FORSYTH BARR

NEW ZEALAND EQUITY STRATEGY

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ESG with a Capital "E"
Part of the Problem or Part of the Solution?

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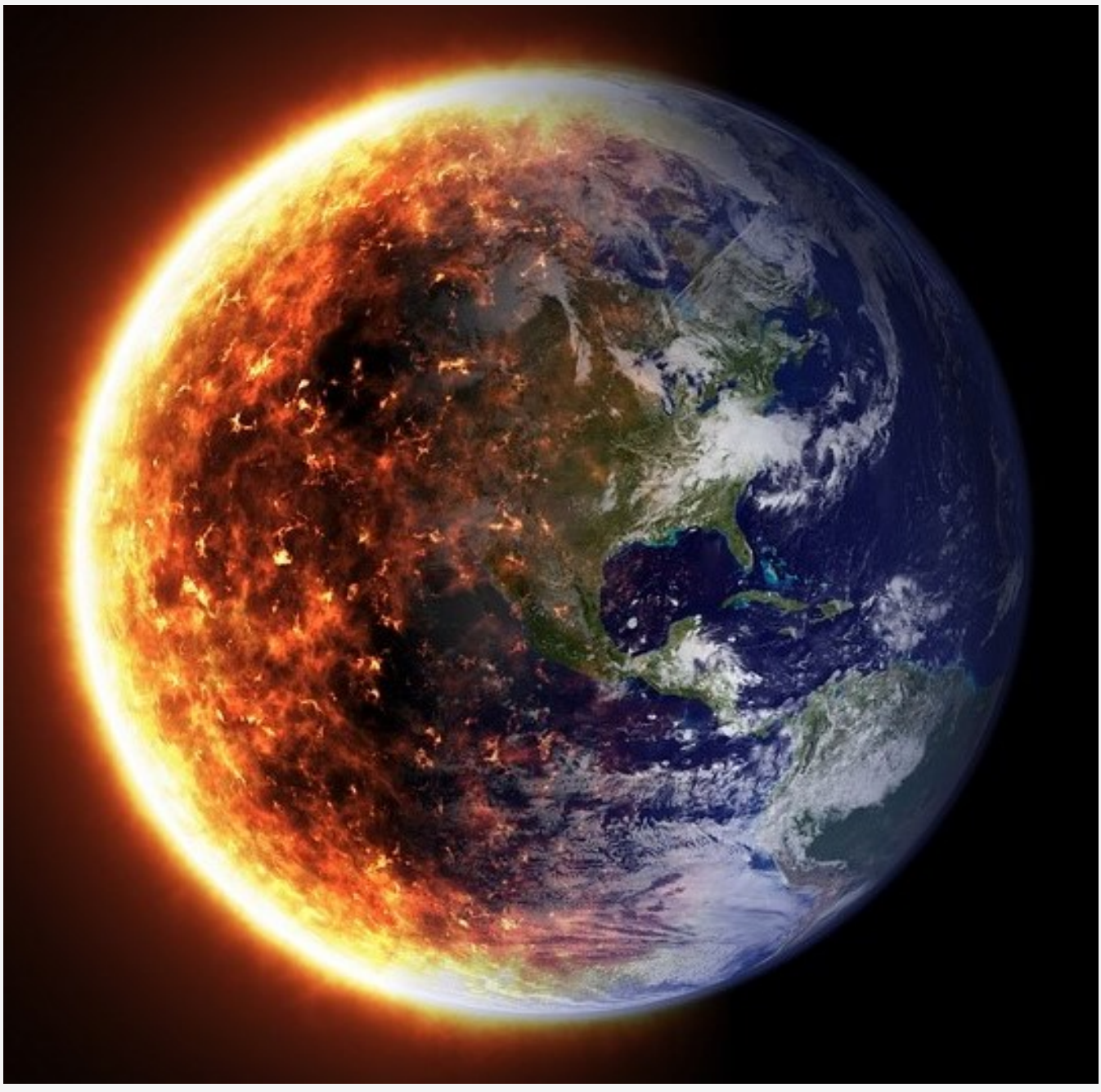

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Our thesis in charts

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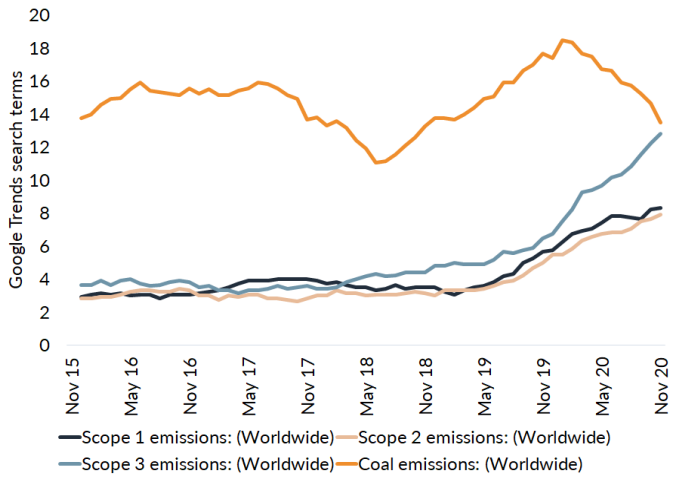
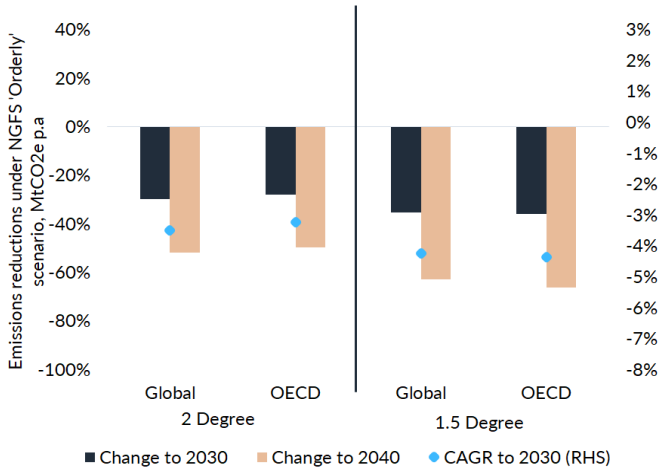


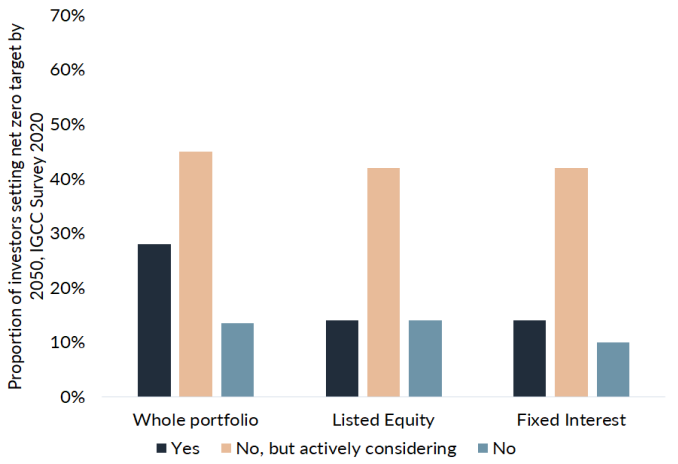
Source: Forsyth Barr analysis, Google Trends

Figure 2. ...in order to bring their portfolios in alignment with climate change objectives



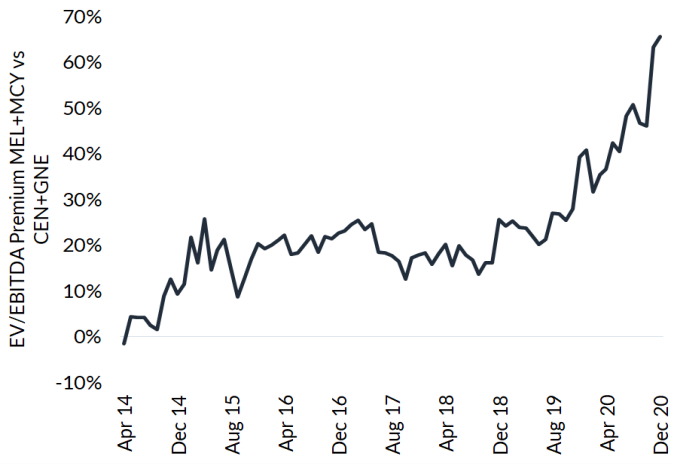
Source: Forsyth Barr analysis, NGFS data. Uses an average of the available NGFS models

Figure 3. 80%+ of the ANZ investing community either have already, or are considering net zero emissions targets...



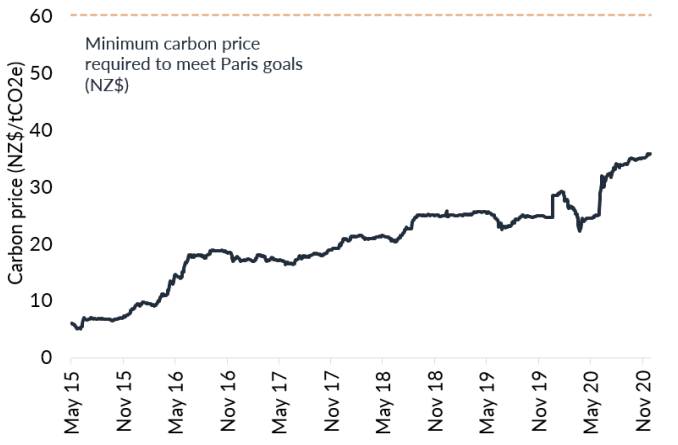
Source: IGCC Net Zero Investor Survey 2020. Survey of Australian and NZ asset managers

Figure 4. ...and being an ESG winner vs ESG target for exclusions can have dramatic implications on valuation



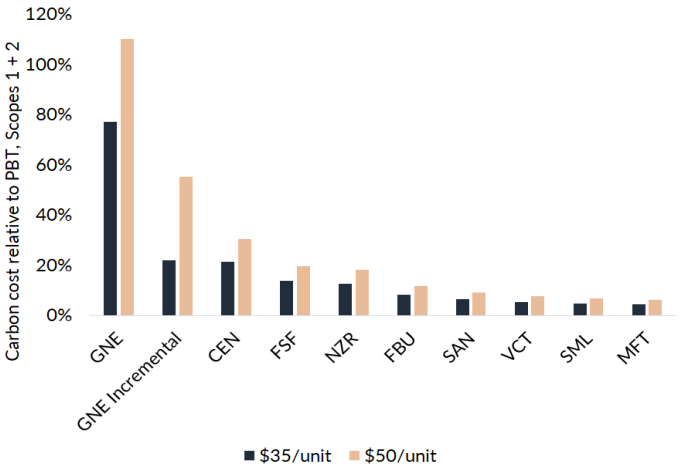
Source: Forsyth Barr analysis, Bloomberg consensus estimates

Figure 5. Carbon costs have continued to increase since the cap at NZ$25 per tonne of CO2 was removed...



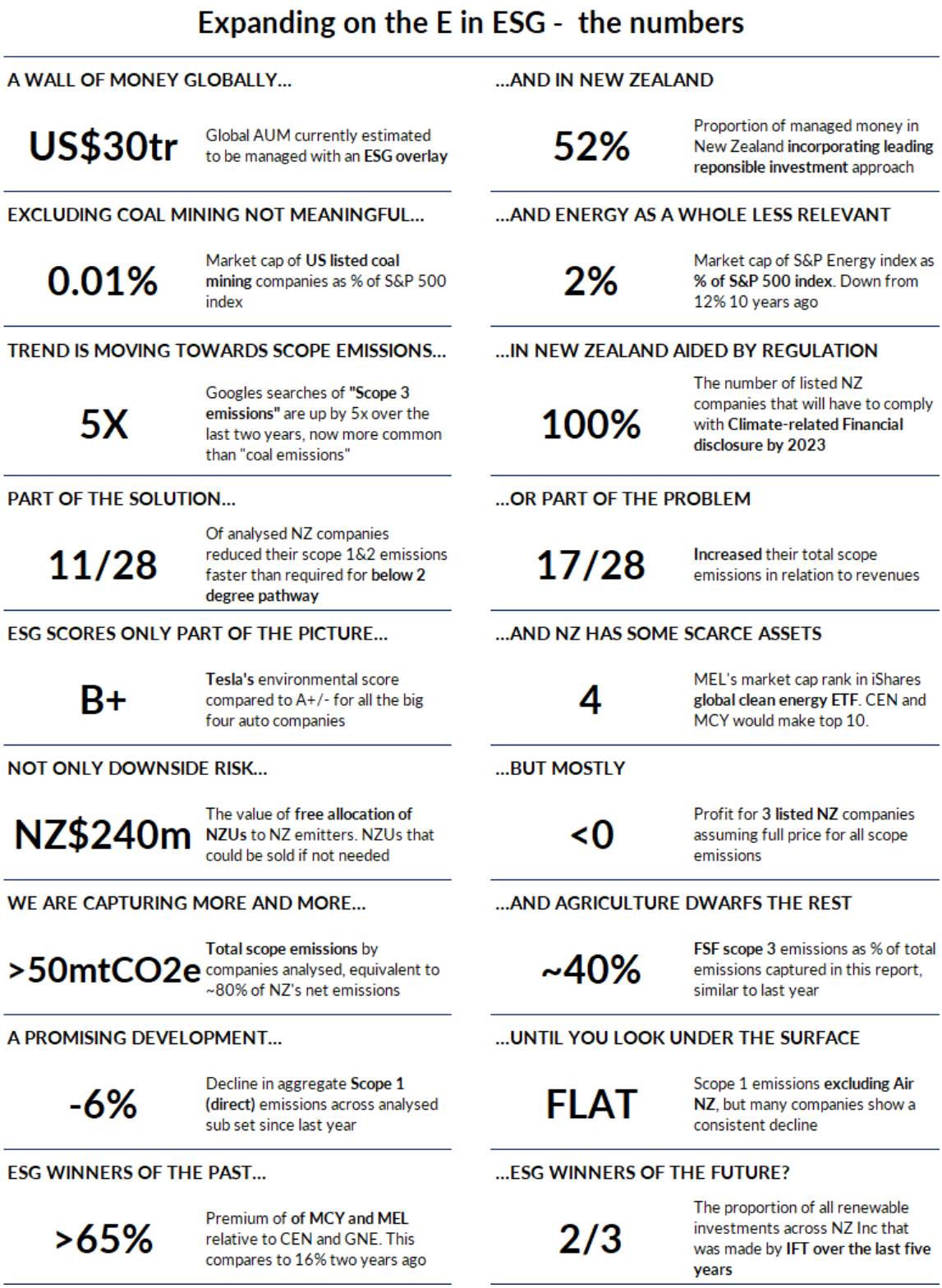
Source: Forsyth Barr analysis, Bloomberg

Figure 6. ...and is meaningful in relation to pre-tax profit for several NZX companies, should they have to carry the full cost



Source: Forsyth Barr analysis

Figure 7. Expanding on the "E" in ESG



Executive summary

The global wall of ESG money is starting to get serious about climate change

The ~US$30tr ESG community is at an early stage of a necessary shift from negative screening (e.g. coal) to a more scientific approach to combating climate change where alignment with Paris commitments is taking centre stage. Australasian investors are no exception to this global trend. More than four out of five Australasian asset managers state they either already are, or are considering, setting a net zero emissions target for 2050. The shift in focus is being made possible due in part to a combination of increased disclosure on total scope emissions and detailed climate modelling. We believe we are at an early stage of this shift.

Being an early adopter can pay off; but picking the ESG winners and avoiding ESG losers is becoming more complicated

Over the last five years energy has declined from 6% to 2% of the S&P 500 index. In NZ, the valuation of MCY and MEL has decoupled from that of CEN and GNE to now be valued at a 60%+ premium, vs no premium five years ago. With an increased focus on level and trajectory of total emissions, both by lawmakers and investors, we believe the ESG winners of the next decade will be harder to pick and may be different from the ones of the last decade.

NZ Inc is embracing the fight against climate change

In NZ there is broad political and private sector support for action on climate change. 119 out of 120 MPs signed the Zero Carbon bill, the Prime Minister has declared a "climate emergency" and 101 executive directors, including the CEOs of 16 NZX listed companies, have pledged that their respective organisations will take voluntary action on climate change.

Greenhouse gases (GHG) matters for investment returns

Our focus in this report is on carbon emissions, or more broadly on greenhouse gases (GHG). We focus on this because we believe it will matter for investment returns over the next 5–10 years, primarily through three vectors; (1) ESG winners of the past and ESG winners of the future, (2) direct costs of high emissions, (3) obsolescence risks and impact investing. With this report we update and expand upon our inaugural report on GHG emissions, published 5 December 2019.

Figure 8. Part of the problem or part of the solution? It depends

Source: Forsyth Barr analysis

ESG investing: from product exclusion to supporting transition

Socially Responsible Investing (SRI) has become a very broad church and ESG screening has become the tool of choice. The global investment universe with an SRI mandate was estimated to have AUM (assets under management) of US$30tr in 2019 (KPMG, *'The Numbers That Are Changing The World'*, 2019), or over one third of total AUM. But ESG investing is not just growing, it is also changing. Particularly so within the environmental aspects of ESG investing. The three fastest growing issues being screened for in New Zealand relate to emissions and almost 50% of Australasian investors surveyed stated that they were "actively considering" net zero whole portfolio targets by 2050. This shift in focus has the potential to materially impact portfolio managers willingness to own not only large direct emitters, but also companies with substantial indirect (Scope 3) emissions.

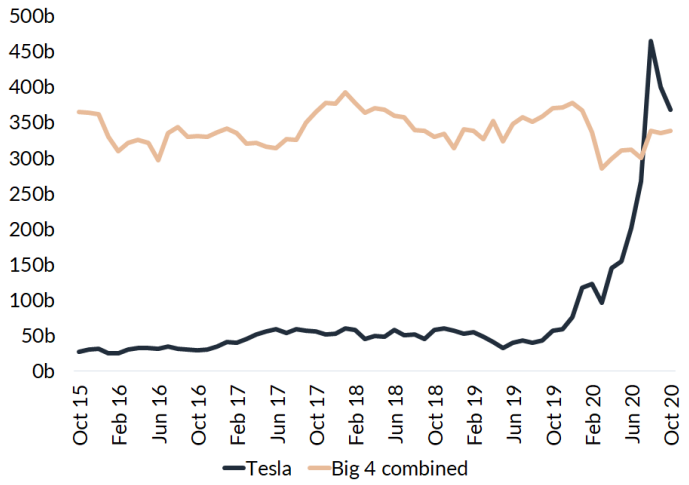
The Paris Agreement (Paris) in 2015 provided a watershed moment for the ESG community. While it was hailed as a big break-through with regards to creating a global consensus around both the need to fight climate change and the tools necessary to do so, it came with a big caveat; it was almost exclusively based on voluntary commitments. Since then a cottage industry of consultants, data providers, NGOs and various multinational bodies has blossomed. Within the ESG investing community the frontier is shifting from product exclusions strategies (primarily coal) to portfolio GHG emissions, with various strategies focussed, somewhat simplistically, on three main objectives; (1) minimising portfolio GHG emissions and related climate risks, (2) maximising portfolio reductions of GHG, and (3) owning the enablers of a transition to a low carbon economy.

Impact investing has room to grow and does not always overlap with broad ESG categories

A subcategory within SRI is impact investing. This style of investing is more targeted than general responsible investing, with a focus on the investments to generate positive, measurable social and environmental impacts alongside a financial return, with less of a focus on ESG as a risk mitigating tool; actively seeking companies that provide solutions, rather than avoiding companies that are part of the problem. The impact investment universe was estimated to be worth US$502bn in 2019, an increase from US$114bn in 2018. Despite this rapid growth, impact investing is still small relative to SRI overall. Focus within impact investing is generally on one or two specific issues such as renewable energy or access to health care.

The overlap between impact investing and ESG strategies is not always perfect. In New Zealand, for instance, we could argue that the company that has had the biggest impact within the renewable energy field is Infratil (IFT), which has committed, directly and through portfolio companies, over NZ$2bn of capital to the development of renewable energy, partly funded through equity issuance (i.e. directly channelling new capital); more than the rest of the NZ market put together. Yet, IFT would have been excluded from most broad ESG strategies due to its below average ESG score (Figure 11).

Figure 9. Market cap of Tesla vs Big 4 (VW, Toyota, Ford, GM)



Source: Forsyth Barr analysis, Refinitiv. US dollars.

Figure 10. ESG Score Tesla vs big 4

	Environmental Score	
	FY-5	FY0
Tesla	C	B+
Toyota	A-	A-
General Motors	B	A-
Ford	A	A
Volkswagen	A	A+

Source: Forsyth Barr analysis, Refinitiv.

Figure 11. ESG Score for IFT

	Environmental Score	
IFT	FY-3	FY0
ESG Combined Score Rank	18%	36%
Environmental Score Rank	12%	47%

Source: Forsyth Barr analysis, Refinitiv.

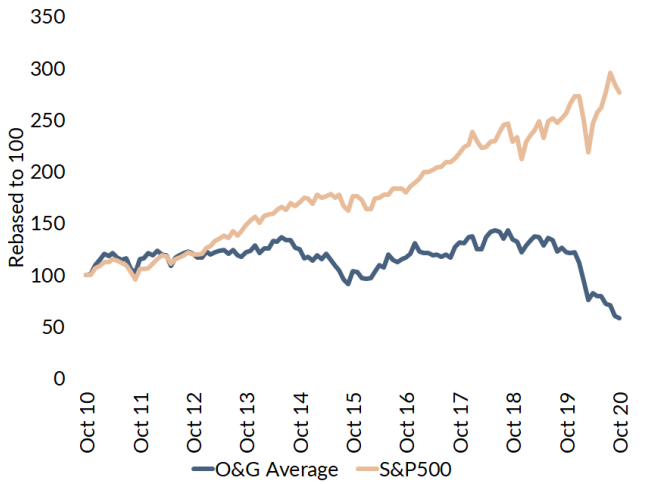
One global example is Tesla vs the "big 4" automakers (Figures 9 & 10). Tesla has, by some margin, the worst environmental score out of the five. Many broad ESG strategies would have excluded Tesla — yet most environmentally focussed investors would argue that Tesla is one key part of "the solution", with many impact investors likely to be invested in Tesla — and rewarded for it.

