or semi-processed 'squares' into South East Asia is a viable option for the region's resource, especially as part of a diversified market strategy	Timber export knowledge is limited in the region, due to only small volumes of exports previously being achieved and port and related services (eg. fumigation, containerisation) are limited, difficult to access and often very expensive	Access to suitable advice and support for engaging in export and related activities
		Increased range and/or accessibility of export-related services

Opportunities

There are two main opportunities in the Douglas Daly/Katherine area. First, the establishment of a wood processing centre or cluster, linked to processing of other agricultural and horticultural products and second, expansion of the established African Mahogany and Sandalwood plantations.

Wood processing centre / cluster

As outlined in this report, Australia has a deep and enduring shortage of sawnwood, with supplies of hardwood resource in short supply for all purposes (structural, decorative, furniture etc). This shortage represents an opportunity for the Douglas Daly/Katherine African Mahogany plantation growers to consider a domestic market, in addition to the export market which is expected to arise when harvesting commences in earnest around 2027.

Information supplied for this supply chain and infrastructure review has resulted in potential processors in south-eastern Australia being identified and discussed with the major African Mahogany plantation owner in the Douglas Daly/Katherine. If nothing else, this underscores the need for continued support to identify and access markets.

The identification of suitable markets and the establishment of potential partnerships will assist in understanding the potential for value-adding within the Douglas Daly/Katherine region.

Industry considers solid-wood opportunities in Australia are likely to necessitate logs to be initially processed in the region, to create ‘cants’ or ‘squares’ of different sizes and grades, that can be efficiently shipped to specific processors in South-eastern Australia and for export.

A pilot plant approach is appropriate, with efficient initial sawmilling capabilities (for example a vertical twin saw, requiring three people to operate), prior to a full-scale investment proposal being prepared. Some form of timber drying could also be included in this approach, noting that solar drying operations are probably sufficient but that efficient milling activities would desirably include some form of stable energy source.

Importantly, this would support some of the options considered in recent research[10] on African Mahogany plantations and their potential for further processing in South-Eastern Australia. It is noted that opportunities to produce veneers and plywood are possible and would represent the highest-value output from the resource. The pilot plant supplements that possibility.

Notably, the potential for production of timber packaging materials as a 'fall-down' product may be locally relevant for the agricultural and horticultural sector, in addition to being of potential benefit to other areas of northern Australia.

Opportunities to value-add and undertake processing in the Douglas Daly/Katherine area extend to the Sandalwood resource. With energy, road, labour and related infrastructure similar to that required to process the African Mahogany, the Sandalwood resource to be pre-processed in the area, with significant benefits.

Pre-processing Sandalwood involves feeding logs into a docking saw, grading of logs and careful separation of the valuable heartwood using optical identification and mechanical punching. An element of the processing includes extracting further valuable material by coring the tree stumps and root ball.

There are both similarities and differences in processing Sandalwood and African Mahogany. One of the major differences is in end products, with Sandalwood pieces, woodchips and fully extracted oil all being valuable. Different levels of processing are appropriate for different markets and varied trading conditions. These can change over time, altering the products to be made. An example is changes to tariffs for importing Sandalwood to India. From the start of 2023, under the Australia-India Economic Cooperation and Trade Agreement (AI-ECTA),[11] the differential tariffs applicable for Sandalwood chips and oils changed, altering consideration for processors about the level of pre-processing it is appropriate to undertake in Australia.

As an example of the potential benefits of Sandalwood pre-processing, the current pre-processing activities undertaken in Kununurra, in the Ord Valley/Kingston area employs twenty-five people.[12]

Because there is insufficient African Mahogany processing work for a full year, industry participants considered it was possible for some wood processing to be conducted in batches, including potentially into the wet season. The advantages of this approach including the opportunity to train and retain labour through an annual cycle of forestry and wood processing activities, supplemented by expanded relationships with other local industries.

The economic pull-through of local processing has potential to expand demand for housing and other resources in the Douglas Daly/Katherine. It is noted that should the area become a wood processing centre or cluster, it would generate an ongoing volume of offcuts, sawdust, chips and other residual material, suitable for consideration as a biomass energy source. All the host trees on which the Sandalwood is grown are suitable for use as biomass, however, there is a sizable resource of Indian Rosewood, (Dalbergia latifolia), being grown in association with the sandalwood plantations. Rosewood may be a suitable resource to support the development of a milling facility in the northern Territory.[13]

Within the Douglas Daly/Katherine, the supply chain for the forestry plantations is largely integrated with the agricultural supply chain. Though the products are often different, the processes of land use and the resources required for that to occur, are very similar.

Plantation management and expansion

The existing forestry industry supply chain is limited by the region's plantations not yet having matured to the point at which an ongoing harvest operation is required.

[10] John McGrath, Christopher Oliver, Frank Miller, Robert McGavin, Tyron Venn, John Turner, Mila Bristow and Dallas Anson. 2022. **'Silvicultural systems to optimise value from northern Australian mahogany plantations'**, VNC402-1617-Silvicultural-systems-to-optimise-value-from-northern-Australian-mahogany-plantations-1.pdf (fwpa.com.au)
[11] DFAT, 2022. 'Australia-India Economic Cooperation and Trade Agreement, 2022. https://www.dfat.gov.au/trade/agreements/in-force/australia-india-ecta
[12] Industry Interview, February 2023
[13] Industry Interview, May 2023

Other than the day-to-day management arrangements for the plantations, additional and strategic support is mainly supplied by contractors. Functions performed by contractors are reasonably consistent with other plantation operations and agricultural land-uses, including:

- Land/soil preparation
- Planting activities
- Pruning, thinning and other silvicultural activities
- Estate management activities (eg. fencing)

It was noted by industry participants these activities are very consistent with the agricultural sector and in some cases utilise the same equipment and resources.

Pending availability of land and/or suitable land-use arrangements such as silvo-pastoralism being established and extended, the Douglas Daly/Katherine continues to present opportunities for **plantation expansion**.[14]

Collaboration in the area

Processing opportunities in the Douglas Daly/Katherine are likely to require collaboration to establish some form of industry processing centre or cluster, where resources (not least, energy) can be shared and a critical mass for investment by industry and co-investment in infrastructure by Government can be achieved.

The opportunities to attract coordinated road freight services to Darwin, for export, are significant. Importantly, freight experts advise that a coordinated cluster approach would increase the incentive to establish a container handling facility in the Douglas Daly/Katherine area, creating efficiencies and reducing the need for significant land resources to be made available around the Port of Darwin.

Industry is keen to collaborate with other industries in the area, noting opportunities for expanded processing of cotton and watermelons are among the current considerations in the region and could occur in the same location or cluster as wood processing could occur.

Constraints

The Douglas Daly/Katherine shares similar constraints to other operating areas of the region, including concerns about the limitations, challenges and costs of exporting through the Port of Darwin. Of particular concern is the limited availability of space and services for activities including fumigation and containerisation.

In particular, the region is constrained by the absence of all-weather roads, reducing the capacity of the industry to operate year-round and optimise the management of its plantations. Further details are provided in section 4.1.3.

Arising from the annual wet season, the Douglas Daly/Katherine has limited capacity to undertake work in or on the plantations for the period from December to March each year. The consequence is that attracting a stable workforce is difficult, including the costs associated with ‘floating’ equipment into and out of the region, or leaving it idle during the wet season.

It is noted the region’s solid wood species – the African Mahogany resource – is yet to be subject to a complete market opportunities assessment. Accordingly, a market development strategy is yet to crystalise, but is evolving and is necessary to guide future infrastructure development and supply chain activities.

If processing is successfully implemented in the Douglas Daly/Katherine and one of the markets is southern Australia, product transport strategies such as back-loading will be vital.

In the absence of processing solutions like those described here, industry in the Douglas Daly/Katherine is able to anticipate the majority of its resource is likely to be exported, most likely as logs, or in some very modest value-added form. A constraint on development of an export pathway for African Mahogany wood products is the lack of industry knowledge and expertise regarding export capabilities.

As with other regions, the Douglas Daly/Katherine is constrained by inadequate energy resources, especially electricity for future wood processing, including timber drying. Its labour and skills needs are described here and are common to other industries and the general forest industry needs.

[14] MEADOWS, J., Annandale, M., Bristow, M., Jacobsen, R., Ota, L. & Read, S. Developing Indigenous commercial forestry in northern Australia, Australian Forestry, 2022, 83:3, 136-151, DOI: 10.1080/00049158.2020.1799518

3.3.2 Tiwi Islands

Overview

In some respects, the Tiwi Islands operate most like a typical corporate, plantation-based fibre producer. Situated on Melville Island, to the North of Darwin, the hardwood plantations are owned by the Tiwi Land Council, through the Tiwi Plantation Corporation and managed by Plantation Management Partners (PMP), a division of Midway Limited.

Planted during the 'MIS era' (managed investment schemes for plantation forestry), the estate of some 32,000 hectares is primarily Black Wattle or *Acacia mangium* but may be replaced post-harvest by red mahogany or *Eucalyptus pellita*.

The Acacia was planted exclusively to produce hardwood woodchips for paper, tissue and synthetic cloth production. The Eucalypts are being planted with solid wood and woodchip applications in mind, with scaling up of planting due to commence in 2023.

A trial of *Eucalyptus pellita* is well established and wood properties and end-use application assessments are being undertaken, supporting the prospect of future solid wood processing. The extent of any planting of *Eucalyptus pellita* or other species will be determined by the traditional owners.

Resource from the Tiwi Islands is currently chipped, transported by road to the Melville Island port and exported in bulk export vessels, to customers in China and Japan. The physical supply chain from harvest to customer is well-established, fit for purpose and generally scalable and predictable.

As an island-based operation, the Tiwi Islands plantations face difficulties and costs in coordinating what would otherwise be an exercise similar to many other plantation timber operations. Significant equipment and diesel fuel is barged to Melville Island from Darwin, adding costs and delays, as does the necessity to fly specialist labour (for example, diesel mechanics and hydraulics specialists) into the operations.

TABLE 4: Tiwi Islands Forest Industries Opportunities, Constraints, Needs & Recommendations

Opportunities	Constraints	Needs
Expand the plantation base for economies of scale and to attract continuing investment	Insufficient and inadequate accommodation to support the required workforce	Specific emphasis on defining, planning for and meeting actual housing needs
	Very poor roads and road infrastructure	Improvements as set out in recommendations
	Insufficient and inadequate phone and internet access	Improvements as set out in recommendations
	Insufficient incentive or investment signals without opportunity to attract carbon credits from participating in the Emissions Reduction Fund in some instances	Improve the value of wood fibre by addressing plantation eligibility rules for participation in the Emissions Reduction Fund
Increasing downstream processing of *Eucalyptus pellita* resource, with emphasis on producing solid wood products that may be suitable for use in dwelling, shelter and/or other building activities on Tiwi Islands (esp. Melville Island)	*Eucalyptus pellita* resource is only being planted from 2023	Completion of existing research being undertaken by Melbourne University and further extension research on the viability of local processing
	Assessments of locally required dwellings and suitability of timber structures is yet to be completed, including with Traditional Owners	Understanding of the level of local demand for solid wood products that can be met by *Eucalyptus pellita*
Improving the value of wood fibre by reducing biological losses and reducing contamination. At different times in the year, an improved fibre handling facility could have utility for other port users	Hardwood chip export hardstand is not currently sealed, increasing biological deterioration and increasing the likelihood of contamination	Install a paved or sealed hardstand on which export wood fibre can be stored

Introducing biomass energy solution/s to provide an energy base for increased local investment and a secure and viable electricity supply for the local community	While consistent with the other regions, diesel has to be barged to Melville Island for all purposes, adding to costs for industry, as well as local communities and contributing significantly to greenhouse gas emissions	Specific consideration of biomass energy proposals for the entire region, with emphasis on the additional costs borne on the Tiwi Islands, of barging diesel fuel
	Biomass energy is likely only to be viable for electricty production and is unlikely to be able to replace diesel in vehicles	

Opportunities

The plantations on the Tiwi Islands are currently focussed on producing wood fibre for international paper, paperboard and/or biomass energy markets. The planned transition to *Eucalyptus pellita* plantations will provide the opportunity to consider alternative opportunities.

