FORESTRY + CARBON | MARKET INSIGHT

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INSIDE THIS REPORT

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An increasing need to address climate change and domestic policy changes has tilted the playing field toward carbon + forestry investments.

SUMMARY

The ratification of the Paris Agreement and recent review of domestic climate change policy settings has strengthened the investment case for forestry and/or Mānuka plantations. A push to do more to meet New Zealand's commitments means there is a growing need to reduce domestic greenhouse gas emissions (GHGs), increase forestry carbon removals (i.e. plant trees) and/or purchase credible international units.

The favourable signals for establishing new forests/Mānuka plantations, include:

1. A higher medium-term direction for the price of carbon;
2. An increasing array of financial and other incentives to plant trees;
3. ETS accounting rules for forestry that deliver greater liability-free emission units; and
4. Sector capability building efforts to deliver on planting a billion trees by 2030.

These are pointing toward a change in the risk and reward incentives for forestry and/or Mānuka plantation investments.

Traditionally, the upfront capital requirements to establish a forest and lack of cashflow over a rotation were impediments to new forest planting by domestic investors and drystock farmers. An overall positive demand outlook for New Zealand forest products and the ability to generate income from carbon sequestration provides a new revenue source and cashflow as a forest grows that is sparking renewed interest in this key export earning sector.

FORESTRY

Summary

The forestry sector is an important part of New Zealand's economic and environmental landscape. In economic terms it generates around $6.7bn of annual gross income, or 1.6% of GDP each year. It is one of New Zealand's largest export earners, bringing in nearly $6.8bn worth of foreign earnings each year (around 12% of total exports).

Forestry is seen as an important contributor to New Zealand's Paris Climate Change commitment. A push to do more means there is a growing domestic need to reduce domestic greenhouse gas emissions (GHGs), increase forestry carbon-removals (i.e. plant trees) and/or purchase credible international units. Forestry also contributes to erosion control on some of New Zealand's steeper landscapes and can be used to improve water quality in catchments – albeit the harvesting phase carries a heightened risk of sedimentation.

Over recent times the forestry sector has seen some of its best returns since the mid-1990's. This has been driven primarily by a combination of steady Chinese demand, further restrictions in export markets on the harvesting of native forests, a domestic building boom, and a supportive NZD/USD relative to in-market prices.

Despite this, it is only in more recent years that forestry seems to have found more favour as an investment option amongst landowners. This is reflected in a recent pickup in new planting activity after many years of the sector's land footprint being in a state of decline.

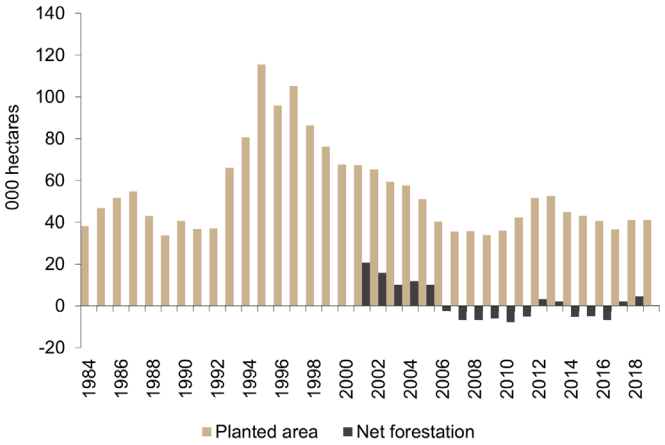
The catalyst has been a review of domestic climate change policies which are explained further in the Carbon section of this report (page 10).

Forestry Area in New Zealand

There are two main surveys (Statistics New Zealand Agricultural Production Survey and the Ministry for Primary Industries National Exotic Forest Description Survey) that measure trends in the planted area and harvesting rates. Both show net deforestation from 2005 until more recently, with an annual decline of 4,800 hectares in the Agricultural Production Survey and a smaller decline of 3,100 hectares in the National Exotic Forest Description (NEFD) Survey.

The NEFD shows the planted forest area peaked in 2003 at 1,827,000 hectares and has declined 7% to 1,697,000 hectares. Some of this area has been converted into pasture land for livestock grazing (i.e. Central Plateau) and some remains unused (either covered in weeds or reverting to a natural state).

Figure 1: Change in Forestry area



Source: MPI, NEFD

This deforestation and strong offshore demand from China for logs has many industry participants worried about the long-term supply of wood once the so-called 'wall of wood' has been harvested over the next 10 years (i.e. the spike in forestry planting that occurred in the mid-90s that is due to be harvested by 2030). The concern of tighter domestic supply to come and tight margins from high log prices has restricted domestic investment in new wood-processing facilities that produce higher margin products (such as panels, laminated products, glulam beams, mouldings, furniture etc) and in other important supply-chain functions.

High-level view of industry structure

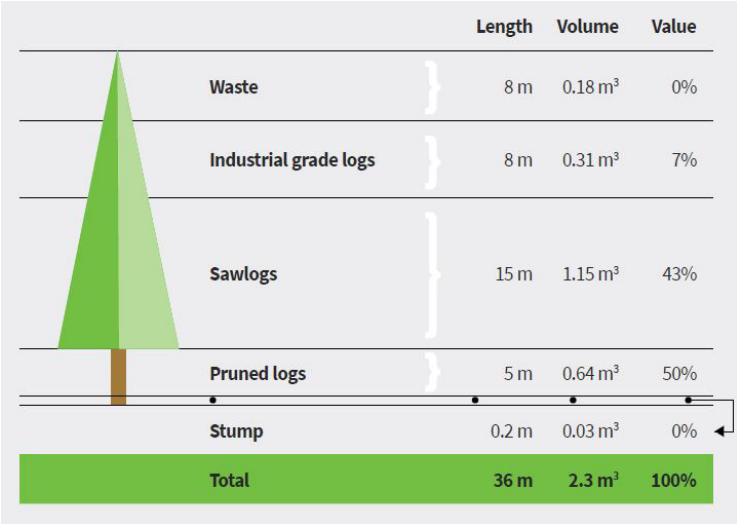
A tree can be turned into many different end products, from structural timber for buildings through to paper; it's the sum of all the returns from these products, minus processing, harvesting, cartage and other supply costs, that determine the net revenue received by forestry owners.

The following graphics show the typical yield of different raw materials produced from a tree under two different silviculture regimes:

'direct sawlog', and 'structural'. The two regimes yield differing quantities of raw materials, which is a factor in determining the end use of the tree and by association the returns received.