If impact investing continues to grow, as we believe it is likely to, investors who lead the way have the potential to benefit from re-pricing of scarce assets, in particular those that may be too small, have patchy disclosure, or for other reasons score low on traditional ESG scoring, an added benefit of "doing good".

Staying ahead of the curve could pay off...

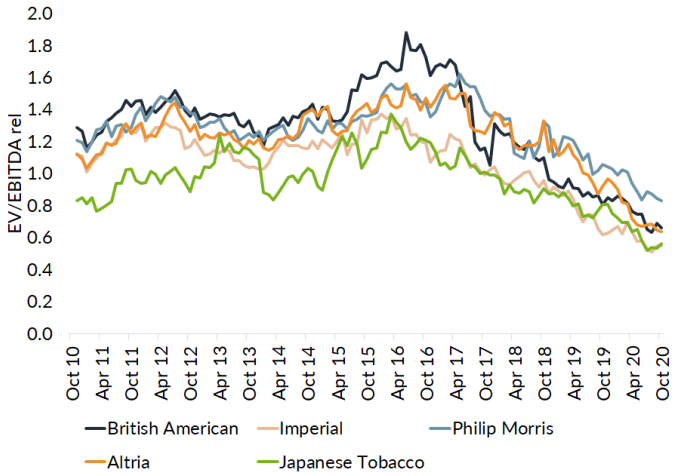
The first wave of ESG exclusions focussed on tobacco and weapons, with alcohol, gambling and other sins (depending on your point of view) following close behind. In short, the focus was firmly on the S in ESG. Recently, coal has overtaken many of the traditional sin issues as the third most commonly screened for issue. What's next? We believe overall GHG emissions and trajectory of GHG emissions could very well be the next large scale issue within the ESG community — and the companies being screened out face potentially meaningful de-rating risks.

Figure 12. Oil & Gas companies (Market Cap)



Source: Forsyth Barr analysis, Refinitiv. Average consists of Chevron, ExxonMobil, BP and Shell. S&P500 is capital only.

Figure 13. De-rating of "first wave" ESG exclusion: tobacco



Source: Forsyth Barr analysis, Bloomberg. Relative to MSCI World Index.

Staying ahead of these trends could provide a source of outperformance for three reasons; (1) as these assets get divested from ESG focussed funds they could de-rate, (2) addressing some of the issues, e.g. emissions from milk production, could drive up costs for the companies that score poorly, much in the same way as carbon costs are impacting the earnings of large traditional emitters, (3) the core issue has been chosen precisely because it has real implications for corporate performance; oil & gas assets, for instance, could become stranded should renewables and electric vehicles (EVs) crowd out their end market.

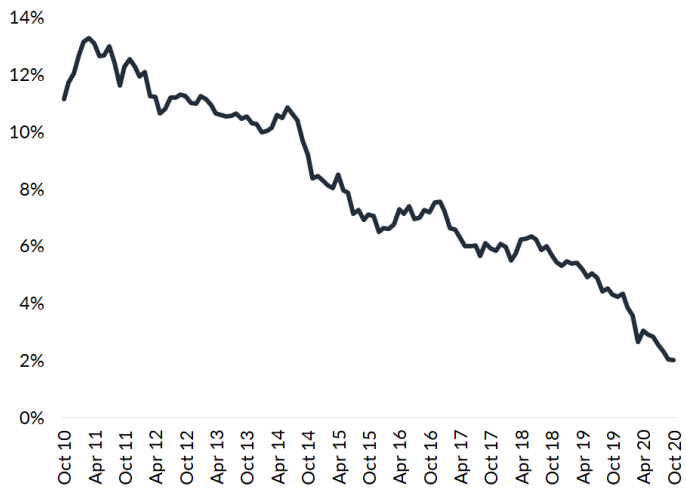
...and the product exclusion strategies are becoming more difficult to monetize within "E"

The aggregate market cap of listed coal companies in the US has dropped by about 80% over the last decade. An ESG focussed investor would have screened out US coal companies and thus benefitted from their demise. Coal mining companies were already a very small part of the index 10 years ago and today their total contribution is measured in basis points. In smaller markets such as New Zealand, screening out coal mining companies yields nothing.

Figure 14. Google trend climate emergency — 24 monthly moving average

Source: Forsyth Barr analysis, Google trends.

Figure 15. Market cap of S&P Energy Index as % of S&P 500 Index



Source: Forsyth Barr analysis, Refinitiv.

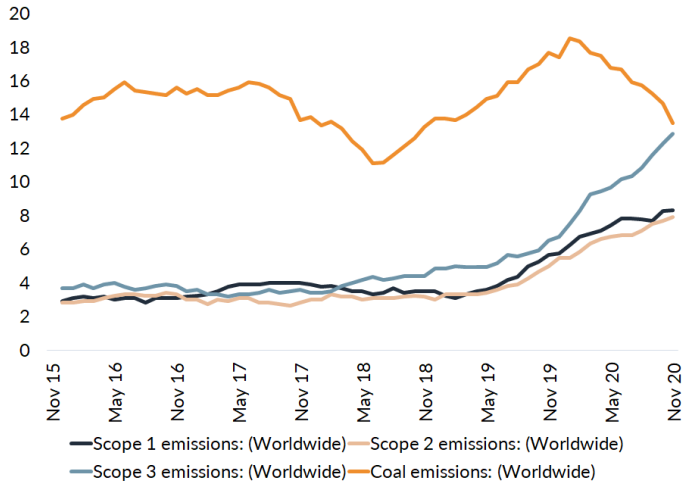
While coal exclusion strategies are expanding to include coal electricity generation and, more broadly, all fossil fuel electricity generation, we believe we are at the end of the beginning of the ESG wave; broad product exclusion strategies may take more of a back seat as increasingly sophisticated strategies focus on climate change directly rather than implicitly.

We measure what we value and value what we measure; we expect a shift from focus on products (e.g. coal) to GHG emissions

A few years ago focus started to shift from only coal to all fossil fuels and more recently it has broadened out to include all greenhouse gases. But a broader scope comes with some challenges. Virtually all companies have some exposure to GHG. Screening out companies with GHG exposure is not a viable option for most investors.

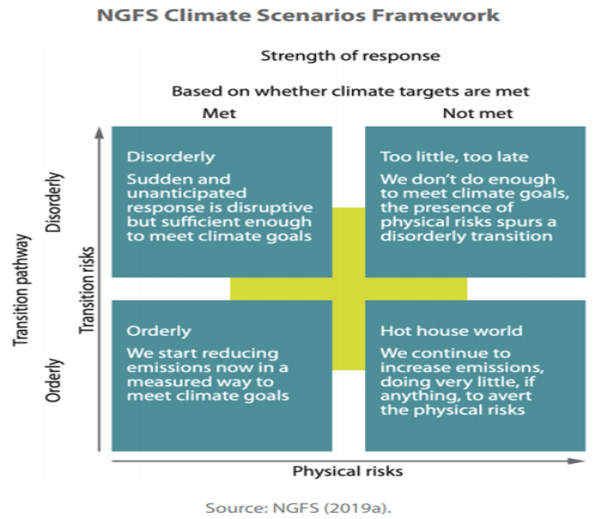
To guide investors wishing to reduce the climate impact of their portfolio a set of standards with regards to how to report GHG emissions has been established by, amongst others, the United Nations Environment Programme Finance Initiative (UNEP FI). UNEP FI is a partnership between UNEP and the global financial sector with an overall goal to mobilise private sector finance for sustainable development.

Figure 16. Google Trends: Scope 1,2,3 emissions vs coal emissions



Source: Forsyth Barr analysis. 12 month moving average.

Figure 17. Network for Greening the Financial System (NGFS)



Source: NGFS

The three scopes of GHG emissions are:

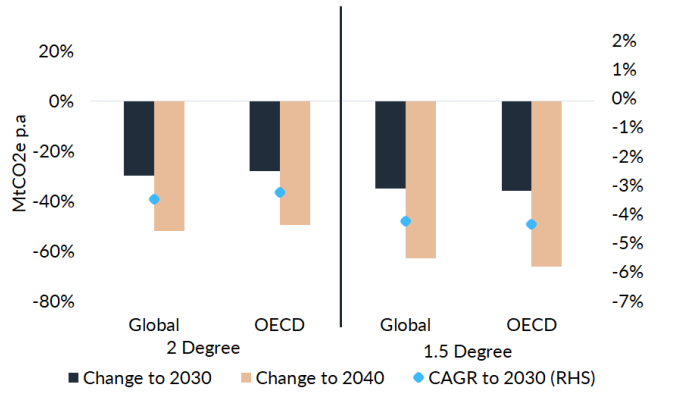
- Scope 1: All direct emissions from the activites of an organisation or under its control (e.g. emissions from milk drying)
- Scope 2: Indirect emissions from electricity purchased and used by an organisation (emissions from the electricity provider)
- Scope 3: All other indirect emissions from activities, occurring from sources it doesn't own or control (e.g. on farm emissions)

Agreeing to standards on how to report is an ongoing process, but we believe we are at an inflection point with regards to both voluntary and mandated disclosures of GHG emissions. The UK was early to introduce mandatory reporting around emissions for large companies already in 2013, but New Zealand looks set to be the first country in the world to make it mandatory to disclose direct and indirect emissions for all debt or equity issuing companies (refer to pages 11 & 12 for more discussion on TCFD). President-elect Biden has already stated that he intends to re-sign the Paris Agreement, likely increasing the pace of disclosure requirement for US companies.

High "scope 3" emitters and business as usual companies at risk of being new targets; ambitious emitters can get salvation

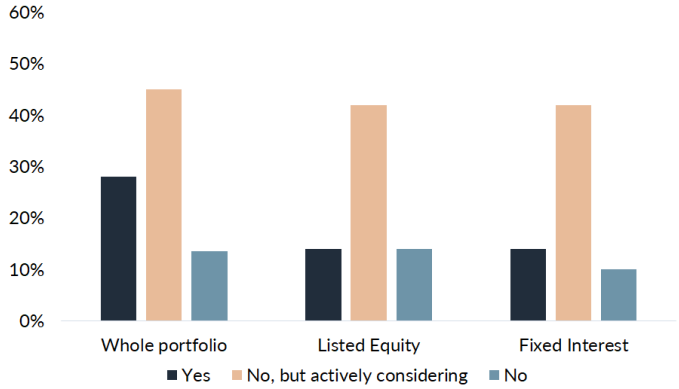
In parallel to reporting standards being developed, a set of "climate scenario" models are being refined. One of the more established ones is an initiative by eight central banks and supervisors called the Network of Central Banks and Supervisors for Greening the Financial System (NGFS). The combination of climate scenario models and standardised emissions disclosure gives investors, regulators, NGOs and other stakeholders the tools to assess companies (and countries) against a set target. The Paris Agreement lays out the main target: limiting global warming to "well below 2°C". Within the ESG community, as well as amongst many countries (including New Zealand) with an ambitious climate agenda, the "well below" has become synonymous with 1.5°C.

Figure 18. Total emissions reductions in NGFS 'orderly' scenario



Source: Forsyth Barr analysis, NGFS data. Uses an average of the available NGFS models.

Figure 19. Proportion of investors with net zero target by 2050



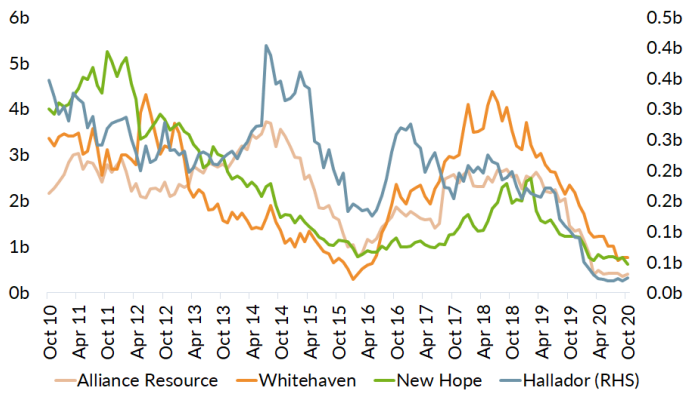
Source: IGCC Net Zero Investor Survey 2020. Survey of Australian and NZ asset managers.

The climate models outline in some detail what is needed to achieve the below 2°C scenario in an orderly fashion. For OECD countries this involves reducing GHG emission by c. 3–4% p.a, roughly halving emissions over the next 20 years. With ~US$30tr assets invested with an ESG overlay, companies that are seen to not take this path seriously could become the new "exclusion" categories. Similarly, companies with large GHG emissions, in particular scope 3 emissions, outside of the energy complex may find that ESG strategies will exclude them. Conversely, some large emitters that are reducing emissions by 4%+ per year may be viewed as part of the solution rather than part of the problem.

Taking a leaf out of the tech playbook, disruption and stranded assets

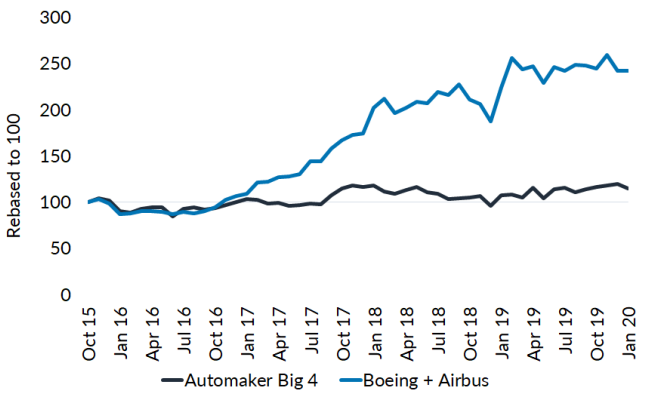
ESG screening and SRI investing have two main purposes; (1) nudge or "name and shame (praise)" corporates to improve behaviours, (2) take advantage of mis-pricing of risks associated with "bad" (good) corporate behaviour. Within the environmental category the main risks relate to increased costs of carbon emissions, as well as regulatory and reputational risks associated with destroying the environment. More recently the concept of stranded assets has gained traction. Stranded assets refer to assets that cannot live out their physical life due to either being un-economic ("economic stranding") or due to regulatory change, such as an outright ban on burning coal.

Figure 20. Market value of listed US coal companies (US$)



Source: Forsyth Barr analysis, Refinitiv

Figure 21. Boeing and Airbus vs big 4 Auto (until COVID-19)



Source: Forsyth Barr analysis, Refinitiv. Total returns. Auto Big 4= Toyota, VW, Ford, GM.

The demise of coal in the US alerted investors to the risk of disruption within the fossil complex leading to "stranded assets". The idea of economic stranding of assets is similar to what has been widely discussed within tech investing for a long time, i.e. old technologies being disrupted by new, leading to a (relatively) sudden collapse of whole industries rather than a gradual transformation from one technology to another. The demise of US coal was not primarily driven by carbon pricing or even environmental concerns or regulation, though both contributed, rather it was primarily driven by new technology; cheap gas and fracking techniques opened up new reserves and falling renewables prices drove coal out of business. In Europe the substantial build out of renewable energy with zero marginal cost has crowded out a significant proportion of gas powered electricity generation, while coal has held up better.

Outside of oil & gas and coal mining, distribution (petrol stations, tankers) and consumers (autos, refineries, traditional utilities) are potential areas with risks of stranded assets. However, we believe it to be too simplistic to view the whole fossil fuel complex as being at risk of being stranded. Within many areas, e.g. flying, there is no viable alternative to fossil fuels, without significant technological advancements.

ESG investing in NZ: after a slow start NZ has more than caught up

As at the end of 2019, the Responsible Investment Association of Australasia (RIAA) estimates that the responsible investment market in New Zealand was worth NZ$153.5bn, making up 52% of total professionally managed assets under management in New Zealand. While the focus so far has been primarily on negative screening, there is broad political and private sector support for the Paris commitment.

In 2019 119 out of 120 MPs signed the Climate Change Response (Zero Carbon) Amendment Act, which includes a target of net zero GHG (excluding biogenic methane) emissions by 2050. To date, 101 chief executives in NZ have also signed a joint statement committing their organisations to take voluntary action on climate change. The statement includes a commitment to measure and report emissions and to reduce them consistent with keeping global warming below 2 degrees. In 2019, some signatories added the ambition to "pursue efforts to limit (...) it to 1.5 degrees".

Figure 22. Listed signatories of the Joint Statement from the "Climate Leaders Coalition"

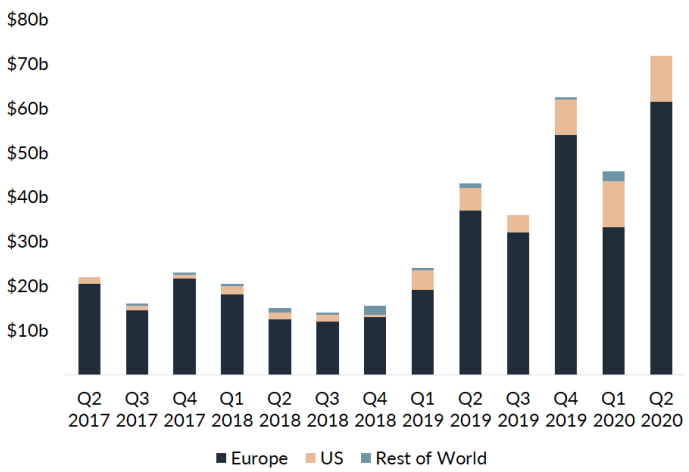
Founders	Joiners	Re-signers
AIR	CEN	MEL
FSF	FPH	SML
SPK	FRE	SPK
VCT	HGH	SAN
WHS	MEL	WHS
ZEL	SAN	
	SKC	
	SUM	
	SML	
	TLL	

Source: Forsyth Barr analysis, Climate Leaders Coalition.

Several NZ Companies are at risk of being 'screened out' of portfolios, emissions increasingly to blame

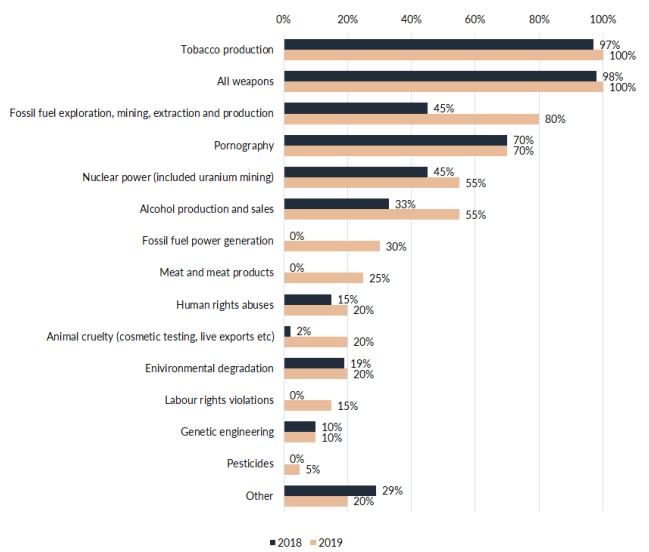
Amongst New Zealand fund managers negative screening (exclusions strategies) dominate. The most common exclusions mirror global trends, with tobacco production and weapons (both firearms and controversial weapons) being the most frequent exclusions. Almost all New Zealand fund managers exclude companies in these industries. As New Zealand does not have any domestic companies in this category and the global market cap is small, this could be considered a low cost exclusion approach. Over the last year there has been a relatively sharp increase in focus on environmental issues such as fossil fuel exploration, power generation, meat production and fish farming (i.e. Sanford [SAN] and New Zealand King Salmon [NZK]); categories where NZ features more prominently. 80% of New Zealand fund managers RIAA surveyed were screening for fossil fuel exploration in 2019, up from 45% in 2018. In addition, screening for fossil fuel generation (GNE and CEN) increased from nothing to 30% in one year.

Figure 23. Global Sustainable Fund Flows (USD)



Source: Morningstar Direct Manager Research, Data as of June 2020.

Figure 24. Frequency of issues being screened, New Zealand



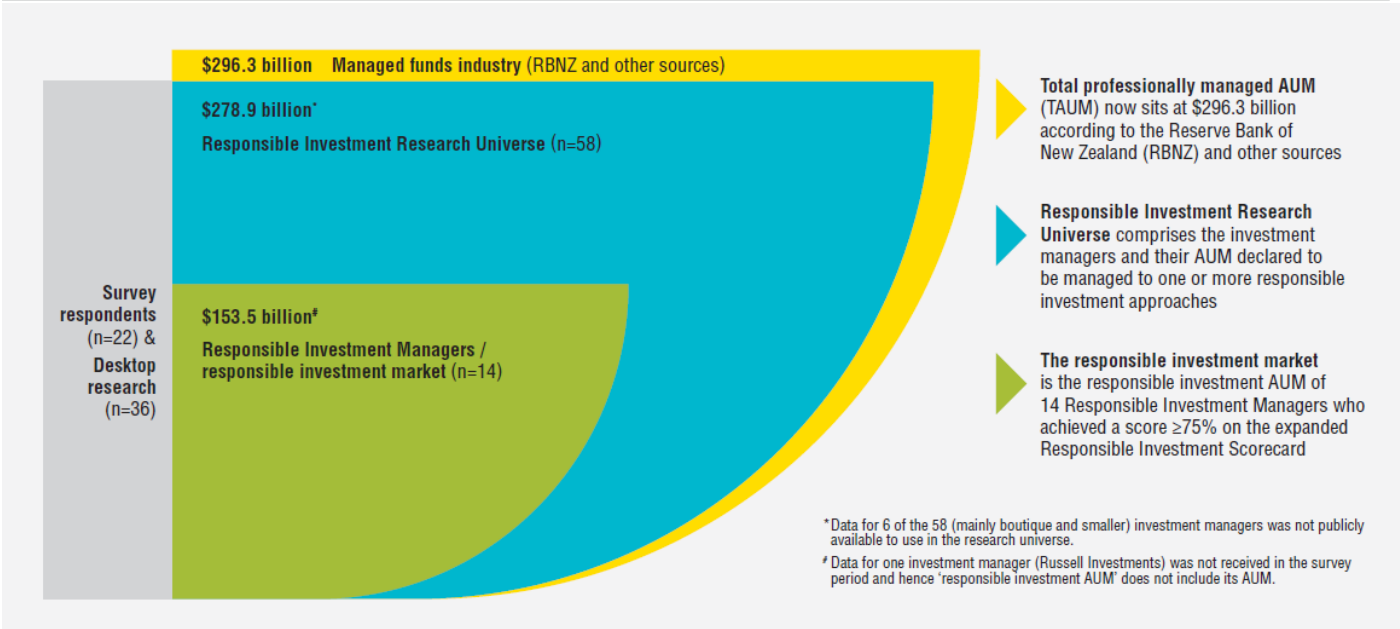
Source: RIAA Responsible Investment Benchmark Report 2020 New Zealand.

