MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
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Forest Economic Advisors

Overview Paper on key factors for consideration in attracting new investment to the sawmilling sector in New Zealand

1.0 Introduction

Forest Economic Advisors LLC ("FEA"), a US-based forestry consulting company with offices in four countries, has been engaged by the Ministry of Business Innovation and Employment ("MBIE") to provide this Overview Paper on key factors for consideration in attracting new investment to the sawmilling sector in New Zealand as well as a series of brief, but informative Spotlight Papers targeting a key theme. Six of these Spotlight Papers have been written to date and will inform aspects of this Overview Paper. The titles of these six Spotlights, across three broad themes, are:

International competitiveness of sawmilling

- Can New Zealand be internationally competitive in selling sawn timber into the Chinese market?
- The impact of B.C. Government log export restrictions on the B.C. Sawmilling industry.
- Impact of Russia/China Lumber Trade on International Log/Lumber Trade and Implications for NZ.

Perspectives on domestic sawmilling

- The looming impact of diminishing pruned log supply on regional economic development in the Central North Island.
- Commentary on key characteristics of a wood supply agreement.

Non-traditional wood processing opportunities

- Two emerging innovative wood product technologies with global prospects.

2.0 Executive Summary

2.1 Current situation

The current situation with regards attracting investment in the NZ sawmilling sector is outlined as follows:

- NZ is currently exporting over 50% of its annual timber harvest. This is significantly greater than other key countries as shown in Table 1 and in 2017 the volume amounted to about 17 million cubic metres of logs sent offshore.
- This represents a lost opportunity for regional economic development – a key platform of the current coalition government being addressed through the Provincial Growth Fund.
- The nature of the wood processing sector is such that sawmilling (primary manufacturing) produces not only sawn timber boards but also lower-value residues (bark, chips, sawdust and shavings) that are the feedstocks for major secondary manufacturing industries (e.g. pulp and paper, fibreboard). Therefore, any lack of investment to grow sawmilling capacity will result in a "choke point" that has significant flow-on effects for the whole wood processing sector.

Table 1 – Coniferous logs exported as a percentage of total harvest for selected countries

Country	Logs Exported
Australia	21.8%
Brazil	0.0%
Canada	5.9%
Chile	0.1%
China	0.0%
Finland	1.9%
New Zealand	55.6%
Russia	7.5%
Sweden	1.2%
United States	4.0%
Uruguay	10.6%

Source: FAOSTAT (2017 data)

- The industry has been quite aspirational about growth in the sector since the early 2000s and recent, significant, brownfield investment targeting domestic markets has occurred in some cases (e.g. Red Stag). However, the sector has not delivered on export growth and the last greenfield sawmill investment was in 2005, also using higher-quality, structural logs targeting the domestic construction market.

- Domestic growth may be possible through government initiatives that encourage domestic demand of timber (by giving timber more visibility in non-residential projects) as well as KiwiBuild (that will increase the number of houses built in the residential market). The likely volumes of timber required could result in, at best, an extra 0.5 to 1.0 million cubic metres of logs being processed in NZ in the next 5-10 years. This volume is not insignificant, but still only represents around 6% of current log exports.
- As such, FEA believes any government support for a program to encourage domestic usage of timber may be helpful but it needs to be tempered by a realisation that it will only deliver a limited impact in terms of onshore processing of the vast number of logs being exported.
- With limited domestic opportunities, any new sawmill development today would require a major export market opportunity for the sawn timber based around lower-quality industrial (A/K grade) logs. The perception is that this is difficult without the higher sawn timber grades to support the revenue line e.g. framing timber (from structural logs) or clear wood (from pruned logs). Despite this, Sequal Lumber have demonstrated that it is possible to operate in this space.
- Furthermore, FEA analysis for a state-of-the-art, greenfield sawmill in Taupo has shown that, at a prefeasibility level of investigation, the business case is investible, even when paying export parity for logs which are among the highest prices in the world. This requires costs being trimmed through efficiencies in other areas e.g. logistics, energy and yield to compensate for such a sawmill to remain competitive against prospective new entrants in other regions.
- Most importantly, the export market needs to be much better understood as the above analysis was a case study based around one segment (cut-of-log, furniture grade sawn timber imported to China). A strategic, offshore investor may bring this knowledge and even a supply chain for the products, but FEA believes that more transparency is needed by domestic stakeholders (including government) in understanding the markets for Radiata pine – both in the major Chinese market and in the Asian growth economies like India, Vietnam and the Philippines.
- Investors need robust business cases to raise capital and make investments. Robust business cases need detailed and credible market research and analysis. This needs to include an understanding of the NZ competitive position in these market segments.
- Furthermore, this market analysis would also be vital for pruned log mills in the Central North Island where changing forestry practices mean a diminishing availability of pruned logs. This is placing many pruned log sawmills at risk and they will require significant re-investment to allow processing of industrial logs in their feedstock mix. Given the "choke point" nature of sawmilling, as mentioned above, this is only going to exacerbate the issues for secondary manufacturers in this key region.
- This type of investigative market analysis is already being sponsored by government entities in the likes of British Columbia and made available to their local industry. This raises the question about similar government support for the NZ industry to underpin investment in new, cost-effective, export-focussed, sawmilling capacity.