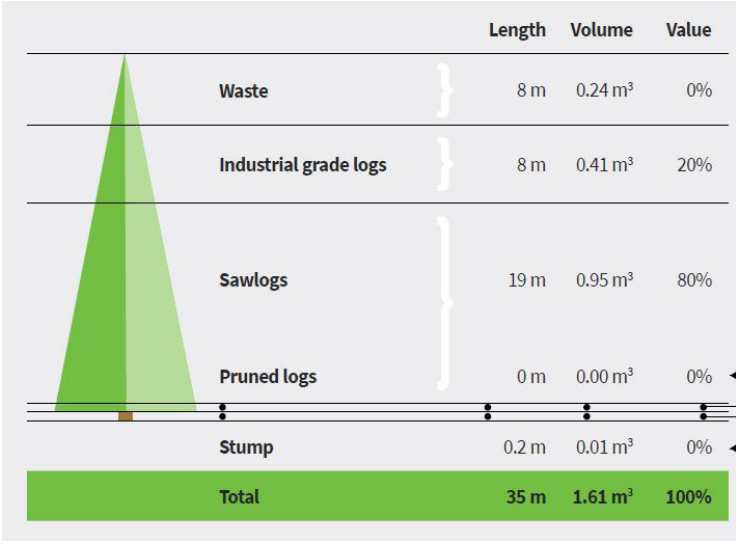
Across the radiata pine stands in New Zealand, which account for 90% of planted tree species, 36% of the area has been pruned without production thinning, 9% pruned with production thinning, 52% unpruned without production thinning, and 3% unpruned with production thinning. The trend is toward unpruned management regimes due to compliance/labour costs, carbon returns and China's log demand.

Figure 2: Typical log out-turn – direct sawlog regime



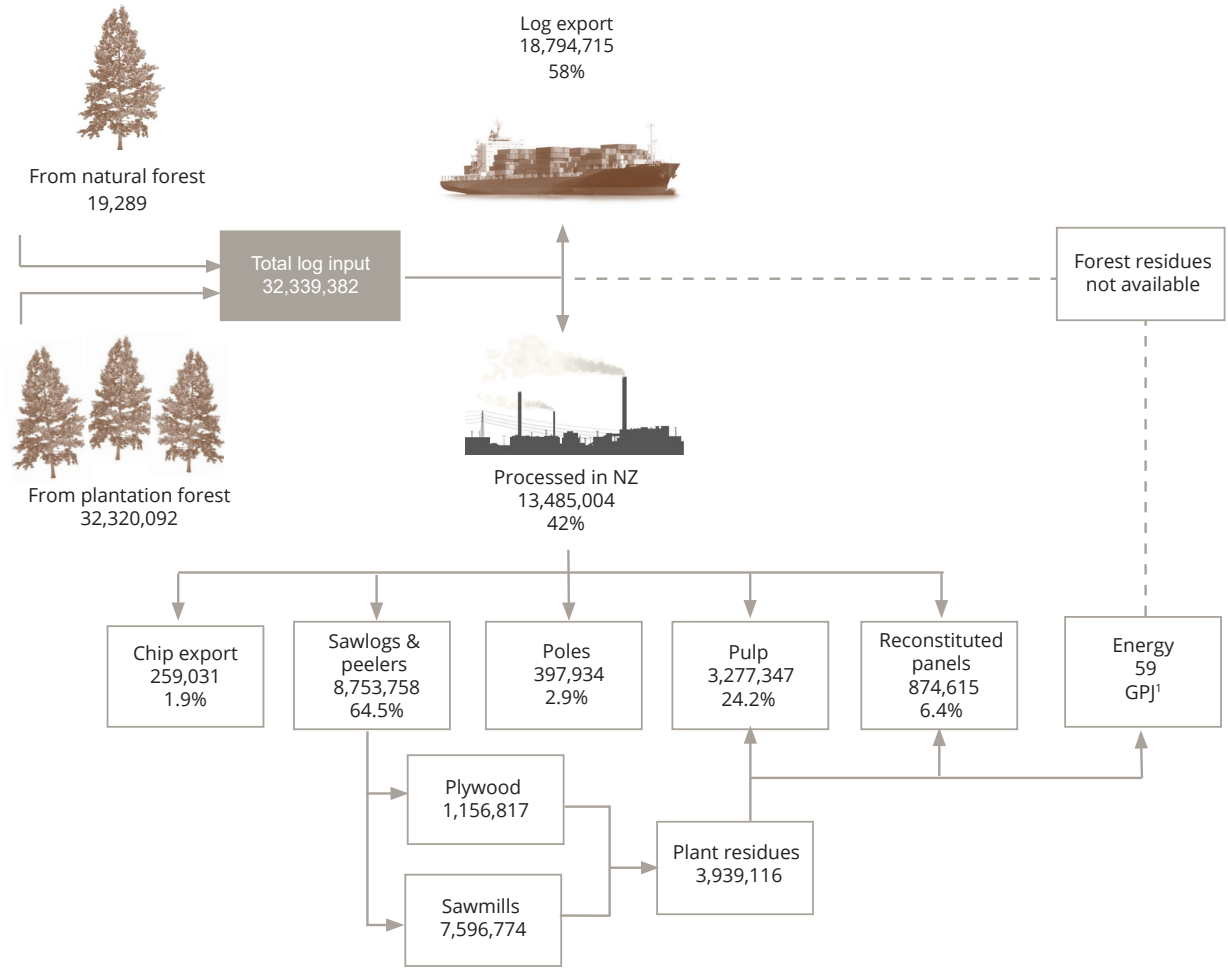
Source: SCION

Figure 3: Typical log out-turn – structural regime



Source: SCION

Figure 4: Flow of logs in the New Zealand Forestry Industry - 5 year average - m^3



Source: MPI, FOA

To understand the movement of raw material from the plantation through to end market, Figure 4 shows the flow of wood within New Zealand. The quantities produced are the annual average volumes for the last five years on a roundwood equivalent basis (m^3).

Figure 4 shows the vast majority of New Zealand's wood supply comes from plantation forests, of which 90% is Pinus radiata. Total harvest volumes have increased steadily over the last 10 years to 35 million m^3. The flurry of smaller woodlot plantings in the 1990s means harvestable volumes are set to increase further toward 37.5-40 million m^3 over the next five years before reducing.

Back in 2012 exactly half the supply was directly exported as logs, with the other half processed within New Zealand. As supply has increased the proportion directly exported as logs has shifted toward 60% of the total harvest. The remaining 40% has been further processed in New Zealand into a range of products, for both domestic use and export.

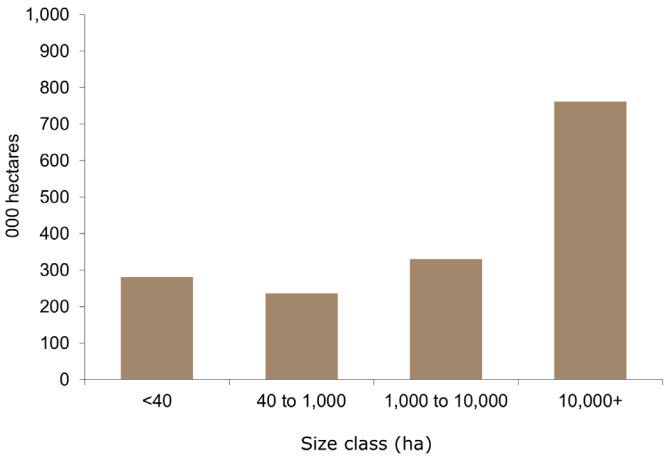
Overall, local processing capacity appears to have held steady in recent years, albeit with some natural turnover of businesses occurring. Of the product processed locally, around 24% is pulp, 6% reconstituted panels, 3% poles and 2% wood chips. The remaining 65% is saw or peeler logs. Of this, around 14-15% is processed into plywood products and the remainder is destined for sawmills to make sawn lumber, panels, laminated products and mouldings. The sawmill residues are also fed back into pulp and reconstituted panel production, as well as being used an energy source.