Default KiwiSaver providers to be fossil-fuel free by 2021

For those institutional investors not currently screening out fossil fuel involved companies, government intervention may catch-up on them. In March 2020, the New Zealand Government announced that from June 2021 default KiwiSaver providers will be required to exclude fossil fuel production from their default fund investment portfolios, as well as to disclose on their websites a responsible investment policy. At this point it is not clear which New Zealand stocks would be affected by this as the scope of the exclusions are yet to be decided by the government. In our view, the company at risk of exclusion from this policy is NZ Oil & Gas (NZO). At this stage it appears Genesis Energy (GNE) will not be caught by the regulation change, as revenue from its Kupe oil & gas asset is below the expected threshold. In addition, GNE is undertaking a strategic review of Kupe, which could result in a sale before the regulations come into force. Downstream oil and gas assets (Z Energy [ZEL] and Refining NZ [NZR]) are not expected to be caught, neither are producers of thermal generation (Contact Energy [CEN] and GNE).

The government's move follows the NZ Super Fund's self-directed shift in 2017 to lower its portfolio's upstream oil & gas exposure, in a move to be more resilient to climate change investment risks. As a result of this the fund sold its GNE and NZO holdings.

Figure 25. Research universe and New Zealand's responsible investment market



Source: RIAA Responsible Investment Benchmark Report 2020 New Zealand

Impact investing on the rise globally could benefit scarce NZ assets, but remains focussed on fixed income domestically

In New Zealand impact investing has grown significantly, from assets worth NZ$158m in 2018 to NZ$570m in 2019. Green bonds (or closely related Social/Sustainability bonds) make up 88% of the impact investment universe in New Zealand, with at least six NZX-listed companies now having green bond programmes: Argosy (ARG), CEN, Meridian (MEL), Mercury (MCY), Precinct Properties (PCT) and Westpac (WBC), as well as government-related entities Auckland Council and Housing New Zealand.

While equity impact investing is small in NZ it has a few, in a global context, unique assets that could benefit from impact investing elsewhere. MEL and CEN are both included in iShares Global Clean Energy ETF, and MCY is large enough to be included as well. Additionally, IFT is a substantial investor in Clean Energy.

Task Force on Climate-related Financial Disclosures (TCFD) framework; NZ leading the way

In our previous report, *Counting Carbon Costs: Climate Change and NZX Companies*, dated 5 December 2019, we signalled that the New Zealand Government was undertaking consultation on compulsory climate-related disclosures for New Zealand companies. This is now close to reality. In September 2020, the New Zealand Government announced new legislation (currently pending parliamentary approval) that would make it compulsory for all NZX listed companies, as well as a range of financial institutions, to report on climate risks from 2023. The requirement will be on a 'comply or explain' basis, and will need to be in-line with the Task Force on Climate-related Financial Disclosures (TCFD) framework. To our best knowledge New Zealand is the first country in the world to require the issuing sector to report climate-related disclosures, although in November 2020 the United Kingdom Government announced its intention to make TCFD-aligned disclosures mandatory "across the economy" by 2025.

Many NZX companies already report in accordance with TCFD requirements, which we take to be a sign of proactive steps towards a low carbon future. We have surveyed the most recent annual/sustainability reports of members of the S&P/NZX 50 and found that 20% of members (10 companies) include disclosures in accordance with the TCFD. The 'gentailers' feature prominently in this group, with CEN, GNE, MCY and MEL including TCFD disclosures in their annual reports.

TCFD reporting will apply to institutions that meet the following requirements:

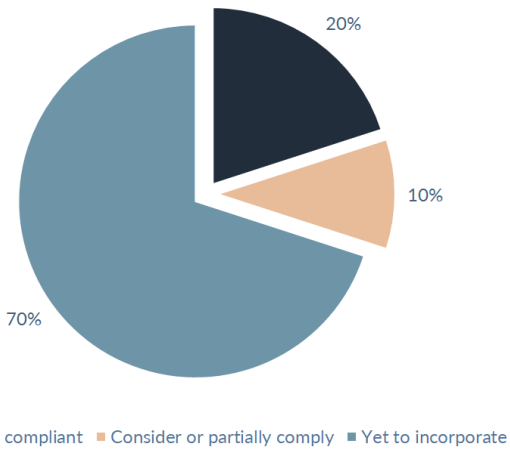
- All registered banks, credit unions, and building societies with total assets > NZ$1bn
- All managers of registered investment schemes with total AUM >NZ$1bn
- All licensed insurers with total AUM > NZ$1bn or annual premium income > NZ$250m
- All equity and debt issuers on the NZX
- Crown financial institutions with total AUM >NZ$1bn

Figure 26. Timeline of NZ commitments

Year	Commitment	Progress
2020	5% below 1990 gross emissions	On track
2030	11% below 1990 gross emissions Biogenic methane emissions 10% below 2017 levels	
2050	Net zero emissions (excluding biogenic methane) Biogenic methane emissions 24%–47% below below 2017 levels	

Source: Ministry for the Environment. Commitments as determined under Paris Agreement and Zero Carbon Act.

Figure 27. S&P/NZX50 TCFD compliance



Source: Forsyth Barr analysis, company reports. Includes ANZ and WBC

Investment implications from an expanding E on NZ Inc

We see three different vectors through which we believe the E in ESG will be relevant for long term investors into NZ equities;

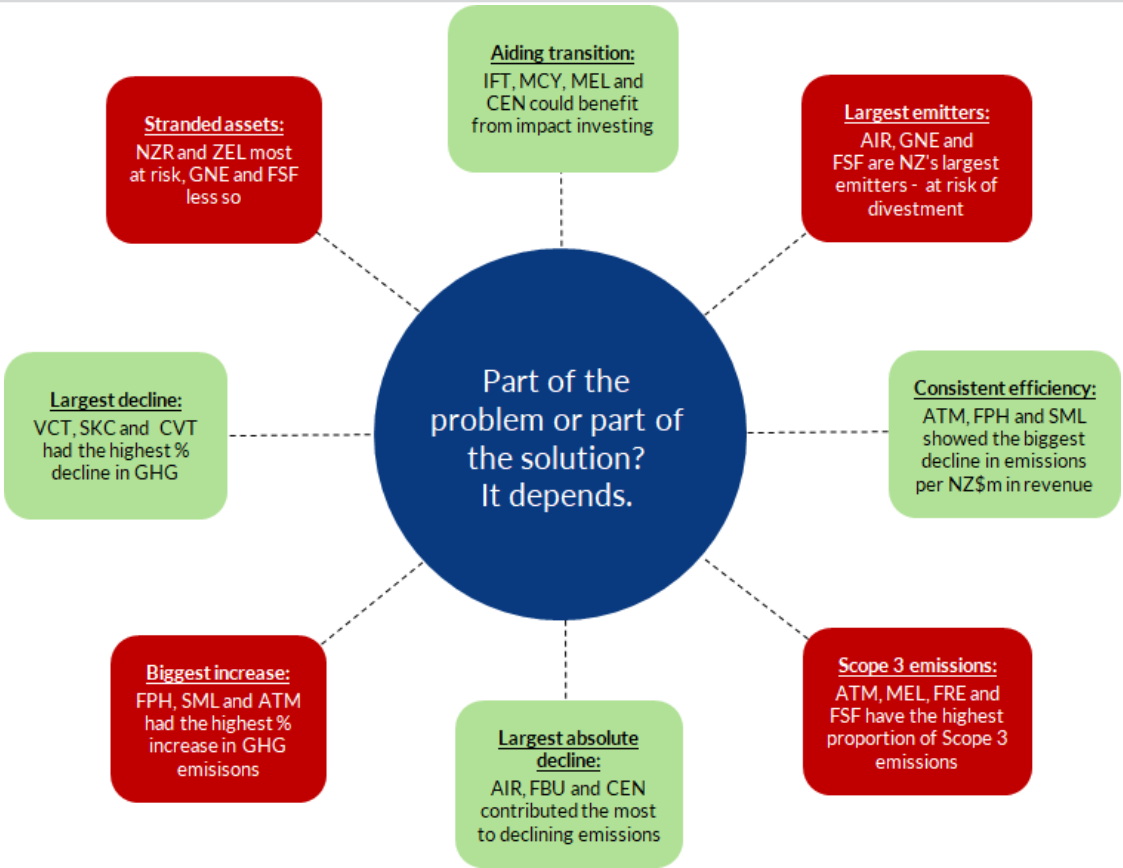
- **Vector 1**: Increasing direct costs of high emissions, expressed either through carbon costs (NZUs), incremental investments, or substitution to more expensive alternatives
- **Vector 2**: A shifting focus for the large and increasing pool of money applying ESG screens has implications for liquidity and cost of capital
- **Vector 3**: Risks of stranded assets for companies directly involved with, or dependant on, fossil fuels. But we also believe there to be opportunities as environmentally more friendly alternatives risk displacing products and/or services

Figure 28. Most exposed NZ companies to various aspects of GHG emissions

Part of the Solution?				Part of the Problem?			
Largest decline	Aiding transition	Consistent efficiency	Largest absolute decline	Biggest increase	Stranded assets	Largest emitters	Scope 3 emissions
VCT	IFT	ATM	AIR	FPH	NZR	AIR	ATM
SKC	MCY	FPH	FBU	SML	ZEL	GNE	MEL
CVT	MEL	SML	CEN	ATM		FSF	FRE
	CEN						FSF

Source: Forsyth Barr analysis

Figure 29. Part of the problem or part of the solution? It depends



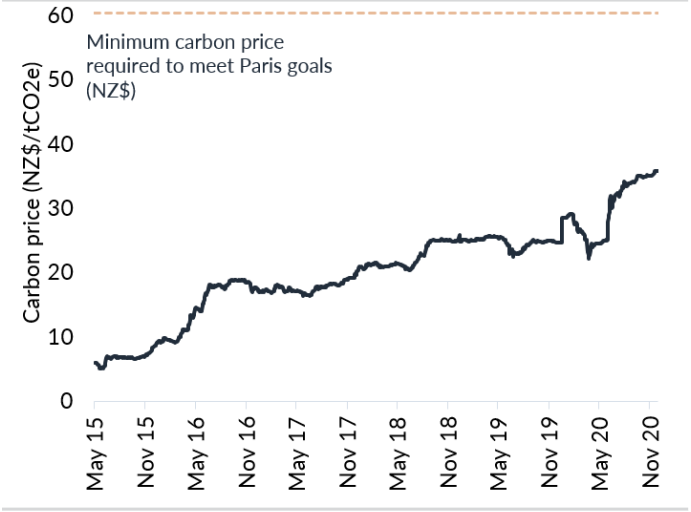
Source: Forsyth Barr analysis

Vector 1: Direct cost for GHG emissions on the rise

The most direct implication from an increased focus on reducing GHG emissions are carbon costs, in New Zealand implemented through the system of tradable NZUs. Carbon costs are impacted by (1) policy and regulatory issues, and (2) supply and demand. Carbon prices have continued their upwards trend in the New Zealand and European trading schemes, as shown in Figures 30 and 31. Both markets saw a noticeable drop in price during the COVID-19 market sell off but have since recovered strongly. After being stable around the NZ$25/tCO2e price cap since August 2018, the New Zealand carbon price started to increase in January 2020, in

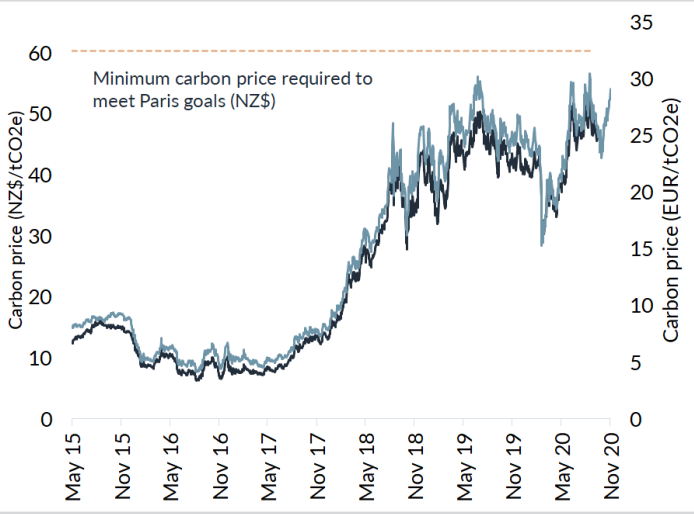
anticipation of the removal of the price cap. The New Zealand carbon price is up +26% year-to-date, while the European carbon price is up +14% year-to-date (in local currency terms).

Figure 30. Price of one tonne of carbon in New Zealand



Source: Forsyth Barr analysis, Bloomberg

Figure 31. Price of one tonne of carbon in Europe



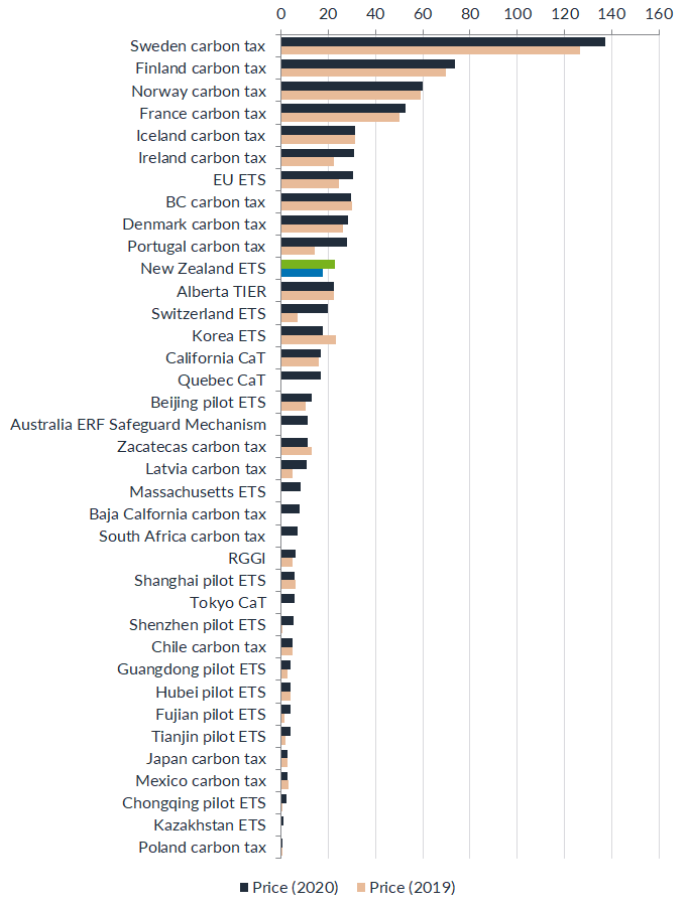
Source: Forsyth Barr analysis, Bloomberg

Prices on the rise in NZ and globally — but further to go in order to reach Paris commitments...

Most experts agree that carbon prices around the world will need to increase in order for carbon pricing schemes to be effective. Figure 32 shows the 2020 and 2019 carbon prices for various schemes around the world, as reported by the World Bank. Of the 37 schemes detailed, the carbon price increased or remained level in 22, while the price decreased in eight schemes. The High-Level Commission on Carbon Prices (CPLC, Report of the High-Level Commission on Carbon Prices, 29 May 2017) estimated that carbon prices of at least US$40–60/tCO2e by 2020 and US$50–100/tCO2e by 2030 are required to meet the temperature goals detailed in the Paris Agreement.

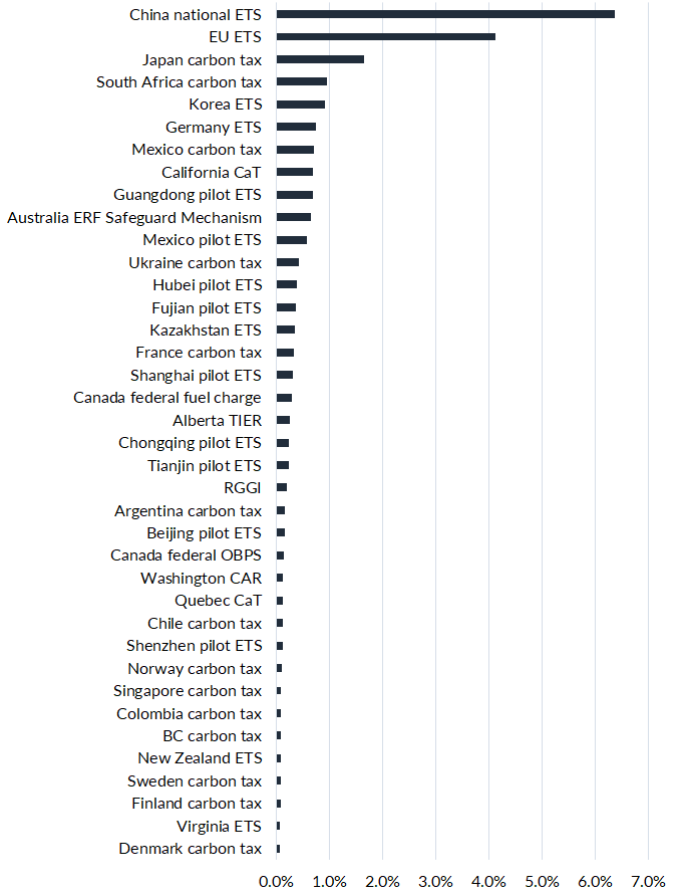
While the increasing trend in carbon prices is supportive of the world's ability to meet its Paris obligations, as of 2020 only four carbon pricing schemes (the carbon taxes of Sweden, Finland, Norway and France) meet the minimum required price of US$40/tCO2e. Additionally, all carbon pricing schemes recognised by the World Bank only cover ~23% total global GHG emissions (Figure 33), including the China national ETS due to cover over 6% of global emissions by 2021.

Figure 32. Carbon price (US$/tCO2e)



Source: Forsyth Barr analysis, World Bank. Some schemes did not exist in 2019.

Figure 33. % of global GHG emissions covered by a scheme



Source: Forsyth Barr analysis, World Bank, only contributions >0.1% included. Data is a 2021 projection to include the China national ETS.

Emissions trading in New Zealand

The New Zealand Emissions Trading Scheme (NZ ETS) was introduced in 2008 and is the government's main tool for reducing GHG emissions and assisting New Zealand's transition to a low-carbon economy. The scheme has been largely ineffective to date, in our view. In our last report, we signalled that proposed changes to the NZ ETS were before Parliament through the Climate Change Response (Emissions Trading Reform) Amendment Bill (ETS Bill). This was passed into law in June 2020.

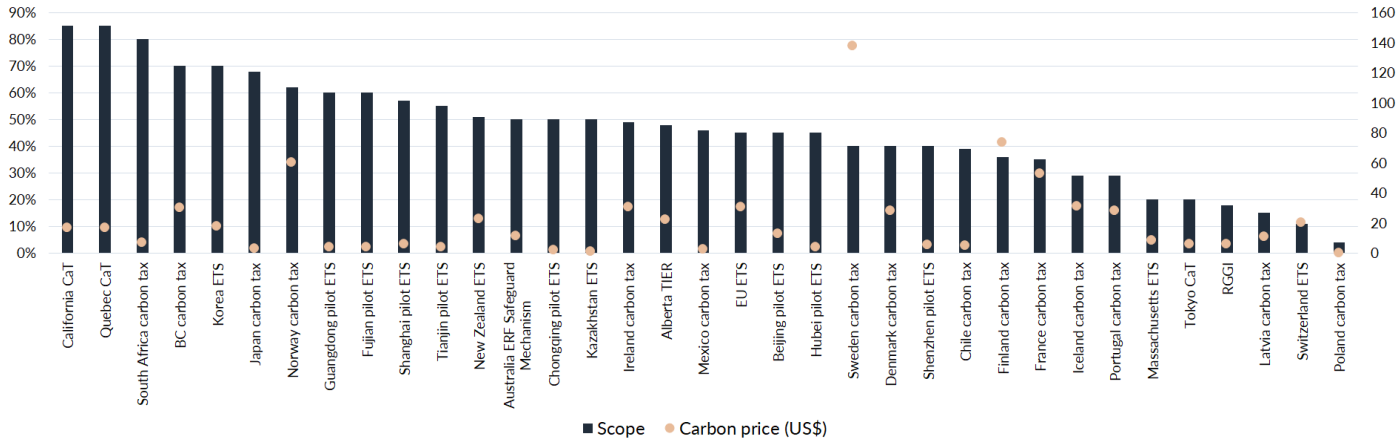
Figure 34. Key changes to the NZ ETS

Feature	Previous ETS	Amended ETS
Price controls	NZ$25/unit fixed price option (FPO)	FPO replaced with a cost containment reserve (CCR), which allows reserve units to be auctioned when the price trigger is hit. The price trigger will be set in regulations at $50 in 2021 and rise by 2% for each subsequent year. The FPO will remain in place during the transition to auctioning but will be raised to NZ$35/unit.
International linkage	The use of international units was stopped in June 2015	No change to the use of international units.
Industry allocation phase-down	Free allocation of units to firms that carry out eligible industrial activities to mitigate competitiveness impacts	Industrial allocation to be phased-out from 2021. Reducing by -1% p.a. between 2021 and 2030, -2% from 2031–40 and -3% from 2041–50. The Minister for Climate Change will have the ability to decrease or increase the base phase out rate.
Compliance and penalties	NZ$30/unit penalty when there has been a failure to repay or surrender units by the due date	Each overdue unit will incur a cash penalty of 3x the market price.
Sectors excluded	Agriculture	Agricultural emissions to be priced from 2025.