Research into the solid-wood processing options and uses of *Eucalyptus pellita* resource is reportedly already underway, involving Charles Darwin University. This research may provide opportunities for local processing of some of the resource, providing sawn timber for use on the Tiwi Islands, including potentially for dwellings, and for shipment to Darwin.

Biomass residues are an arising from all processing activities. Whether used for drying timber or for production of other energy (including electricity), the creation and use of processing residues could provide a stable base for the further consideration of biomass energy on the Tiwi Islands.

Reducing biological losses and contamination in the handling of woodchips and other fibre resources can be a straight-forward means of improving the value of those resources, supporting continued and increased investment and providing important regional income. Improving the hardstand at the Melville Island wharf at Pirlangimpi would contribute to this objective.

Constraints

In addition to the general constraints experienced by the forest industries in northern Australia, the Tiwi Islands face the added isolations and costs associated with their island status.

The costs of transport to and from the Tiwi Islands are very significant, with all major supplies needing to be barged from Darwin.

In particular, the cost of transportation adds significantly to diesel fuel costs, not to mention the additional greenhouse gas emissions created by a reliance on diesel fuel and its shipment to the Tiwi Islands, with little else available as an energy source.

3.3.3 Ord Valley/Kingston Rest

A natural river system, the establishment of the Ord River Irrigation Area (ORIA) commenced in 1960. In 2022, ORIA provides irrigation to around 28,000 hectares of developed and 'to be developed' farmland. Its ongoing development is planned.[15]

The area is home to 5,000 hectares of sandalwood plantations, owned by two companies: Quintis Limited and Alpha Santanol.

The integration of gravity-fed hydroelectricity for the region and its major town, Kununurra, with the supply of residual water for flood irrigation is an effective use of existing resources, adding value to the region and its investment potential and providing guidance of possible energy solutions for other areas in northern Australia.

As is the case for other forestry sectors in northern Australia, the Sandalwood companies use back-freight of around 20 tonnes per week, to truck logs and ground sandalwood to southern Western Australia, where

[15] DPIRD, 'Ord River development and irrigated agriculture, Western Australia, https://www.agric.wa.gov.au/assessment-agricultural-expansion/ord-river-development-and-irrigated-agriculture-western-australia, downloaded 13th October 2022

oils are distilled, prior to export to South East Asia and increasingly, to Europe and North America. Export of Sandalwood pieces, woodchips and 'fines' also occurs from southern Western Australia.

TABLE 5: Ord Valley/Kingston Rest Forest Industries Opportunities, Constraints, Needs & Recommendations

Opportunities	Constraints	Needs
Attracting a long-term expert workforce would support opportunities to invest in local processing of Sandalwood	In addition to other limitations, the Ord Valley/Kingston Rest and Kununurra specifically, has insufficient housing suitable for families, which limits the desirability of the region as a location for a long-term workforce, especially with the skills required for processing oils and other aromatic products from Sandalwood. Social conditions are often cited as a reason people will not take up jobs in the region.	Sufficient housing - estimated to be as much as 500 dwellings for the region - to provide suitable housing for the workforce of the future and all existing communities
Recent changes to water allocations and water management processes have made the Ord Valley/Kingston Rest a more investible region, adding significantly to its renewable electrical energy resources (ie. Gravity-fed Hydroelectricity)	Part of the water management process requires flood irrigation users to establish run-off dams of significant size, with costs to be borne by land-users, but limited coordination of the total effort	Flood irrigation run-off collection and management to be coordinated across the region, rather than operating on a stand-alone basis
Containerised shipping of Sandalwood from the Ord Valley/Kingston Rest, via the Port of Wyndham, would place the region much closer to its main current customer base in Asia, potentially at lower cost than current road transport to Perth	Port of Wyndham is currently not capable of handling containerised freight, reducing potential regional investment in downstream processing	Efficient and orderly container handling at or adjacent to the Port of Wyndham
		Sufficient volume of copntainer traffic to attract a container vessel service on a periodic basis, to provide shipping to Singapore (or other transit hub) for on shipment to customers

Opportunities

An integrated solution to ensuring there is a direct and indirect workforce able to meet the needs of the Ord Valley/Kingston Rest industry is an opportunity improve the labour resources available to the industry in the area. Achieving this would involve establishing significant additional housing (both for the local indigenous population and for specifically skilled labour that needs to be attracted to the region).

Industry advises it does not anticipate the Sandalwood plantations increasing in area because of some of the constraints discussed below, but there may be some opportunity to increase local processing of Sandalwood, if the challenges of securing suitably qualified labour are able to be overcome.

Constraints

Constraints on the development of industry in the Ord Valley/Kingston Rest are similar to those described for other regions, although notably, the availability of hydroelectricity in the region means there is less concern about sustainable sources of energy.

Overall, industry reports the prospect of further plantations in the region may be limited because of supply-chain and infrastructure challenges. Industry has described these challenges as:

- Local housing;
- Skilled personnel;
- Regional community support.

Housing suitable to attract a technical and managerial workforce is required, along with the support services contributing to a community: shops, schools, health care and other necessities, if the industry is to expand at any time in the future.

Importantly, these limitations are a driver for plantation sandalwood producers considering alternative areas in the Eastern States, for future plantations.

In general, industry considers export via the Port of Wyndham is not currently feasible and would require the following:

- Efficient and organised container handling services;
- Direct container vessel access to Singapore or other location for on-shipping to specific markets.

Road transport to Darwin would be an option, if it were not for the cost of exporting via the Port of Darwin being more expensive than road freight to Perth, then exporting by vessel.

3.3.4 East Arnhem Land

Forestry *industry* activities in East Arnhem Land are based on the native forest resource around Nhulunbuy, consisting almost entirely of the integrated harvesting and sawmilling activities of the Gumatj Corporation Limited at Nhulunbuy and a specialty high-value furniture manufacturing business, Manapan Furniture on Milingimbi Island. The activities have been undertaken since 2014, involving the harvesting of trees and milling of logs on land managed by Rio Tinto, prior to mining activities.[16]

Locally produced timber is primarily used in the built environment, in particular for local indigenous housing and other structures.[17]

Trees are currently harvested and processed in the Northern Territory, by the Gumatj Corporation. Most of the trees harvested and processed are Darwin Stringybark (*Eucalyptus tetrodonta*), a hard, heavy and stiff timber species, resistant to termites and demonstrated to have high durability. Its best applications appear to be in sawnwood and other solid forms, including in exposed positions or conditions.[18]

The species is among the more prolific across Northern Australia and has been found, according to an as-yet unpublished report, to have "… a naturally high resistance to termites and fungal attack, and with excellent long-term weathering properties."

The tree selection and harvest process is one of the major challenges in sustaining the Gumatj Corporation's operation. These activities currently rely on the lessee of the local land – Rio Tinto – advising its bauxite mining schedule and facilitating access to the land before mining, for selection and harvest of suitable trees.

Harvest is selective, with logs transported to the sawmill in Nhulunbuy, where they are stored and sawn to make timbers of varying sizes, before a range of drying and dressing activities are undertaken.

A range of sawnwood and roundwood products result, most of which enter the built environment, especially providing shelter of various types, in and around the community within proximity of Nhulunbuy. More recently, timber from the Gumatj Corporation is being procured for use in institutional buildings, including the new local aged care facility.[19]

Stakeholders have identified design and procurement processes as inadequate for purpose, for consideration of options for indigenous forestry to meet specific needs like those set out here. The NT Government Aboriginal Procurement Policy is welcome and would be activated by indigenous forestry activities in East Arnhem Land and elsewhere in the Northern Territory.

Opportunities

In East Arnhem Land, the opportunities are primarily centred around utilising local resource, in the local and regional built environment, especially housing and other structures, and for other purposes (eg. bollards, posts and poles).

Importantly, the 'local solution for local needs' model could reduce the necessity for transport infrastructure to move timber very long distances to market. It is noted this opportunity could be replicated in other areas of

[16] STEPHENS, et al, 2020

[17] ABC Online, 'Arnhem Land timber to help revitalise Darwin's CBD, a big win for remote Indigenous saw mill', 2018, https://www.abc.net.au/news/rural/2018-09-06/arnhem-land-gumatj-timber-deal-helps-revitalise-darwin-cbd/10169470

[18] WOOD SOLUTIONS. 2022. 'Darwin Stringybark', https://www.woodsolutions.com.au/wood-species/darwin-stringybark

[19] Stakeholder Interview, October 2022

northern Australia, where Traditional Owners considered this would be an appropriate model or framework for their own lands and communities.

One option for further consideration is establishing suitable plantations on former mine-sites, where the objective could be either or both of producing timber for construction purposes or wood fibre for international pulp, paper and biomass energy markets.[20]

Enhancing established relationships between Gumatj Corporation and Manapan Furniture and expanding those relationships to other potential participants could establish a regional network, providing sustainable employment and economic opportunities.

Constraints

Like much of the region, East Arnhem land is beset by transport challenges – timber destined for external markets needs to be barged to Darwin for instance. Improved all-weather roading would provide support for the forestry and wood products industry in the region, as it would for all industries. Reliable road services would make road-based back freight options within the area's grasp. There may initially be a small number of other potential industrial/commercial users of an all-weather road, that could be expected to expand over time.

In East Arnhem Land, despite the abundance of vegetation, stocking levels of suitable trees are relatively low, requiring a selective approach to harvest. Security of access to sufficient volumes of raw resource to assess therefore requires access to more land, over a longer period of time, with more notice than is often provided by Rio Tinto, which holds current mining leases.[21]

Once access to land is provided, knowledge and skills required to undertake assessments of the available resource are required. East Arnhem Land – and industry participants consider this is consistent across the entire region – has limited understanding of the native forest resource available to it, and its capabilities and potential uses.

Other constraints include:

- Absence/under-utilisation of 'local first, indigenous first, timber first' policy
- Limited access to external markets and information to support engagement with higher value export markets
- Insufficient support for development of further value-adding technologies, processes and products
- Access to reliable sources of fuel, specialist labour and parts for equipment maintenance and professional services to support business expansion.

3.4 Sectors and species

Just as the current Northern Territory and Ord Valley forestry industry has four distinct operating regions, it also has four distinct main sectors, supported by an additional sector involved in the extraction of oils within the Darwin region.