2.2 Thinking outside the square

- The WoodScape study undertaken by Scion looked at a range of wood processing technologies – both primary and secondary manufacturing. Key findings were published in 2013 and FEA believes it would be timely to run this analysis again to see what other options might be "revealed" by a re-investigation. The market analysis work discussed above could feed into the sales volume and pricing assumptions for traditional sawmilling. Furthermore, can A/K grade logs be peeled successfully in NZ (as opposed to China) to make veneer products and what would the economics and markets look like? Are there developments in the engineered wood products area beyond the growth being seen by CLT (cross laminated timber) that could pull through either sawn timber or veneers to underpin investment in primary wood processing?
- TTT Products Ltd has been identified as a particularly exciting and dynamic business. This company has unique capability and intellectual property around using poles for ground stabilisation to allow construction on otherwise unsuitable lands. Market growth prospects to deploy this technology throughout Asia in areas with poor soil and water table issues seem extensive. Furthermore, the conversion yields, economics and job creation prospects are all better than the Taupo sawmill A/K grade case study. TTT Products Ltd has deliberately "flown under the radar" to date but has significant expansion aspirations into regional NZ. The owners are currently reviewing their strategic objectives and the types of support they might need from government to give them every opportunity to succeed and flourish. Given this potential contribution to the Government's wood processing and regional development objectives, FEA believes a focused and coordinated whole of government approach to support this company could be warranted. There is "daylight" between what this business and technology could potentially offer in terms of "logs to jobs" and the next best, known, current opportunity.
- China is currently undertaking a massive afforestation program which will see forested land expand from around 7 million hectares in 2020 to 20 million hectares in 2035. This includes an increase of plantation forestry by about 4.4 million hectares from 2.3 to 6.7 million hectares. Radiata pine has been seen, in some Chinese circles, as a preferred species for consideration. This provides a potential opportunity for government intervention and negotiation to consider how NZ might look at leveraging its expertise and know how in growing Radiata pine in the different soil and climatic conditions seen across China. Could Chinese investment into greenfield NZ sawmills be part of any technology transfer deal on a government to government basis? FEA believes this should at least be considered and investigated based on a detailed risk/reward type analysis.

3.0 Sector Overview

3.1 Recent history of wood processing growth is underwhelming

The New Zealand commercial forestry sector is fundamentally plantation-based and monocultural with 90% of the plantation forest area planted in Radiata pine (*pinus radiata*). Radiata pine is a fast-growing, versatile species selected specifically for NZ conditions based on trials as far back as the early 1900s. As a wood species, it is fairly easy to kiln dry, machine and treat, as needed, for a range of solidwood applications (structural, appearance, industrial) and has more than adequate fibre qualities for pulp and paper manufacture.

For the year to end of March 2017, the New Zealand forest industry harvested just over 30 million cubic metres ("cum") of logs and exported more that 17 million cum of these, or 57%.[1] Calendar year data for 2017 shows the major recipients of these logs were China (74%), South Korea (13%) and India (8%). These three Asian countries, by themselves, took 95% of NZ's total log exports.

This begs the question, "Why aren't more of these logs being processed domestically to create jobs, value-added sawn timber and residues for secondary manufacturing?" This is not without the best intentions of the wood processing sector. Successive industry associations have promulgated bullish goals around growth of domestic wood processing adding significant value to the New Zealand economy and export earnings:

- In the early 2000s, NZ FIC (New Zealand Forest Industry Council) promoted vision targets that included export earnings growing from $3.1 billion at the time to >$14 billion by 2025.
- In 2012, WoodCo (Wood Council of New Zealand) issued its ten-year Forestwood Strategic Action Plan that had a goal of increasing forest product export earnings from $4.5 billion in 2011 to $12 billion in 2022.

Export earnings from forest products for calendar year 2017 were $5.2 billion (total NZ merchandise trade) with the WoodCo plan being removed from its website and now under review. Despite strong industry aspirations, Table 2 shows that growth in wood processing has been moderate and underwhelming when compared to other export-focussed countries like Brazil (MDF and pulp), Chile (sawnwood and plywood) and Russia (sawnwood and plywood). China has grown tremendously to meet both internal demand (e.g. plywood for construction) and to provide feedstocks for value-added export products (e.g. MDF for furniture and pulp for papers). Canadian growth has also been moderate, but they come off a much larger production base than NZ (roughly ten times) and harvesting of the predominantly government-owned forests are mandated by an annual allowable cut (AAC) set by the provincial governments.

[1] Note that FAO data per Table 1 can differ slightly from national data due to interpretations of product codes

Table 2 – Production by wood product category and country for 1997 and 2017

Product	Country	Production (m^3)			
		1997	2017	Increase	% Change
Sawnwood, coniferous	Brazil	5,610,000	8,600,000	2,990,000	53%
Sawnwood, coniferous	Chile	4,274,000	8,309,100	4,035,100	94%
Sawnwood, coniferous	Canada	46,829,584	48,159,258	1,329,674	3%
Sawnwood, coniferous	China	12,104,000	34,408,000	22,304,000	184%
Sawnwood, coniferous	New Zealand	3,130,000	4,234,000	1,104,000	35%
Sawnwood, coniferous	Russian Federation	16,675,000	37,819,636	21,144,636	127%

Product	Country	Production (m^3)			
		1997	2017	Increase	% Change
Veneer Sheets / Plywood	Brazil	2,118,000	4,056,000	1,938,000	92%
Veneer Sheets / Plywood	Chile	152,000	1,479,400	1,327,400	873%
Veneer Sheets / Plywood	Canada	2,331,000	3,013,362	682,362	29%
Veneer Sheets / Plywood	China	8,213,000	120,516,000	112,303,000	1367%
Veneer Sheets / Plywood	New Zealand	506,000	922,173	416,173	82%
Veneer Sheets / Plywood	Russian Federation	1,079,000	4,714,000	3,635,000	337%

Product#	Country	Production (m^3)			
		1997	2017	Increase	% Change
Fibreboard	Brazil	1,854,378	7,522,000	5,667,622	306%
Fibreboard	Chile	889,000	1,700,200	811,200	91%
Fibreboard	Canada	9,017,000	10,015,647	998,647	11%
Fibreboard	China	6,369,000	64,477,000	58,108,000	912%
Fibreboard	New Zealand	826,000	906,873	80,873	10%
Fibreboard	Russian Federation	2,239,000	3,390,000	1,151,000	51%
# Includes Particleboard, OSB, MDF/HDF, Hardboard and Other fibreboards					