Source: Forsyth Barr analysis, Ministry for the Environment

With about 50% of emissions covered by a GHG scheme, New Zealand sits slightly above the (participating) global average. However, New Zealand's scheme is unusually comprehensive outside of the agriculture sector, with virtually all major sources of GHG emissions accounted for.

Figure 35. National emissions covered by GHG schemes in relation to price of carbon equivalents



Source: Forsyth Barr analysis, World Bank.

All national GHG schemes have exemptions. The broad principle is that the internationally traded sector with high emissions is either exempt or heavily subsidised. The idea is to avoid emissions leakage and loss of economic activity; if high emitters move to countries with low carbon costs the environment does not benefit and the net result is just loss of economic activity. But the list of exemptions is long, and on average less than half of national GHG emissions are included. New Zealand applies a comprehensive system of industrial allocations to trade exposed sectors.

NZ's exemptions

Industrial allocation is targeted at emission-intensive and trade-exposed activities. To be eligible to receive industrial allocation a company must: (1) have high emissions intensity — the company produces a large amount of emissions relative to the revenue it generates, and (2) be trade-exposed — there is international trade of the company's output and importing/exporting the output is viable.

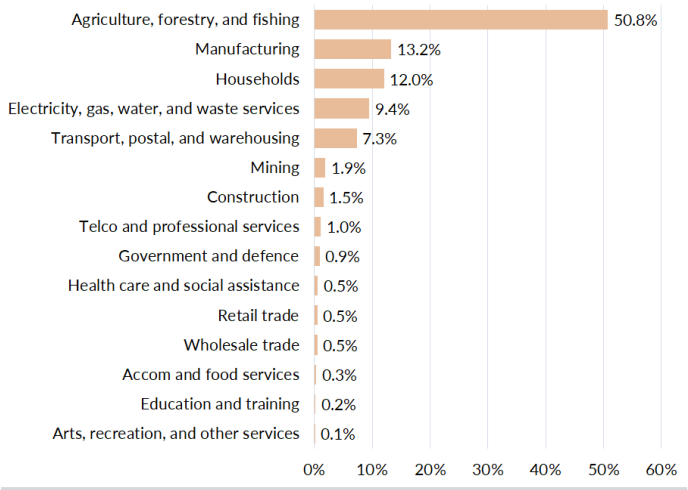
If both conditions are met there are two allocation tiers which depend on the emissions intensity of the activity:

- Highly emissions intensive (>1,600 tCO2e/NZ$1m revenue) — receive allocation that covers 90% of emissions for the activity
- Moderately emissions intensive (>800 tCO2e/NZ$1m revenue) — receive allocation that covers 60% of emissions for the activity

Current pathway looks slow in relation to emerging international standards...

The (current) impact on New Zealand's industry is therefore substantially smaller than what the headline numbers suggest due to this comprehensive system of free allocation of NZUs to the tradable sector. Of New Zealand's main emitters, it is only utilities and domestic transport that currently face full exposure to increasing carbon prices. Energy Intensive Exporting Industries (EIEI), such as steel, receive a free allocation of NZUs representing 90% of of total emissions. Less energy intensive industries (e.g. light manufacturing) receive 60% free allocation.

Figure 36. Emissions by industry NZ, 2018 GHG inventory



Source: Forsyth Barr analysis, Stats NZ

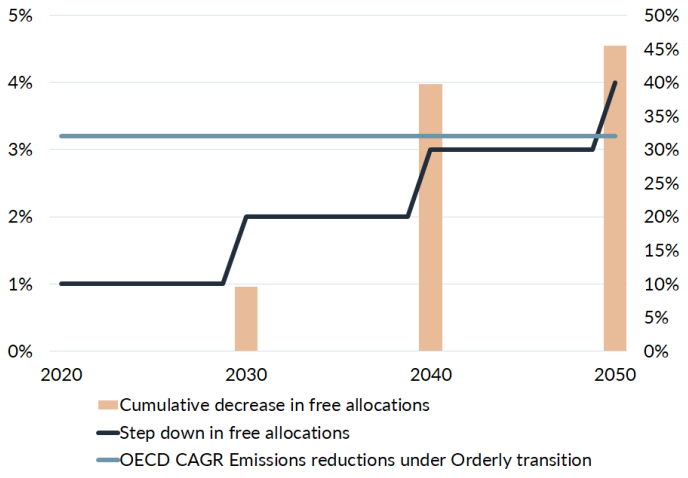
Figure 37. 2019 Free allocation of NZUs

Industry	Units Allocated (%)
Iron and steel manufacturing	26.0%
Chemical Products	22.8%
Aluminium smelting	20.6%
Market pulp	9.0%
Cement	8.4%
Paper and Cardboard	5.7%
Newsprint	2.9%
Food & Agri	2.8%
Reconstituted wood panels	1.0%
Glass containers	0.8%
Total	**100%**

Source: Forsyth Barr analysis, NZ Environmental Protection Authority

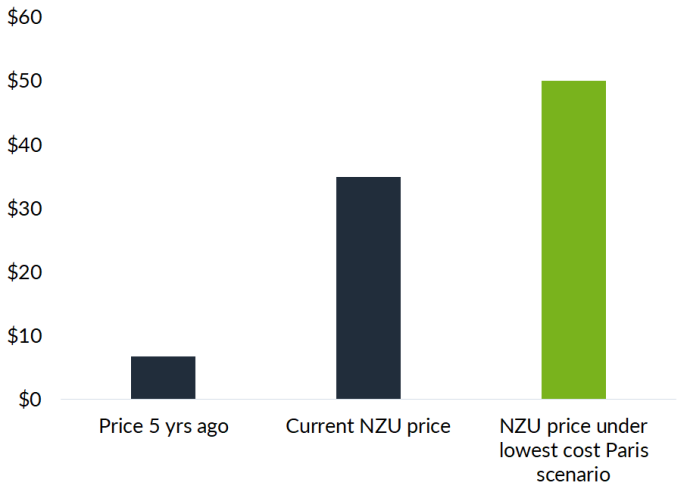
The free allocation of NZUs will be withdrawn at a relatively modest pace of 1% p.a. until 2030, increasing to 2% and 3% in the following two decades. This pace is clearly below the ~4% p.a. suggested by the climate models to be needed for the below two degree path. New Zealand is relying on mitigation, primarily planting pine forests, to mitigate this shortfall. However, this focus on "net emissions" is drawing increasing criticism from the global community. We believe that we could potentially see an increased pace of withdrawals, in particular as the current government has declared a climate emergency.

Figure 38. Pathway to reduced free allocation of NZUs



Source: Forsyth Barr analysis, Ministry for the Environment, NGFS.

Figure 39. NZU prices

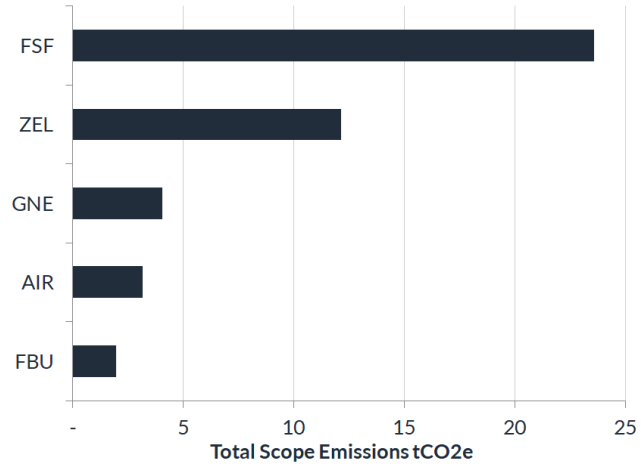


Source: Forsyth Barr analysis, Bloomberg, Productivity Commission.

Direct impact using current prices could be material for a select group of large emitters...

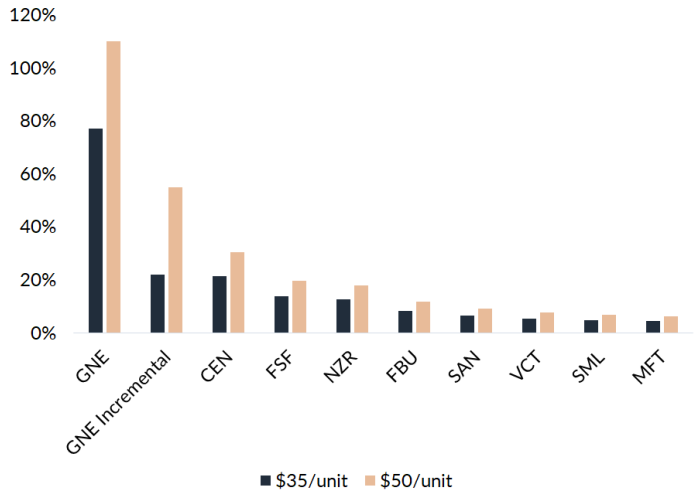
The companies with the largest total (Scope 1+2+3) emissions in New Zealand are Fonterra (FSF) and Z Energy (ZEL). However, for both these companies the vast majority of emissions relate to Scope 3 which are unlikely to be subject to direct costs within the foreseeable future.

Figure 40. NZ largest emitters of GHG (top 5)



Source: Forsyth Barr analysis

Figure 41. Carbon cost relative to pre-tax profit, Scope 1+2



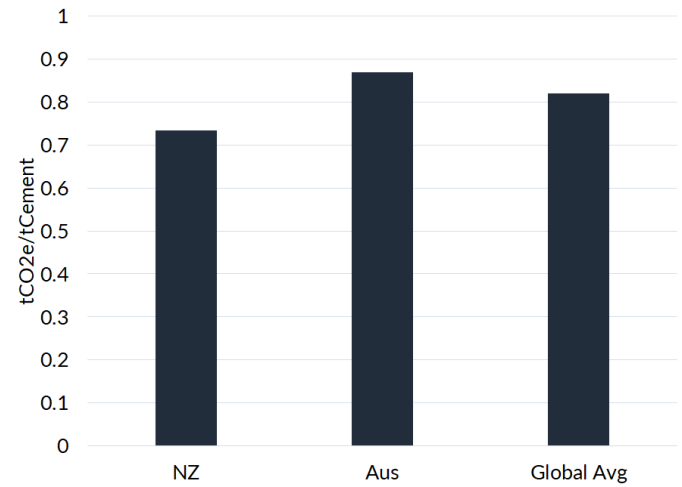
Source: Forsyth Barr analysis

However, NZR, GNE and Air New Zealand (AIR) could see a meaningful impact should carbon prices continue to rise. With regards to companies outside of the direct fossil complex, Fletcher Building (FBU) and SAN could both see profit before tax impacted by over 10%.

...but high prices also provide opportunities for industry leaders to unlock monetary value of environmental gains

The basic idea with an ETS is not to ban emissions or make them prohibitively expensive, but to price the negative externalities correctly, and in doing so guide investments towards where they have most effect. This is also why most ETS schemes start off with generous annual allowances of carbon credits to large emitters, which are then slowly reduced in order to give industries time to invest in cleaner technologies and, importantly, reward companies that do so by letting them sell excess credits.

Figure 42. GHG emissions per tonne of cement



Source: Forsyth Barr analysis, Beyond Zero Emissions (2017). Company disclosures.

Figure 43. Total value of carbon credits received by industry, NZ

Industry	Value (NZ$)
Iron and steel manufacturing	$61,054,695
Chemical Products	$53,504,447
Aluminium smelting	$48,376,955
Market pulp	$21,050,528
Cement	$19,648,613
Paper and Cardboard	$13,408,880
Newsprint	$6,792,747
Food & Agri	$6,578,028
Reconstituted wood panels	$2,229,555
Glass containers	$1,938,827
Total	**$234,583,272**

Source: Forsyth Barr analysis, NZ Environmental Protection Authority. 2019.

Large emitters, somewhat unintuitively, effectively receive free allocations worth >NZ$200m every year from the government. And this is not only a theoretical exercise, these can be sold to other emitters for actual money. This dynamic creates an opportunity for heavy emitters. If we take the construction industry as an example, the price of one tonne of cement is ~NZ$200–NZ$250 and producing a tonne of cement emits ~1 tonne of CO2e. At a carbon price of NZ$35, a 10% reduction in emissions would add c. 1.5% to margins, all else equal. This dynamic is important and explains why these EIEI industries receive NZUs rather than just a free pass to emit.

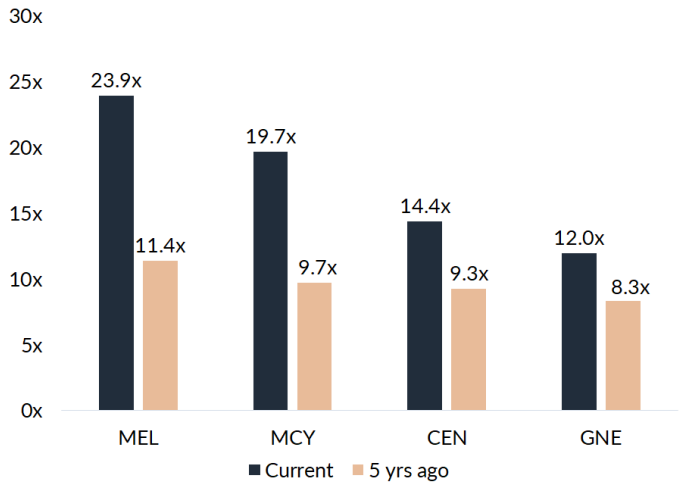
Vector 2: ESG winners of the past vs. ESG winners of the future

Norges Bank, with ~US$1tr of AUM has been a pioneer amongst large asset managers with regards to environmental policies; it divested from coal assets in 2015. The argument in favour of divesting fully from coal is not only that it is bad for the environment but also that there are alternatives in the form of, for instance, renewable gas. No such argument can be made for GHG emissions overall, there is no alternative. We believe New Zealand's ESG winners may look different in the 2020s vs the last decade. We expect a shift of focus, both by international and domestic investors, to companies that show, both in action and intention, that they are taking climate change seriously.

Valuation bifurcation amongst the gentailers a case study in how ESG can impact performance; the ESG winners of the past?

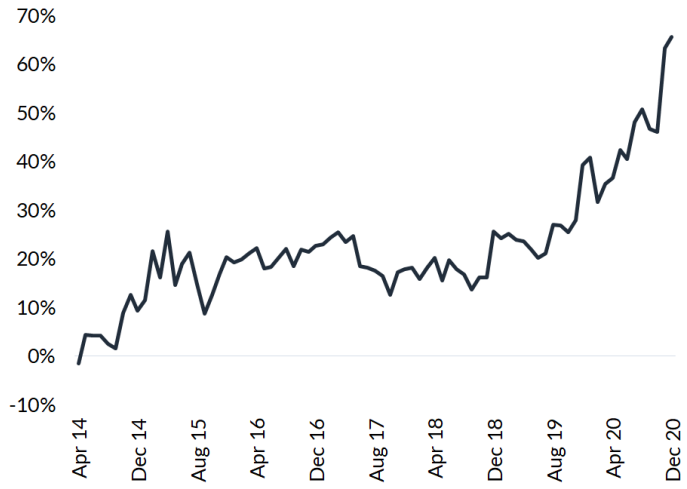
New Zealand's four large gentailers provide an almost unique case study of the impact ESG has had on stock performance. They are near 100% domestic, similar in nature, exposed to the same regulatory framework and are of similar size. All gentailers have performed well over the last five years but looking under the hood reveals some relatively dramatic diverging fortunes. Five years ago, the two fully renewable companies MCY and MEL were valued on the same EV/EBITDA multiple as the (part) fossil fuel dependent CEN and GNE. Today they are valued at a premium of over 60%.

Figure 44. Gentailers EV/EBITDA



Source: Forsyth Barr analysis, Bloomberg consensus estimates

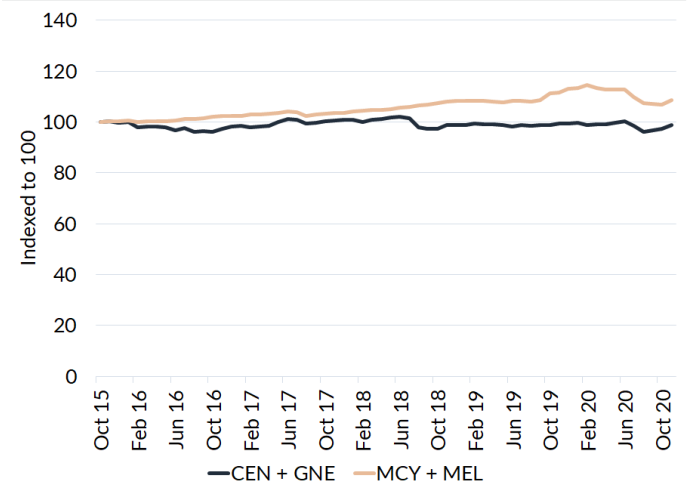
Figure 45. EV/EBITDA Premium MEL+MCY vs CEN+GNE



Source: Forsyth Barr analysis, Bloomberg consensus estimates

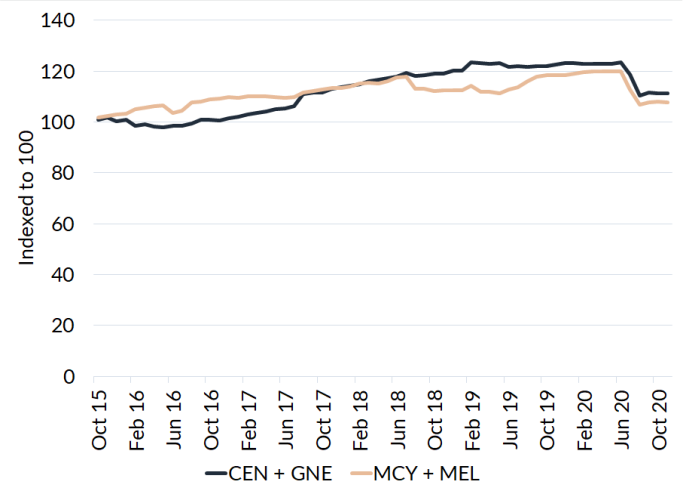
Yes, MEL and MCY EBITDA growth has been stronger than CEN and GNE over the past five years (mainly due to MEL offloading NZAS power contract volumes to other gentailers and some good hydro years). But looking at delivered fundamentals there is no obvious reason why MEL and MCY should have re-rated relative to CEN and GNE to such a degree.

Figure 46. EBITDA CEN + GNE vs MCY +MEL, indexed



Source: Forsyth Barr analysis, Bloomberg consensus 12m fwd estimates.

Figure 47. DPS CEN + GNE vs MCY +MEL, indexed



Source: Forsyth Barr analysis, Bloomberg consensus 12m fwd estimates.

We believe there have been two interlinked drivers of the divergence between the fossil fuel dependant gentailers from the fully renewable ones. One is supply and demand; as fossil fuel users are being excluded from portfolios there is a smaller pool of money

pricing those assets (and conversely, more money chasing renewable electricity assets). It is also plausible that the domestic investors that divest from CEN and GNE chose to be overweight MCY and MEL to keep the sector weight stable; this strategy alone would have yielded a 100bp outperformance p.a. over the last two years. We could call these "technical" effects. However, we also believe there to be a fundamental, forward looking impact. As investors price in their view of future carbon prices, the outlook for long term profitability for CEN and GNE looks worse relative to MEL and MCY. The nature of the wholesale electricity market means the marginal price is typically set by the cost of running thermal generation, which increases as carbon prices rise. Renewable generators receive the same wholesale electricity price, hence, have more upside to rising carbon prices (they benefit from increasing prices, without facing the carbon cost impost).

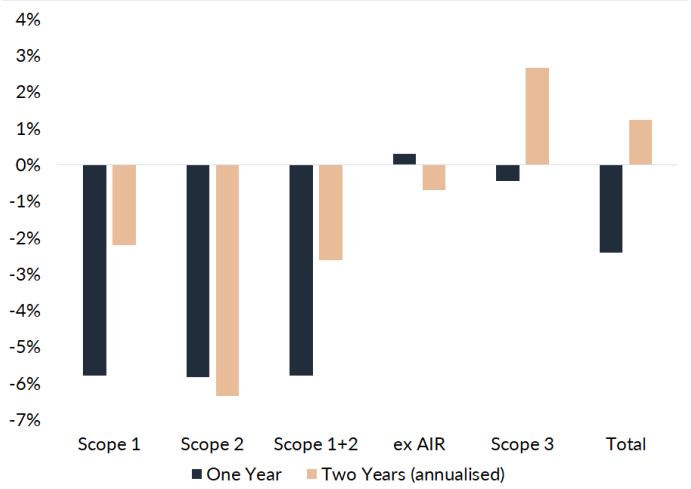
Emissions for NZ Inc; many ways to measure success

We have updated our inaugural analysis on GHG reporting from our 5 December 2019 report. There are many different ways to measure success (and failure) with regards to emissions; absolute, change, relative to revenues/units/profits. We believe a combination of different metrics will drive the ultimate perception of companies as either part of the problem, or part of the solution.