This section briefly describes the sectors and identifies their specific needs. While each sector faces the same major infrastructure constraints and experiences the same supply-chain challenges as other sectors, each has specific needs.

3.4.1 Hardwood plantations – solid wood

Hardwood plantations grown for solid wood production purposes are primarily located in the Douglas Daly/Katherine region. Consisting of around 13,500 hectares, the plantations owned and managed by African Mahogany Australia will reach maturity progressively from about 2027, when harvesting is expected to commence in earnest.

Currently, the likely outcome of harvest is the entirety of the resource each year will be exported, with minimal value adding. However, opportunities for value-adding and for supply into local, national and international markets are potentially viable. See section 4.2 for further details.

[20] STEPHENS, et al. 2020
[21] Industry interview, November 2022

Creating employment and value-adding in the Northern Territory would be supported by the following measures:

- Trialling of initial wood processing
- Conduct of a market opportunities assessment
- Collaborative approach to coordination of back-freight to southern Australia
- Coordination of workforce recruitment, retention and skills development strategies to support long-term employment
- Formal recognition of carbon stored in wood products.

3.4.2 Hardwood plantations – wood fibre

Hardwood plantations grown for wood fibre purposes are located on Melville Island in the Torres Strait. Consisting of around 32,000 hectares, the plantations owned by the Tiwi Plantation Corporation and managed by Plantation Management Partners (a division of Midway Limited). Originally planted to Acacia Mangium, planting of Eucalyptus pellita commences in 2023.

Currently, all of the resource is targeted for export to South East Asia as woodchips for the manufacture of pulp, paper and paper products. Value adding is currently limited to woodchipping and the operation of the Melville Island port as an export terminal.

Some future opportunities may exist to process Eucalyptus pellita logs for purposes other than exporting woodchips. The following measures would support those opportunities:

- Completion of research to understand the breadth of opportunities presented by the Eucalyptus pellita resource
- Conduct of a market opportunities assessment for Eucalyptus pellita, including for provision of local dwelling and other construction needs
- Coordination of workforce recruitment, retention and skills development strategies to support long-term employment
- Formal recognition of carbon stored in wood products.

3.4.3 Sandalwood

Sandalwood plantations in the Ord Valley/Kingston Rest and Northern Territory are grown near Kununurra in Western Australia and the Douglas Daly/Katherine in the Northern Territory. Consisting of around 15,500 hectares, harvesting is now ongoing in the Ord Valley/Kingston Rest and is expected to commence in approximately five years in the Douglas Daly/Katherine.

Despite proximity to the port at Wyndham, movements of logs, woodchips and 'fine' Sandalwood are primarily on trucks to Perth, where distilling of oils occurs and export activities occur. Though a different oil, it is notable that the extraction of blue cypress oil does occur in the Northern Territory, and export occurs from Darwin.

Future opportunities exist to process Sandalwood in the Douglas Daly/Katherine area of the Northern Territory, potentially as part of a wood manufacturing centre or cluster. This processing – already undertaken in the Ord Valley/Kingston Rest area – could add as many as twenty-five year-round jobs.[22]

This is a challenging prospect, requiring an industry wide approach and collaboration with other industries, as set out elsewhere in this report. Industry noted that a technical workforce and support is required for processing to be undertaken successfully. The following measures would support those opportunities:

- Improved housing suitable for families, to support recruitment and retention of a technical workforce in the Ord Valley/Kingston Rest area and the Douglas Daly/Katherine area;
- Capacity at the Port of Wyndham to efficiently handle shipping containers and/or improved capacity at and around the Port of Darwin;
- Collaboration to establish a wood processing centre in the Douglas Daly/Katherine area.

[22] Industry Interview, February 2023

3.4.4 Indigenous native forestry

Northern Australia's harsh climate is home to some hardy, resilient and adaptive timber species. Though sparse across the landscape, trees are prolific, especially across the most northerly regions, including in the Northern Territory.

Indigenous communities, through their corporations, are harvesting and processing local timber resources, for a variety of end-use applications, especially to build shelters, including dwellings. The local processors have developed expertise, and in East Arnhem Land, have established a sustainable business that appears to be constrained by supply, far more than by demand.

While there is demand further afield for timber and wood products derived from local resource, there is abundant demand within local communities that needs to be met before external markets (whether in the rest of the Northern Territory, across Australia or exported to other countries) can be considered. Importantly, local production will displace imports, most of which are manufactured from non-renewable resources and/or are transported very long distances.

For the most part, the trees grow on indigenous land, in relative proximity to the indigenous communities that own them. These are the same communities where there is longstanding and unmet demand for suitable and appropriate shelter, housing, cultural buildings and other wood products.

Nonetheless, the communities and homelands are distinct and as with any land-owner, their needs and interests are different. Although there are examples of existing activity in indigenous forestry in the Northern Territory, and there is some capacity and growing capability, that will not automatically translate from one community to the next

The development of the Northern Territory's indigenous forestry industry can be unique, making a specific contribution to indigenous communities, based on their individual needs and interests. As with any significant opportunity, there are impediments and actions to take, to deliver on the potential.

Darwin stringybark is currently harvested and processed in the Northern Territory, by the Gumatj Corporation at Nhulunbuy, in East Arnhem Land.

A sustainable indigenous forestry model

Recognising communities will make their own decisions, especially about access to their land, an emerging model of interest has been discussed.

Leveraging the expertise developed by the Gumatj Corporation, establishing a dedicated forest assessment and harvesting crew, equipped to harvest and mill timber in the bush, could provide a 'roving' crew able to move between communities, where those communities seek to access their resource for local indigenous forestry activity.

In conjunction with a Registered Training Organisation (RTO), the dedicated crew could provide the practical element of in-community skills development in the critical areas of:

- Resource assessment
- Tree selection
- Harvesting
- Bush milling
- Handling logs and timber

It is feasible for the dedicated crew to also include simple construction skills and to work with local communities from a start-to-finish perspective, ensuring local communities develop skills, mill timber and produce simple structures they have identified.

If structures require more sophisticated milling, it is open to the communities to transfer logs to the Gumatj Corporation for processing.

Not all indigenous communities will be interested in or have access to resource sufficient to copy the example provided by the Gumatj Corporation. A current research project is addressing this matter. It may be that for all its vast land estate, the East Arnhem Land region can sustain only one sawmill operation. Where appropriate from the perspective of communities in different homelands, and where transporting logs to Nhulunbuy is an option, Gumatj could undertake contract milling, returning required timber to the communities for construction of the buildings they require.

Over time, once local needs are met, indigenous forestry could provide the gateway to local economic extension, including supplying timber for tourism infrastructure such as shelters, picnic tables, amenities blocks.

To expand the indigenous forest industry in East Arnhem land and potentially elsewhere in the Northern Territory, the following actions are required:

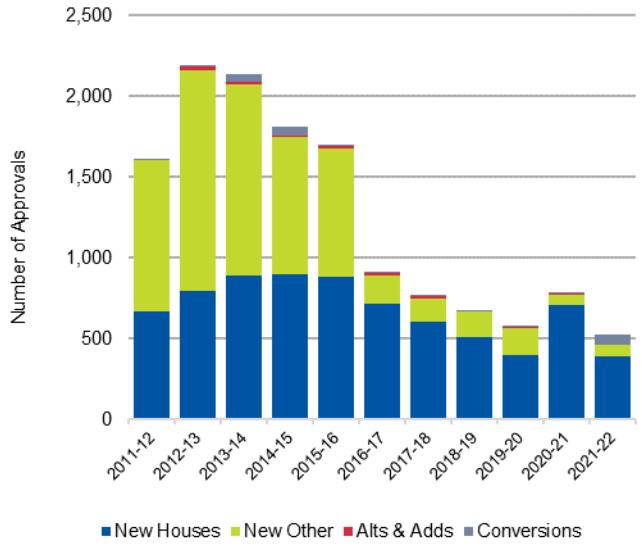
- Developing forestry inventory and tree selection skills;
- Developing a model for community consultations to determine specific interest in forestry and preferred models for participation;
- Conducting community-based needs assessments of structures that could be constructed from local indigenous forestry activity;
- Engaging with design and procurement processes for community-based structures;
- Funding development of a business case for establishing a dedicated crew for training, harvesting and bush milling;
- Arising from the above, support existing processors (Gumatj Corporation) with longer-term schedules of harvest, including those arising from other communities/homelands;
- Improving sealed road infrastructure in East Arnhem Land.

3.5 Demand for timber and wood products from dwellings

From the perspective of demand drivers, unlike all other regions in Australia, the formal market for new dwellings in northern Australia is insufficient to generate significant forestry and wood products activity, with one probable exception. For instance, at its decadal peak in 2012-13, as the chart and table below show, total dwelling approvals reached just 2,184 separate approvals.

Approvals of free-standing dwellings (houses) – where most timber is used – peaked at 897 in 2014-15. Even if all these dwellings were constructed of timber (they are not, of course), they would be insufficient to sustain a typical timber industry, in its own right.

Figure 3: Northern Territory Dwelling Approvals and Activity: 2012 – 2022 (Number)



Source: ABS & IndustryEdge

Number	New Houses	New Other	Alts & Adds	Conversions
2011-12	667	935	6	6
2012-13	798	1,360	23	3

2013-14	889	1,187	10	50
2014-15	897	851	12	50
2015-16	885	794	14	9
2016-17	716	178	9	9
2017-18	605	142	16	10
2018-19	506	160	6	6
2019-20	398	169	7	7
2020-21	705	69	6	11
2021-22	388	71	4	66

Most formal dwellings constructed in the Northern Territory are built from products other than timber. However, many dwellings include timber products, especially flooring, and/or have internal timber frames and timber doorways and lintels. These represent an opportunity for expansion of the local industry.

In Darwin and surrounds, there is one prominent manufacturer of timber trusses (NorTruss) and understood to be three other timber truss manufacturing 'jigs' in operation. Currently reliant upon engineered wood products and sawn timber supplied from south-eastern states, these manufacturers are reliant for demand on new housing developments that are primarily driven by government expenditure. Industry advice is that improved emphasis on local supply and manufacture of government funded housing across northern Australia could support growth in the local wood processing sector.[23]

A policy and program focus is required, aiming to deliver stable and reliable demand for new housing in northern Australia. This would in turn provide increased demand for building materials and would contribute to the forestry and wood product sector's development. This could form part of an approach to contribute to the Commonwealth's National Housing Accord, to the benefit of northern Australia.[24]

[23] Industry Interview, January 2023

[24] NATIONAL HOUSING ACCORD, website: https://www.nationalhousingaccord.au/

4. Supply chain and infrastructure constraints, needs, opportunities and recommendations

This section sets out infrastructure and supply chain constraints, needs and opportunities for the whole of the northern Australian forestry and wood products industries and also for the specific regions, operating locations, sectors and species

This approach has been taken because some constraints are needs are consistent and very similar across the region, while others are distinct to particular operating locations and there are genuine differences in opportunities, constraints and needs on a sectoral (and therefore species) basis.