The central North Island accounts for around a third of the total plantation area due to superior

growing conditions, followed by the East Coast at 17%, with the rest evenly distributed around the remaining regions.

Around half the total forest area is owned by 27 entities in woodlots that are 10,000 or more hectares in size. The remaining 50% is fairly evenly split over the other size cohorts. There are 102 entities with woodlots of 1,000 to 10,000 hectares in size that account for 20% of the forest area. The remaining 32% of the area is fairly evenly split between woodlots less than 40 hectares in size and those 40 to 1,000 hectares in size. The number of owners for woodlots between 40 to 1,000 hectares in size is estimated to be 1,585.

Figure 5: Forest area by size of woodlot



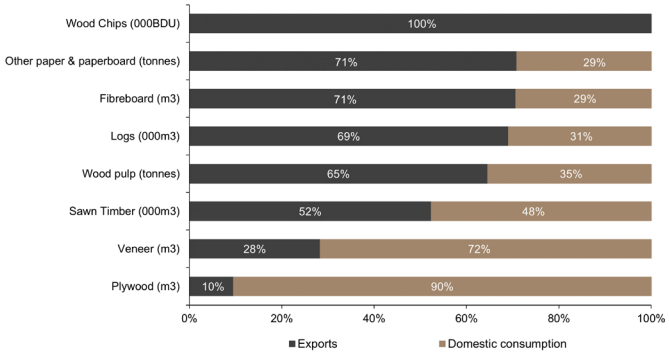
Source: MPI

Processing plants are clustered around the supply of wood and other important infrastructure such as ports, because logs and timber are expensive to transport long distances. The major export ports are Tauranga, Whangarei and Gisborne, which together have accounted for 61% of total log and sawn timber exports in recent years. Other key ports are Napier, Wellington, Nelson, Dunedin and New Plymouth, accounting for an additional 30% of total log and sawn timber exports.

A look at key end markets

A high-level view of the main forestry products New Zealand produces and how much is consumed domestically versus exported in shown in figure 6.

Figure 6: New Zealand's market mix for selected Forestry Products (3-Year Average)



Source: Statistics NZ, MPI, FOA

As previously mentioned, the increase in harvested volumes in recent years has seen an increasing number of logs being directly exported, especially to China. Nevertheless, looking at the logs that are processed into a range of products in New Zealand there has been a domestic market share gain at the expense of exports. This is largely due to the construction boom for housing, where there is a strong preference to use timber for structural framing compared with the likes of concrete and steel. Indeed, the quantity of sawn timber utilised by the domestic market has been rising, while the share exported has dropped to 42% recently. It's a similar story for other building materials, such as fibreboard, plywood, veneer and particleboard.

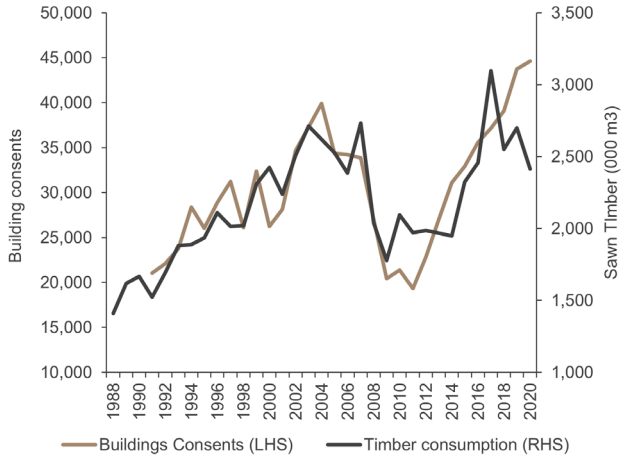
Domestic Market

The vast majority of New Zealand's sawn timber and other wooden materials are destined for the local construction market, specifically new houses. This is highlighted by the strong relationship between sawn timber consumption and new building consents (Figure 7).

Since post-recession lows in 2011, the annual number of new dwellings consented has surged toward 45,000 per annum, surpassing the previous peak in 2004.

There are a number of reasons for this strong performance. Historically low borrowing costs, strong house price gains relative to construction costs (improving returns for developers), rebuild work associated with the 2010/11 Canterbury earthquakes and generally decent levels of investor confidence.

Figure 7: Sawn timber consumption and new dwelling consents



Source: MPI, Statistics NZ

More fundamentally, it reflects strong population growth over the past 10 years (thanks to record rates of immigration and declines in emigration), a housing shortage that has built-up over a long time and more general infrastructure deficit due to underinvestment.

Looking ahead, many of the factors mentioned above are expected to continue to support housing construction activity. Even if the number of people per household was assumed to be three (higher than it is currently), the current rate of new dwelling consent issuance is really only just keeping pace with current demand, and not eating into the existing shortage.

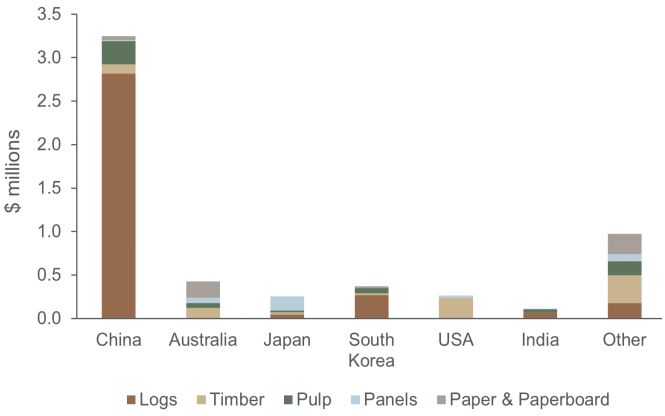
That said, there are some challenges for the construction sector to navigate including capacity constraints such as skilled labour, the availability of credit for larger projects, and housing affordability becoming so stretched it is dampening demand. The capacity constraints and current supply disruption are being reflected in rising construction costs, which is subsequently spilling over into the viability of new projects. It has also seen increased import competition for a range of wooden products from the likes of Canada, Chile, China and even Russia in recent years. Other construction challenges include access to suitable land due to local council zoning restrictions, through to the availability/cost of waste and water infrastructure.

Looking at the big picture, a positive outlook for the construction sector is likely to persist in the long term. Rather than seeing significantly more upside to current levels of activity, it seems capacity constraints, slowing population growth and housing affordability concerns will see a more elongated cycle to address the structural housing shortage and national infrastructure deficit. This should continue to translate into solid domestic sawn timber and other building material requirements for an extended period.

Key export markets

Looking offshore, the top 10 forestry export markets account for 92% of total export returns. Of these, the top six destinations of China, Australia, Japan, South Korea, US and India account for 84% of total exports. This makes for a somewhat consolidated marketplace compared to many other export sectors.

Figure 8: New Zealand's top 10 export markets and product mix



Source: MPI, Statistics New Zealand

China

China accounts for 56% of New Zealand's total forestry export returns. The bulk of it (87%) is logs destined for further processing into a range of products for the construction market (an estimated 85-90%) and other products such as finger jointing, finger jointed edge-glued clearwood panels, finger jointed mouldings, painted mouldings, doors, furniture and glulam beams. Logs used in the construction sector are mainly used as framing materials, or as box framing for concrete in multi storey (apartment) buildings. China is also a key destination for New Zealand's sawn timber (14% of total) and wood pulp (45% of total).