Product*	Country	Production (tonnes)			
		1997	2017	Increase	% Change
Chemical Wood Pulp	Brazil	5,795,000	18,210,000	12,415,000	214%
Chemical Wood Pulp	Chile	1,868,000	4,859,600	2,991,600	160%
Chemical Wood Pulp	Canada	13,075,000	9,072,000	(4,003,000)	-31%
Chemical Wood Pulp	China	1,736,457	7,849,201	6,112,744	352%
Chemical Wood Pulp	New Zealand	647,000	762,214	115,214	18%
Chemical Wood Pulp	Russian Federation	2,495,000	5,669,000	3,174,000	127%
* Includes Sulphate (bleached and unbleached) and Sulphite (bleached and unbleached)					

Source: FAOSTAT

Indications from secondary manufacturers in NZ (pulp/paper, fibreboard companies) are that they are prepared to invest in expanding existing capacity or greenfield enterprises. Commentary from Oji Fibre Solutions[2] who operate the two major kraft pulp mills at Kawerau and Kinleith is as follows:

"Oji Fibre Solutions ("OFS") has a Kraft pulp mill in Kawerau and a Kraft pulp mill/linerboard machine at its Kinleith complex. The total fibre input to both mills is about 3.6 million tonnes/year. Total employment across both sites is around 650FTEs and OFS is a significant

[2] Personal comment from Jon Ryder, CEO of Oji Fibre Solutions. November 2018.

employer for these regions. Both pulp mills are small by world-scale and sit precariously in the third quartile of cost competitiveness against all other kraft pulp mills worldwide. OFS are able to be financially viable by making (1) niche pulp products e.g. pulp used in fibre cement board manufacture and (2) pulp used in the production of linerboard for their captive cardboard plants in New Zealand. However, OFS could consider investing around $s 9(2)(b) to scale-up the Kinleith site by an additional s 9(2)(b) tonnes/year. This would make the operation world-class and secure the 650-700FTEs in the region for at least another 20+ years. The issue for OFS is a lack of locally available, cost-effective fibre. OFS needs several more primary sawmills in the CNI region to produce the chip residues they need to justify the significant investment in more processing plant and equipment."

However, these sectors need the lower-cost fibre generated from sawmilling residues. It is not economically viable for these secondary manufacturers to chip whole sawlogs to produce their feedstock and sawmills are needed to extract higher-value lumber to allow residues to be sold at prices significantly less than the whole log value. The implication is that exporting logs is not only leading to less domestic sawmilling and losing out on the jobs that these sawmills would otherwise bring, but this also has flow-on effects to secondary manufacturing - as evidenced by the OFS comments above.

This situation around reducing sawmill capacity and less availability of residues is likely to be exacerbated in the medium term due to major forest owners electing not to prune their forests in the Central North Island region[3]. Sawmills that have been built to process pruned logs will need to either (1) cut back production with some eventually closing or (2) re-invest in their green mill operations, at least, to allow them to process unpruned logs.

Sequal Lumber[4] represents one excellent example of a sawmill cutting A/K-grade logs and investing in capacity growth at their site in Kawerau. They achieve this through a focus on custom cutting to specific dimensions for their customers (reducing their customer's process waste) and excellence in global supply chain solutions, including just-in-time deliveries. However, Sequal Lumber is the exception, not the norm, and a lack of significant, capacity-enhancing investment in the sawmilling sector has become the "millstone around the neck" of growth in the whole wood processing sector. A lack of primary manufacturing impacts growth aspirations of the secondary manufacturers. There has been significant investment in some brownfield sawmills to modernise and expand capacity with Red Stag being the most well-known, after its recent $60 million "super-mill" investment increasing log input to over 1 million tonnes per year.[5] However, this is largely driven by a strategy to increase its share of the high-value, domestic, timber framing market where 90+% of new houses are built using timber-frame construction. Any expansion of one competitor will have implications on higher-cost sawmills operating in this sector. This has been seen in the past with closure of other older and smaller-scale sawmills where the owners were not prepared to make the investment to remain competitive e.g. CHH Rainbow Mountain and Putaruru sawmills.

[3] Spotlight #3. "The looming impact of diminishing pruned log supply on regional economic development in the Central North Island".

[4] See http://sequallumber.co.nz/

[5] See YouTube clip at https://www.youtube.com/watch?v=Ed-U4_Ayfww

As a matter of record, the last greenfield sawmill development was the TDC Sawmills "Project Fortress" sawmill built in Whangarei in 2005/06 on a 58-hectare site known as the "Port Hills" that required significant earthworks to flatten the top of the site.[6] Ironically, this sawmill was also established, primarily, to process higher-stiffness sawlogs into structural lumber for the residential market in NZ.

In some ways, the TDC and Red Stag investments are a microcosm of the reasons why further investment in sawmilling has been problematic:

- The available logs, that are being exported in the necessary quantities to supply a modern, world-scale, domestic sawmill, are lower-quality, industrial sawlogs (referred to as A-grade and K-grade logs).
- The needs of the domestic market are already being met by established processors meaning any new investment in a greenfield sawmill will, by necessity, need to have a significant export market focus.

Furthermore, any export play for sawn timber brings into account a range of other factors such as foreign exchange rates, import tariffs (benefitting local sawmills in the target country), local regulations, international supply channels, changing local market dynamics and competition from other countries and species.

The WPMA (Wood Processors and Manufacturers Association), as the peak industry association in NZ for wood processors, have been vocal[7] in pointing out that NZ sawmillers are disadvantaged through non-tariff barriers which mean New Zealand sawmillers are not competing on a level playing field. These include:

- In some destination markets, a combination of import taxes on sawn timber imports and subsidies for their domestic sawmillers (e.g. China) make them competitive with imports to shore up local employment.
- In some competitor regions looking to export their own sawn timber products, local factors exist such as log export restrictions[8], log export taxes and quotas[9] that support domestic production.