Industry has identified a range of specific constraints and needs that fall under several major themes:

- Scale and expansion
- Labour, skills and workforce
- Regional economic and social development
- Capacity, capability and coordination

Key needs that cut across these themes address:

1. Policy change and improvement, especially related to plantation establishment, water rights and support for sustainable and reliable housing demand;
2. Improved road servicing and access to digital communications for key forestry areas;
3. Stabilisation of dwelling demand in northern Australia, including industry's own accommodation needs and supporting housing developments in remote indigenous communities;
4. Improved export and trade infrastructure, including at key ports and information to support export activities.

4.1 Constraints and needs

Like the entirety of northern Australia, the location of the region's forestry and wood products industry can be both its constraint and its opportunity. Considered from a constraints perspective, the distance from the rest of Australia means it is distant from national markets, without a population base to provide a very substantial local market. Conversely, northern Australia's proximity to Asia and its huge populations present significant opportunities.

4.1.1 Plantation scale and forestry expansion

Scale is a persistent issue

Perhaps, as a consequence of its own small population base, the region's forestry activities – with the exception of the Indian Sandalwood plantations – is below scale for optimal efficiency, as other studies have identified.[25]

It could be argued that tree plantations – especially the African Mahogany in the Douglas Daly/Katherine – are less than half their optimal size. Extension of the silvo-pastoral opportunity can assist to address this constraint.

Improvements in guaranteed access to surface and ground water associated with land used for growing plantations would also support plantation expansion.

Though it is to a lesser extent, scale is an issue for the established plantations on the Tiwi Islands. Business-level efficiencies and investment returns that can drive the long-term future of the industry are enhanced by appropriately larger plantation estates.

Constraints on plantation establishment under indigenous land tenures

In several areas – the Tiwi Islands is a prominent example – plantation expansion is considered viable and desirable. However, there are constraints specifically related to the nature of the tenure.

[25] PwC Advisory, 'An evaluation of Northern Territory agriculture supply chains and export opportunities' 2022

Under tenure models where the land is able to be bought and sold, land-owners seeking to establish or expand their plantations are able to borrow, using the land as security. Land under indigenous tenure in northern Australia is held collectively and cannot be bought and sold.

In consequence, land cannot be used as security for loans, which reduces the appetite for participation by financial institutions and other investors.

Effective access to surface and ground water is vital for growth

As a land use option, plantation forestry is a form of long (multi-year) rotation cropping. Investment decisions can take many years to realise returns, making them particularly sensitive to policy uncertainty or policy inconsistency, compared with other land uses.

As with other forestry and plantation regions in Australia, industry in northern Australia considers the appropriate water policy would provide 'as of right' access to surface and ground water connected to the land it uses and, in that context, seeks no different treatment to any other land use, especially for the agriculture and horticulture sectors.

Consistent and reliable carbon policy would support investment and development

To be eligible for participation in the Commonwealth's Emissions Reduction Fund (ERF), new forestry plantations are required to be planted on land where rainfall is less than 600 mm per annum.[26] This reduces the income available to plantation companies because they are unable to participate in ERF auctions to receive upfront payment for the carbon stored by the trees, unlike other revegetation projects.[27] The flow-on effect is the investment incentive for plantation tree growing is reduced. Reversing the 'water rule' will increase the investment incentives available to support expanded and continued plantation forestry.

As Australia moves toward becoming a net zero carbon-emitting economy, it needs to harness the full potential of all tools available to meet its objectives. Planting trees extracts carbon dioxide from the atmosphere and sequesters carbon, often long into the future.

Removing the 600 mm rainfall restriction will support investment in key plantation forestry regions across Australia, including in northern Australia. The Commonwealth Government has committed to removing the 'water rule' from those plantation growing areas where it still applies.

In addition, the carbon stored in wood products, including houses, other buildings, joinery and furniture is not recognised, despite the significance of its contribution to reducing atmospheric levels of carbon dioxide. There is however, no current method for recognising carbon stored in wood products. It is noted the peak advocacy group, the Australian Forest Products Association (AFPA), has established a Built Environment Working Group, part of whose remit is to address this matter as a priority.

Efforts to develop a scientifically based and appropriate policy framework are being supported by practical measures, including government actions. The Clean Energy Finance Corporation (CEFC) has nominally allocated $300 million to the Timber Building Program, to help kick start mass timber construction in Australia, which has the potential to substantially reduce embodied carbon, by supporting increased use of mass timber construction.[28] The Commonwealth Government has reserved a further $500 million of its $15 billion National Reconstruction Fund specifically for agriculture, fisheries, forestry and food and fibre.[29]

The co-investment process led by the CEFC has commenced, with a 'landmark' Melbourne project receiving $70 million of CEFC funding support from the program in late 2022.[30]

[26] CER, 'Plantation forestry method', accessed 16 January 2023 at https://www.cleanenergyregulator.gov.au/ERF/Choosing-a-project-type/Opportunities-for-the-land-sector/Vegetation-methods/plantation-forestry-method
[27] CER, 'Emissions Reduction Fund methods', accessed 16 January 2023 at https://www.cleanenergyregulator.gov.au/ERF/Pages/Method-development.aspx
[28] CEFC, 'CEFC Timber Building Program – A greener approach for large-scale buildings', 2023, downloaded 16 January 2023 from https://www.cefc.com.au/media/pknahl5c/cefc-timber-buildings-program.pdf
[29] DAFF, 'Forestry – New forestry measures,' 2023, downloaded 16 January 2023 from https://www.agriculture.gov.au/agriculture-land/forestry
[30] CEFC, 'Landmark T3 Collingwood kickstarts CEFC Timber Building Program', 2023, downloaded 16 January 2023 from https://www.cefc.com.au/media/media-release/landmark-t3-collingwood-kickstarts-cefc-timber-building-program/

4.1.2 Value Adding and Downstream Processing Development

Unstable demand for housing limits investment and development
Northern Australia has a small population with only limited formal housing demand. Demand for new housing in northern Australia is sporadic and intermittent. This is largely due to the periodic nature of demand from Government agencies and the 'boom-bust' cycles of the mineral resources industries.

Uncertainty in an already thin market makes investment difficult, especially for emerging industries with great potential, like the forestry and wood products industry. Without relative certainty of underlying demand, it is difficult for the low carbon, timber-based dwelling sector to commit the investments required to transform dwelling construction in northern Australia.

Limited knowledge of local, Australian and global markets for some products
Although some products (Sandalwood and Woodchips) are sold in sophisticated international markets and there is clear evidence of medium-term success in those markets, the market knowledge of those engaged in the other sectors requires support over coming years. Supplying wood products into southern and eastern Australia, as well as for export, requires specific skills and knowledge.

No current 'processing centre' to support downstream processing
Value adding and downstream processing developments require transport and energy infrastructure, as well as industry specific equipment – in this case, most likely a combination of a small sawmill for processing African Mahogany and a pre-processing facility for Sandalwood.

It is noted there is a sawmill operating at Nhulunbuy in East Arnhem land. This is a discrete, distant and somewhat inaccessible facility for resource in the Douglas Daly/Katherine area.

To develop processing capabilities and link to a supply chain of operational support and logistics infrastructure, future forestry and wood products value adding needs to be linked to other industries and sectors. The wood processing centre or cluster approach proposed for the Douglas Daly/Katherine area could be closely linked to other agricultural and horticultural activities, to their mutual and collective benefit.

Workforce accommodation
Attracting and maintaining an adequate workforce is constrained by insufficient and inadequate housing in some key operating areas for the industry.

Of course, this is a challenge across the whole of northern Australia. For the forestry and wood products industry, in particular in the Douglas Daly/Katherine and Tiwi Islands operating areas, the immediate need is to increase the stock of accommodation, in forms suitable to meet the expected and likely workforce.

Plantation expansion in both areas will be limited (and also from no later than 2027, harvesting and processing in the Douglas Daly/Katherine area). In particular, adequate accommodation will be required for the Douglas Daly/Katherine area to process harvested logs and add value when the African mahogany resource harvest commences, or value-adding will occur outside northern Australia.

Native forestry on indigenous land
The area of vegetation in northern Australia is vast, much of it on land managed by traditional owners. In some areas, there is resource able to be harvested and processed to meet community needs via local forestry activity. The Gumatj Corporation at Nhulunbuy provides the example and model.

Industry stakeholders consider one of the constraints to potential extension of the 'local supply for local needs' model as the difficulty in making assessments of the potential of local native vegetation to supply solid wood needs, for dwellings and other purposes.

Simple resources, training and direct support are needed to support indigenous communities to assess the potential of the native forests accessible to them, to facilitate effective decision-making about the suitability of undertaking forestry and wood processing activities.

4.1.3 Transport, shipping, freight and logistics

Road quality

The region's forestry and wood products industries are constrained by the state of the current road system in northern Australia, especially during the wet season.

Industry is very aware of budget limitations for road development works and considers integrated needs assessments will provide the best mix of roading improvements over the longer term. Wherever possible, roads meeting industry needs should focus on local industry and also meet community needs.

As part of this research, industry has collated a list of priority road development actions, set out in the table below.

TABLE 6: Specific Major Road Needs in Northern Australia

Road	Location	Current Status/Conditions	Priority
Fleming Rd	Douglas Daly	• 37 km road of which only 3 km has bitumen. • The remaining 34 kilometres is a gravel/graded road. • No true road formation with adequate base and camber is not present for a majority of the unsealed road. • Large sections become nearly impassable during the wet season. • Load and truck configuration restrictions are applied when road conditions become too bad. This can lead to financial losses (to pastoralists) if stock is required to be exported. A similar situation could eventuate in the future for AM products. • A number of accidents have occurred on this road. • Responsibility NT Gov (DIPL)	High Not only for future movement of African Mahogany resources but also currently for the safe movement of workers between accommodation, plantations and social/community facilities.
Cadell Rd	Douglas Daly	• Approximately 17 km of road no bitumen. Runs from Oolloo Rd to Fleming Rd. Approximately 7 km directly impact on AM operations. • True road formation with adequate base and camber is not present for a majority of the unsealed road. • Stretches become nearly impassable during the wet season. • Load and truck configuration restrictions are applied when road conditions become too bad. This can lead to financial losses (to pastoralists) if stock is required to be exported. A similar situation could eventuate in the future for AM products. • Responsibility NT Gov (DIPL)	High Not only for future movement of African Mahogany resources but also currently for the safe movement of staff and workers accommodation, plantations and social/community facilities.
Oolloo Rd	Douglas Daly	• Sealed road that is the entrance/exit into the Douglas Daly region ~65 km. (Majority is sealed ~57km). • The start of the road is off Dorat Rd at the Cosmo Mining Village. • The initial 9 km is very un-even and in poor condition. • Responsibility NT Gov (DIPL)	High The "only" way in/out of the Douglas Daly. High volume of road trains for movement of cattle, horticultural crops, cotton and hay. High movement of light vehicles (service providers, local community members and tourists) Will be important for movement of forest products in the future (sandalwood and AM).
Dorat Rd	Douglas Daly	• Sealed road. ~5km from Stuart Highway to Oolloo Rd. • Principle exit to the south (Katherine) from the Douglas Daly. • Somewhat narrow. Work by DIPL (Roads) for the upgrade and replacement of culverts and drains. • Responsibility NT Gov (DIPL)	Low-Medium

