

NZ Insight: Climate change and the path ahead

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Contact

Susan Kilsby, Miles Workman or Liz Kendall for more details.

Climate change and the path ahead

Summary

- Pressure to act to mitigate climate change is building. International co-operation and technological advancement will be crucial to limit the impact, but New Zealand has a role to play, especially if we want to leverage our “clean, green” image in international markets.
- The Climate Change Commission recently warned more effort is required from New Zealand to meet its Paris Agreement commitments. Reducing emissions is possible, but it requires a concentrated effort across a range of sectors.
- The costs of regulatory change are being felt, particularly by agricultural firms. Farmers are working hard to play their part by improving efficiency and increasing plantings. This has seen costs rise and presents ongoing challenges, but there are opportunities too.
- Livestock numbers will ultimately need to reduce over time if we are to meet our targets. But fortunately, productivity gains are expected to offset that over time, so that milk and meat production can be maintained near current levels.
- Despite these pressures, agriculture will remain the lifeblood of our economy. Changing preferences globally mean that consumers are demanding lower-emission sources of food, and our primary industries are better placed to provide these than our competitors.
- Forestry is a key part of the solution, but we cannot just rely on increased exotic plantings of trees to meet our targets. More plantings of slower-growing natives are needed, alongside adjustments across a wide range of industries to reduce, rather than just offset, emissions.
- Consumers are not immune to the impacts of changing regulation, especially price incentives. The cost of living may increase on the back of higher prices for food, travel and utilities, though changes to carbon use and product selection could offset this in time. As part of the move to more renewable energy sources, electric vehicles are expected to become cheaper and more accessible to consumers.
- We must brace for the direct effects of climate change. Sea level rises, changes to rain patterns, extreme weather events, ocean acidification, biodiversity loss and glacial melt are all expected, with severity depending on the extent of mitigating actions now.
- Suitability of land for various uses is likely to change, and housing and infrastructure will be at greater risk of inundation. Insurance is expected to be costlier and less accessible as properties become more exposed, with implications for property values and credit availability, especially near coasts and rivers.

- Risks associated with flooding do not appear to be fully appreciated, and New Zealand’s obsession with coastal property continues. There is potential for a marked correction in some areas down the track, which could lead to pockets of financial hardship. It is not a given that costs will or should be socialised, given their scale.
- Costs associated with climate change will be felt more acutely by the next generation if we do not act now, and these could be enormous and potentially catastrophic. Responding comes with costs, risks and opportunities, but we must play our part.

State of play

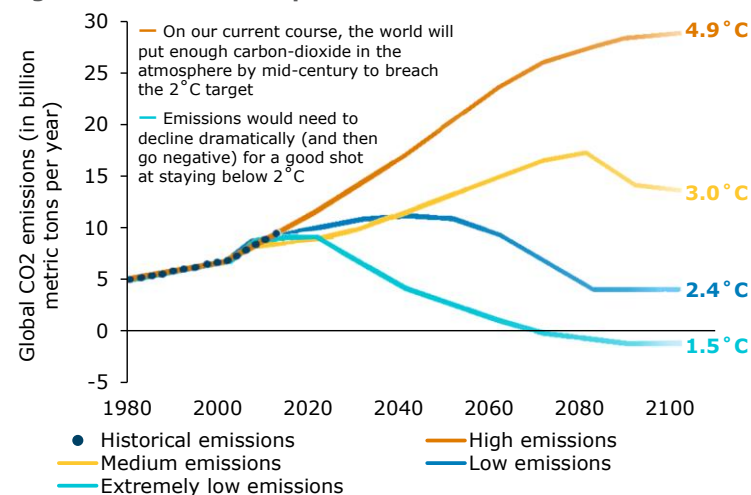
Over the past century, human activity has launched our world into a state of environmental uncertainty that will impact the global economy in coming decades. Climate change impacts are highly uncertain, but they are already impacting our daily lives – and that’s only going to intensify.

Warming and acidification of oceans, shrinking ice sheets in the Antarctic and Greenland, glacial retreat (including in New Zealand’s tourist hot-spots), decreased snow cover in the Northern Hemisphere, rising sea levels, and more extreme weather events are already happening.

Under the Paris Agreement (2016), it was agreed that the world must make a concerted effort to keep temperatures within 2 degrees of pre-industrial levels. There is uncertainty about the trajectory of emissions and temperatures from here, but it is widely accepted that this “2 degree” target is a ‘tipping point’, beyond which seas will begin rising rapidly, widespread crop failure will occur and human health will be compromised, according to climate scientists.