Supply sources

Overall Chinese lumber and log imports have trended higher in recent years on the back of strong construction sector activity and a tightening in commercial harvesting of natural forests. China's total forestry area is estimated at 208 million hectares, of which a third (69 million hectares) is deemed timber-producing. New Zealand's total plantation area pales in comparison at just 2.4% of China's timber-producing plantation area. That said, China's wood quality is low and log diameter generally small, meaning much of the domestic supply is destined for pulp production, wooden panels/flooring, plywood and self-use in agriculture or forest areas. Imported product is used for construction materials in urban areas, furniture and packaging materials.

Domestic supply has tightened further in recent years with China's timber harvesting reduced and wider restrictions of commercial logging in natural forests. While radiata pine does not directly substitute for the domestic hardwood species that are used in wooden panels/flooring and plywood, some substitution is expected, supporting softwood import demand.

On the import front China's main sources are softwood species for both logs and lumber. The main suppliers are New Zealand, Russia and Europe. New Zealand supplies around 30% of the imported logs, Europe 20% and Russia 15%. Russia is the major supplier of lumber (50%) followed by Southeast Asia (20%) and Europe (15%).

Figure 9: China's log and lumber imports over last three years

China log imports - rolling 3mth ave, tonne				Share of imports
	2019	2020	2021	2021
World	3,977,726	3,464,116	4,135,673	
New Zealand	1,109,775	926,313	1,285,860	31%
Australia	335,998	323,140	1,294	0%
Europe (xcl. Russia)	387,974	773,082	932,539	23%
Russia	634,152	488,908	514,024	12%
South America	338,805	124,416	380,661	9%
US/Canada	387,991	201,511	340,160	8%

China lumber imports - rolling 3mth ave, tonne				Share of imports
	2019	2020	2021	2021
World	1,973,186	1,679,846	1,464,977	
Europe (xcl.Russia)	204,349	271,378	221,216	15%
Russia	1,033,391	816,302	649,975	44%
Southeast Asia	283,633	251,700	301,762	21%
US/Canada	317,849	192,925	164,258	11%
Other	133,965	147,541	127,764	9%

Source: AgriHQ

Russian competition

The largest direct competition for New Zealand radiata pine is wood sourced from Russia, North America and Southern Asia-Pacific. Russia is New Zealand's largest direct competitor. It is estimated to have the largest harvestable area of forests in the world and an estimated 20% of the world's softwood forests. The total growing stock of Russian forests is estimated at 82.1 billion m^3. Annual harvesting levels are around 200 million m^3 with exports of only 20 million m^3. Most of the exports go to China. The balance is domestic consumption.

In recent years Russia's market share in China has reduced with a range of government interventions (i.e. tariffs on export of logs and domestic subsidies) to encourage more domestic production of 'value-add' products in Russia. Other longer-term constraints at present include:

1. Long distances from forest source to end market, adding additional transport costs;
2. New processing investment in North-West Russia has added additional distance to China's market;
3. Despite improved infrastructure, forest roads, harvesting resources and the transportation network remain below par; and
4. The government continues to change tax regimes in unfavourable ways.

These constraints suggest more modest growth moving forward, but modernisation of the sawn timber industry, supply chain improvements and advances in harvesting productivity could allow Russia to continue to harvest more of its vast forest resource and sell to China in-time.

China's construction/housing demand

There is also the end demand to consider. With China's construction/housing market utilising the lion's share of New Zealand's logs and sawn timber, activity in these segments matter the most.

While China has undertaken a lot of construction/ infrastructure activity over the last 15 years, more is still required over coming decades. The normal drivers of population growth, societal preferences and demographics in developed economies are still important drivers of long-term capital and

construction/housing formation in China. But continued urbanisation, a rapid lift in consumer purchasing power, and a need to enhance the economy's overall efficiency/productivity add additional drivers.

Indeed, as the urbanisation process continues, and earnings of urban dwellers continue to rise at a rapid rate, the burgeoning middle class population will provide the impetus for China to shift more toward a consumption-led economy.

If the urbanisation process and rise in incomes continues housing-related expenditure should remain, due to demand for better and bigger houses. The demand for construction materials lifts as the average dwelling size increases, as well as the need for more wooden furniture and other furnishings. While there are offsets from an aging population, the anticipated rise in incomes and the urbanisation process are expected to supersede these, supporting long-term housing formation rates.

That's not to say there won't be ups and downs. Near term there are challenges in the form of an overhang of housing stock, especially in lower/third-tier cities, and financial stability concerns arising from a build-up of excessive debt and rising non-performing loans. State and local government regulatory settings play an important role in the cycles of construction/housing activity in China and there is an on-going correction risk due to excessive tightening. There is also the reality that history shows few emerging-market economies successfully make the difficult jump out of the middle-income trap to reach 'developed' status.

All up, the above market dynamics, combined with an opaque supply chain, make it challenging to understand and forecast what might happen to the demand for and price of New Zealand radiata pine in China over the long term.

However, with pine being very good for a wide range of end-use applications it is very versatile. This should serve it well in meeting current applications in the housing/construction sectors, as well as being able to adapt to meet newer functions for housing fit-outs, wood remanufacturing applications and furniture end-uses as market conditions dictate.

The latter two applications open up more export opportunities and reduce reliance on domestic Chinese demand too.

The next four export markets are of similar size and can fluctuate according to market conditions.

Australia

Australia accounts for 6% of New Zealand's total forestry export earnings. It takes a wider range of products than China, being an important destination for sawn timber (14% of total), wood pulp (9% of total), paper & paperboard (36% of total) and plywood (74%of total).

Again, much of this product is destined for the housing market. Australia's housing market has similar drivers to New Zealand's. Population growth, societal preferences and demographics all play an important role in determining rates of housing formation. In the past population growth has outpaced housing construction activity, resulting in a shortfall of housing stock (especially detached housing). This has led to higher house prices and overvaluation concerns in some areas.

Looking forward, Australia remains an attractive place to live and this is expected to support migration and population growth, albeit at a slower rate than during the mining boom and pre-Covid period. Combined with the existing housing shortfall from underbuilding over a long period this is expected to support dwelling formation rates above long-term averages.

In terms of competition, domestic log supply is similar to New Zealand's total production, averaging slightly above 30 million m^3 in recent years. The majority (88%) comes from a slowly reducing commercial plantation area of slightly less than 2 million hectares and the remainder from a much larger native forestry area estimated at around 82 million hectares. The supply of hardwood from the native forest areas has been in decline in recent years and much of it is protected. However, the large native area suggests an ability to increase supply and/or expand the commercially focused plantation area if desired. Of the log supply around a third is hardwood and the rest softwood.

Imports account for around 10% of sawn wood, 17% of wood-based panels and 45% of paper and paperboard consumption. Import competition is spread across a number of countries.

China is the largest overall supplier, but this is

mainly concentrated in wood panels and paper/paperboard products. New Zealand is the main sawn timber supplier, given proximity to market.

Other Asia

South Korea and Japan are similar sized export markets, but the product mix varies. The South Korean market is focused on logs (9% of total) and wood pulp (9% of total), whereas Japan takes a wider variety of products and is particularly important for fibreboard (51% of total), largely due to their investment mix in New Zealand wood-processing assets. These markets are viewed as largely stable these days, with fluctuating import competition from Russia, Chile and North American supply depending on local conditions within Canada/US.