The situation exists today where Radiata pine logs sent to China are being sawn and kiln dried into knotty boards, docked and profiled into mouldings, then being re-exported to New Zealand and sold against locally-produced mouldings!

The coalition government has ruled out log export taxes likely due to worries about private property right implications and impacts on free trade agreement negotiations. FEA understands that government is now looking at policies around a log buyer registration and security of supply to domestic sawmills. The intention of these policies is to support local sawmills to get the volumes they require; sawmills are still likely to have to pay export parity prices and these policies do not affect the competitiveness of local sawmills in export markets.

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[6] The Wood Engineering Technology (WET) plant in Gisborne is a greenfield development, but it is primarily a proof-of-concept operation for their highly innovative Optimised Engineered Lumber (OEL™) timber product.
[7] See, for example, http://www.wpma.org.nz/news/nz-wood-processors-lobby-government-for-help/
[8] Spotlight #2. "The impact of B.C. Government log export restrictions on the B.C. Sawmilling industry."
[9] Spotlight #6. "Impact of Russia/China Lumber Trade on International Log/Lumber Trade & Implications for NZ."

3.2 Fundamentals do stack up, but extensive market research is imperative

Despite the concerns raised above, prefeasibility work carried out by FEA on a greenfield sawmill in Taupo (in conjunction with Contact Energy and the Taupo District Council), has shown that a modern, state-of-the-art technology, world-scale sawmill can export sawn timber competitively to the Chinese market and yield acceptable returns to an investor.[10] There is an issue around the high net wood costs, due to export parity log prices any sawmill would have to pay even for lower quality A/K grade logs, but these can be compensated for by other factors such as location, efficient sawmill operation (yields and costs), geothermal energy and world-class logistics costs, in this case through the Port of Tauranga.

The government, through NZTE, is now supporting efforts to identify potential investors in this sawmill project with a view that subsequent greenfield processing in other regions could be pursued once a first mill in Taupo is successfully up and running. NZTE chose to limit funding of a more detailed business case, including extensive market research beyond the base case identified by FEA (pith-free, cut-of-log, rough-sawn, kiln-dried, furniture-grade sawn timber), as they are targeting strategic industry investors who would know their supply chains and markets and would be capable of doing their own due diligence. The NZTE approach is built around a "NZ is open for business" investment pitch given the current government agenda in forestry and our track record in areas such as low corruption, ease of doing business, productivity, environmental performance.

Time will tell if this strategy is successful. FEA is aware of some interested parties in ongoing dialogue around this opportunity. Regardless, FEA believes that there is value in government support of much more detailed, "open source" market analysis of sawn timber products in not only China but other targeted Asian economies that have a history of Radiata pine usage (e.g. South Korea, Japan) or are on a high-growth trajectory (e.g. India, Vietnam, the Philippines). This work would not only support and help target investors in any potential greenfield plant investment proposition, but also provide some level of confidence for re-investment and expansion of existing sawmill capacity, including at risk pruned log sawmills. NZ sawmills generally do not have the resources (financial and personnel) to carry out such an extensive market research program and sit in somewhat of a vacuum because of the "I don't know what I don't know" mindset around possible, untapped, market opportunities.

Investors invariably require some form of business case to support their funding arrangements and robust business cases need in-depth market research to validate the sales assumptions. FEA experience on sawmilling investment has led to the following commentary[11]...

"I find that you can prove anything with a proforma since it is just numbers. The greatest wildcard to a sawmill proforma is not costs. Costs are easily definable, except for log costs. It is the sales average and the product/market mix planned that can have an even greater impact. So, this is where the most work should be conducted to validate the potential margin."

[10] Spotlight #1. "Can New Zealand be internationally competitive in selling sawn timber into the Chinese market?"

[11] Russ Taylor, FEA. Personal comment. May 2018

Other factors such as tariffs, the impact of the current US/China trade war, diversifying a supply base, other Asian countries looking to mitigate Chinese expansionism, climate change ramifications of using timber etc. are considerations that can be explored. Also, further value-add manufacturing beyond just exporting sawn timber boards e.g. manufacture of flooring and furniture components, may be merited in NZ due to these geopolitical factors.

There is precedent for such work in MBIE with the highly successful Food and Beverage Innovation Project. The website[12] notes that:

The Project publishes comprehensive data-driven reports on the current and evolving state of New Zealand's food and beverage (F&B) industry, providing analysis on the structure and dynamics of the industry. This includes information on market trends, future opportunities and threats, and peer country comparisons.

Some of the reports are specifically identified as Investor Guides and these are designed to be used by four audiences:

1. Investors (domestic or international)
2. Industry participants (firms & individuals)
3. Government (across all roles and responsibilities)
4. Scientific researchers (academic, government & corporate)

FEA believes that if NZ government is serious about a "logs to jobs" vision of seeing more domestic sawmilling and, as a consequence, more secondary manufacturing, then a program similar to the Food and Beverage Innovation Project could be sponsored by the government and implemented by the relevant government agency.

Interestingly, FEA sourced a report commissioned by MPI in 2016 that investigates end-uses of various NZ log grades in China, South Korea and India.[13] The purpose of this report was to review material flows and end-uses of harvested wood products produced from New Zealand log exports. This work was undertaken to enable MPI to make informed decisions around the options concerning the uptake and policy regarding greenhouse gas (GHG) reporting and accounting, the Emissions Trading Scheme (ETS), and policy development processes. The report has some value to sawmillers wanting to understand how Radiata pine logs are used in these countries, but it is not clear how widely this report was circulated. With some scope tweaking around inclusion of prices and competitiveness of other species, this work is indicative of the type of market research analysis that FEA is suggesting needs to be undertaken in future by government. Even more compelling would be a similar study looking at export markets for Radiata pine sawn timber and comparing how Radiata compares against species and grades from other countries in the various market segments.