No clear signs of decreasing emissions, excluding effect from COVID on AIR

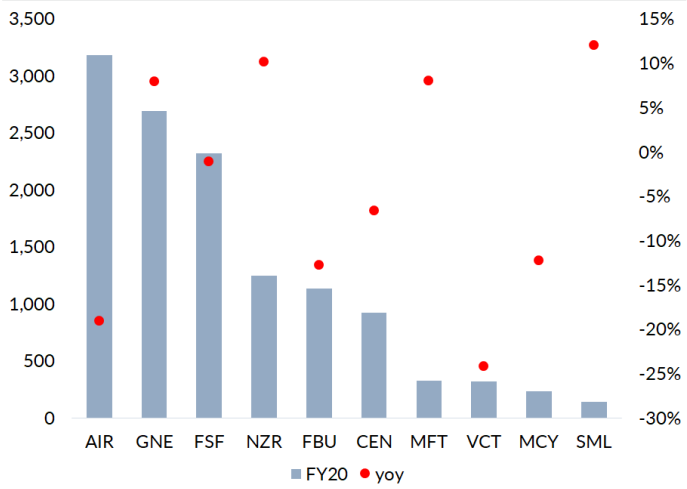
Total scope 1+2 emissions have declined ~-6% over the last year of company reporting, however, this includes a major decline from AIR, the largest direct emitter in NZ, due to reduced travel as a result of COVID-19; the overall picture in NZ looks average (overall, scope 1+2 emissions were flat in NZ excluding AIR). While still early days, the strong commitment from both corporates and politicians does not appear to have translated to a consistent decline in emissions. Including Scope 3 emissions (primarily FSF and ZEL) , total emissions were down 2% relative to FY19, but up relative to FY18.

Figure 48. Total scope emissions, analysed sub set



Source: Forsyth Barr analysis, Company disclosures

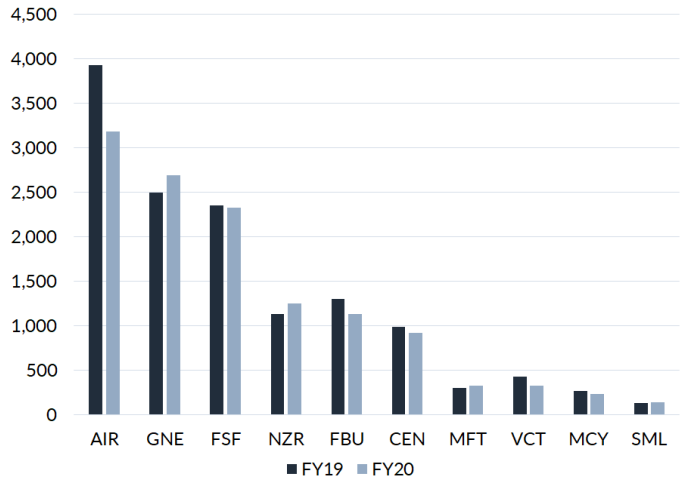
Figure 49. Largest Scope 1+2 emitters and change vs last year



Source: Forsyth Barr analysis, Company disclosures

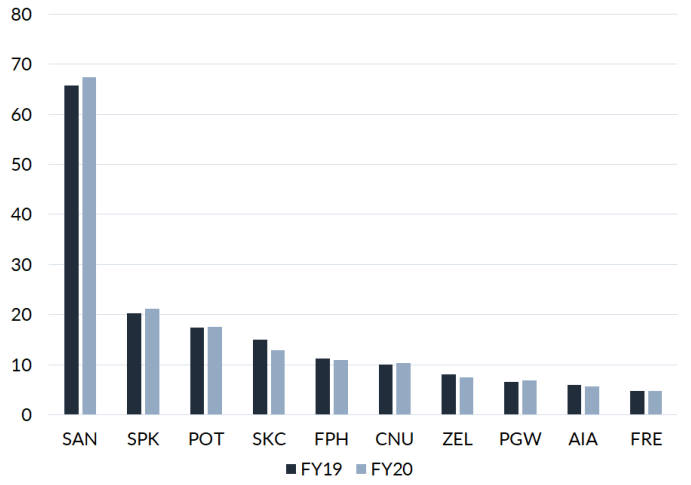
But under the surface there have been some meaningful declines, not only attributable to COVID-19. MCY and MEL continue to see meaningful reductions, Vector (VCT) and FBU as well, which, in combination with ambitious socially responsible statements could increase the perception of them.

Figure 50. Total scope 1+2 emissions, top 10 (ktCO2e)



Source: Forsyth Barr analysis, Company disclosures

Figure 51. Total scope 1+2 emissions next 10 (ktCO2e)

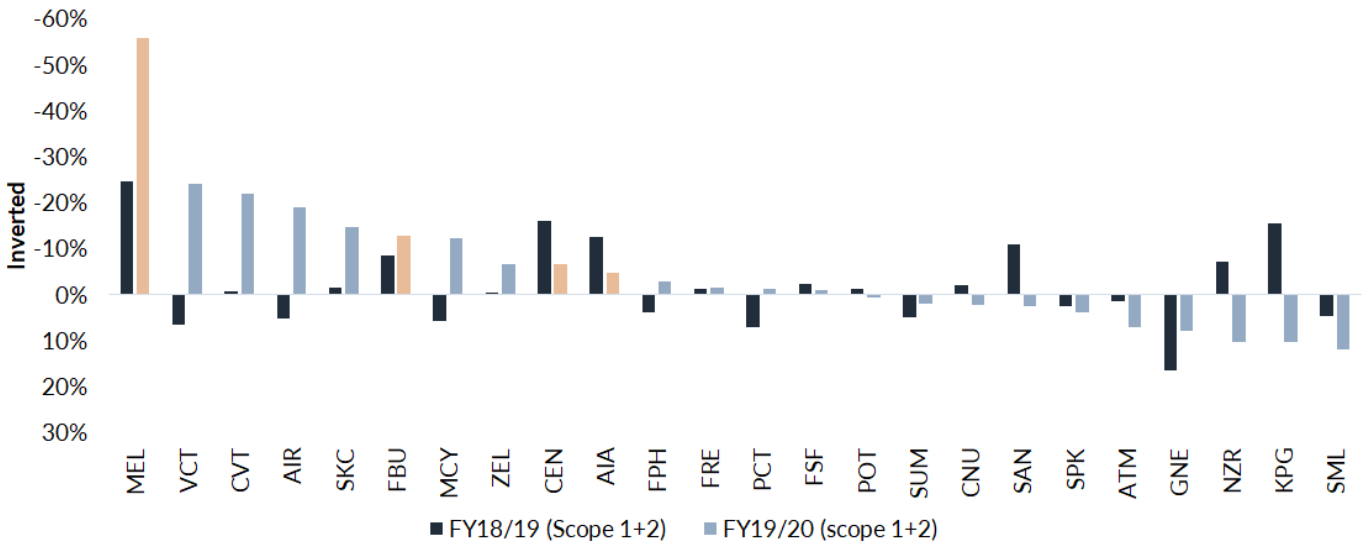


Source: Forsyth Barr analysis, Company disclosures

Among the many ways to measure success in reducing emissions, consistent delivery over time will be key...

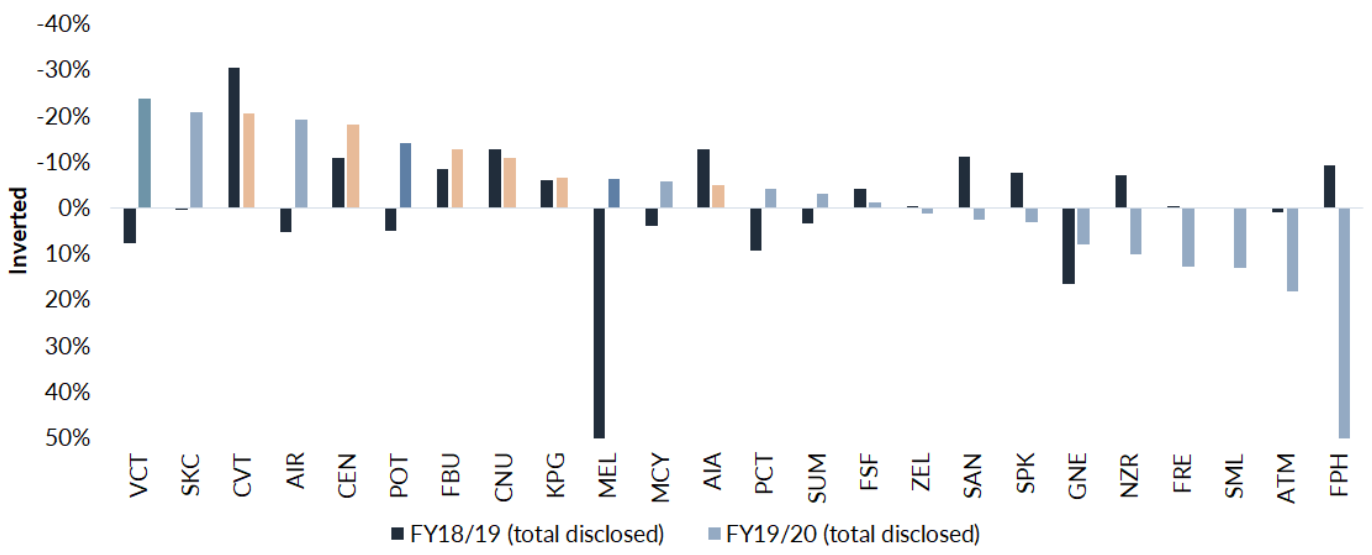
There are many ways to measure emissions; only scope 1+2 (within "control"), total scope emissions, emissions in relation to revenues, unit production. We will not attempt to answer the question we asked in our report title: "Part of the Problem or Part of the Solution?" but we do believe that investors aiming to direct their investments towards the "solution" companies will, and should, look at numerous indicators over time to inform their decisions. A single year, in particular a single year like the one we have just had, is not likely to have a meaningful impact on the company's standing within the ESG investing community, however, building up a track record of reducing emissions could prove to be valuable in the future. Of the 24 companies for which we have three years of consistent scope 1&2 emissions data, only four have delivered at least -4% annual decline over the last two years (CEN, MEL, FBU and AIA). However, both FBU and AIA have benefited from decreased scope of their business.

Figure 52. Scope 1+2 emissions,annual change, four companies (CEN, MEL, FBU and AIA) have two consecutive years >-4%



Source: Forsyth Barr analysis

Figure 53. Total emissions (if disclosed) annual change, six companies (AIA, CEN, CVT, KPG and CNU) have two consecutive years >-4%

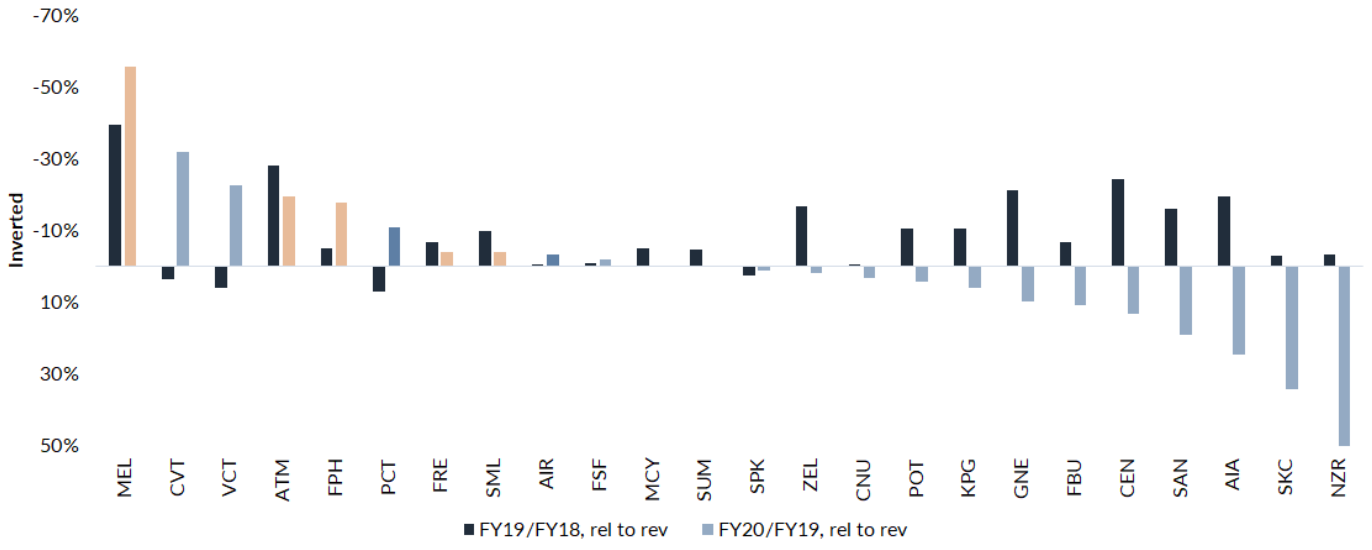


Source: Forsyth Barr analysis

Adding scope 3 emissions changes the picture somewhat; MEL in particular had a substantial (7x) increase in scope 3 emissions in FY19 due their Swaption agreement with GNE. Only CEN and FBU show consistent improvement looking at both Scope 1+2 as well as total scope emissions.

Another, more nuanced approach, is to look at emissions in relation to revenues, even though it is also a crude metric, it gives investors a better idea of underlying improvements in emissions intensity. The A2 Milk Company (ATM), Synlait Milk (SML), FRE and FPH are the companies with consistent reduction in Scope 1+2 emissions in relation to revenues.

Figure 54. Scope 1+2 emissions relative to revenues five companies (MEL, ATM, FPH, SML and FRE) have two years >-4%

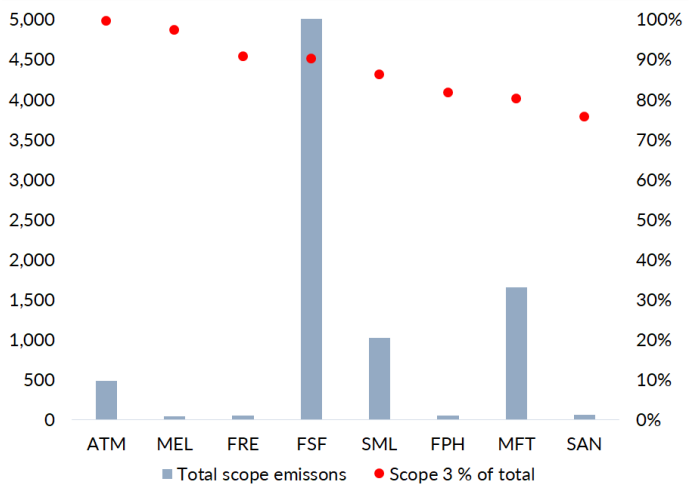


Source: Forsyth Barr analysis

...but watch out for companies with large Scope 3 relative to Scope 1+2 emissions — they could become disclosure victims

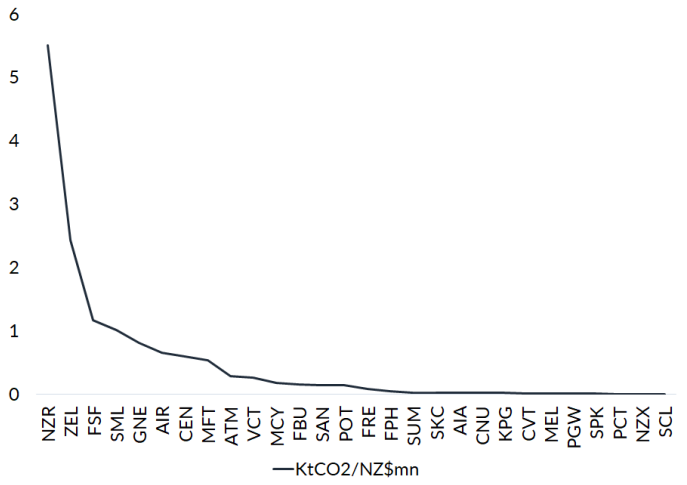
Scope 3 emissions is the "latest addition" to common disclosures, and it is still somewhat patchy, but the majority of larger cap companies under our coverage now disclose Scope 3 emissions, some for the first time. We believe this has the potential to alert investors to some "hidden" or secondary exposure to carbon emissions. Mainfreight (MFT) and the agriculture exposed names (ATM, SML and FSF) are most exposed. MEL, despite very low overall emissions, may also be subject to increased scrutiny.

Figure 55. NZ companies with >50% Scope 3 emissions relative to total emissions



Source: Forsyth Barr analysis

Figure 56. ktCO2/NZ$m revenues



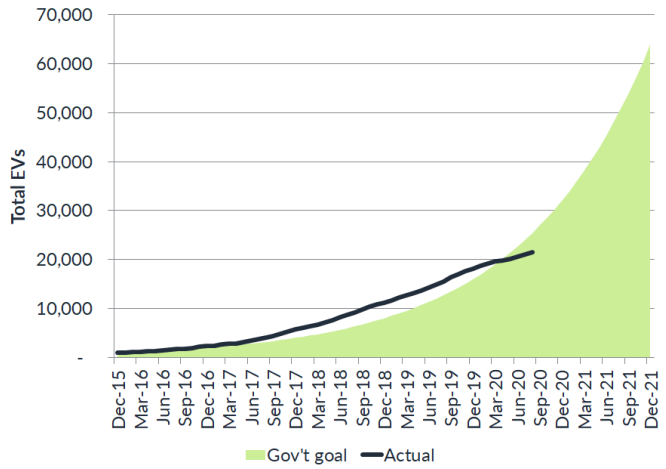
Source: Forsyth Barr analysis

Overall we expect a changing landscape, with more varied approaches taken by investors. The ESG "winners", we believe, will be the companies with clear goals to manage their businesses in accordance with a two degree celsius path, and ability to deliver on those goals. Several companies shows promise, highlighted above, but we expect a multi year discovery process, aided by improved and streamlined disclosure.

Vector 3: Clean & green, impact investing and stranded assets

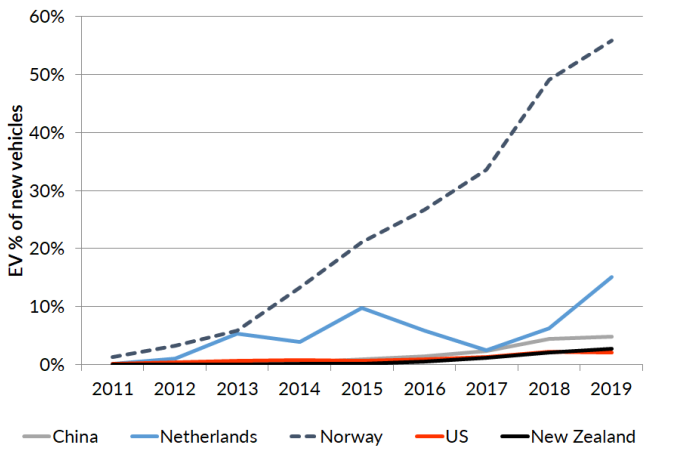
We believe focusing on emissions alone is not enough. Investors need to factor in pace of technological change, ability and costs for incumbents to adapt as well as local variations. New Zealand is, in our view, uniquely well positioned to see fossil fuels being replaced within electricity generation, yet we do not see it as a big threat as the incumbents are likely to dominate the transition. Within the oil & gas complex it is more complicated. New Zealand has so far seen slow adoption rates of EVs as the car market is dominated by second hand imports and has a low value stock overall. Prime Minister Ardern's declaration of "climate emergency" with an associated mandate by government agencies to only buy electric cars may speed up the transition.

Figure 57. EVs in NZ, Gov't goal vs actual uptake



Source: Forsyth Barr analysis, MBIE

Figure 58. EV adoption can be fast. If the price is right.



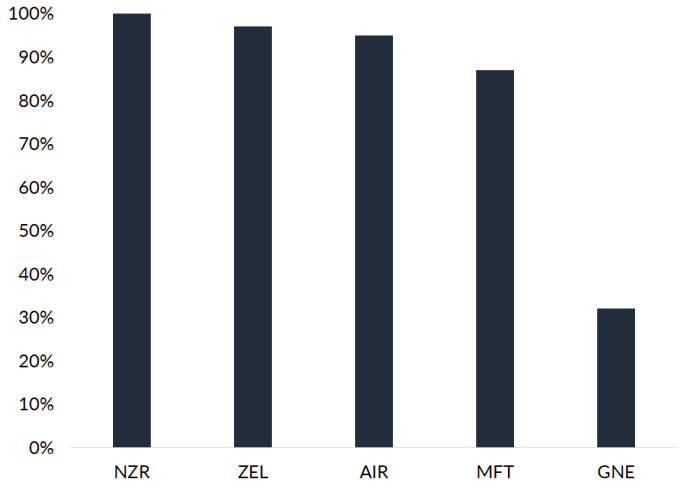
Source: Forsyth Barr analysis, IEA

Government priorities are not only about the environment and international commitments. New Zealand has a large current account deficit, exacerbated by the recent dramatic drop in tourism following COVID-19. New Zealand has an abundance of untapped domestic renewable energy while petroleum products contribute >10% to its current account deficit. Being an island with no domestic car production could result in rapid, disruptive change once EVs reach parity with petrol cars, forecast to take place within the next decade.

How did you go bankrupt? Slowly, then suddenly...

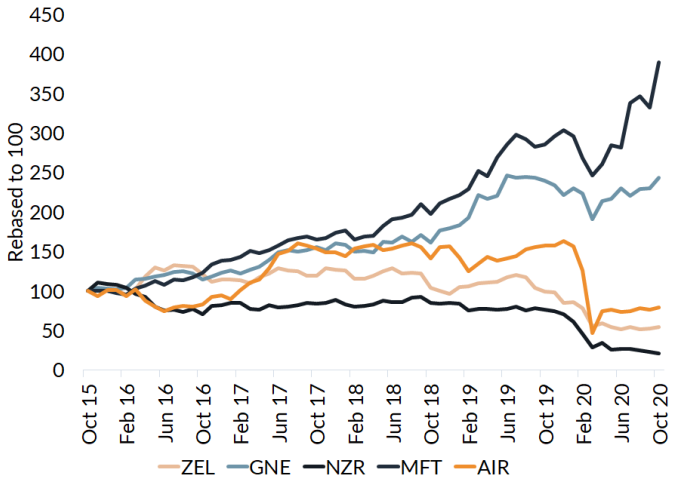
Within the high emitting part of our coverage, we only believe there to be risk of disruptive change within the oil & gas assets, ZEL and NZR. We see the risks within agriculture, electric generation and aviation as one of increased costs, but not displacement. Within the oil & gas complex we believe disruptive change to be far away, but investors are likely to already today factor the risk into cost of equity.