Fountain Head (West)	Douglas Daly	• Sealed road. ~2.5km from Stuart Highway to Dorat Rd. • Principle exit to the North (Darwin) from the Douglas Daly. • Somewhat narrow. Work by DIPL (Roads) for the upgrade and replacement of culverts and drains. • Responsibility NT Gov (DIPL)	Low-Medium
Stuart Highway	Katherine to Darwin	• Sealed road. ~300 km • Responsibility Commonwealth Gov (in conjunction with NT Gov) • On-going improvements being conducted.	Low-Medium
Proposed Fleming Rd Extension	Douglas Daly to Katherine	• Touted that there is a long term proposal for the continuation of Fleming Road to link up with either the Dorisvale Rd and/or Florina Rd. This would cut approximately 150 km off the current route (via Oolloo/Dorat/Stuart Hwy) to Katherine. Would give another option for movement of logs/timber out of the district to head south – potentially to Katherine rail siding/industrial area.	Low-Medium
Pirlangimpi Road – Stage 1	Melville Island	• 11.5 km section to be sealed from 3 way intersection towards Pirlangimpi	High
Pirlangimpi Road – Stage 2	Melville Island	• 16.3 km section to be sealed towards Pirlangimpi, starting from Stage 1	High
Pickertaramoor Road	Melville Island	• 8km section to be sealed from 6.1 km East of 3 way intersection towards Pickertaramoor	High
Pickertaramoor Road	Melville Island	• 7.8 km section to be sealed towards Pickertaramoor, starting from the prior section	Medium
Pickertaramoor College Access	Melville Island	• 4.4 km section to be sealed to Tiwi College, starting from the prior section	Medium
Pirlangimpi Road – Stage 3	Melville Island	• 20.5 km section to be sealed towards Pirlangimpi, starting from Stage 2	Medium
Milikapiti Road	Melville Island	• 27.8 km section to be sealed from 3 way intersection to Milikapiti	Low-Medium
Paru Road	Melville Island	• 9.4 km section to be sealed from existing sealed section to Paru Community	Low-Medium
Road Network to Nhulunbuy	East Arnhem Land	• Entire road network to Darwin requires improvement to allow loaded trucks to travel to and from Nhulunbuy	Medium

Source: Industry interviews, company feedback, NTOVFH and FIANT

It is noted, funds have been allocated for the road upgrades on Melville Island. However, due to the unavailability of contractors and equipment and the cost of materials, there is now insufficient funding allocated to complete the required road projects.

Access to road transport, including back freight

Road freight into northern Australia and between towns and regions is sporadic, expensive and challenged by the quality of roads, as set out above. One factor adding cost is most road freight journeys are loaded inbound and empty outbound.

It is important for the development of northern Australia that road transport constraints are reduced and their impact limited.

The cost of inbound timber for use in housing and other construction, transported from southern Australia to northern Australia, or from timber imported to Australia via the Port of Darwin, creates a cost disincentive to expand the use of timber in the region.

Preliminary cost modelling of timber transport costs shows that on a like-for-like basis (the same timber at the same material cost), for delivery to two locations: Darwin and Nhulunbuy, is significantly cheaper than supply from southern Australia or from imports, as the table below shows.

Table 7: Estimated Freight Cost (excl. Timber Cost) of Timber to Darwin and Nhulunbuy: AUD/m³

Destination	Despatched From			
	Adelaide	*Import*	*Nhulunbuy*	*Darwin*
Darwin	$ 436.20	$ 440.00	$ 180.00 ^	
Nhulunbuy	$ 687.60	$ 680.00		$ 240.00

Source: IndustryEdge, based on data from multiple sources ^ Discount for back freight

While it is an inbound cost constraint, one-way road freight loads represent an opportunity to leverage cheaper 'back freight' options for timber and wood products to reach markets in Darwin, the rest of Australia and to reach export markets. Estimates from road freight firms and industry confirm consistent and reliable back-freight services can be established for less than half the inbound cost of road freight, with a one quarter cost advantage for 'spot' bookings.

Further work is required to create a freight model that supports the development of a coordinated back freight system to support northern Australia's timber and wood products to access the Australian market.

Rail freight remains an option for accessing markets in southern and eastern Australia, especially where the end-user of the wood products is also close to efficient rail services. It should be noted the decision between rail freight and road freight options is often very marginal and specific, can be seasonal and is often taken on a case-by-case basis.

Port and export infrastructure and services

As recent floods in north-west Western Australia[31], poor quality roads and the annual wet season all demonstrate, seaports can be the life-blood for northern Australia, from a community and economic development perspective. Industry participants have provided several examples of difficulties with port infrastructure that constrains the existing supply chain and limits the region's development.

In an ideal situation, seaports would provide consistent supply and market access, to the rest of Australia and for export. Actions to improve the reliability of port infrastructure, access and services would support the development of the northern Australian forestry and wood products industry. One stakeholder described the need to 'close the distance' with the rest of Australia.

Specific constraints identified are:

- Limited 'off port' services such as forwarders and fumigation yards for container freight at the Port of Darwin, adding significantly to outbound costs;
- Poor and unreliable container freight schedules to/from the Port of Darwin and poor servicing of the Port of Wyndham overall;
- Inadequate infrastructure at the Port of Wyndham, specifically related to an inability to handle logs and shipping containers efficiently;
- Lack of coordination by industry to organise efficient use of the single inspector available in the region, creating delays and adding costs.

Stakeholders support the Western Australian Government's taskforce to examine shipping services[32] in the light of the January 2023 floods and the long-term closure of roads. In particular, the re-establishment of a purpose-specific shipping fleet for the region, akin to the former State Shipping Service of WA,[33] and all remote coastal Australia was considered a positive development.

[31] January 2023
[32] SUPPLY CHAIN CHANNEL, 2023 'WA announces new taskforce to examine shipping industry', https://supplychainchannel.co/wa-announces-new-taskforce-to-examine-shipping-industry/
[33] WIKIPEDIA, 2023 'State Shipping Service of Western Australia' https://en.wikipedia.org/wiki/State_Shipping_Service_of_Western_Australia

There is no doubt the northern Australian forestry and wood products industry would also benefit from more and better information about export market requirements and pathways, potentially through an 'export process' education activity.

4.1.4 Operating Infrastructure, supply chain and research

Energy security and sustainability
Developing northern Australia's forest industries would be supported by increased use of renewable energy, including solar, wind and biomass energy options.

In some cases, there may be opportunities to utilise renewable energy without connection to the electricity grid. Other opportunities may require connection with the grid.

Where available, electricity grid connectivity or access to the north-south gas pipeline is capable of delivering the most cost-effective and reliable source of energy for advancing the forest industries, and other regional industries.

In the absence of adequate alternatives, the region's forest industries are heavily dependent upon liquid fossil fuels, especially diesel. It is unrealistic for some of this liquid fuel to be displaced in the near term, especially related to vehicles.

However, there are locations in the Northern Territory where there is significant use of diesel for production of stationery energy and also an abundance of biomass, including woody biomass (some thinnings, residues and etc). Some research work has reportedly been undertaken through Charles Darwin University to consider the role of renewable biomass in the energy mix on the Tiwi Islands, associated with the Tiwi Islands Plantation Corporation and Plantation Management Partners (PMP).

When processing of African Mahogany and Sandalwood commence in the Douglas Daly/Katherine area around 2027-28, a relatively large volume of biomass will become available, for which there is no current use. It is standard practice across the world for wood processing facilities to utilise residues for production of energy required on site.

Recognising there are a range of views about the utilisation of biomass for energy production, an information and consultation exercise needs to be completed, to ensure any consideration is in accordance with community expectations and interests, not just the availability of resource able to displace liquid fossil fuels.

Digital infrastructure supports a growing forestry and wood products industry
Through most of northern Australia's forestry regions, mobile phone communications on the 4G network are very limited and insufficient. Around main work areas, major companies have boosters installed, but plantations - especially as they mature – mask signals. The same is the case for UHF radio, which is widely deployed for forestry operations, including with company funded boosters.

Digital infrastructure has community wide benefit, requiring companies to work closely with one another and with the communities in which they operate, to ensure the appropriate infrastructure is installed.

A prime example is the **Douglas Daly/Katherine** region, where the *Douglas Daly Community Development Association Inc*., with support from the local community and businesses, and NT Farmers, have put a case to the Australian Government and Telstra for a tower in the district under a grants project. The proposal is understood to be in the final round of contenders.

In the Douglas Daly/Katherine region, this is critical infrastructure for the harvest due to commence in 2027-28, when it will be required to manage the entirety of the harvest program, including monitoring harvest activity, volumes and wood flows and managing log transportation and personnel movements to maintain operational safety.

The development of a broader network would be beneficial to the whole **Douglas Daly/Katherine** region, to the **Tiwi Islands** where the digital infrastructure is limited to the towns and the forestry camp, as well as to any other forestry operation and community in which its is located – as it would support both agricultural businesses and forestry companies to monitor operations across their properties including for:

- Irrigation control

- Monitoring cattle water trough/tank status efficiently (using CCTV over the internet)
- Access control (monitored gates),
- Fire detection/observation (CCTV on a tower over the internet)
- Development of IOT devices and communication to the station/central office and
- Integrated automatic weather stations.

4.1.5 Labour, skills and workforce

An adequate, capable and committed workforce is a fundamental requirement of all successful supply chains.

Consistent with a small population and a series of remote operating areas, the industry is beset by labour and skills constraints. Coupled with the industry's perennial – and global – challenge of its work being seasonal, labour challenges require new considerations, if they are to be resolved.

In addition to industry specific input, this section summarises and references key findings and recommendations from an (as yet) unpublished report, the 'Skills Gap and Training Needs Analysis' for The Northern Territory and Ord Valley Forestry Region, prepared by ForestWorks for the NTOVFH, in early 2023.[34]

Promoting industry and supporting local pathways

In the inevitable competition for scarce labour resources, it is important for the forestry and wood products industries to promote the industry effectively as a destination, able to provide reliable and rewarding employment, with skills development and remuneration opportunities. This can be especially powerful in local communities.

ForestWorks recommends extending industry engagement with local schools, to provide career path opportunities, including potentially the application of school-based traineeships and apprenticeships. (ForestWorks' Recommendation 4)

Improving labour demand workforce data

Industry's clear view is that Census and other employment data for the northern Australian forest industries is inadequate, unrepresentative and often incorrect. There are many drivers for this, not least of which is that survey respondents may describe their work in a way that is interpreted as being related to another industry (eg. a 'truck driver' is in the transport industry even if they are a 'log' truck driver). Equally, significant seasonal work is often excluded from official 'counts'.

Seasonal work in planting, weed suppression, thinning, pruning, harvesting and general estate management have seasonal peaks and troughs when additional labour is required. Joined with northern Australia's 'wet season', the peaks and troughs of seasonal work are very difficult to manage. Unsurprisingly, this important factor is reported to suppress the appetite for investment in plantation expansion.[35]

An updated industry labour force analysis is required to accommodate these variances.

Coordinating and sharing labour needs

Whether occurring within operating areas (the Douglas Daly/Katherine area is an example) or across the entirety of northern Australia, a coordinated approach to meeting labour requirements would support the sectors and could provide industry-related employment across a full year.