[12] See https://www.mbie.govt.nz/info-services/sectors-industries/food-beverage/information-project

[13] Manley, B. and Evison, D, "Material flow and end-use of harvested wood products produced from New Zealand log exports." August 2016, ISBN No: 978-1-77665-348-5 (online)

3.3 Forest Innovation Investment – the British Columbia (B.C.) model

With the B.C. government owing 95% of the provincial forest land, they have a greater obligation to do promotional work as well other industry and market support than might be undertaken by the NZ government. Nonetheless, the B.C. approach is instructive.

A key organisation is Forest Innovation Investment (FII, see https://www.bcfii.ca/). Like New Zealand, B.C. (and Canada too, in global terms) has a relatively small population and the forest sector relies on export markets to grow and prosper. FII helps maintain, create and diversify markets for B.C. forest products to ensure the forest sector continues to be a key contributor to the B.C. economy. FII achieves this by managing three separate but complimentary programs:

1. MARKET OUTREACH | MARKETING B.C. FOREST PRODUCTS The goal of the Market Outreach program is to position wood as an environmentally friendly, preferred building material, and B.C. as a reliable supplier of quality products from sustainably managed forests.
2. MARKET INITIATIVES | GROWING MARKETS IN ASIA AND NORTH AMERICA The goal of the Market Initiatives program is to ensure returns from B.C.'s conventional and emerging forest products are optimized in markets offering high potential.
3. WOOD FIRST | ADVANCING WOOD USE AND CAPACITY IN B.C. The goal of the Wood First program is to ensure B.C. is a leader in using innovative forest products and building systems.

FII is governed by a Board of Directors that is accountable to the B.C. Ministry of Jobs, Trade and Technology. The Government appoints the Board to set operational policy for the organization and, in cooperation with senior management, to set strategic direction. The Board also monitors FII's performance based on the Province's planning and reporting principles. The Minister provides annual direction to the Board through issuing a mandate letter.

A Corporate Overview document from the website is attached as Appendix 1 and notes some of the market research reports published as follows:

- 2016 Trend Analysis in Export Markets for B.C. Forest Products
- Indian Furniture Market Report
- Forest Products Market Analysis: United States
- South East Asia Strategic Review
- China Remanufacturing Study
- Vietnam Manufacturing Study

These full reports are only available to B.C. companies, trade associations and research institutions through password protected access. There did not seem to be any reports specifically looking at the global competitiveness of the various B.C wood processing sectors.

3.4 Domestic market growth and EWPs – how far can we go?

There are a range of reasons for government to encourage domestic demand of wood including:

- It is synergistic with their billion-tree afforestation program over the next ten years
- It could mean more wood processing in NZ and jobs in the regions so supports the work being undertaken with the Provincial Growth Fund
- There are potential GHG emission benefits in terms of embedding carbon in timber buildings as opposed to concrete and steel
- Timber buildings are more earthquake resilient if designed correctly
- Timber allows biophilic[14] design of buildings that have been shown to improve health and wellbeing for occupants in offices, schools, hospitals etc.

In terms of this Overview Paper, the key questions are:

1. What level of domestic growth of timber usage in the wider construction sector is feasible, and
2. What does this mean for greater domestic wood processing?

The construction sector is conveniently divided into the residential and non-residential market segments to answer these questions.

In terms of the residential market, light timber framing ("LTF") has traditionally had 90+% of the market which has been dominated by detached housing. However, with the population growth seen in the major centres, and particularly Auckland, attached housing or medium-density housing (such as apartments, terraces housing and town houses) is becoming more prevalent to house more people as land becomes scarce and prices rise. Typically at 2-4 stories, these buildings will still largely be constructed with LTF although steel and concrete elements may be incorporated where it makes sense e.g. long-spam beams, partition walls.

Yield factors are used by building economists to estimate material usages based on floor area. The yield factor for LTF in detached homes and terraced housing is around 0.1 cubic metres timber per square meter floor area i.e. 0.1 cum/sqm. Indicative average square meter areas are 215 sqm for detached homes and 115 sqm for terraced houses. Assume that the 100,000 KiwiBuild houses planned over the next ten years are 50% detached homes and 50% terraced housing at an average of 10,000 houses per year (acknowledging there is a ramp-up, but this is an indicative calculation). As well, assume that these KiwiBuild homes are all <u>additive</u> to current housing supply which is being provided by domestic sawmillers. The calculation below shows that the annual increase in LTF, if all are timber built, is around <u>165,000</u> cum per year.

(50% x 10,000 x 115 x 0.1) + (50% x 10,000 x 215 x 0.1) = 57,500 + 107,500 = 165,000 cum LTF

This is a significant increase on current usage of around 350-400,000 cum per year and is, not surprisingly, being aggressively encouraged by structural sawmillers. However, it hardly makes a dent in our log exports which are approaching 20 million cum per year.

[14] Biophilia is the term used to describe human's innate tendency to seek connections with nature.

The non-residential market is potentially more interesting, because timber is less commonly used than concrete/steel and this provides options for market share growth. Engineered wood products (EWPs), such as CLT (cross-laminated timber) and LVL (laminated veneer lumber) offer alternatives for the structural beam and wall systems needed to support the higher loads for these bigger structures.

BRANZ (The Building Research Association of New Zealand Inc.) conveniently divides the non-residential market into a range of sub-sectors such as hotels/motels, hospitals, education buildings, offices, shops, factories, farm buildings etc. In 2013, a BRANZ study[15] was published that estimated the possible uptake by CLT into each of these sub-sectors. The analysis looked at current costs for the incumbent systems i.e. steel/concrete. Where CLT was more cost-effective than the incumbent technology, an indicative penetration rate of 10% was assumed that reflected the conservation nature of the construction sector in adopting new technologies and any competitor response. As well, where CLT was not cost-effective, an uptake of 1% was assumed for aesthetic reasons. The analysis showed that the total market size for CLT was around 40-50,000 cum per year. If CLT uptakes were greater than BRANZ projections, even by as much as a factor of five (i.e. 50% penetration versus 10% penetration), as an extreme upside, the indicative demand would then be around 250,000 cum year.