Figure 59. Fossil fuel dependent revenues (%), select companies



Source: Forsyth Barr analysis. Fossil fuel dependent revenues as % of total revenues.

Figure 60. Five year total shareholder return, big emitters



Source: Forsyth Barr analysis, Refinitiv

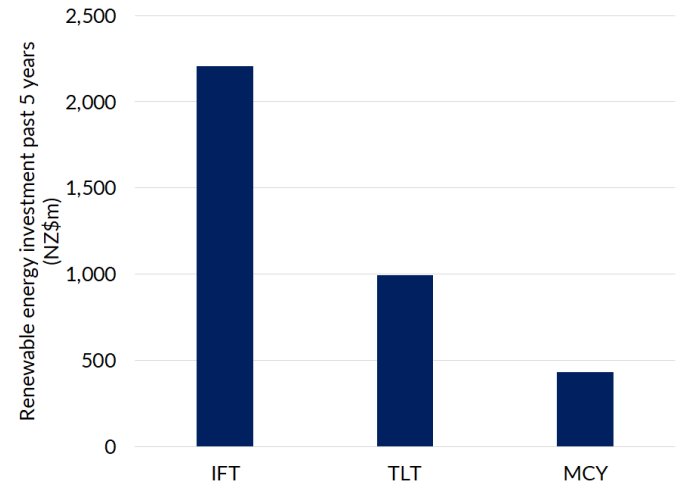
While companies like AIR and MFT, or the latter's independent contractors, may find themselves with stranded assets at some stage, asset life is much shorter which reduces the risks materially. Should, for instance, electric transport displace MFT's current fleet of vehicles, even under a relatively short time frame MFT would simply replace retiring diesel trucks with new electric ones, not an option if you own petrol stations or a refinery.

Supporting systematic change

Renewable energy remains the top theme within impact investing, and a substantial build out of renewable energy is a cornerstone of a transition to a low carbon economy. New Zealand has an abundance of renewable energy providers which carries significance on a global scale.

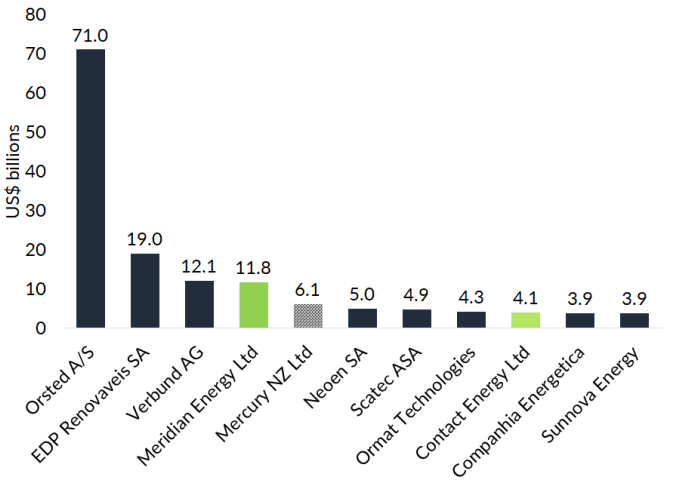
MEL, despite its modest market cap of US$10bn, is one of the four largest companies in the iShares Clean Energy ETF, MCY is excluded due to liquidity reasons, but would comfortably be in the top 10 on market cap. CEN is currently screened out from some more stringent ESG funds due to its use of fossil fuels but is included in the iShares Clean Energy ETF. Should CEN exit gas generation it could transform from being screened out of some ESG funds to being a top 10 market cap within the most popular impact investing theme.

Figure 61. Net addition of renewable energy, NZ, by company



Source: Forsyth Barr analysis

Figure 62. Utilities in the iShares Clean Energy ETF



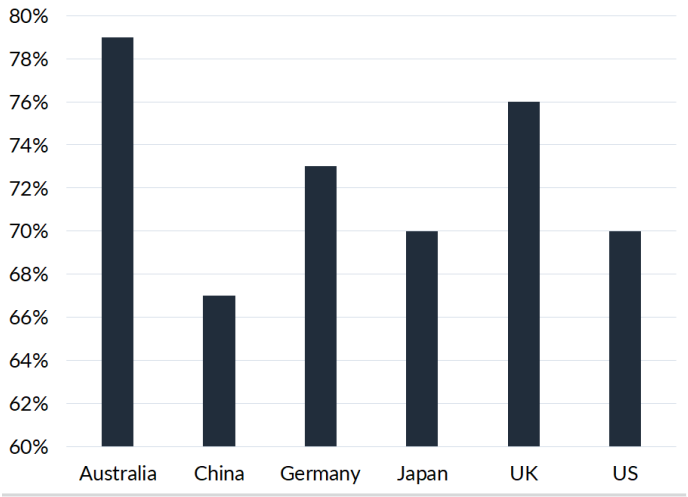
Source: Forsyth Barr analysis, Refinitiv. Mercury Limited is not a a holding in the iShares Clean Energy ETF. Market caps as at Dec 4 2020.

Another New Zealand company, IFT, could also benefit due to its significant direct investment in renewable energy. We estimate that IFT commits more capital to the build out of renewable energy than the rest of the New Zealand electric utilities combined, partly through its majority ownership in Tilt Renewables (TLT) and partly through its part ownership of Longroad in the US.

NZ clean and green

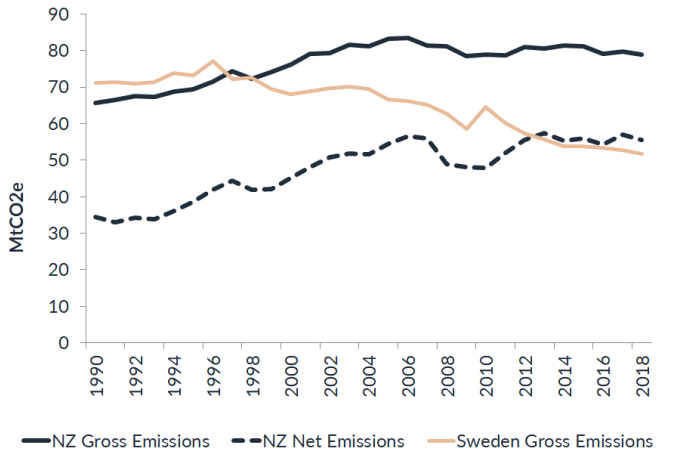
New Zealand is associated with being clean and green despite the fact that its emissions do not stand out as low in an international context, neither does New Zealand stand out with regards to reducing emissions. Contrary to many European countries, New Zealand's gross and net emissions are substantially higher today vs. the 1990 Kyoto base line year.

Figure 63. Nationality of survey respondents that associate NZ with "The environment is clean and unpolluted"



Source: Forsyth Barr analysis, Tourism NZ. As at October 2020, 6 month rolling avg.

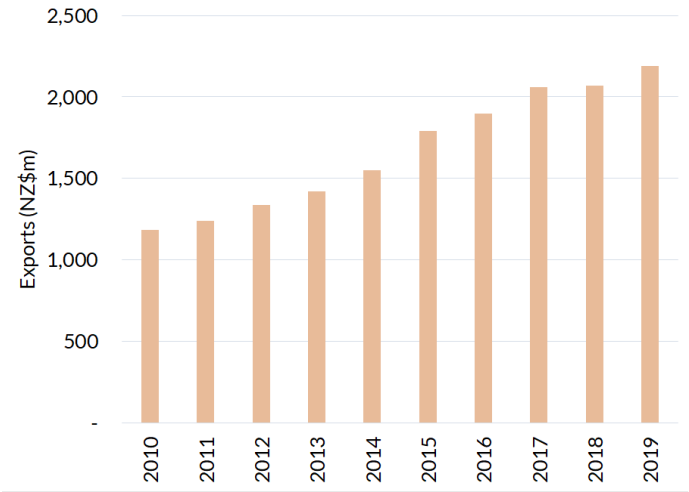
Figure 64. NZ gross and net GHG emissions



Source: Forsyth Barr analysis, Ministry for Environment, World Bank.

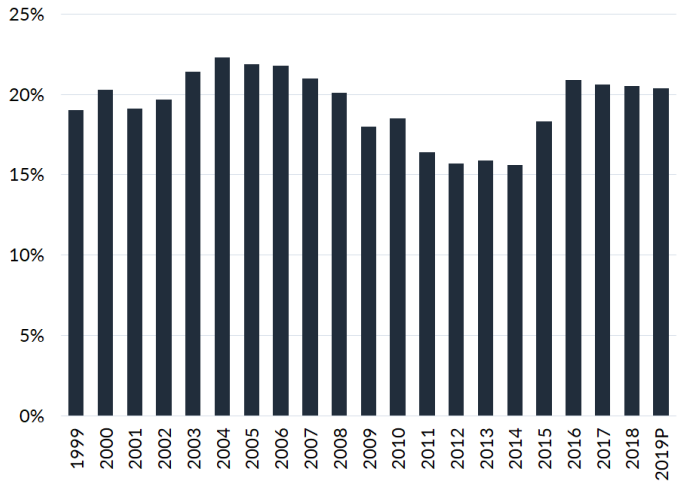
We believe that New Zealand's increasingly self-assured messaging around climate change and climate risks can provide a boost to New Zealand's image within key sectors such as food and tourism. However, with increased global scrutiny on emissions, questions may be asked around New Zealand's messaging in relation to tangible achievements to date. Sweden and a few other countries with equally self-assured messaging have brought carbon emissions down substantially since 1990.

Figure 65. NZ high end food exports (Wine, Manuka honey)



Source: Forsyth Barr analysis, Stats NZ

Figure 66. International tourist spend as % of total exports



Source: Forsyth Barr analysis, Stats NZ

Company and sector analysis: five high emitting sectors in focus

We believe all sectors will be subject to increased scrutiny with regards to climate change practises, however, all sectors are not created equal. Within New Zealand we see five sectors as most impacted; (1) energy, (2) oil & gas, (3) dairy, (4) transport & tourism, and (5) construction. Overall we see the broad trends as supportive for energy, detrimental to oil & gas, and creating both challenges and opportunities for the other three sectors. The challenges are both direct (increased cost) but also one of perception. We are of the view that New Zealand companies overall take ESG, in general, and climate change, in particular, seriously. SML, FBU and AIR, to mention three of many, have ambitious targets and are starting to deliver. However, with wholesale "net zero" targets introduced by portfolio managers and a general decarbonisation of large proportions of managed assets, they still face the risk of being screened out due to high emissions intensity relative to the index overall. This will increase the demand on the companies to communicate their ambitions at the highest corporate level and they would likely benefit from including their targets and achievements in the traditional earnings releases.

Energy: Decarbonisation is an opportunity for the electricity sector

Electricity will be at the centre of New Zealand's decarbonisation efforts. Outside agricultural carbon emissions, transport and industrial emissions are the next largest and more importantly easier to reduce through the electrification of transport and industrial heat. Given the potential breadth of this topic, we have focussed on high level analysis. Decarbonisation is an opportunity for the electricity sector.

- From increased electricity demand, which will provide support for wholesale electricity prices
- From the replacement of thermal generation with renewable generation. Whilst there is a modest earnings headwind for CEN and GNE from closing thermal generation, both companies will become increasingly renewable, improving their ESG scores

However, these are long-term trends. We do not expect electricity demand from decarbonisation of the economy to materially lift electricity demand until after 2030. In addition, with the exception of CEN's TCC generation plant, the closure of thermal generation is also more likely to occur at the back-end of the decade (assuming NZAS remains open).

What is required to deliver 100% renewable electricity? Is it doable?

At the 2020 election, the Labour Party put forward a target of 100% renewable electricity generation by 2030. Putting to one side the fact both the Productivity Commission and the Interim Climate Change Commission said this isn't the right goal (focussing on reducing carbon emissions from the energy sector as a whole, not just electricity, is more effective), we note below what would be required to achieve a 100% renewable electricity system. Coal/gas generation play two very important roles in the electricity system:

- Provide cover when dry periods result in hydro storage lakes running low on water (and therefore fuel) to run the hydro-electric plants
- Enable peak demand to be met (typically evening on cold winter nights)

Figure 67. Thermal generation assets in NZ

Plant	Owner	Date built	Type of generation	Capacity (MW)	Average annual generation (GWh)	Capacity factor	Role in system
Rankine units, Huntly	GNE	1982-1985	Coal/gas	500 (2x250MW)	1,390	32%	Dry year support
Unit 5, Huntly	GNE	2007	Combined cycle gas turbine	400	2,690	77%	Base load
TCC	CEN	1996	CCGT	380	975	29%	Winter base load
Whirinaki	CEN	1978	Diesel	155	4.5	0%	Peak demand
Stratford peakers	CEN	2011	Peaker	200 (2x100MW)	410	23%	Peak demand
Junction Road	Todd Energy / Nova	2020	Peaker	100 (2x50MW)	300	34%	Peak demand
McKee	Todd Energy / Nova	2013	Peaker	100 (2x50MW)	300	34%	Peak demand
Unit 6, Huntly	GNE	2004	Peaker	50	73	17%	Peak demand
Total				**1,885MW**	**6,143**	**37%**	

Source: Forsyth Barr analysis, Company reports

In energy terms, after current under construction generation (Waipipi & Turitea wind farms and Ngawha geothermal) are completed, we estimate thermal coal/gas generation will generate ~5,500GWh per annum (in an average hydrology year). However, in dry years, when hydro generation is below average, up to an extra ~3,000GWh is required. In our view, the energy challenge is relatively easy to solve. Whilst it would result in an "over-build" and increase spilling of water, there is currently more than 2,000MW of consented wind farms and 250MW of consented geothermal which will deliver sufficient energy to replace all of New Zealand's thermal generation (all of the wind generation consents expire by the end of 2024. However, the key point is there is plenty of wind resource in New Zealand).

Figure 68. Thermal generation and required energy replacement

	Close Rankines & CCGTs		Close all thermal	
	MW	GWh	MW	GWh
Thermal generation closed	1,250	1,000	1,920	5,500
Dry year reserve energy to be replaced (GWh)		1,500		2250
Total capacity/energy to be replaced	1,250	2,500	1,920	7,750
Note: the 2,000GWh cover is less as this is effectively overbuild in the system, forcing hydro to run higher than historic average				
Source of energy replacement to cover thermal plant closure				
Geothermal (Tauhara)	250	2,000	250	2,000
Wind	150	500	1,727	5,750
Required build	**400**	**2,500**	**1,977**	**7,750**

Source: Forsyth Barr analysis

Replacing capacity is more of a challenge. All of the thermal generation is North Island based, so ensuring there is sufficient generation to meet mid-winter peak electricity demand without thermal generation is the challenge. Whilst the additional generation to meet the energy short-fall will help, wind generation is not designed to meet peak electricity demand because there is no guarantee the wind will blow.

We see grid-scale battery technology playing an important role in meeting future peak generation requirements. Batteries are getting bigger and costs are coming down quickly. A 2019 NREL report (summarising other reports on grid-scale battery costs), indicates the current cost is ~US$300/kWh (for a 4-hour release battery), and should fall to ~US$200/kWh by 2030.

If NZ were to become 100% renewable, we estimate 150MW of demand side response and 650MW of batteries, (in addition to the generation required to meet the energy short-fall) would be sufficient to meet peak demand requirements, at a capital cost of ~NZ$1b.

A brief word on Project Onslow

Project Onslow is a massive pumped hydro scheme that will be investigated in 2021 as part of a wider MBIE study looking at solving New Zealand's dry year reserve and peak demand issues (in the context of a 100% renewable electricity goal). Whilst the massive storage lake will resolve dry year risk, it will need significant transmission upgrades to be of any use in helping meet winter North Island peak electricity demand. Project Onslow will be expensive — at least NZ$4b, before adding in the cost of filling the lake the first time and any transmission upgrades. Our current view is that there are likely to be more economic solutions than Project Onslow — as noted above.

Increasing electricity demand only makes the 100% renewable electricity goal more challenging

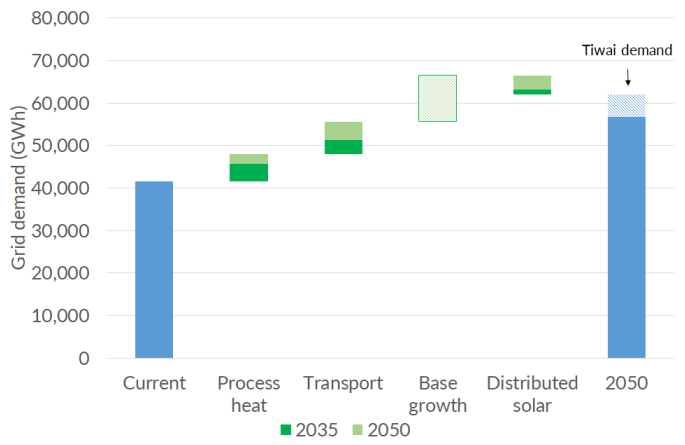
Whilst electricity demand growth over the next decade is likely to be limited (the future of NZAS is a massive uncertainty) decarbonising the economy is expected to increase electricity demand growth from 2030 onwards.

The key drivers of electricity demand in the next three decades will be the electrification of process heat and the electrification of transport. In Figure 69 and 70 we show MBIE's and Transpower's expectations for an accelerated decarbonisation scenario. Both show a similar demand increase from electrification of process heat of between ~6,500 and ~6,800GWh and assume that mostly low and medium process heat is converted. Transpower is expecting a much larger increase from the electrification of transport than MBIE, forecasting demand growth of ~15,900GWh compared to ~7,600GWh. Both scenarios assume there is government intervention to encourage the uptake of electric vehicles, which we see as the most likely outcome.

We are skeptical of the electricity demand growth expectations associated with general economic growth from both MBIE and Transpower of between ~5,000 and ~10,000GWh, given there has been no demand growth in the past decade. We also view the distributed solar generation expectations as optimistic.

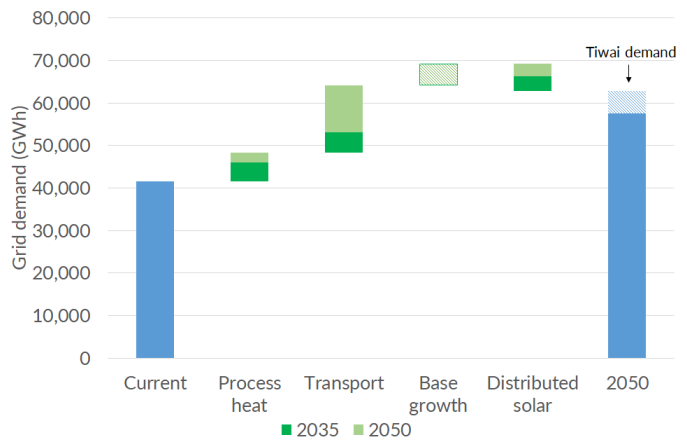
Despite arriving at the conclusion in different ways, both MBIE and Transpower assume demand growth of ~+60% in the next two decades (if NZAS stays open). This increase in demand makes the 100% renewable target even more challenging.

Figure 69. MBIE environmental scenario



Source: MBIE, Forsyth Barr analysis

Figure 70. Transpower accelerated electrification scenario



Source: Transpower, Forsyth Barr analysis

Impacts on the listed sector if it goes 100% renewable?

We note below the key impacts from NZ going 100% renewable:

- **Stranded thermal assets** — CEN and GNE will have to close thermal generation. It is now cheaper to build new renewable generation than it is to run existing baseload thermal. This situation is only going to get worse over time as carbon prices increase. Both GNE's support of Waipipi and CEN's Tauhara plans are being built to replace current thermal generation. Thermal generation has always struggled to earn an appropriate economic return, so lost earnings will not be significant.
- **Increased wholesale price volatility** — As more base load renewable generation comes onto the market it will result in greater wholesale electricity price volatility. When there is a surplus of renewable energy (because it is wet and/or windy) wholesale electricity prices will be very low. Conversely, during dry spells and when the wind does not blow, wholesale electricity prices will soar, sending signals for demand side response and/or battery discharge. The electricity gentailers are skilled at managing wholesale electricity price volatility, hence, we do not see this as a particular issue.
- **ESG improvement for CEN and GNE** — The main benefit of increasing renewable electricity generation is the improvement in ESG scores for CEN and GNE. As noted earlier in this report, MCY and MEL have benefitted from being 100% renewable electricity generators. CEN and GNE should, therefore, also benefit as their generation portfolio become increasingly renewable, enabling them to close the value gap to MCY & MEL.

That said, this is both a long-term story and a relative story. It will take at least 10 years before CEN and GNE are also 100% renewable. We suspect there will be a combination of CEN & GNE being rerated upwards and MCY & MEL valuation metrics falling closer to CEN & GNE.

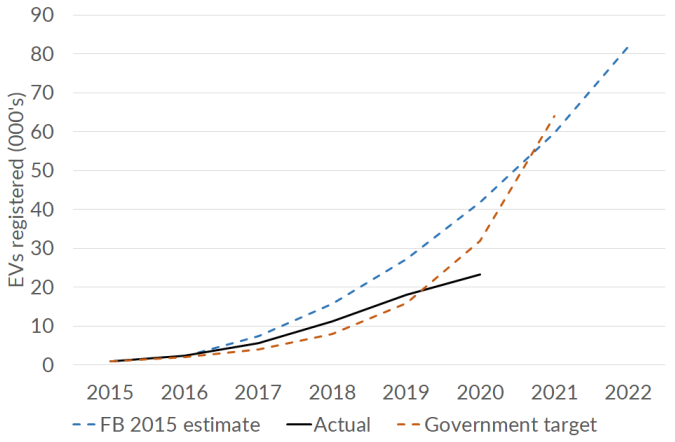
Oil and Gas: EV adoption has little to show for so far, but time and regulation not on its side

The long-term risk for the oil and gas sector, both upstream and downstream, is reduced demand due to consumers switching to alternative, greener fuels. Bio-fuels have been in the mix (ZEL has built a currently mothballed bio-fuels manufacturing facility), but there is insufficient production capacity to replace fossil fuels (the ZEL bio-fuels plant had a 20m litre capacity, vs. diesel demand of 1.5b litres). The market is heavily focussed on electricity as the main replacement fuel, but there is increasing focus on hydrogen as an alternative fuel.