US & India – possible future growth markets

Rounding out the top six export markets are India and the US. India takes mainly logs (3% of total NZ log exports) and the US sawn timber (28%) and fibreboard (11%). Both offer growth opportunities, the US in the near term and India over the longer term.

US

The US market is large, but much of it is supplied from domestic sources. Imports account for around 20% of total consumption, with Canadian supplies dominating log and sawn timber products.

Most of the softwood products sourced from New Zealand are destined for the housing market where activity is picking up. On the demand side the US housing market has seen formation rates head back to above long-run averages. While still carrying scars from the subprime lending crisis, favourable demographics, better affordability than the Australasian market and low interest rates suggest a tailwind for US housing formation rates.

India

India offers long-term opportunities too, with a growing wood supply deficit. India has a culture of wood use, and uses it extensively for a range of products. Hardwoods have traditionally been the material of choice, but as global supply is becoming more limited and expensive, softwood imports have gained acceptance as a substitute.

Local supply is becoming more constrained due to both land use change reducing forestry areas, and stricter regulatory restrictions (environmental, biodiversity etc) on the harvesting of native forests. With domestic growth remaining robust this could see the deficit widen quickly. This increases import demand for softwood logs to process at local sawmills. However, infrastructure remains a challenge for imports, with many small sawmills and an inefficient supply chain, especially further in from coastal areas.

Wood pulp and paper markets

The wood pulp and paper/paperboard markets are another part of overall forestry returns.

Wood pulp and paper/paperboard can be used in a wide variety of end products/industries ranging from newsprint, printing material, writing paper, and sanitary products through to packaging materials.

New Zealand produces around 0.8-1 million tonnes of chemical pulp each year and 0.68 million tonnes of mechanical pulp. Around 80% of the chemical pulp and one third of the mechanical pulp is exported. Mechanical pulp is used for products that require less strength, such as newsprint and paperboards. Chemical pulp is used for materials that need to be stronger, or is combined with mechanical pulps to give different characteristics to a product.

The top five New Zealand wood pulp markets of China, Australia, India, Indonesia and South Korea account for 79% of exports. China is the dominant market at 45% of total exports.

Longer term the consumption of paper products for newsprint, writing, books etc is under downward pressure due to the digitisation of written material and improved recycling efforts in developed countries. No doubt these trends will continue and limit any upside from natural consumption growth in developing markets. Other areas such as household sanitary and packaging materials are lifting; especially in developing countries where general consumption levels are lifting with wage rises.

New processes and concepts are expected to result in innovative new products and applications based on cellulose fibre that generate more added value. These could include products that fit into the textile, cosmetics, food, pharmaceutical and bio-based fuel/chemical areas.

CARBON

Summary

The ratification of the Paris Agreement and recent review of domestic climate change policy settings has strengthened the investment case for forestry/Mānuka plantations. New Zealand has committed to reduce greenhouse gas (GHG) emissions by 30% below 2005 levels by 2030 by either investing in emissions reducing technology/activities, increasing forestry carbon removals (i.e. plant trees) and/or purchasing credible international units.

The favourable signals for establishing new forests/Mānuka plantations, include:

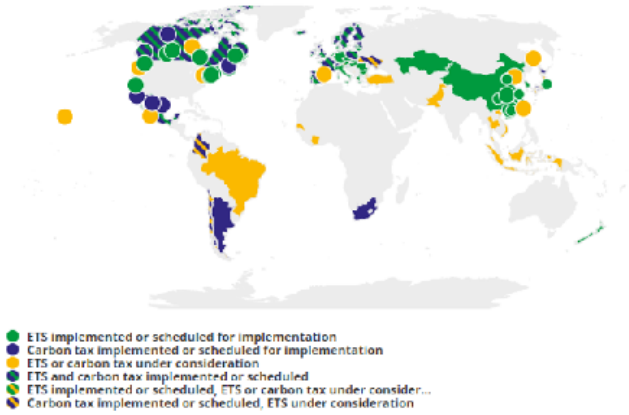
1. A higher medium-term direction for the price of carbon;
2. An increasing array of financial and other incentives to plant trees;
3. ETS accounting rules for forestry that deliver greater liability-free emission units; and
4. Sector capability building efforts to deliver on planting a billion trees by 2030.

The inclusion of carbon helps to provide cashflow as carbon is sequestered over the first rotation. While the 'old' accounting approach provided significant return and cashflow/liquidity uncertainty come harvest time. A new 'averaging' approach which becomes mandatory in 2023 delivers greater liability-free emission units over the first rotation. The future inclusion of accounting rules that consider emissions retained in harvested wood products could also support returns.

The Global View

Despite political ructions in many countries on the nature and required regulatory response to climate change there is evidence of more regulatory and other policy actions to address the effects of climate change. The commitments made under the Paris Agreement and its ratification by 179 countries representing 89% of global emissions in November 2016, the broadening of a price being applied to GHGs through one mechanism or another; and other policy initiatives being implemented at both the national and state level suggest a second wind of action is occurring.

Figure 10: Global carbon market developments



Source: World Bank

New Zealand government as a signatory to the Paris Agreement has made the headline commitment to reduce its GHG emissions by 30% below 2005 levels by 2030. The International Carbon Action Partnership estimates approximately 15% of the world's GHG emissions are now covered by emissions trading schemes. Economies with an ETS in place produce more than 50% of global GDP and are home to almost a third of the global population.

Developments in international climate change policy are important as these set the framework for the policies developed in New Zealand.

The Domestic View

Domestically, bi-partisan political support to do more to address climate change has increased. This has been spurred on by New Zealand's ratification of the Paris Agreement and the general public's desire to do more to address climate change.

With the formation of a new centre-left government in 2017 a number of domestic policy areas have been reviewed and new initiatives implemented.

To date the government has taken several key actions:

1. The establishment of the Zero Carbon Act which has:
    a. Enshrined a 2050 target of reducing New

Zealand's net emissions to zero by 2050.

b. Established a framework to determine emissions budgets to target short and long-term GHG reductions for the economy.

c. Established a Climate Change Commission to monitor GHG reductions and provide independent policy advice to the government of the day.

2. Reform of the ETS and the development of complimentary policy measures to move New Zealand to a low-emissions economy. Key aspects of the ETS that have been changed include:

a. A range of policy changes to strengthen technical settings to better support the country meeting its international GHG reduction targets for 2030 and 2050.

b. The rules governing forestry in the ETS (more on this below).

The changes to strengthen technical ETS settings fall into two broad categories. One affects the supply of emission units into the ETS, which is critical in influencing the price of carbon in the ETS. The second is largely operational around the scheme's governance, reporting, compliance and other technical aspects.

For forestry/Mānuka plantations, the supply of emission units is of interest as this influences the medium-term carbon price in New Zealand. Key changes that have led prices to more than double over the last year include:

a. Annual and future emission budgets that determine the overall cap on units within the ETS. This will interact with the actual emissions the economy is producing and specifically emitters obligations within the ETS.

b. The auctioning of government-held emission units to ETS participants. This is determined through the setting of the NZ ETS cap/budgets, technical adjustments, allocation of free NZU's to emitters, required reductions in stockpiled units and future allowance of international units.

c. The implementation of price control measures. From next year this involves an effective price floor starting at $30/t with annual ratchet and price ceiling starting at $70/t with annual ratchet.

d. Changing the allocation of emission units to sectors of the economy, as well as the phase-down period of freely allocated emission units to those same sectors.