For example, seasonal work across the year includes some distinct periods and tasks and others that coincide with one another, with some work being required year-round. An example from the Tiwi islands is set out below.

Table 8: Tiwi Islands Workforce Needs and Seasonality

Months of Year	Job Title	Number Workers
Aug-Feb	Plantation nursery jobs, including Driver jobs	14-16

[34] FORESTWORKS, 2023 ''Skills Gap and Training Needs Analysis for The Northern Territory and Ord Valley Forestry Region' Melbourne [unpublished]
[35] Industry Interview, December 2022

Jan-Feb	Tree planting (likely to be contractor crew)	25-30
Year Round	Silviculture workers (in-field plantation management)	10
May-Oct	Plantation fire crew	12
Mar-Dec	Driver and operator roles, linked to harvest and haulage, including: 'Loader' and advancing to specific forestry equipment (eg. Feller buncher, Skidder, Chipper, Heavy Rigid, Heavy Combination, Bulldozer)	32-36
Mar-Dec	Road maintenance jobs, including Grader Operators	4
Year-Round	Management/Supervision jobs including General/Ops Manager, Harvest Manager, Nursery Manager, Workshop Manager, Foresters (2),	6
Year-Round	Camp, Maintenance and Facilities jobs, including Administration (2), Chefs (2), Maintenance workers and coordinators (3), Cleaners (3), Purchasing (1), Boilermakers (2), Diesel Mechanics (10), Light Vehicle Mechanics (2)	8*

Source: PMP

** Some of these positions are required year-round, but others are not required during the wet season, when harvest and haulage activities are paused*

ForestWorks recommends businesses establish and share workforce development plans to provide opportunities for Registered Training Organisations (RTOs) to plan for meeting industry needs. (ForestWorks' Recommendation 1) It is noted a consistent approach to preparing workforce development plans would assist subsequent coordination.

Taking that further, it appears further work to align more jobs into an integrated career path could provide a larger 'core' or year-round workforce, which would need to be supplemented over the period when harvesting occurs (from March to December). By designing jobs broadly across a company or region, it may be possible to reduce the reliance on short-term and more transitory labour and provide more stable employment.

In turn, this would support ongoing training and skills development activities, including the important element of that training that must occur on site and at the workplace level.

Specific labour and skills shortages

The industry has identified specific labour and skills shortages that need to be addressed for it to advance its potential and the opportunities set out in this analysis. Summaries, provided by ForestWorks based on interviews undertaken by the Forest Industries Association of Northern Territory (FIANT) are provided in the tables below.

Table 9: Workforce demand in the forest industry (present and the next 3 years), the Northern Territory and Ord Valley Forestry Hub region

Region	Job role	No of workers	Job-specific pre-employment requirements
Douglas Daly and Katherine	Harvest manager	2	Forest industry harvest experience
	Irrigation manager & irrigators	3	Advanced technical understanding of crop evapotranspiration and irrigation scheduling
	Process operators	5	Range of production-based skills including mechanical, scheduling and manual labour
	Saw doctor	1	Experience in saw blade maintenance and sharpening
	Sawmill workers	2	NA
Ord Valley	Goat manager / Farm hand	1	Qualification & experience

Region	Job role	No of workers	Job-specific pre-employment requirements
	Irrigators	1	Experience
	Tractor operators	4	Driver's license, excavator, skidder, forklift tickets and experience
Across the above regions	Machinery operators	18	License and experience
	Mechanics (Diesel)	1	Trade certificate and experience
	Operations managers	1	Trade certificate and experience
Tiwi Islands	Mechanics (Diesel)	4	Apprenticeship options
	Jobs in plant propagation (nursery workers), planting (planter/seasonal), machinery operation, spraying, ground preparation, silviculture and other activities	>40	Capacity to engage work experience students as a commencement to employment
	Safety managers	1	NA
	Workshop managers	1	NA
Total		>60	

Note: This and the information that follows is not an exhaustive list of the workforce and skill needs in the Northern Territory and Ord Valley Forestry Hub region; rather, it is based on a select sample of businesses that includes key forestry operations in specified regions.

Source: Northern Territory and Ord Valley Forestry Hub interviews, 2022

Table 10: Required skills and training in the forest industry (present and the next 3 years), the Northern Territory and Ord Valley Forestry Hub region

Region	Required skills/training	Targeted job roles	Preferred form of training
Douglas Daly and Katherine	Aboriginal Engagement, emotional intelligence	All roles	Any (online, at the workplace, together with trainees from other organisations, within business hours)
	All kinds of agricultural equipment verification of competency (VOC).	Operational roles	
	Certificate III or IV in relevant position	Operational roles	
	Digital skills (Drone, imagery, GIS, LiDAR Excel, statistics)	Technical staff	
	Frontline management, senior management and senior leadership skills development, project management	Management roles	
	FSC and PEFC, ISO	Forest managers; Technical staff; Senior operators	
Ord Valley	Driver's license, excavator, skidder, forklift tickets* and experience	Tractor operators	On-site or TAFE Kununurra
	First Aid, CPR, ChemCert, Chainsaw, Tractor operations, mechanical, irrigation	Forest workers and operators	On-site or TAFE Kununurra
Across the above regions	ChemCert, Firefighting, First Aid*	Forest workers and operators	NA
		Machinery Operator; Tractor, Grader, Loader, Hedger, Excavator	NA
Tiwi Islands	Environmental and forestry awareness	Nursery, silviculture and related workforce	Onsite
	Nursery and silviculture skills (eg. Propagation, weeding, watering, chemical use, competition control etc)	Nursery, establishment and silviculture workforce	Audience dependent schools, TAFE/CDU, onsite, including training nurseries

Region	Required skills/training	Targeted job roles	Preferred form of training
	Digital capability - Resolving ICT issues, and word processing and basic computer operation (e.g., excel and other software) Management and leadership	Operational staff	At workplace
		Management roles	On campus at University or similar, some remote learning
	Transferable skills (e.g., problem solving, critical thinking, teamwork, attention to detail, self-management, leadership)	Operational staff	

Note: * Regular reviews and updates are required on these skills and associated certifications.

Source: Northern Territory and Ord Valley Forestry Hub interviews, 2022

Supporting training and skills development

The challenges of a small, seasonal and widely dispersed workforce extend to difficulties in organising and delivering training to meet the skills needs of the industry and its workforce.

Remote delivery (online) strategies delivered by RTOs are important (ForestWorks' Recommendation 5), but practical training must in many cases occur in the workplace. This requires developing a cohort of trainers and assessors who are accredited. (ForestWorks' Recommendation 6) Capability in delivering and assessing the skills of the workforce is a critical element of establishing a workforce for the future, as is supporting indigenous learners with appropriate language support and culturally appropriate training environments. (ForestWorks' Recommendation 9)

Equally significant is that funding support for training is so standardised that in most cases it fails to account for 'thin markets', remoteness and associated travel costs. The result is the cost of training a remote workforce is usually significantly higher than for a more concentrated workforce.

ForestWorks recommends advocacy by industry in respect of these matters (ForestWorks' Recommendations 7 and 8), in particular to have specific skills shortages identified and advised to the NT Government and to have funding levels increased to meet a reasonable proportion of actual costs.

Because opportunities may exist to expand forestry and wood products industry activity on land under Traditional Ownership, an important element of skills development may be developing landowner knowledge and information, to support informed decision making. ForestWorks recommends developing specific information and training resources for this purpose, noting that the NTOVFH's emerging indigenous landowner communications protocols are a necessary precursor to that development. (ForestWorks' Recommendation 13)

Coordination resources

Whether it is the coordination of shared labour needs across seasons, or the always complex organisation of training and skills development needs in 'thin markets', coordination support is required for improvements to be realised.

ForestWorks recommends government fund a dedicated education and workforce development officer, possibly in conjunction with the horticulture industry which faces the same challenges and competes for the same limited labour force (ForestWorks' Recommendation 16). It is noted close collaboration with NT Farmers is a logical and efficient approach.

4.1.6 Capacity, capability and co-ordination

Capacity and capability cluster

Stakeholders repeatedly describe the difficulties in understanding and developing capability within the region's operating areas and sectors, on particular topics. Perhaps because of geographic separation, with exception of issues like regulation (eg. water access) and basic infrastructure (eg. roads), some in industry are concerned they constantly seek to reinvent the wheel. This is resource inefficient and a clear constraint on development.

The role of the NTOVFH and the industry associations (FIANT and NT Farmers) is regarded and coordination between them is respected in the industry. As a stakeholder described[36], the industry needs to operate through the Hub, as an industry cluster, to develop further capability and share capacity.

A committed Hub strategy and cluster approach is needed, leading to a model where critical development activity can be co-funded by industry, to work to meet collective priorities.

4.2 Opportunities

This section sets out opportunities for the future of the forestry and wood products industry in northern Australia, from a 'local', national and international perspective. Some opportunities are the response or counter to the constraints and needs set out in Section 4.1, while others are broader and more strategic.

4.2.1 Plantation scale and forestry expansion

Scale is an important consideration for the northern Australian industry and for individual businesses in the region. Two established plantation companies have expressed a desire to expand their plantations, in part to increase scale efficiencies. Of note is the Tiwi Plantation Corporation's consideration that increasing their plantations to around 50,000 hectares (from the current 30,000 hectares) would be achievable and desirable.[37]

As set out earlier in this analysis, for plantation expansion to be achieved, there are financial constraints to be resolved under indigenous land tenures and challenges with respect to infrastructure and access to water rights and carbon credits, under all tenures.

Land use decision making is complex. Several stakeholders suggested a useful tool for landowners would be a detailed plantation establishment/farm-forestry implementation guide. Such a resource would ideally be customised for northern Australian legislation, regulation, tenures and circumstances. However, the resource would ideally be based on similar work developed by other Forest Industry Hubs, by ABARES and Forest and Wood Products Australia.

Silvo-pastoral practices

In addition to expanding established plantations, there are opportunities to increase the use of silvo-pastoral practices – the growing of trees in conjunction with pastoral activities – where the co-benefits of grazing cattle and growing trees for shelter and profit can be realised.

Previous analysis[38] and a currently operating, three-year, practical research project underway in Queensland, aimed at unlocking an additional income stream for beef graziers, demonstrate the potential.[39]

Importantly, African Mahogany Australia (AMA) are already engaged in silvo-pastoralism in the Douglas Daly/Katherine area, demonstrating the opportunity to establish a silvo-pastoral model as core business for northern Australian land use, where it is appropriate for implementation.

Mine-site rehabilitation

Whether in the context of established harvesting and wood processing operations like that operated by the Gumatj Corporation in Nhulunbuy, or in other mining-related settings, the opportunity to establish suitable plantations as a long-term crop is real and under consideration. This form of mine-site rehabilitation may be particularly suitable for communities and settings where Traditional Owners are interested in continuing income and local employment opportunities when mining ceases.