We wrote an extensive piece looking at the EVs and how quickly they are likely to enter the market in 2017. We concluded that it will take time for EVs to replace fossil-fuelled vehicles. Surprisingly, little has changed at this point and EV take-up has fallen materially behind the government's goal of 64,000 EVs (either pure electric or plug-in hybrids) by the end of 2021. The issues hindering EV take-up in 2017 still exist:

- The cost of new EVs remains a significant premium to petrol/diesel engines
- The range of options has not improved materially

Figure 71. Electric vehicle registrations vs. government target & our 2017 estimates



Source: Ministry of Transport, Forsyth Barr analysis

Figure 72. Electric vehicles available for purchase in 2017 compared to 2020

		2017	2020	Change
BEV	# makes	4	9	+5
	# models	6	28	+22
	% sub-$100k	50%	54%	+4%
	% sub-$60k	0%	4%	+4%
PHEV	# makes	6	10	+4
	# models	9	27	+18
	% sub-$100k	67%	52%	-15%
	% sub-$60k	11%	22%	+11%
BEV	Average price	123,823	110,482	-11%
	Average range	348	381	10%
PHEV	Average price	127,175	127,710	0%
	Average range	37	40	9%

Source: Forsyth Barr analysis

That said, more car manufacturers are setting out ambitious plans to develop electric replacements and regulatory changes are likely to boost take-up in coming years. In particular, we expect the feebate scheme that NZ First blocked in the last electoral cycle to be introduced within the next three years. There is also the possibility that a ban on the importation of petrol/diesel light vehicles will be introduced — designed to coincide with the UK ban in 2030. This is something that Green Party co-leader James Shaw is pushing at present. Whilst we acknowledge the downside risk to ZEL and NZR, we are sceptical electric vehicle alternatives will have fully cracked the cost, range, and option problem.

Whilst we see EVs as largely replacing the light vehicle fleet in time, heavy vehicles that need to travel long distances and planes are currently not suitable for batteries, and batteries may not be the best long-term solution. Significant technological improvements would be required. The issue is batteries weigh a lot and cannot store enough energy for the journeys these vehicles make.

If hydrogen becomes the fuel of choice for long haul/heavy load vehicles, the oil and gas downstream players may still have a part to play. ZEL and NZR are both used to handling hazardous fuels, and that will be a primary consideration with hydrogen.

The asset stranding risk for both ZEL and NZR have been well understood by the market for some time and we believe have been factored into their current share prices.

Dairy: Crucial to convince investors and consumers it is part of the solution

The three NZ listed dairy sector companies all clearly take sustainability seriously — with good disclosure, a multitude of initiatives underway and a suite of quantitative targets. However, some of these are best described as 'stretch targets', with the sector facing complex challenges. The biggest challenge is natural animal emissions, while we would argue the largest near-term risk is the sector's reliance on coal in processing. SML is leading the way and a clear standout in the sector.

Emissions in a snapshot

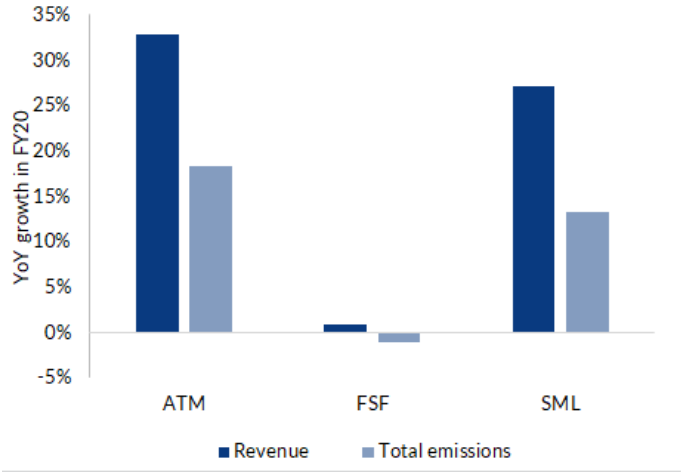
- **Progress over the past 12 months:** Yes, emissions per unit down and in SML's case meaningfully so. However, headline emissions for both SML and ATM were up — reflecting business growth (and for SML, the acquisition of Dairyworks)
- **Intent:** High. Sustainability and environmental priorities are clearly integrated within all company strategies
- **Key challenges:** Reliance on third parties (most importantly buy-in from farmers), natural animal emissions and who pays
- **Direct considerations:** Cost is a material barrier, particularly on-farm if/when emissions are priced and for the sector to shift away from coal. The majority of the burden currently appears to be falling on the processors, however, importantly consumers do appear willing to pay a premium which should help
- **Indirect considerations:** There are risks, however, NZ is also well placed to be best-in-class and enhance its premium positioning

What's changed in the last 12 months?

Headline metrics do not flatter the sector, with total emissions increasing for both SML and ATM in FY20 (including and excluding Scope 3), while FSF reported a small decline. The overall NZ listed dairy sector thereby saw emissions unchanged over the past 12 months (-0.2% to 25k tCO2-e). However, digging deeper this reflects business growth (and in SML's case also acquisition) with progress evident on emissions intensity vs both revenue and volumes. Unsurprisingly, the most progress has been made 'off-farm'

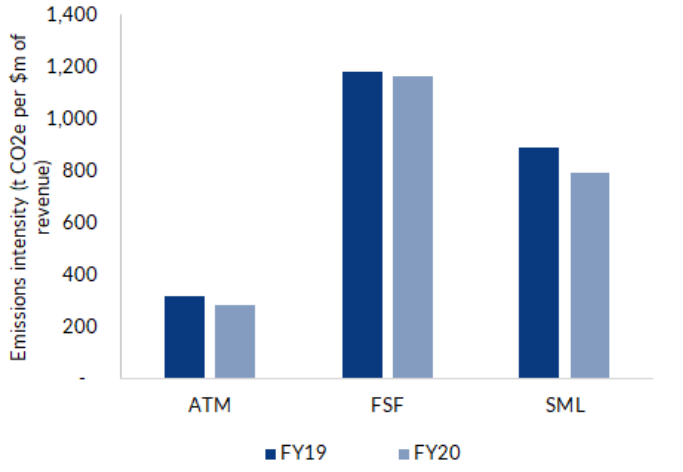
where the processors have direct control and aren't reliant on third parties (farmers and animals). The other most notable sector achievement was SML's B Corp certification.

Figure 73. FY20 growth in total emissions vs revenue



Source: Forsyth Barr analysis, Company disclosures

Figure 74. Emissions intensity



Source: Forsyth Barr analysis, Company disclosures

The a2 Milk Company (ATM) — intent is there, but largely reliant on third parties for material change

2019 saw a marked step-up in ATM's focus and disclosure on environmental impact and sustainability more broadly, with 2020 a further step-up again. Disclosure is now more comprehensive, data quality improving, various climate scenario analysis was undertaken to "inform strategic planning today" and (for the second year) ATM purchased carbon credits to offset indirect and direct emissions. However, the biggest change is plans to launch "The a2 Impact Fund" in FY21 — redirecting the value of indirect GHG emissions to invest in tangible programmes to drive change.

Emissions have increased through FY20, albeit not to the same extent as revenue growth.

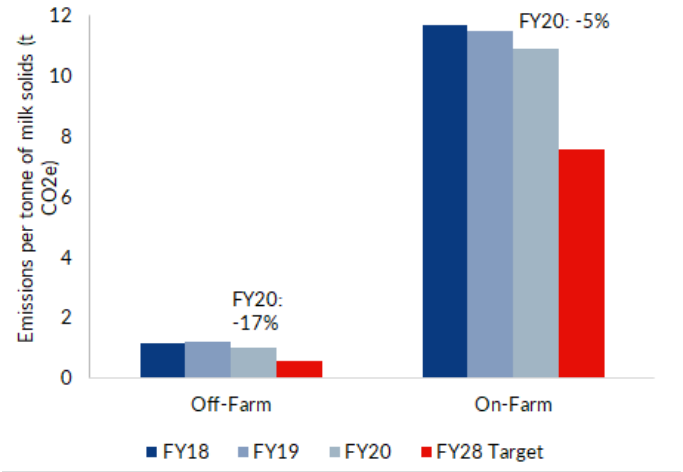
Synlait Milk (SML) — headline metrics don't tell the full story; substantial progress, with B Corp certification the highlight

A clear standout in terms of disclosure, willingness and initiatives underway. SML provides particularly impressive disclosure around its carbon footprint, broken down by line-item. This includes a Sustainability Report and separate Greenhouse Gas Inventory Report. SML has bold targets (comfortably ahead of policy) and is taking some opex/capex risk frontfooting the necessary change. This should also help support its premium positioning. Sustainability is included throughout SML's strategy, reinforced by the company by-line "doing milk differently for a healthier world".

Over the past 12 months, surface level metrics do not flatter SML, however, digging deeper shows substantial progress — with both on-farm and off-farm emissions per tonne of milk solids reducing materially (Figure 75). The most notable other achievement during the period, was SML achieving B Corp certification in June 2020.

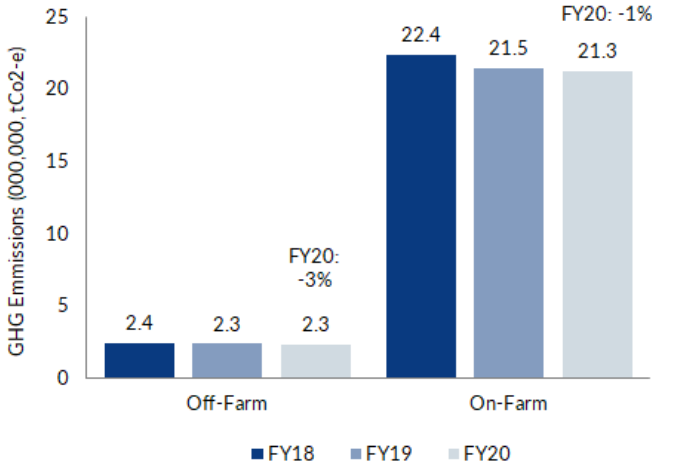
The company has a multitude of initiatives underway and our engagement with management reinforces a lot of work has, and is, being done testing, learning and modelling various options to reduce its environmental footprint and assist its supplier farmers. We expect to see further progress in FY21.

Figure 75. SML emissions progress vs targets



Source: Forsyth Barr analysis, SML sustainability report

Figure 76. FSF emissions progress



Source: Forsyth Barr analysis, FSF sustainability report

Fonterra (FSF) — every step counts; hard road still ahead

FSF faces the largest challenge, primarily on-farm, but also in processing. The complex journey is well underway with various targets, albeit hurdles are evident and more solutions are still required. The co-op has clearly done a lot of work across numerous projects over the last 12 months. Headline metrics are moving in the right direction, however, the gradual progress at the group level reinforces the magnitude of the challenge, particularly given the size of the co-op.

Key progress over the past 12 months include: (1) launch of a premium payment for farmers (up to 10c per kgMS) if the farm meets sustainability and milk quality targets, (2) launch of carbon-neutral milk alongside Foodstuffs, (3) moving one of its key Waikato sites (Te Awamutu) to renewable energy (from coal to wood pellets) which will reduce FSF's coal use by almost 10%, (4) delivered on its longstanding target of reducing energy intensity at NZ manufacturing sites by 20%, from a 2003 baseline.

Triple bottom line reporting (on its staff, the environment and the business) reinforces the co-op's commitment. Further progress, particularly with GHG emissions from its manufacturing, was evident in 1Q21.

Direct considerations

Working to lower emissions is no longer a choice, however, higher cost is a reality for the dairy sector. The processors are leading the discussion, taking some risk and already bearing additional cost/opex. What it will cost and how the burden will be shared remain the most difficult questions to answer, and will likely evolve through time. Importantly, consumers do appear willing to pay a premium.

(1) Who bears the cost? Processors kick-started it, but mix likely in time — importantly consumers are willing to pay a premium

Reducing emissions, and other sustainability measures, will require bold decision-making and trade-offs. Returns are harder to measure for some of these projects, particularly versus the counterfactual of not investing. There is likely to be some efficiencies along the way, however, ultimately there will be a cost burden (opex and capex).

Decisions are already being made on more than just traditional economics and with a long-term lense, particularly at SML (with the recent electrode boiler the most obvious example). In theory the Farmgate Milk Price Manual limits the processor's (particularly FSF's) direct exposure to additional opex/capex. However to date, the processors appear to be taking most of the capital and cost risk, including incentive payments to farmers, research projects/initiatives, cost burden of some switching away from coal.

We ultimately expect the cost burden to be shared through the supply chain participants (i.e. farmers, processors, transport, brand, customer), however, how is less clear and will likely to be difficult to measure. Initial survey results show the consumer is prepared to vote with their wallets. As an example a global survey from IBM saw: *nearly eight in 10 respondents indicate sustainability is important for them. For those who indicated it is very/extremely important, over 70% would pay a premium of 35%, on average, for brands that are sustainable and environmentally responsible.* New Zealand dairy is already pursuing value over volume strategies, which makes sense and should help share the burden.

(2) What does it cost to shift from coal?

The use of coal in the manufacturing process is one of the largest risks and challenges for the dairy sector. In particular it represents a risk to Brand NZ and our 'clean green' image.

Alternative options are not new to the sector, with large scale boilers available that can deliver the required steam pressure and are already in use in some global markets. However, upfront costs are high and it doesn't appear economic at the moment for mass conversion from coal boilers to electric. Opex (namely electricity costs) is currently higher, although wholesale agreements are available and the likelihood of increasing carbon costs could shift those economics. However, the largest barrier is capex, particularly transmission costs. While the capex of a boiler is broadly similar for a greenfield, conversion costs appear to range from nothing to highly prohibitive, depending on the specification and age of the boiler. Transmission costs will vary by site but various anecdotes have range from NZ$40m (one site) to NZ$100m+ (two sites) — a material hurdle. There is potential transmission costs could be at least partially resolved at a policy level, with the cost of capital of government investment low.

Wood biomass is also being assessed by the processors, with some conversion done in 2020, however, this also has some challenges particularly constraints on the supply of wood pellets.

Figure 77. SML Dunsandel: NZ's first large-scale electrode boiler

Source: Forsyth Barr analysis

Figure 78. Scenario modelling of dairy on-farm system change (sample of farms)

	Change in GHG	Change in EBIT
Reduce stocking rate by 10%		
Farm 1 (pre: 2.7 cows/ha, 4.9 tDM/cow offered)	-6%	+12%
Farm 2 (pre: 2.8 cows/ha, 5.4 tDM/cow offered)	-7%	-4%
Farm 3 (pre: 2.3 cows/ha, 5.0 tDM/cow offered)	-8%	-3%
Farm 4 (pre: 2.9 cows/ha, 5.9 tDM/cow offered)	-6%	+11%
Replace N fertiliser with bought-in feed	-11%	-18%
In-shed feeding with increased cow numbers	+11%	+12%
In-shed feeding, no increase in cows	+10%	+9%
Grow maize instead of buying in PKE	-4%	+0%
Limit N fertiliser to 100 kgN/ha	-5%	-12%
Shift to once-a-day milking	+3%	+21%

Source: Forsyth Barr analysis, New Zealand Agricultural Greenhouse Gas Research Centre

(3) What does it cost on-farm?

There is no easy answer to this question given the number of variables at play. Key considerations:

- **No 'silver bullet':** Various modelling and scenarios have been trialled which demonstrates each farm is different (Figure 78). While a reduction in stocking rate is often proposed as a 'silver bullet' mitigating strategy, the resultant impact on farm profitability can vary, depending on where the farm sits on its profitability curve
- **More research and solutions still needed:** It has been estimated that biological emissions can be reduced by up to 10% for the dairy sector with currently available farm management practices. Most of these mitigation measures involve good farm practices, such as feed utilisation, choice of feed type and being more selective about how and when to apply fertiliser and effluent. Significant research is underway including various pilot studies on breeding low-emitting sheep and cattle and testing low methane feed
- **Pricing emissions likely to be problematic, if full priced:** The government has previously estimated the average dairy farm — with a 95% discount on emissions and carbon price of NZ$25 a tonne — would incur costs of NZ$0.01 a kg of milk solids. However, both of these inputs are unlikely sustainable in the longer-term. Under a scenario where emissions are fully priced (at NZ$25 per CO2e tonne) using an average farm (433 cows at peak milk), this implies an additional cost of NZ$21,650 or c. 3% lift in expenses. This becomes a meaningful burden as the carbon price increases
- **Incentives available, but not likely to fully cover additional cost:** Farmers are already being offered incentives to improve farming practices and sustainability measures, including via milk price premiums. This, combined with some efficiencies, help but we understand this does not always cover the full cost of the needed initiatives

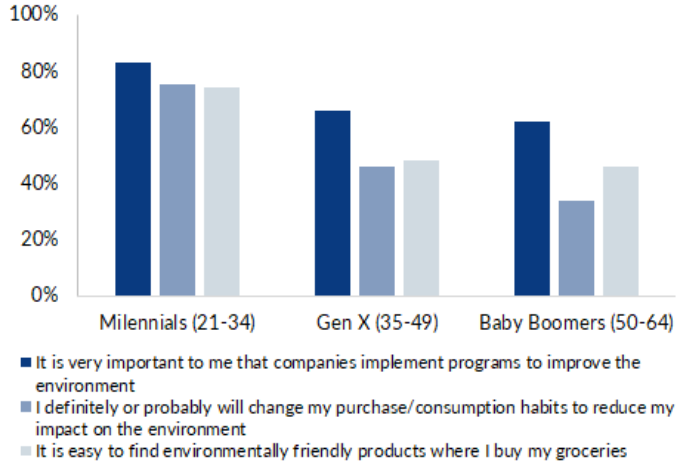
Indirect considerations

(1) Changing consumer preferences — perception is reality

There is a multitude of research and data showing growing consumer preferences and behaviour change in relation to environmental choices, social preferences and perceptions around brands and their values. This is only likely to increase. 'Sustainable products', alternative protein and various natural products are, by and large, experiencing high growth ahead of traditional brands. However, not all is equal and preferences are also highly likely to continue to evolve as the consumer continues to learn more and votes with their wallet. While the sector is front-footing the issue, and we expect continued progress in the coming years, the unknown is: is this enough?

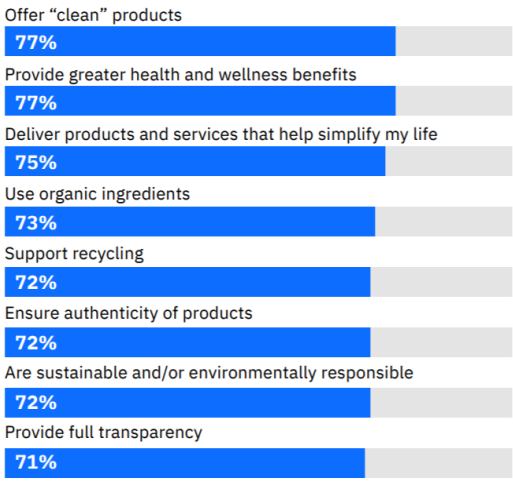
- Current: Our analysis of the current landscape suggests that dairy's nutritional value, accessibility (availability & affordability) and taste profile is comfortably outweighing some (growing) commentary around emissions. Comparability between products is difficult, however, alternatives to dairy also appear to face challenges around emissions and broader environmental footprint
- Longer-term: With growing awareness and focus on carbon emissions and sustainability, there is risk around consumer perception and negative headlines for the dairy sector, although also potential for positive headlines given the sector's clear appetite to drive change. While the NZ dairy sector is moving in the right direction, is this enough? This will likely be influenced by relative pricing, perception and availability of substitute products. FSF and SML are already pivoting (including offering plant-based/organic product and a focus on lowering emissions), however, we expect to see more as consumer demand continues to increase

Figure 79. While Millennials may be leading the charge with increasing sustainability preferences, they are not alone



Source: Forsyth Barr analysis, Nielsen 2018

Figure 80. For attributes consumers say are very important to them, they are willing to pay a premium for brands that:



Source: Forsyth Barr analysis, IBM Global survey 2020

(2) Brand NZ — can we retain, or grow, our premium positioning? Yes, the opportunity is there

There is no doubt a number of New Zealand brands and processors rely on source of origin as a key selling point/competitive advantage including ATM, SML and FSF. New Zealand comes from a favourable position, already known for high quality, 'clean green', and our dairy sector has materially lower emissions vs other countries. There is a real opportunity, in our view, to strengthen this through tackling emissions head on. The listed participants look to be taking this approach, however, more progress is still needed including from the broader stakeholders. We see SML and ATM as best placed, particularly given SML's leadership in the space, to enhance their premium positioning which should help retain/win customers.

Unintended consequences of a single country approach

New Zealand's pasture-based farming systems have lower GHG emissions than most of the meat and milk produced around the world. While reducing our dairy production would lower emissions, there would be unintended environmental consequences if this is simply replaced with production elsewhere.

- **New Zealand an exporter:** New Zealand produces a large amount of dairy products relative to the size of the population. Circa 90% of dairy emissions are associated with consumption in other countries
- **New Zealand emissions low vs global standards:** The carbon footprint of NZ's on-farm milk supply is less than one-third of the global average and up to 30% lower than GHG footprints of Europe and North America milk production. Peer reviewed research found a litre of milk produced in NZ creates 0.91 kg of CO2 emissions vs the global average of 2.5 kg

Transport and Tourism: Emissions reductions reliant on global technology solutions

The listed transport and tourism companies listed on the NZX appear to be taking sustainability seriously. They all (1) now measure their GHG emissions, (2) are exposed in their domestic operations to carbon pricing and therefore are offsetting, and (3) the operators among them are well placed to transition to lower emissions in future given typically young fleet age (for both owned and contracted vehicles). For example, MFT ensures owner-driver vehicles are retired after seven years, and AIR has one of the younger fleets among global airlines (refer to Figure 83).