In summary, FEA believes anything that the government does to stimulate more timber usage in the local construction market is welcome, but this is not the panacea to the central issue of processing a greater proportion of the 17+ million cum per year of logs that are exported.

FEA has previously provided advice to MBIE on the potential of the EWP market and, in particular, export opportunities. This was largely premised off the WoodScape findings (see next section below) and the realisation that poorer quality A/K grade logs can be sawn (or peeled) and re-constituted to make higher-quality, higher-value products. FEA identified one of its clients, a major EWP company in the US, that had been looking for a light duty beam and header product to complement its product line. There was the possibility that NZ wood processors could provide this solution with their existing technologies. However, when the client provided a target delivered price to the US West Coast, it became clear that, just like had been seen with the Taupo sawmill study above, net wood processing costs in NZ are prohibitively high and need quite specialist solutions to compensate in other ways so overall delivered costs can meet market price points.

In this particular case, FEA did meet with Wood Engineering Technologies (WET) who were in the process of establishing a demonstration plant for their patented and unique OEL™ (Optimised Engineered Lumber) wood product in Gisborne. Because WET uses highly productive technology, incorporating all the sawn timber from the log (outer wood and core wood) into OEL™, the economics are very different from traditional structural EWP processes. As such, WET advised they expected they could meet the USA price point. The commissioning of the demonstration plant in Gisborne is in its final stage and planning for the construction of the first commercial plant very advanced. However, it will be dedicated to the NZ market where WET believes there is significant demand for further dedicated plants and is likely a preferred capital allocation choice for some time. The US market lumber dimensions are

[15] "Cross-laminated timber potential in New Zealand." August 2013. BRANZ report for Grow Rotorua and Scion.

different to NZ but WET advises their technology can be readily configured to the requirement of the US market for the bigger cross-section light duty beam and header product.

Beyond WET choosing to allocate capital to plants dedicated to the export market, FEA did not identify any other significant export market opportunities for more traditional EWP manufacturing processes using Radiata pine logs primarily because of high fibre pricing due to logs selling at export parity pricing.

3.5 WoodScape – is there a "killer" process out there we might have missed?

The WoodScape study was a national level analysis of wood processing options completed in 2013. It used a financial modelling and market review approach to assess the potential of a range of traditional and emerging technologies. The primary metric used for assessing financial performance was Return on Capital Employed (ROCE). This metric reflects the attractiveness to investment of the technology. Other considerations were technical readiness of the process and the market opportunity for the product.

The study was contracted by WoodCo to Scion and governed through a WoodCo appointed board. It was funded by the Wood Processors Association (WPA), Pine Manufacturers Association (PMA), New Zealand Forest Owners Association (NZFOA), Ministry for Primary Industries (MPI), New Zealand Trade and Enterprise (NZTE), and Scion.

A comprehensive, but not exhaustive, list of 39 different wood processing technologies (18 traditional and 21 emerging technologies) were assessed and this expanded to 63 options when plant size variations were added to examine capital cost efficiencies. The technologies covered a wide range of potential wood processing options including:

- sawmilling
- engineered wood products, e.g. laminated veneer lumber
- secondary wood products, e.g. remanufacturing
- pulp and paper
- heat and power and
- fuels and chemicals.

It was noted in the final analysis that many of the technologies that have attractive ROCEs rely on a plentiful supply of residual fibre from primary processing i.e. sawmills.

In terms of outputs, WoodScape identified three ways forward – compete, transform and innovate and these are summarised below. These are consistent with many of the themes and conclusions (underlined for emphasis below) that FEA has been exploring based on our own market data, knowledge, analysis and insight.

The Way Forward: *Compete*

There are limited growth opportunities for some of the traditional primary processing options. Establishing a new sawmill in New Zealand needs to cope with domestic markets being fully supplied and current export prices giving low or negative returns. Many New Zealand wood processors are small scale and have limited funds for export market development. There is a need for a collaborative approach to market intelligence and development work, potentially in partnership with government. Primary solid wood processing is a vital component of the wood processing sector because many other processing options rely on their residues for their input feedstock. Without profitable primary processing of high-quality logs the supply of feedstock for manufacturers who use residues is at risk. To realise the Woodco strategy and benefit the economy from greater wood processing, New Zealand needs to markedly increase the global competitiveness of sawmilling operations.

The Way Forward: *Transform*

The current forest sector exports approximately half of its harvest as unprocessed logs. In order to realise the Woodco strategy greater onshore processing of these logs is required. The majority of these logs are A and K grade of lower quality than S grade sawlogs but superior to pulp logs. These large volumes of knotty logs are a significant issue as there are currently very limited options for profitable processing of this material. To achieve significantly greater onshore processing requires two approaches:

- a focus on implementing processing technologies that can utilise K and A grade logs such as industrial plywood
- where profitable relocate overseas processing of log exports (a significant proportion of which is used for industrial plywood) back to New Zealand.

The Way Forward: *Innovate*

A substantial section of the current wood processing industry is not adding much value to its inputs with a value-add ratio of less than 3. In contrast, for many of the emerging wood processing technologies, this ratio is around 4 to 6. WoodScape identified two promising areas showing solid returns (above 10%) and potential to add value. These are:

- engineered wood products
- fuels and chemicals.

Fuel and chemical processing options rely on residues from primary processing. The focus for New Zealand forest product stakeholders in this area should be: reducing technical risk, improving the competitiveness of the facilities, developing new higher-value products and opening up new markets. This requires strong partnerships between research and industry.