To have a good shot at adhering to this target, net global emissions will not only need to go to zero; they will eventually need to go (and remain) negative. This isn’t entirely impossible, but, globally, it will likely require some combination of rapid decarbonisation, a whole lot of afforestation, and some pretty incredible technological advances. Policy change will be vital if countries are to fulfil their commitments.

Figure 1. Predicted temperature increases under various emissions scenarios



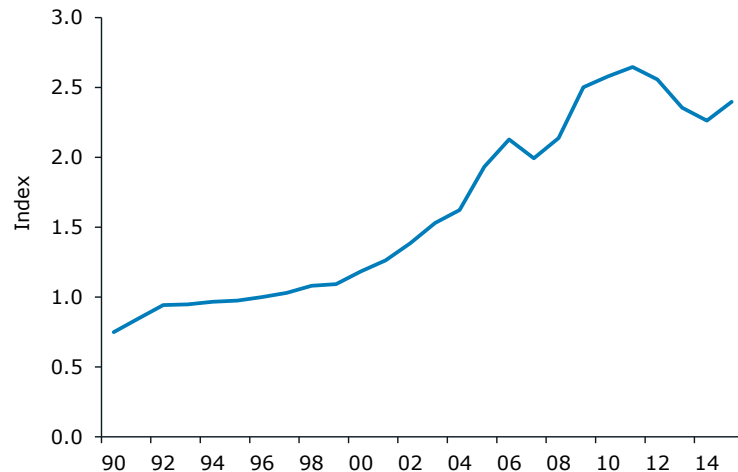
Source: Sanford et al. (2014)

And the fact is, even if global action and coordination successfully manages to limit warming to 1.5 degrees, we’re still going to experience disruption from more severe weather events – impacting agricultural production, and causing coastal erosion and tidal surge that threatens a non-trivial share of our housing stock and even some of our major cities.

Pressure on policy makers and technology to step up is building.

The OECD Environmental Policy Stringency Index reveals that there has been a substantial move toward more stringent environmental policy globally in the past two decades (figure 2).

Figure 2. Environmental Policy Stringency Index (average 32 countries)



Source: OECD, ANZ Research

International co-operation is crucial in ensuring that global emissions can be reduced. Efforts have ramped up recently, with US President Biden signing an executive order to re-commit the US to the Paris Agreement, after Trump withdrew in 2017. Now, with Democrats holding a slim majority in the Senate, the world will be watching to see if Biden will be successful in implementing the rest of his climate action agenda, including transiting to clean energy and setting the economy on a path to achieve net zero emissions by 2050. The next UN climate summit is scheduled to take place in Glasgow in November, where countries will provide updated emissions targets for the next ten years.

Here in New Zealand

New Zealand represents only a small portion of global emissions (0.17%). But with the 7th highest emissions per capita in the world on a production basis,¹ we have an important role to play in contributing to the effort. This is particularly important if we want to retain our “clean, green” image internationally as 70% of New Zealand’s export earnings are directly reliant on natural capital, including tourism.

In 2019 the Zero Carbon Bill (2019) was introduced, aiming to limit emissions by setting targets for 2050. The Government also declared a climate change emergency in December 2020 and has committed to a carbon-neutral Government by 2025.