It's worth noting that alongside these specific climate change workstreams, the government is also pursuing complementary measures, such as:

a. A plan to plant a billion trees. Half of this is expected to be bare land development potentially expanding the area of commercial plantation forest by nearly a third to 2.2 million hectares. The remainder is expected to come from forest replanting obligations under the ETS.

b. The government's Policy Statement on Land Transport supports investment in low- emissions transport (electric vehicles), supporting public transport development in urban areas and improving urban transport design.

c. Establishing a $400 million Green Investment Fund, to stimulate new investment in emissions reduction projects.

Some might say investment uncertainty will remain high due to the fickle nature of political cycles leading to further change. However, the actions of centre-right politicians both when they were previously in government (ETS amendments and ratification of Paris Agreement) and now in their overall support for the Zero Carbon Act suggest otherwise.

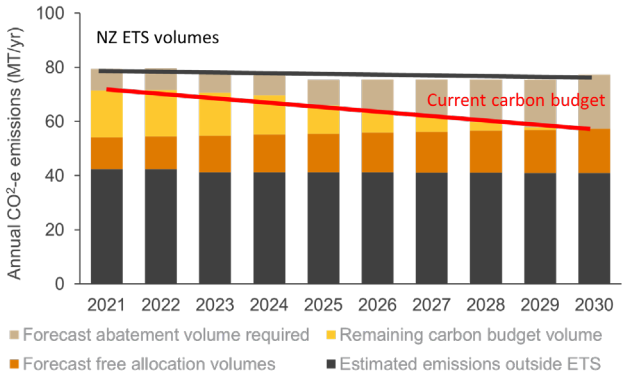
There appears to be sufficient support from the major New Zealand political parties to ensure the longevity of many recent policy changes. For forestry/Mānuka plantations, the most important aspects are changes that affect the medium-term price of carbon (and its volatility) and rules governing forestry in the ETS.

The basics of the Emissions Trading Scheme

New Zealand's future abatement requirements

Although New Zealand's net GHG emissions have remained fairly steady since 2005 the goal of a 30% reduction by 2030 requires a step change from business as usual if it's going to be achieved. This goal can only be attained through reducing domestic emissions, increasing forestry carbon-removals (i.e. planting more trees) and/or purchasing credible emission units from other countries.

Figure 11: Emissions Trading Scheme Supply & Demand

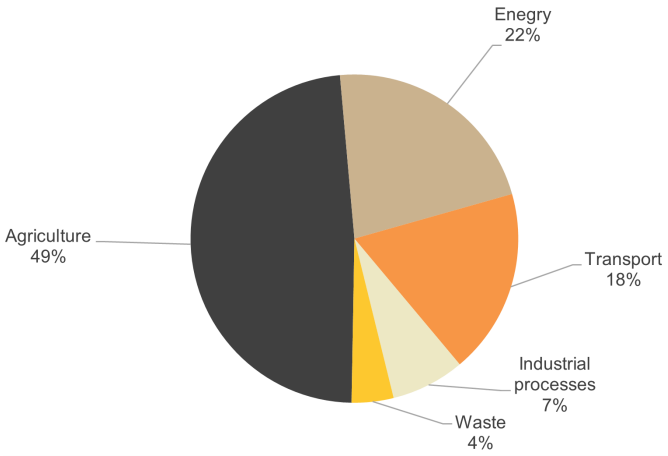


Source: MyFarm, Ministry for the Environment

A major part of the challenge is that 49% of New Zealand's total GHG emissions come from agriculture, which currently has limited cost-effective options to reduce these and is trade exposed.

Forestry and land-use change has sequestered a significant amount of carbon since the early 1990's, lowering New Zealand's liability under the Kyoto Protocol period (2008-2012) too. However, this source of abatement is expected to dwindle as a result of the ageing of pre-1990 forests (which reduces their sequestration rate) and the net deforestation of post-1989 forests which has occurred since 2006. Net deforestation of post-1989 forests could continue as the spike of plantings established in the mid-1990s is harvested into the mid-to-late 2020's also.

Figure 12: New Zealand GHG Emissions by Major Sector



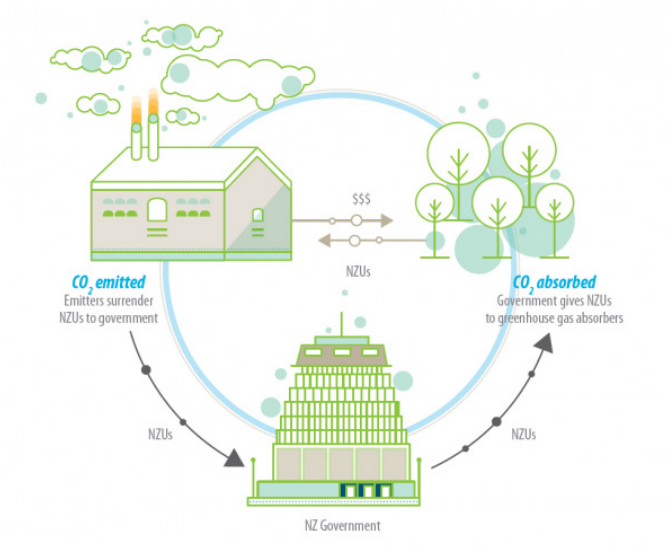
Source: MyFarm, NZ GHG Inventory 2016

How the Emissions Trading Scheme (ETS) Works

The ETS has been designed as an all-sectors, all gases scheme to ensure it can impact as many emissions sources as possible.

Its purpose is to impose a price on sources of emissions as an incentive to embrace low-emissions technologies, switch to more efficient production methods, and investing in the planting of more trees. The price is determined by the supply-demand balance within the ETS, which is in turn influenced by the government's technical settings as they apply to emitters and the supply of emission units in the ETS. Emitters can currently meet their obligations through directly purchasing emissions units on the open market, buying units in the quarterly government auctions and/or paying the government a fixed price of $35/t for emissions relating to the 2020 year (which ended in May 2020).

Figure 13: Illustrative example of how the New Zealand ETS works



The currency of the ETS is the New Zealand Unit (NZU). The NZU equates to a tonne of carbon dioxide equivalent greenhouse gas (CO_2-e)[1].

Participation in the ETS is mandatory for anyone that undertakes a specific activity that generates GHG emissions. These specific activities are defined in the Climate Change Response Acts by schedules that describe the emissions sources covered under the ETS, and in some cases who is responsible for those emissions sources. Using forestry as an example, the responsibility for emissions from deforestation, or claiming credits from afforestation rests with the landowner, rather than the tree owner.

The ETS operates by requiring business and industry to account for the emissions of their economic activities. Electricity generators have to account for their fossil fuel emissions. Fuel companies must account for the emissions of their customers. Payment for these emissions from electricity and fuel are covered under the ETS at point of sale. Electricity generators pass the cost on to retailers who then pass the cost on to consumers. Fuel companies do much the same.