The WoodScape study additionally noted that the most significant risks are: foreign exchange (a 15% change in the US exchange rate can shift return on capital employed by up to 10% for some technologies) and market knowledge. Market knowledge would include identifying potential competitors in and into potential export markets.

In terms of Next Steps, WoodScape identified a number of actions, two of which are relevant for this Overview Paper:

- Undertake a comprehensive study of options for K & A grades
- Identify alternative sawmilling approaches to make sawmilling sustainably profitable.

FEA notes that the WoodScape work was carried out in 2013 at a time when many businesses were still re-evaluating their situations after the tumultuous events of the 2008/09 global financial crisis. For many, it was still a time for stabilisation and not growth. Furthermore, five years have now passed since the study was published. In this time, the industry has changed significantly as witnessed by NZ log export volumes and pricing to China and the emergence of the Russian sawmilling sector as but two major events. In light of this, FEA believes that it is timely to re-look at the WoodScape work to update the analysis in conjunction with the more extensive market analysis work proposed above.

The work on the Taupo A/K grade sawmill has shown an investible proposition albeit highly dependent on one market segment in China (pith-free, cut-of-log, furniture grade sawn timber). Are there other opportunities in existence today that could significantly impact on A/K grade log usage in NZ (the "killer" process) that only further detailed analysis may uncover?

3.6 TTT Products Ltd – have we found a significant "whole-of-log" solution?

TTT Products Ltd is a unique, NZ-based, wood processing business that has been profiled in one of the Spotlight papers.[16] To re-cap, TTT Products Ltd ("TTT") is a 25-year old, privately-owned company that manufactures a range of timber poles used in many applications such as:

- ground stability (mitigate against lateral spreading and liquefaction in seismic events).
- below ground foundations systems for construction, including timber raft systems.
- power transmission or telecommunication poles.
- above ground structural components such as columns, floor panels, shear wall panels.
- marine applications
- construction and retaining walls.

As well, TTT designs and manufactures specialist heads for attaching to diggers to optimise the process of driving in the poles for ground stability and foundation systems.

Traditional poles have been the "stock standard" TTT offering. Although high quality and well manufactured, they are easily replicable by a committed competitor due to relatively low barriers to entry in terms of set-up capital and manufacturing know-how. However, about 8 years ago TTT began selling its "MultiPole". The MultiPole is produced by a hole coring processing technology. The process has not been patented and remains a trade secret of TTT.

[16] Spotlight #5. "Two emerging innovative wood product technologies with global prospects.

The hole in the MultiPole serves several purposes including:

- Easier to treat with timber preservatives which can penetrate from outside and from inside the core.
- Assists drying (much faster) with less checking/splitting.
- The pole is lighter which has several benefits i.e. easier to handle, lower transport costs (30% more volume on a truck) and lighter machines to install (important for sites with marginal ground conditions where heavier diggers could not operate).
- Poles can be easily connected end-on-end with special connectors for greater depth.
- The core allows hydrojetting to assist when installing the pole into place.

As an aside, the TTT process does produce residues from both the log peeling process (exterior of log) and the hole coring process (interior of log) which would be ideal for pulp production or any other new process looking to extract valuable biochemicals from wood.

Fundamentally, TTT's core offering is they can design a foundation solution for any ground condition for anywhere in the world i.e. ground improvement. Radiata pine is an excellent species for this technology due to high growth rates (large diameters), adequate strength, relatively low taper and ease of treatability with preservative chemicals. TTT have 35 years of experience in this market including silty sites with high groundwater, seismic zones, and working with Housing NZ including the red zone in Christchurch. Their competition comes from steel/concrete solutions used in similar applications, except marginal sites (e.g. silty) where they are unsuitable due to their weight. In these ground environments, TTT's MultiPole has a distinct competitive advantage both in terms of cost and installation time.

TTT are currently going through a major plant upgrade on their 18-hectare Tuakau site and they have plans to expand to other regions.

A MultiPole line is comparable to a sawmill in terms of value-add with significantly higher yields and employment than the state-of-the-art, A/K-grade log-in, Taupo sawmill.

Furthermore, the TTT plant is scalable so this expansion could be staged to match the market development. TTT make the point that trees grow naturally round and are stronger, so why not use wood in this natural form as opposed to sawing into square boards. The yields are higher (a sawmill loses 50% as residues) and all the log is sold as the value-add product (a sawmill has to sell lower-value core wood sawn timber at lower prices).

Should the owners wish to engage with government programs to assist with their expansionist endeavours, then FEA believes they should be given all the necessary support to do so.

3.7 Can we leverage our forest growing intellectual property?

China is currently undertaking a massive afforestation program which will see forested land expand from around 7 million hectares in 2020 to 20 million hectares in 2035.[17] This includes an increase of plantation forestry by about 4.4 million hectares from 2.3 to 6.7 million hectares. A range of timber species have been identified for the various sub-regions in China and Radiata pine has been proposed as a strong option for consideration versus poplar, eucalyptus, Chinese fir and others.[18] Specifically it was noted by the Chief Expert of the China Timber and Wood Products Distribution Association that:

- *Pinus radiata timber has good wood properties and a wide range of uses. it can be used to produce plywood, fibreboard, particleboard, veneer, building plywood and other wood-based panels. In furniture production, Pinus radiata has a soft colour and strong nail holding properties. It is a good furniture material.*
- *The texture of existing Chinese plantation species is poor and the yield per unit area is not high at 53 cum/hectare compared to Radiata pine at 290 cum/hectare. A productivity improvement on volume of 5.5 times.*
- *Radiata pine has been introduced already in Sichuan*
- *New Zealand has had successful experience in planting Pinus radiata. Introducing technology and management can be considered in cooperation with New Zealand.*

This provides the opportunity for NZ to look at leveraging Chinese investment into greenfield NZ sawmills as part of any technology transfer deal involving planting Radiata pine in China. FEA believes there is merit in the NZ government leading an in-depth discussion with local industry about the merits and approach of entering into such a venture and developing an agreed approach, before engaging with the Chinese government.