[36] Industry Interview, January 2023
[37] Industry Interview, January 2023
[38] STEPHENS et al, 2020
[39] TIMBER QUEENSLAND, 'Silvopastoral trials of commercial pine systems in North Queensland', 2022, http://www.timberqueensland.com.au/Docs/Growing-Processing/Silvopastoral-Trials-of-commercial-pine-systems-in-North-Queensland-Fact-Sheet-1.pdf

4.2.2 Value adding and downstream processing development

Solid wood to meet the Australian and international market needs

Global demand for wood products (both for solid wood and wood fibre for pulp and wood panels, and also for Sandalwood) is strong internationally. Currently, due to only limited processing options in northern Australia, the likely destination of all the region's plantation forestry resources is export in the form of logs and/or woodchips.

The opportunity is to emphasise strategic processing of logs, to increase value-adding in the local market, before product is sold into end-use markets

From a 'demand-pull' perspective, the best local and long-term opportunities for growing the region's forestry and wood products industry, appear to be in manufacturing solid-wood products for use in the built environment, both locally and in Australia more generally.

As discussed in this analysis, Australia already has a significant deficit in wood products, especially for structural purposes. The deficit will grow in coming years. Opportunities to support a growing northern Australian market, and especially the established Australian market, with local native species (eg. Darwin stringybark) or plantation African Mahogany may be viable.

There is opportunity for the industry to experience greater demand, driven by a 'local first' and 'climate first' approach to government procurement in northern Australia. The region's industry could benefit from policy similar to that adopted in other regions in Australia that 'encourage wood procurement'. The first of these policies was implemented in Latrobe City in Victoria in 2014.[40]

In just a few years, the African Mahogany plantations in the Douglas Daly/Katherine will commence harvest, providing feedstock for plantation-based solid wood production in northern Australia. That may be supplemented by *Eucalyptus pellita* resource on the Tiwi Islands, but not in the next decade, and potentially not at all.

After proving the suitability of the resource by shipping logs to customers for them to process, adding value, initially by milling logs to 'squares' or 'slabs' for more efficient transport to advanced processing locations may be a viable processing option. Suitable infrastructure and equipment would be required, as set out elsewhere in this analysis. Subsequent processing of local log resources – both plantation and native forests – could include manufacturing products like hardwood timber flooring for use in local markets.

While noted that some customers may always prefer to receive logs rather than sawn wood, taking this step-by-step approach to value-adding in northern Australia has potential to add significant regional income, over time, in both domestic and export markets.

Leveraging high-value furniture and joinery markets

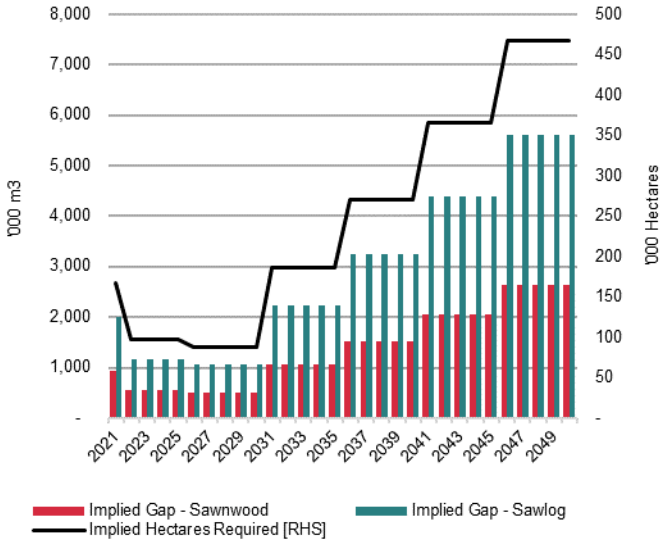
The African Mahogany resource growing in the Douglas Daly/Katherine area will be targeted to high-value product options, including the local, national and international furniture and joinery markets. It is notable that some northern Australian native timber species are very suitable for the same outcomes and are already in use, meeting market demand.

As an example of existing success and ongoing potential, Manapan Furniture operates an integrated business model, delivering high-value furniture, manufactured from local species, to international markets.[41] Importantly, Manapan Furniture has a supply-chain partnership with Gumatj Corporation, from which it receives some sawn timber.

In particular, the opportunities to assist the nation to increase its stock of domestic sawn timber and engineered wood products are significant and enduring. Recent analysis undertaken for Forest & Wood Products Australia (FWPA) demonstrates for example, that at no point in the foreseeable future will Australia be self-sufficient for sawn timber or sawlogs, with the gap between known supply and conservatively estimated demand continuing to expand.[42]

[40] LATROBE CITY, 'Wood Encouragement Policy', 2014, https://www.latrobe.vic.gov.au/Council/Our_Organisation/Corporate_Documents/Council_Policies/Wood_Encouragement_Policy
[41] MANAPAN FURNITURE, Website, https://manapan.com.au/
[42] INDUSTRYEDGE. 2022 *'Future market dynamics and potential impacts on Australian timber imports'*, Geelong.

Figure 4: Implied Sawn Softwood, Sawlog and Plantation Gap: 2021 – 2050 ('000 m³ & '000 Ha)



Source: ABARES, Omega Consulting & IndustryEdge

Improving the timber-based housing-related supply chain in northern Australia

Northern Australia has limited and spasmodic formal demand for dwellings, as set out in Section 4.1.1. This appears largely due to the intermittent requirements of Commonwealth government agencies and the boom-bust cycles prevalent in the resources industries. It is difficult to establish and maintain a timber-based housing sector supply chain in this context.

Throughout northern Australia, an adequate and sustainable housing stock is required for the region to develop further. It is noted this is a specific constraint in the Douglas Daly/Katherine, Tiwi Islands and Ord Valley/Kingston plantation growing areas.

The Northern Territory is already served by a small but committed cohort of timber fabricators (of frames and trusses). Northern Australia is well placed to expand timber used in the built environment, using structural timber supplied from southern Australia and/or from an expanded focus on appropriate harvesting from local native forests.

Despite limited opportunities to date (the prominent example is the work of the Gumatj Corporation in Nhulunbuy discussed later in this section) native timbers are proving to be very effective in appropriate applications in the built environment in northern Australia.

Coordinated and managed dwelling demand (to the extent possible) could provide more consistent and reliable demand for housing in northern Australia. Stable demand would support investment in the local dwelling construction industry, including the timber-based building materials sector.

Industry participants suggest they would respond to consistent demand with a gradual and orderly increase in supply, commencing with offering an expanded range of timber components, like interior wall frames and other elements able to be manufactured off-site and shipped to site for rapid installation.

Industry based dwelling opportunities in northern Australia

Industry plantation operators have experienced significant challenges attracting and retaining labour. As discussed earlier in this analysis, one of the constraints on recruitment and retention of labour in northern Australia is the provision of adequate and sustainable housing, especially in more remote areas.

In the Douglas Daly/Katherine area and on the Tiwi Islands, there is demand for suitable accommodation to meet medium to long term needs, especially as the former comes into its harvest timeframe around 2027-28. As the level of operational sophistication increases, retaining a skilled workforce will become even more critical.

This specific demand represents an opportunity for a coordinated and collaborative approach to industry development. Potentially coordinated through the Hub and its cluster approach, known demand for housing could be met by the plantation companies working with local timber frame and truss fabricators and selected builders to:

- Develop a standard, timber-based, 'off-site' manufactured dwelling unit;
- Provide specific demand (the number of required dwellings and the timeframe);
- Source appropriate wood products from southern Australia, from northern Australian plantations and where possible, from northern Australia's native forest estate;
- Establish an assembly system in Darwin or Palmerston;
- Road freight semi-assembled and modular dwelling units to the Douglas Daly/Katherine for installation and
- Barge components to the Tiwi Islands for assembly and installation.

By meeting the industry's own demand for suitable dwellings, it can also improve system capacity and capability and provide a demonstration of the opportunities presented by timber-based dwellings in northern Australia.

It is important to note the challenge of providing suitable accommodation for the workforce required in the Ord Valley/Kingston area includes other challenges, as set out in this report.

Supporting indigenous housing

Many indigenous communities are very remote and must import supplies, including building materials, over long distances and at great expense. Recently, under the $2.1 billion 'Our Community. Our Future. Our Homes' program jointly funded by the Northern Territory and Commonwealth government[43], demountable buildings have been manufactured elsewhere and trucked into communities, in some cases.[44]

Stakeholders consider that in some communities, local indigenous native forestry and wood processing opportunities could be integrated with dwelling demand to provide locally appropriate and locally built housing and employment opportunities.

The underlying challenge is not the identification of the opportunity. The challenge lies in drawing together the many elements required to take advantage of it, in consultation with the indigenous communities and established and potential building companies.

In addition, there are likely to be opportunities to expand existing indigenous native forest harvesting and processing in East Arnhem Land, to provide additional built environment needs of local communities. Notably, the sawmilling operations of the Gumatj Corporation in Nhulunbuy is supplying timber to the town's new Aged Care facility.

Northern Australian needs a steady supply of packaging timber

Local demand for packaging products, for shipping goods to southern Australia and for export, is significant. Demand is mainly met by timber packaging, primarily pallets, that either:

a. Arrive in northern Australia as finished units and are re-used on routine journeys, or
b. Are manufactured in and around Darwin, using resource supplied from other parts of Australia.

It should be noted the nature of exports from northern Australia means pallets are made almost entirely from hardwood resource, the scarcity of which has increased rapidly as access to southern native forests has declined. Local pallet manufacturers report they were unable to source sufficient sawn timber on several occasions in 2022.[45]

Arising from this, industry considers opportunities may exist to utilise local timber resources to repair and potentially manufacture pallets, cases, crates and so on. This opportunity could be suited to a number of

[43] NT GOVERNMENT, 2019, Our Community. Our Future. Our Homes, Downloaded 28 February 2023: https://ourfuture.nt.gov.au/
[44] ABC Online, 2022, Concerns NT government homes not built to last as it surges ahead with Remote Housing Program, Downloaded 28 February 2023: https://www.abc.net.au/news/2022-11-13/remote-housing-built-to-last-nt-government-housing-build/101643186
[45] Industry Interview, February 2022

different operations and varied hardwood species, including as a second and lower quality product arising from primary sawmilling.

Organic, 'green' and other chemicals

As with many plant species, the cellular structure of trees and wood fibre include a range of unique chemicals, many of which have existing applications. Extractives from wood fibre include lignin, cellulose and hemicellulose, each of which has a different structure and potential applications.

In Australia, the Bioresource Processing Institute of Australia (BioPRIA)[46] located at Monash University conducts research and development activities in conjunction with commercial partners, on all three platforms and has focussed on products *including*:

- Cloth: Cellulosic fibre and non-woven materials for high performance applications
- Packaging: Super-hydrophobic and super oleophilic paper for liquid and food packaging
- Barrier Coating: Engineering specific barriers with coated paper
- Water Treatment: Nanocellulose coating for reverse osmosis membrane
- Platform Chemicals [multiple applications]: Nanocellulose-nanoparticle composites

Adding value to tree plantations by the extraction of a variety of organic chemicals and compounds remains an evolving activity, especially where new chemical or liquid fuel manufacturing or similar facilities are being installed. Whether for energy (eg. liquid biofuels) or other applications, such facilities often target production residues from plantations or forests.

In the event of such a facility being proposed for or developed in northern Australia, industry participants should ensure they discuss opportunities with proponents and operators.