[1]Carbon dioxide equivalent (or CO_2-e) is a measure for describing how much global warming a given type and amount of greenhouse gas may cause, using the equivalent amount of carbon dioxide as the reference. CO_2-e is used to account for the different global warming potency of the different greenhouse gases, and allows them to be reported consistently. Gases are converted to CO_2-e using the amount of warming they would cause in the 100 years following being emitted into the atmosphere, compared to the effect of CO_2-e itself.

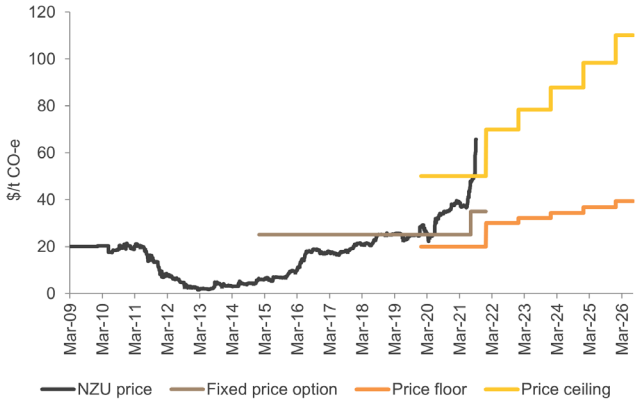
Industrial processing companies must account and pay for the emissions of their production and manufacturing processes. Similarly, landfill operators need to account for the methane that landfills generate.

Although agricultural emissions are yet to be priced in New Zealand, there is a requirement that processing companies account for the volume of product they process so carbon emissions for the sectors can be calculated. For meat processors, this means reporting the number of ruminant livestock and carcass weight. Dairy processors report the volume of milk solids or milk butter. Fertiliser companies report the volume of nitrogenous fertiliser they produce and the nitrogen content of those fertilisers. At the moment, this requirement is limited to filing in an annual emissions return, but depending on upcoming government advice the sector could either join the scheme in 2025 or manage emissions through a separate system.

Price action of carbon market

Since the ETS was implemented the value of NZUs have fluctuated for a number of reasons. A steep decline in the value of NZUs (between September 2011 and October 2013) occurred because of over-allocation in the European Union's ETS and the ability for New Zealand emitters to source cheap emission units from a variety of offshore sources.

Figure 14: New Zealand's carbon price



Source: MyFarm, ANZ, Bloomberg

The price then recovered through the 2015-2020 period due to several regulatory changes to the ETS settings:

1. The phased removal over three years of a one-for-two obligation of 'free' emissions to all sectors captured in the ETS from 2017. This meant the 50% surrender obligation for emitters increased to 67% from 1 January 2017; 83% from 1 January 2018; and full surrender is required from 1 January 2019. This increased the overall demand to around 35-40 million NZUs each year (from 20 million NZUs previously).
2. The banning of international emission units in the 2014 to 2015 period. Previously emitters and foresters could surrender foreign units to meet their domestic obligations. When the price collapsed in 2013 nearly 95% of the credits handed over to the government to meet emission obligations were international units. At some undefined point international credits are likely to be allowed again, but these will be restricted to units and countries with high quality credentials.

More recently the price of carbon has doubled in the past year to \$60/t CO_2-e. The rapid increase has been driven by the structural changes in the ETS to meet obligations under the Paris Accord. The main drivers is the elimination of the fixed price option and move to a capped number of units and supply being allocated via an auction system. The second factor has been the CCC recommendation for a wider price corridor with both a higher price floor and ceiling with annual ratchet for each.

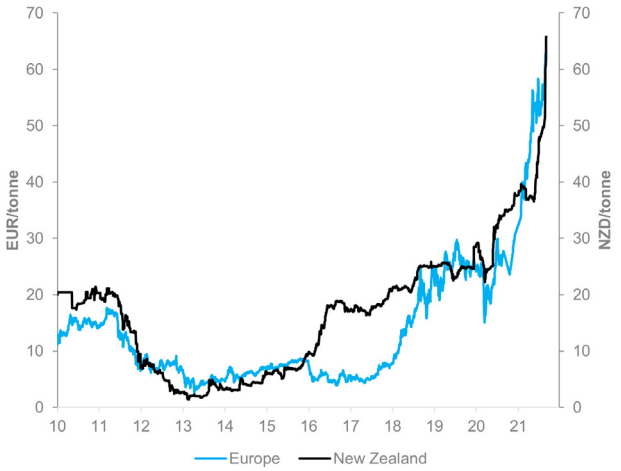
Looking ahead it is fairly clear the government wants a higher carbon price over the next 10 years. In fact, it needs a higher price of carbon in the ETS to have any hope of achieving Paris Agreement targets and delivering on the transition to a low-emissions economy. Until recently the carbon price has been so low it has been ineffectual in influencing emitters' investment decisions and household behaviour.

Current indications are pointing toward \$50-\$100/t CO_2-e, while weighty pieces of analysis from both the Productivity Commission and CCC have indicated a price is excess of \$75/t CO_2-e (or even as high as \$250/t CO_2-e by 2050) is required to shift to a low-emission economy.

While the carbon market is heavily regulated and vulnerable to the fickle nature of political cycles, centre-right support for the Zero Carbon Act, prior ratification of the Paris Agreement and the ETS technical review the opposition started while in power all point to more proactive action to lower New Zealand emissions. A higher carbon price and complimentary other measures are key elements to delivering on this.

It is important to note that government has made a commitment to keep the domestic carbon price in line with international carbon prices also. The best comparison is perhaps Europe where carbon prices have doubled over the past year to EUR\$55/t CO_2-e. This is due to a reduction in the free allocation of units to emitters and spike in European electricity demand. Now France is calling for a price floor of EUR\$25-\$30/t CO_2-e for power generation. While this market is not directly linked to the NZ market, and therefore the prices are non-fungible, some market participants view this as a lead indicator as to the general direction of travel for our own carbon prices.

Figure 15: Carbon price comparison between NZ and Europe.



Source: ANZ

Forestry in the carbon market

Forests act as carbon sinks. They do not offer a permanent solution to reducing emissions, but can buy time to adjust to a carbon-limited world.

To stimulate forestry investment from private enterprise the government is targeting several key areas:

a. Taking a leadership position on planting trees – promotion of planting a billion trees.

b. Support of supply chain investment (i.e. nurseries) and upskilling labour to increase industry capacity.

c. Revamp of the ETS – particularly lifting the carbon price, but also improving administrative requirements.

d. New financial incentives to plant trees.

The current accounting rules

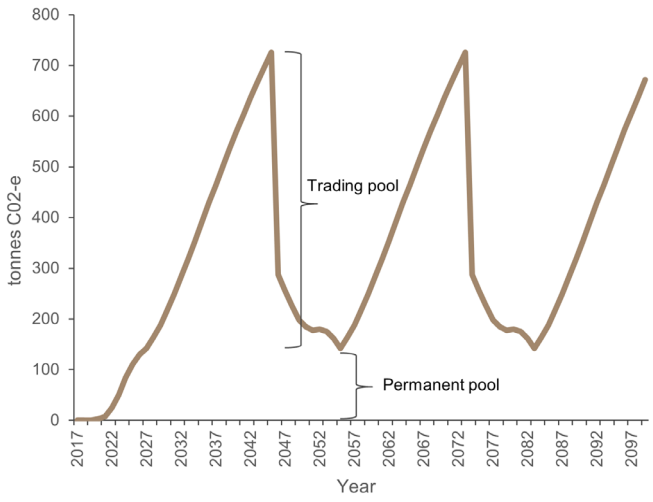
The ETS only recognises sequestration of emissions in trees where the forested area meets the following definition:

- Was planted after 31 December 1989;
- Covers an area that is greater than a hectare;
- Has canopy cover of at least 30% of the area;
- Comprises tree species that can reach 5 metres when mature; and
- The planted area is wider than 30 metres.