Air New Zealand (AIR) is the most exposed by some margin (5x more than Mainfreight [MFT] on emissions per dollar of market cap basis) and accounts for the majority of sector emissions. While it has a number of GHG emission reduction strategies in place, it will be largely reliant on industry solutions to lower emissions, in our opinion.

In particular, a key opportunity for aviation is the shift to Sustainable Aviation Fuel (SAF). IATA recntly called on governments to support the development of SAF, which cuts GHG emissions by ~-80% currently and has scope to cut emissions by >100% in future (yes, this sounds absurd, but reflects for example rotational crops that help sequester CO2 in the soil as they grow) but is on average 2–4x more expensive than fossil fuels currently. SAF feedstocks are varied; ranging from cooking oil, plant oils, municipal waste, waste gases, and agricultural residues. The CO2 emissions from the burning of SAF in an aircraft engine are not fundamentally different to fossil fuels, but the production of the feedstock takes CO2 out of the atmosphere, creating a 'loop'.

Figure 81. Transport and tourism sectors sustainability snapshot

	Years of GHG reporting	Pages covered in: Annual report	Result preso	ASM preso	Sustainability report produced	Emissions exposure/NZ$ of mkt cap	Key GHG targets	Sustainability indices inclusions
AIR	10	n/a	1/5	2	✔	1.5	100% electric Ground Service Equipment (where feasible) by end FY23 100% electric vehicles in light ground fleet (where feasible) by end FY30 5% annual reduction in electricity use against 2011 baseline	FTSE 4 Good Index Series
AIA	9	1	1	n/a	✔	0.0	Reduce carbon emissions 45% per square metre of terminal area by 2025, from base year of 2012	Dow Jones Sustainability Index
FRE	7	2	0	1/3	x	0.0	3% intensity reduction against base year, specifically targeting vehicle diesel use	n/a
MFT	2	2	1	1	x*	0.3	Move road capacity to rail and coastal shipping More efficient driving	n/a
NPH	2	1	0	0	x*	0.0	Minimise carbon footprint in line with government targets	n/a
POT	4	8	8	5	x	0.0	Reduce emissions intensity by 10% within five years of the base year	n/a
THL	4	2	0	0	✔	0.2	20% reduction in absolute countrywide emissions, and 20% reduction in customer journey emissions by 2025 compared to 2017	n/a

Source: Company reports, Forsyth Barr analysis Note: *MFT has a GHG emissions inventory report, *NPH has a sustainability framework report

Air New Zealand: CORSIA's COVID cop-out

AIR is the heaviest Scope 1 emitter on the NZX, but unlike many other heavy emitters (those protected by the Emissions Intensive Trade Exposed regime) it is having to increasingly offset its GHG emissions. It does this in two ways:

- **Domestic emissions** (16% of FY20 emissions) — have been fully (100%) incorporated within the NZ ETS since 1 January 2019. For example in FY20, AIR's domestic GHG emissions total of 518.6kT in FY20 amounts to a financial cost of NZ$18m (based on NZU price of NZ$35/T). In FY20 7% of New Zealand passengers also undertook voluntary offsetting through its FlyNeutral programme, which facilitates offsetting in excess if the NZU compliance obligation of the airline. Voluntary offsetting uptake increased across all major markets for AIR.
- **International emissions** (83% of FY20 emissions) — The global mechanism for achieving carbon neutral growth in the international aviation sector is the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). New Zealand is a signatory to CORSIA. Airlines subject to CORSIA are to monitor, verify and report their carbon emissions (it excludes other harmful GHGs) on covered international flights from 1 January 2019. Moreover, operators will be required to purchase "emissions units" from 1 January 2021 to offset the growth in CO2 emissions covered by the scheme. However, in reality this is unlikely to happen at least for another two years, and probably longer, given the re-engineering of CORSIA in light of COVID-19.

The implementation of CORSIA is phased. The pilot phase (2021–2023) and first phase (2024–2026) are voluntary. The second phase (2027–2035) is mandatory with exemptions for some smaller emitters, which can join voluntarily. Currently 88 (up from 81, 12 months ago) countries, representing ~80% of pre COVID-19 international aviation activity, intend to voluntarily participate in CORSIA from the outset. Notably for AIR a number of countries will not participate initially including China, Argentina, Hong Kong,

Taiwan, the Cook Islands, Samoa, Tonga and Fiji. These are either not signatories or are exempt. Although China has not stated that it intends to participate in the initial phase, it is actively monitoring aviation emissions.

CORSIA's offsetting requirement will be based on a combination of (1) its own emissions in its baseline years, and (2) the growth in emissions for the global airlines industry (the "growth factor"). The growth factor represents the global average growth in emissions in a given year, relative to the base line year (the average of 2019 and 2020 emissions). In light of COVID-19 the baseline for the pilot phase will be based entirely on 2019 emissions. Therefore, until the global aviation emissions recover to above 2019 levels, there should be no need for any offsetting from airlines. This may not happen until 2023–2025, which means CORSIA will have zero impact on international aviation emissions for the next few years.

Air New Zealand: MfE correction increases AIR's emissions

AIR incorporated the Ministry for the Environment (MfE) aviation fuel emissions factors in its GHG emissions disclosure in FY20 for the first time. Previously it used factors from the Climate Change (Liquid Fossil Fuels) Regulations 2008 (SR 2008/356). This follows the lowering (correcting) of the MfE's aviation fuel emissions factors in August 2019. In doing so, AIR restated upwards its previous emissions discloses by +13%.

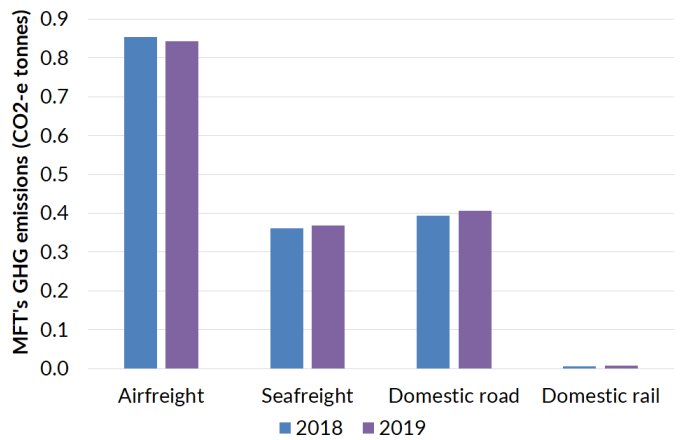
AIR's emissions factors are based on emissions without "radiative forcing" (the global warming potential of emissions arising from aircraft transport at altitude through atmospheric processes and changing cloud abundance). As future research better understands the impact of radiative forcing on global warming, AIR's factors may increase further. For example, last month the European Aviation Safety Agency (EASA) reported that non-CO2 aviation emissions are currently warming the climate at ~3x the rate of associated CO2 aviation emissions.

This may add to AIR's, and the wider airline industry's, GHG emission risk with a larger offsetting cost in future and consumer demand consequences if the impact of air travel is perceived/found to be higher than accepted from just burning jet fuel.

Mainfreight: Reports GHG emissions data for first time

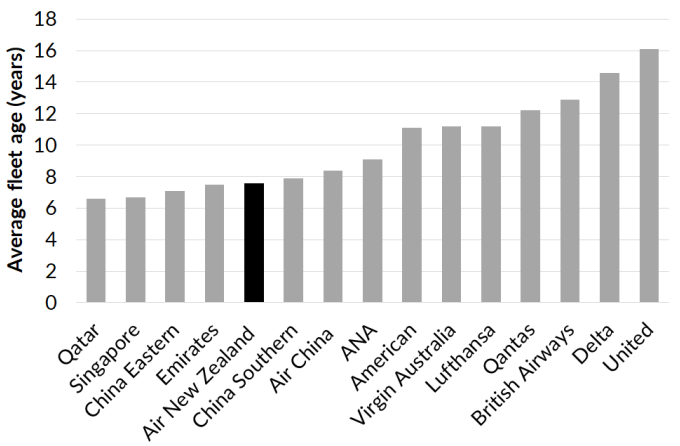
Mainfreight (MFT) published its first GHG inventory reports in 2020 for both CY19 and CY18. Its total emissions were higher than we previously estimated, making it the sixth largest emitter on the NZX. Emissions intensity is highest for its Air & Ocean business (16% of PBT in 1H21, but ~73% of CY19 CO2-e emissions), given the high emissions nature of long-haul airfreight. Management has previously highlighted the attractive nature of Air & Ocean expansion (low capital outlay, high return on capital), however, its high emissions intensity (a necessary cost of doing business in international freight) may hinder investor appetite in future.

Figure 82. MFT's emissions by mode: concentrated in high value, low volume airfreight



Source: MFT, Forsyth Barr analysis

Figure 83. AIR's average fleet age profile is towards lower end of global full-service aviation



Source: AirFleets.Net, Forsyth Barr analysis

In contrast, rail provides MFT with its lowest emissions land transport option, with emissions at ~20% per that of road as measured on a tonne-km basis. Rail investment (rail enabled facilities) remains a key strategic drive for MFT in providing customers alternative transport links and affords a competitive advantage given the cost benefits relative to road.

MFT's total emissions are ~30x that of Freightways (FRE). This significant difference reflects several factors: (1) FRE delivers small (light) time-sensitive packages in New Zealand. In contrast, MFT delivers (heavy) freight internationally. The delivery cost per tonne of freight will be significantly larger for FRE than MFT. (2) MFT's business is substantially bigger than FRE (at a revenue level it is more than 4x larger). FRE's emissions intensity will increase following its Big Chill purchase this year.

Port of Tauranga/Napier Port: Extension of compulsory Methyl Bromide emissions recapture

Methyl bromide is a highly effective fumigant used for treating primary products for export — as well as imported goods — to control quarantine pests. It is a colourless, odourless, non-flammable gas that (1) is toxic to humans, and (2) can damage the Earth's ozone layer. Fumigation of forest products (primarily at POT, NPH and Northport) for export accounts for about 94% of methyl bromide use in New Zealand. Fumigation with methyl bromide is the main treatment option for above-deck log exports to China, and is the only feasible option for log exports to India. The deadline for methyl bromide users to adopt 100% recapture technologies had been set for October 2020, but was then extended to 28 April 2021, and in September was further extended to 28 August 2021.

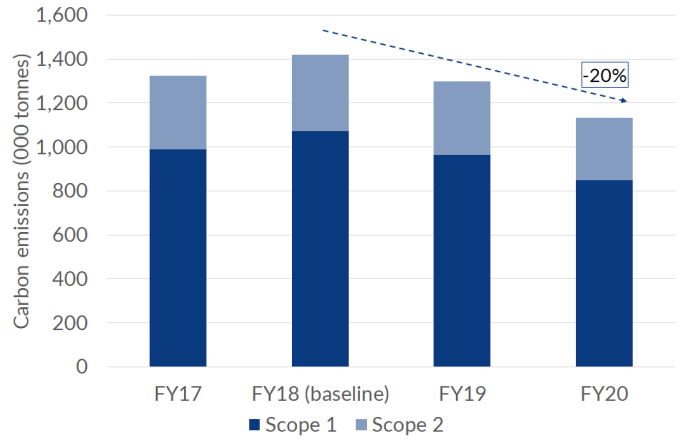
Construction: More than meets the eye

As the 5th largest emitter of CO2 listed on the NZX, Fletcher Building (FBU) has the potential to position itself as part of the solution. The majority of FBU's Scope 1 and 2 emissions are from (1) its Golden Bay Cement plant in New Zealand (c.47% of total emissions), and (2) direct and indirect energy across its Australia businesses, most notably Laminex, Fletcher Insulation, and Iplex (c.43% of total).

FBU has a -30% carbon emissions reduction target

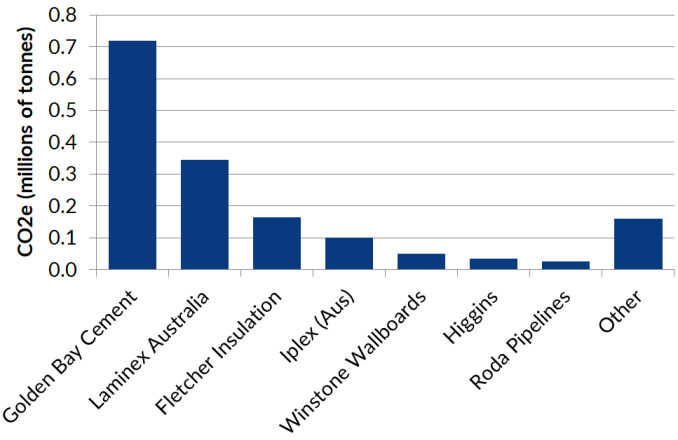
FBU has committed to achieving an ambitious 30% absolute reduction in its Scope 1 and 2 emissions from its 2018 base line by 2030. Two years after making this commitment emissions are down ~-20%. Specific near-term initiatives include: (1) alternative fuels (namely tires which are difficult to dispose of by other means) at Golden Bay, (2) cogeneration energy at Laminex, Australia's Gympie site, (3) increasing electric and hybrid vehicles in its fleet, and (4) LED lighting in Tradelink stores. To further reduce emissions FBU can 1) lower its Australian energy use or switch to greener sources where possible, or 2) reduce CO2 from cement production via capture and storage, further use or alternative fuel, and/or lower production volumes.

Figure 84. Emissions reductions to date



Source: Company reports, Forsyth Barr analysis

Figure 85. Emissions by activity



Source: Company reports, Forsyth Barr analysis

Cement makes up a large chunk of FBU emissions with currently limited ability to reduce

Cement production is a carbon intensive process. As well as being FBU's largest source of emissions, cement production produces c. 8% of global carbon emissions: c.70% of cement emissions comes from the decarbonisation of limestone and c.30% from the use of thermal fuels in the process. Current technology initiatives to reduce carbon emissions from cement production are largely limited to the reduction of thermal fuels. Carbon capture and storage technologies remain in research and/or demonstration stages.

FBU's key domestic cement competitor imports its cement therefore differences in carbon pricing across countries can impact earnings. FBU currently receives a free allocation of carbon credits that if not surrendered to satisfy emission obligations can be sold to other emitters. A 10% reduction in FBU's cement emissions could improve margins by c.1.5ppts, assuming a carbon price of NZ$35 and all else equal. Conversely, the ability to recover higher carbon costs through price may be limited.

Concrete technology may provide a pathway to lower emissions

While it may be difficult to reduce carbon emissions from cement production, globally there is a significant amount of research and development focussed on reducing the carbon footprint of concrete, including creating concrete using less or no cement. This is typically achieved by replacing cement with pozzolans, material such as volcanic ash or coal ash that have cementitious properties. As well as reducing cement use, pozzolans can increase the strength and durability of concrete resulting in a better end product.

Natural pozzolans were first used c.4000 years ago and hold together many Roman, Greek, Indian, and Egyptian artefacts still standing today. However, the supply and chemical makeup of natural pozzolans has significant geographic variation, making standardisation an issue and resulting in pozzolan specific concrete recipes. Industrial pozzolans such as ash from coal fired power plants and granulated blast furnace slag (waste from steel production) are more standardised but may have longer term supply risks.

Similar to the effects of pozzolans, CarbonCure has developed a technology that increases the strength of the concrete by injecting CO2 into the mixture before it has cured. The end result is a 7% reduction in cement use for similar strength concrete and C02 that is permanently embedded. While this technology is still in its start-up phase, it is easy to incorporate into current concrete plants.

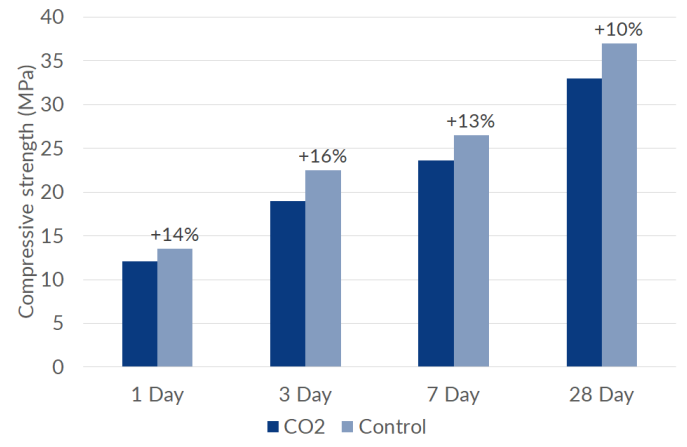
Changing our building materials could also lower emissions

There is also potential to reduce cement demand by changing the way we build. While concrete and steel are currently the most common structural materials used in high rise construction, cross-laminated timber (CLT) has started to become more common. These wooden alternatives are attractive due to their lower emission manufacture and ability to store C02. CLT structures also create less noise pollution during construction with less processing of raw materials on site, have a much quicker build time due to most of the structure being able to be pre-built in CLT manufacturing plants, and offer strong earthquake resistance. Notable CLT projects so far have been the 280-foot-tall Mjøstårnet tower in Norway, International House in Sydney, and a 12 story office tower under construction in Wellington. Cost remains an issue due to the lower volume of CLT builds.

Cement plants are high fixed cost — potential for stranded assets if cement demand reduces

There is risk this technology change in concrete and building construction reduces NZ cement demand and potentially leaves the Golden Bay cement plant obsolete. Cement kilns have a high fixed cost base so small changes in volume can have a large impact on economic viability. This would in theory halve FBU's emissions giving it the potential to lower emissions more than many other companies but this may come at a large cost.

Figure 86. CarbonCure concrete strength



Source: CarbonCure website, Forsyth Barr analysis

Figure 87. International House Sydney under construction

Source: Forsyth Barr analysis

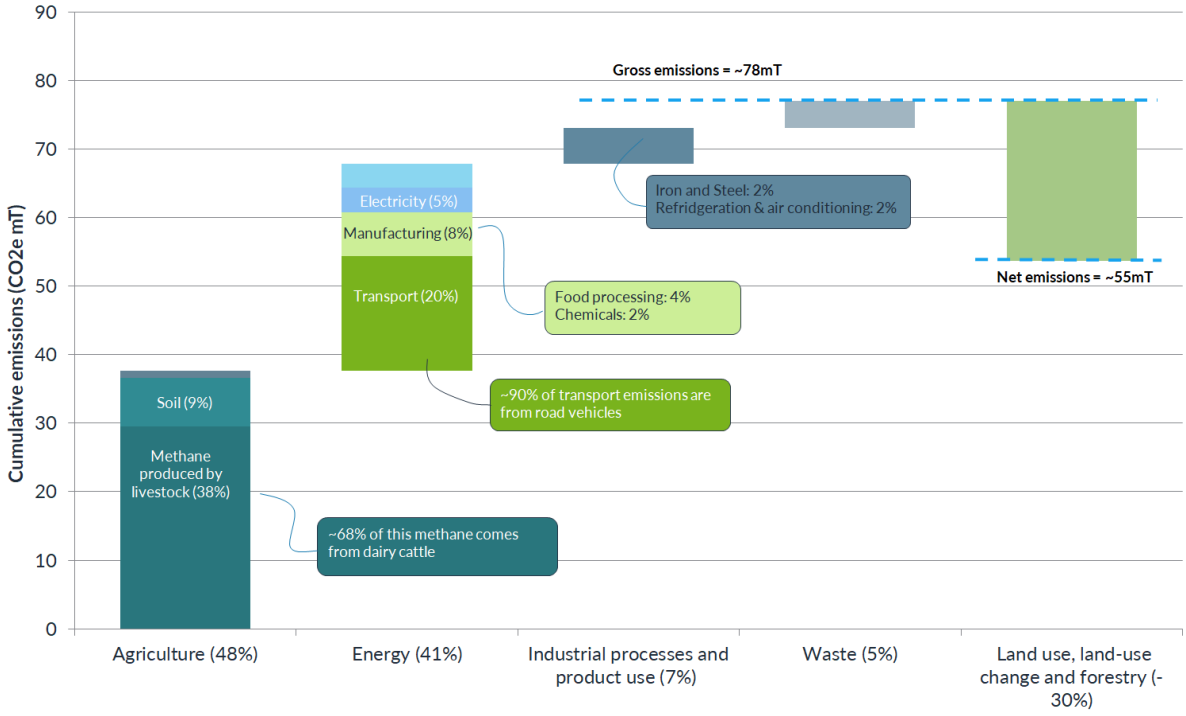
Appendices

Appendix 1: New Zealand's emissions profile

The April 2020 edition of the Ministry for the Environment's Green House Gas Inventory reported New Zealand's gross GHG emissions at 78.9m tCO2e for 2018, down -1.0% on 2017's figure of 79.6m tCO2e. The sector breakdown for 2018 is largely unchanged over 2017, with agriculture still dominating emissions at ~48% of New Zealand's gross emissions. In net terms (gross emissions less emissions removed via the Land Use, Land-Use Change and Forestry sector), New Zealand's emissions in 2018 were 55.5m tCO2e, a drop of -2.6% over 2017.

Note that emissions profile data lags the reporting period by ~15 months, and as at the time of writing the most recent data available is for 2018.

Figure 88. Emissions profile by sector — 2018



Source: Forsyth Barr analysis, Ministry for the Environment.

Appendix 2: State of disclosure

The level of emissions disclosures in the New Zealand market is increasing, slowly but surely. In our last report, we identified 46% (22 companies) of S&P/NZX 50 members as providing Scope 1–3 emissions. As of 2020, this has risen to 50% (24 companies, excluding the Australian banks). When we expand this to include any of Scopes 1, 2 and 3 this number rises to 63% (30 companies). We would expect the level of disclosure to improve significantly over the next few years, with the introduction of mandatory TCFD disclosures by 2023 (at the earliest) which require the disclosure of Scope 1, Scope 2, and if appropriate, Scope 3 emissions.

Figure 89. Forsyth Barr coverage universe emissions disclosures summary

	Scope 1	Scope 2	Scope 3	All scopes	Some disclosure
Disclosed most recent FY	33	32	29	28	35
Disclosed previously	3	3	4	4	4

Source: Forsyth Barr analysis, company reports.

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