Improved market access by leveraging 'back-freight'

Road freight into northern Australia is expensive. It can also be unreliable. One way in which freight companies reduce their costs is to take discounted 'back-freight' loads from northern Australia back to southern and eastern Australia. Discounts are offered because supply of freight services is significantly greater than demand.

Industry reports it is already using back-freight to access markets in the rest of Australia. A prominent example is provided by Manapan Furniture, based on Milingimbi Island in Arnhem Land. Its products are sold across Australia, including from a retail outlet in Melbourne, as well as internationally.[47]

Sandalwood producers also use back-freight to ship logs, woodchips and other material to Perth for processing.[48]

A coordinated approach to back freight and sharing of available information would assist the industry to access larger markets across Australia.

[46] BioPRIA, Bioresource Processing Institute of Australia, https://www.biopria.com.au/. [NOTE: Tim Woods, one of the authors of this report is the non-Executive Chair (voluntary) of the Monash University Foundation providing industry funding support to BioPRIA]
[47] MANAPAN FURNITURE. Website, https://manapan.com.au/
[48] Industry Interview, November 2022

4.3 Recommendations driven by opportunities

To provide context, the recommendations arising from this report and analysis are presented against the broad opportunities, constraints and needs identified for northern Australia.

TABLE 11: Northern Australian Forest Industries Opportunities, Constraints, Needs & Recommendations

Opportunities	Constraints	Needs	Recommendations
A. Plantation and farm/forestry expansion			
Achieve efficient scale for regional tree plantations, targeting growing solid wood markets in which Australia has a deficit	Access to suitable land is limited for 'stand-alone' plantation expansion	Collaborative land-use models, including silvo-pastoral activities, that provide existing land-use with opportunities to integrate plantation forestry for income and other co-benefits	A1. Local industry continue to engage with other silvo-pastoral research, development and extension projects and share findings and opportunities within the region, including with NT Farmers and its members.
	Infrastructure needs of the existing industry represent investment barriers for new entrants		
	Investment in plantations has reduced incentive because of the current inability of some plantations to participate in the Emissions Reduction Fund	Amendment to legislation to allow plantation forestry to participate in the Emissions Reduction Fund	A6. Commonwealth Government continue efforts to incentivise establishment of plantation forestry in northern Australia, by removing remaining impediments to the sector's participation in the Emissions Reduction Fund.
Increase understanding and ease of establishing plantation forestry and other (eg. silvo-pastoral farm forestry) programs, regardless of tenure	There are complex and varied requirements for plantation and other forestry activity, depending on the tenure under which the land is held. This increases uncertainty and reduces the possibility of investment	A one stop information source that sets out requirements and possibly available income streams, developed collaboratively, and approved and promoted by industry and government	A2. NTOVFH and industry associations work with NT Government to develop a single/unified process guide of the pathway/s to establish plantations or other farm forestry activities, regardless of land tenure, using pre-existing resources, as a base.
	Only limited information is available to support some forms of potential plantation expansion, including the establishment of plantations on rehabilitated mine sites	Specific information and support to develop a framework for land-owners to consider establishing plantations on rehabilitated mine sites	A3. Industry support landowner activities and projects to consider the establishment of plantations on rehabilitated mine-sites on land owned by Traditional Owners.
	Land owned by Traditional Owners is generally unable to be transacted and cannot form part of the assets used to attract secured investments in land use activities	Innovative co-designed models that are able to facilitate institutional investment in plantation forestry on land owned by Traditional Owners	A4. NTOVFH, industry and landowners consider options for addressing investment challenges associated with growing plantations on land owned by Traditional Owners.
Expand plantation forestry activities to improve economies of scale and economic development in northern Australia	Some plantation development activities are constrained by water licencing requirements, similar to constraints on other crops	Reliable access to ground or surface water on property within the control of the land user	A5. As water rights and allocations are revised by the Northern Territory Government, plantation forestry be afforded the same status as other crops, with access to water by land users available 'as of right'.
B. Value-adding and downstream processing development			

Increase local utilisation of wood products grown, harvested and processed in the region	With the possible exception of indigenous procurement policy, the Northern Territory has no particular emphasis on procurement of locally produced wood products, which removes an investment signal that is available in a growing number of regions throughout Australia	Coordinated local procurement policy for sustainable building materials	B1. NTOVFH and industry associations develop a locally appropriate template for a 'local first, timber first' procurement policy for approval by industry, stakeholders and Traditional Owners, to pursue with Governments, in addition to established 'indigenous first' procurement policy.
Establish stable demand for housing, sufficient to encourage investment in local, carbon positive building materials, including timber and wood products	NT Government policy does not appear to be effective in stimulating demand and Commonwealth agencies provide sporadic demand	Policy and program consistency aimed at increasing the housing stock in populated areas on an orderly and consistent basis, including as part of the National Housing Accord	B2. NT & Commonwealth Governments engage the housing construction supply chain in discussion to establish the appropriate mix of policies to provide orderly management of dwelling construction to encourage investment, recruitment and skills development, including in the local forestry and wood products industry.
Access markets in 'fibre-starved' southern and eastern Australia, for wood products produced in northern Australia, especially for use in the built environment	Insufficient market connections and information	Northern Australian industry to become directly engaged with processors and market operators in the rest of Australia	B3. Local industry with potential sawnwood supply, seek support from industry associations to improve linkages and relationships with potential processing partners and market operators across Australia.
Breadth of potential markets for the African Mahogany plantation resource provides a base for establishing and expanding plantation wood processing in northern Australia	Current market opportunities assessments need updating	Updated market assessment	B4. Local industry conduct/update a market opportunities assessment and develop an implementation plan for the African Mahogany resource, prior to the commencement of annual harvesting around 2027.
Establishing value-added wood processing in northern Australia, in a 'step-wise' manner, supported by processing activities related to other industries	Scale and critical mass needs to be assembled before infrastructure such as sites, energy, water and etc can be prepared	Coordinated approach to considering an economic development / processing centre or cluster in northern Australia, where wood processing could be central to the opportunities	B5. NTOVFH and members liaise with other industry sectors and with landowners in the Douglas Daly/Katherine to explore options for an economic development / processing centre to be established at a suitable location in the Douglas Daly/Katherine, including a trial wood-processing facility to improve value-adding and enhance access to Australian and international markets.
Meet specific industry demand for appropriate workforce housing, especially in regional operating locations, resulting in increased local demand for timber, including local timber	Insufficient housing, especially in the plantation growing areas, makes labour recruitment and retention difficult. Lighter-weight, sustainable timber-based building options not considered, partly because of a lack of supply chain capacity and capability	Clear demonstration of the suitability of timber-based housing for northern Australia and the development of capacity and capability to design, construct, ship and assemble dwellings	B6. Local industry develop a profile and schedule of operationally required dwellings and other structures and jointly consider the extent to which that demand could be met in part, or in full, by locally produced, possibly modular, timber-based buildings.
C. Transport, shipping, freight and logistics			

Improved all-year access to plantations and forests and major operations, including future processing opportunities	Wet seasons limit access to plantations and forests in any land-use situation, however, in the region, access can be so limited that investment in value-added processing has too great a risk	Improved all weather road systems, developed on a targeted basis for the industry's operating regions	C1. NTOVFH maintain for industry, the specific list of major road needs, for each operating area, prioritised for those that would support increased investment in scale or value-adding and for which there is broader community need. The initial road needs are set out in Table 6.
Export knowledge, systems and infrastructure, including ports, provide timely, cost-effective and straight forward access to global markets and year-round certainty of access to Australian markets	Inexperience in exporting wood products, especially through northern Australian ports	Access to Australian forestry and wood products industry with expertise in exports	C2. Local industry seek support of industry associations and bodies to create linkages and relationships with existing exporters across Australia, to access information and support as they develop export options.
	Extended periods when road infrastructure is unpassable or destroyed, removing access to markets in Australia	Access to guaranteed shipping services	C3. Governments consider the reintroduction of state-operated coastal shipping services as a means of ensuring supply chain consistency and reliability, thereby encouraging investment for supply of forestry and wood products to the rest of Australia.
	Northern Australia's port infrastructure has been established for products other than wood and service options are limited, expensive and difficult to access and coordinate	Improved infrastructure for handling logs and other wood products, including fumigation and containerisation facilities, hardstands and yards	C4. NTOVFH develop and maintain for industry, the specific limitations of existing export support services (eg. access to scheduled shipping services, fumigation yards, freight forwarders and adequate port infrastructure) to be used to seek infrastructure and supply chain improvements.
Back freight transport services to access southern Australia are in operation but could be enhanced to provide increased market access	Like most industries in northern Australia, the cost of road freight to major markets in Southern Australia is an impediment to servicing those markets. 'Back-freight' on trucks is used, but the market is disaggregated and load collation, management and therefore cost management and scheduling are left to freight companies	A co-ordinated approach to back-freight operations could increase the reliability and regularity of opportunities and potentially lower costs	C5. NTOVFH and local industry develop and maintain a back-freight cost analysis and schedules for discussion with road-freight service providers and potentially with other industry associations and bodies.
D. Operating infrastructure, supply chains and research			
Improved capacity to conduct day-to-day and strategic business from northern Australia	Digital infrastructure is not sufficiently reliable, increasing delays and impacting efficiency of current operations and opportunities	Improved digital infrastructure for telecommunications include phone service coverage and internet access	D1. NTOVFH collate a specific 'digital hotspots' list of areas that require increased access to digital infrastructure
Contribute to improved access to energy resources for industry and communities, with appropriate use of residual biomass, arising from harvest and potential processing activities	Energy resources are limited in the Northern Territory, especially in the main operating regions for the forestry and wood products industry	Industry and remote communities need reliable and cost-effective sources of thermal energy for drying timber and other purposes, and also need electricity for operating equipment and entire businesses	D2. NTOVFH and members seek support to undertake analysis of options suitable for remote biomass energy utilisation for the production of thermal and electrical energy, drawing on established literature and technologies.

	Electricity generation by diesel generators is expensive and creates net greenhouse gas emissions		D3. Local industry develop an 'additional cost' model for shipping diesel to the Tiwi Islands, as a supplement to any biomass energy analysis undertaken for the entire region
Resource from the Tiwi Islands continues to improve in quality and value because of improved resource handling infrastructure	Unsealed hardstands can increase operating limitations during the wet season, increase contamination and biological losses	A sealed hardstand	D4. Local industry develop a business case for a sealed fibre hardstand on Tiwi Islands to share with stakeholders and to seek the support of Government, with the support of the NTOVFH and industry associations.
Northern Australia's developing wood processing and timber-based building supply chain is enhanced by more plantation species coming into use for solid wood production	Further research required into the opportunities for *Eucalyptus pellita* and other species	Ongoing research	D5. Local industry support the continued research and development process for *Eucalyptus pellita* and NTOVFH support fact-based extension activities to determine the suitability of *Eucalyptus pellita* to meet local solid wood needs.
Sandalwood resource is more closely and reliably managed and able to be processed in northern Australia	Suitable housing supply in the Ord Valley is limited	Coordinated effort to improve the quality and stock of housing available for use by industry	D6. NTOVFH, local industry and associations engage with existing efforts to address urgent accommodation shortages and to develop a housing development strategy with the region, including with Homes West, relevant Government agencies and the Shire of Wyndham-East Kimberley.

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