Assuming these criteria can be met, the post-1989 forest can be registered under the ETS to receive NZUs for the emissions estimated to be sequestered on an annual basis. The accumulated NZUs can then be traded on the open market. Participants are required to submit emissions returns every year the forest remains registered under the ETS. De-registering the forest from the ETS, for whatever reason, means that the forest owner has to repay the same number of NZUs they have claimed against the forest under the ETS.

At present, forest owners can receive NZUs equivalent to the amount of emissions that are sequestered each year over its rotation cycle. Around 20-25% of the carbon sequestered in a permanent forestry situation is classified as 'safe' or liability-free. This recognises that not all of the emissions sequestered in a forest is removed from the land when trees are harvested. However this proportion of 'safe' NZUs can only be claimed for the first rotation[2]. Under current rules the other 75-80% of sequestered carbon that accumulates through the forest's growth cycle is deemed to be emitted at time of harvest. This means there is an obligation created to surrender the equivalent number of NZUs at time of harvest.

Figure 16: Illustrative carbon sequestration profile of Pinus Radiata forests



Source: MyFarm, Ministry for the Environment, Ministry for Primary Industries

As a result, there are a number of different ways to view the potential revenue from forestry NZUs. The 20-25% that is deemed permanent can be traded fairly easily if the land is intended to remain in forestry across multiple rotations. The remaining pool of NZUs is trickier and depends on movements in the price of both carbon and lumber/logs over the forest's growth cycle and at time of harvest (i.e. will the lumber/log cheque be large enough to cover the emissions liability at time of harvest?).

Perhaps most importantly, forestry NZUs provide forest owners with an early cashflow option, but depending on the relative changes in the price of both carbon and lumber/logs come time to

[2] First rotation is from bareland planting through to first harvest.

harvest, can also create large cashflow and overall return risks.

Some of this risk, but not all, can be mitigated through:

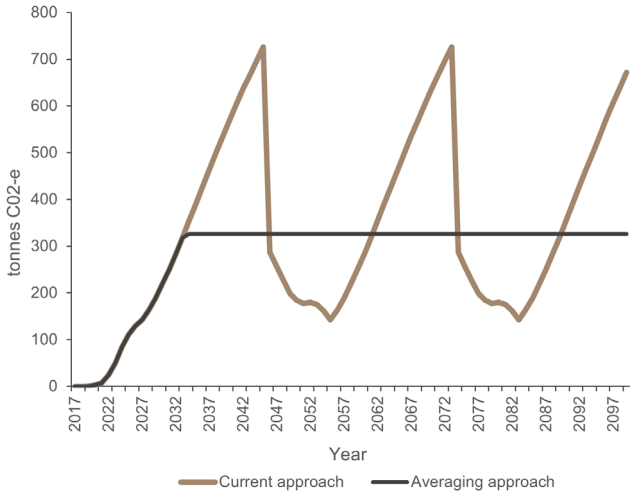
1. The creation of a multi-age forest to spread risk;
2. Selecting a production regime that has a long and stable maturity profile. This means that harvesting can occur over a very long period of time.

For larger-sized and specialised forestry production, it has been easier to manage these dynamics, than smaller-sized woodlots commonly found on extensive drystock farms.

New averaging rule changes

A game-changer for the future return and liquidity risks of forestry NZUs is the change to 'average accounting' which will be mandatory from the start of 2023. Put simply, averaging accounting allows forest owners to earn NZUs up to the point their forest reaches an average level of sequestration of what the forest will hold over the long term (i.e. through multiple rotations). In this situation, there is no longer any liabilities at harvest time or following an adverse event, allowing the forest owner to treat earned NZUs as effectively 'safe' or liability-free. Liability for NZUs claimed against the forest would, however, remain with the forest land and be transferred to any subsequent landowners.

Figure 17: Illustrative carbon sequestration profile when averaging



Source: MyFarm, Ministry for the Environment,Ministry for Primary Industries

The main factors affecting the total sum of NZUs received by a forest owner (under averaging accounting) include:

1. Species planted and productivity of specific planted area
2. Planting density and applied silviculture.
3. Length of rotation.

For the likes of a pinus radiata stand, one is likely to accumulate NZUs up to year 16 or 18 and no more after this. While this is less than under the old rules there is no requirement to surrender those NZUs when the forest is harvested. Under averaging accounting a liability only arises if there is a change of land use to something other than forestry or that negatively affects the average age of the registered forest.

For smaller foresters who are unable to establish a multi-age forest that spreads risk, averaging accounting is a notable development. This means it will become more attractive to drystock farmers to diversify their income base further into forestry. As drystock farmers face increasing pressure to prevent stock access to waterways in coming years and address other environmental pressures, then the planting of trees on some of the more sensitive areas of farms is likely to make both financial and regulatory sense.What does carbon revenue mean for forestry returns?

When investing in bare land conversion or already established forests there are a number of factors that can influence returns. Some of the key ones include product prices, tree quality/yield, tree type, silviculture regime, topography, arterial access quality, harvesting difficulty, distance to port/mill, cost of land and annual plantation costs. All of these factors can have an impact on whether or not it's worthwhile planting a forest on a particular site.

Generally, it's considered a Pinus Radiata forest good-to-excellent in quality/yield and located within 200 kilometres of a port/mill can deliver an average pre-tax rate of return between 3-8%. However, there are wide variations with the result heavily influenced by land values.

While all of the factors above are key to the investment proposition for forestry, carbon provides a new revenue source and cashflow as a forest grows.

There are a number of different ways returns can be modelled depending on site and approach being taken to the carbon revenue. For simplicity the modelled returns in Figure 18 have taken an underlying forestry return of 5% and added the carbon returns for the two different accounting approaches. The returns are for the first rotation of a forest. The Ministry for Primary Industries lookup tables for forests under 100 hectares in size have been used to determine the number of carbon credits earned. These are likely conservative, but the best available without on the ground data.

Figure 18: Returns from forestry under different carbon accounting approaches

Incremental Returns (IRR)		
Price of carbon	Old approach	Averaging approach
$25/t	2.5%	2.2%
$50/t	5.0%	5.2%
Total Returns (@7% for Forestry)		
$25/t	7.5%	7.2%
$50/t	11.0%	10.2%

Source: MyFarm

The result is the internal rate of return for forestry is lifted by 2-3% when the carbon price is $25/t (this is over and above the forest/wood returns). If the carbon price doubles to $50/t then the IRR increases by 5-6%.

One of the key takeouts is the averaging approach provides a lot more certainty about what the returns from carbon might be due to there being no future liability at harvest time from a higher than expected carbon price at the time. This alongside the cashflow provided as the trees grow makes the investment case more compelling, especially if the carbon price is above $50/t - it takes about 4-5 years before carbon sequestration starts to increase substantially.