FEA has made some initial enquiries and determined that the State Forestry Administration (SFA) and Chinese Academy of Forestry (CAF) are two of the main organizations that should be contacted for the potential co-operation between New Zealand and China. However, because the government can be slow to make any recommendations, a better approach might be to talk directly to private forestry companies. One such company was contacted in Guangxi who are very interested to trial Radiata pine. Guangxi is one of the most important provinces for plantations with Eucalyptus, Chinese Fir and Mason pine, but Guangxi also has big and growing demands on radiata pine log imports. As such, Radiata pine should be suitable species in Guangxi.

[17] Chen Yong. "Analysis of domestic timber supply in China." Sept. 2018. FEA China Conference, Chongqing.
[18] Zhu Guang Qian. "Sino-US trade war impact on wood industry of both sides." Sept. 2018. FEA China Conference, Chongqing.

4.0 Proposals for Consideration

FEA believes that the NZ government can better position itself to attract new investment to expand the domestic wood processing sector in New Zealand ("logs to jobs") by implementing the following five recommendations:

1. Engage in extensive sawn timber market research, including competitor analysis

Any investor will need a detailed business case to raise capital. These business cases need to have a credible sales strategy based around extensive, supporting market research. While information on log costs, processing technologies, yields, operating costs (including labour and energy requirements) and logistics are all well understand there is an information gap in terms of any in-depth analysis about how Radiata pine sawn timber is, and could be, used in both current and emerging, offshore markets. This information gap can be filled by government intervention as the wood processing sector does not have the wherewithal to do this collaboratively. Furthermore, government-funded information can be made available in the public domain for both current sawmillers and new investors to use for business case development. The current NZTE approach has been more "hands off" and reliant on strategic investors to fill this market knowledge gap. If these efforts fail, government and the sawmilling sector will be none the wiser and unable to address any strategic investor market concerns or deficits through renewed efforts both in terms of R&D (Scion) and operational/processing advancements. Without looking, you don't know what you don't know!

There is a precedent in the work done by MBIE as part of the Food and Beverage Information Project. A similar focus on sawn timber markets could be sponsored by the government and implemented by the relevant government agency. An example of similar work done by Forest innovation Investment - a standalone government entity in British Columbia – is instructive.

2. Support timber usage in the domestic market

Any initiative that promotes timber usage in NZ will have flow on effects to the sawmilling industry through increased demand and is welcomed. The only note of caution FEA wants to raise is that this is not the panacea to solve simultaneously the issue of processing significantly more export logs on shore. FEA estimates of the benefits in terms of additional processing are, at best, from 0.5 to 1.0 million cubic metres of logs in the next 5-10 years as log exports approach 20 million cubic meters in total.

3. Re-run and expand the WoodScape Study from 2013

The findings from the previous WoodScape study are consistent with some of the recommendations in this Overview Paper – especially around domestic markets being fully supplied and a need for market intelligence and development work supported by government. It seems this study was promulgated with a lot of fanfare at the time but has largely been forgotten.

However, the current coalition government has a different agenda and focus with regards environmental sustainability, forestry and regional economic development. Given that the major costs around developing the WoodScape modelling tool have been spent and Scion has refined its capability in the interim for other, specific project work, it should not be as significant a piece of work to re-run the techno-economic analysis.[19] It would largely encompass data gathering and validation. FEA's scope of work under the Services Agreement with MBIE allowed one scenario to be tested – a 400,000 cum/year, A/K grade log-in, state-of the art, sawmill based in Taupo and selling a single product (pith-free, cut-of-log, furniture grade sawn timber) to the Chinese furniture market. There are other markets and other product mixes, including value-added components (furniture or flooring) that could be tested and the tool to do this relatively quickly, including Monte Carlo simulation to understand the risks and uncertainties of any assumptions, is sitting already within a government Crown Research Institute.

4. Provide a "Whole of Government" approach to the TTT Poles business and growth opportunities

The TTT Products Ltd business offers a unique and differentiated ground stabilisation solution that has the potential to utilise significant volumes of export-destined logs in a domestic wood processing operation quite different to sawmilling. FEA has previously noted that the TTT Products expansion warrants, if the owners so wish, government support for its expansion plans and ambitions.

It could be more compelling if a focused and coordinated whole of government approach is taken to support the company, given its potential contribution to the Government's wood processing and regional development objectives. FEA recommends that this manner of support be considered as there is "daylight" between what this business and technology could potentially offer in terms of "logs to jobs" and the next best, known, current opportunity.

[19] Personal discussions with Scion staff overseeing the WoodScape model

5. Investigate how "NZ Inc" can leverage Radiata pine growing IP with China

There have been some indications that Radiata pine could be an ideal species in certain regions of China to underpin their massive afforestation program. There is a potential opportunity to leverage NZ's tremendous knowledge and IP around growing Radiata pine as part of a technology transfer deal that could involve Chinese investment in sawmilling operations in NZ. The number of stakeholders and the complexity of such a deal means this can only really be led by government, which is generally the preferred way to do business with Chinese interests. As well, private forest growers in China would unlikely have the desire or capability to invest in a sawmill in NZ so any way forward requires involvement of Chinese government to co-ordinate various interests.

The NZ government would need to develop the best way forward with key NZ players and then make a direct approach to China through the appropriate government channels. Chinese interests have invested in forestry in NZ so are already gaining an appreciation of operational skills and capabilities. They would not yet, hopefully, have the depth of knowledge that sits inside, for example, the Radiata Pine Breeding Company, Forest Growers Research and Scion.

Appendix 1: Corporate Overview of Forest Innovation Investment