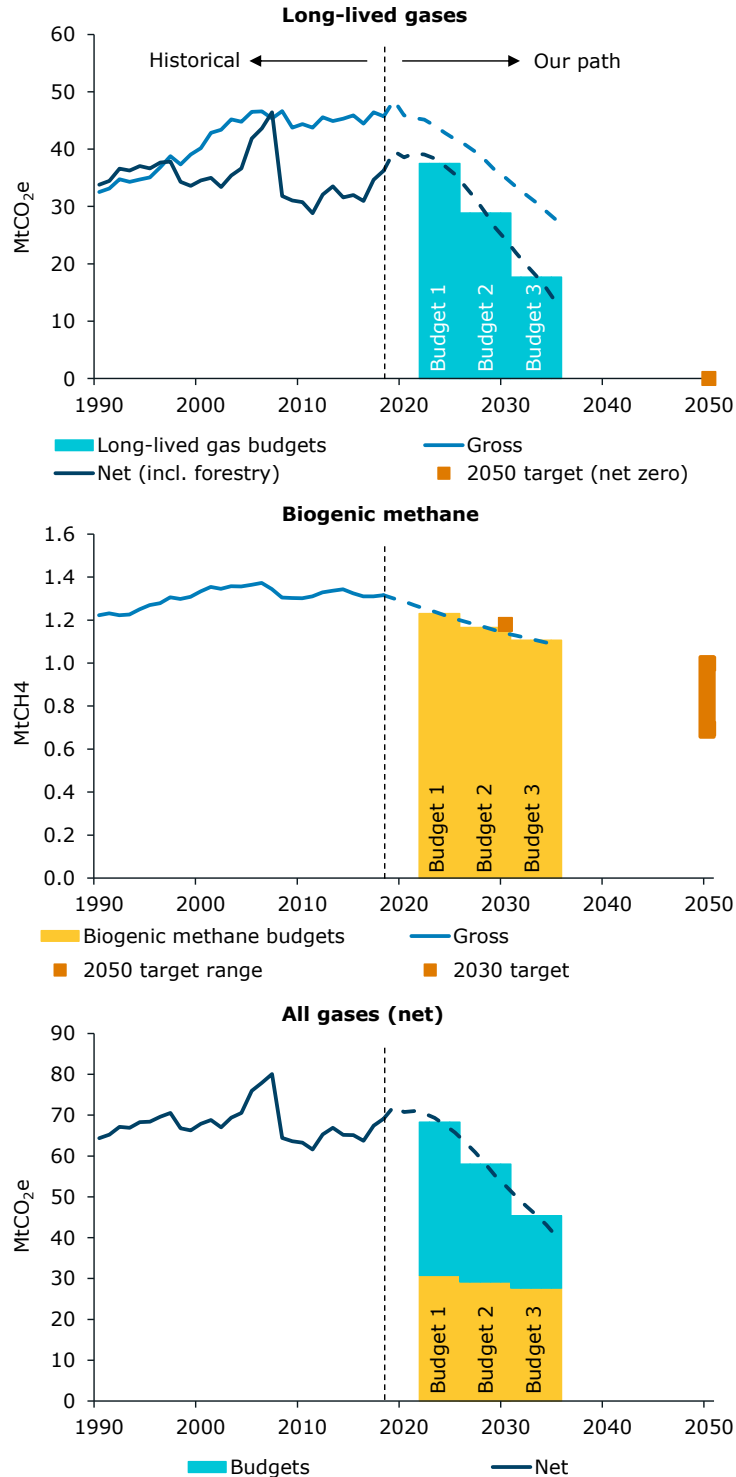
Recently the Climate Change Commission released its [draft advice \(January 31 2021\)](#) warning that unless we take decisive action (and soon), New Zealand will not meet its 2050 carbon zero target, calling for “transformational and lasting change across society and the economy”. The target is net zero emissions of long-lived gases, such as CO₂, by 2050 and a 24-47% reduction in biological methane – a gas that is more potent than CO₂ but has a much shorter lifespan.

¹ <https://www.mfe.govt.nz/sites/default/files/media/Climate%20Change/snapshot-nzs-greenhouse-gas-inventory-1990-2017.pdf>

The good news is that the Climate Change Commission deems it is possible for New Zealand to reduce its emissions so that it meets its current obligations – provided there is a concerted effort across all sectors.

The report outlines three proposed “emissions budgets” over the next 15 years and a swathe of detailed policy recommendations aimed at achieving them. These budgets would see a 2% reduction in 2018 greenhouse gas emission by 2025, a 17% reduction by 2030, and a 36% cut by 2035 (figure 3).

Figure 3. Emissions under proposed budgets



Source: Climate Change Commission

But policy action is required to incentivise households and businesses to act. There's a lot on the table here, including the adoption of electric vehicles, switching to low-carbon fuels in heavy transport, phasing out of coal, limiting the use of natural gas in our homes and businesses, planting native trees, and much more. Likewise, the Productivity Commission has previously suggested that increased emission prices in the Emissions Trading Scheme (ETS), a transport 'feebate' system, land-use diversification, a shift to low-emission agricultural practices and building on the renewable energy supply are the sorts of measures that should be utilised to reach our targets.

Impacts of regulation being felt, especially in agriculture

Currently, the most material economic impacts from climate change are being felt as a result of environmental regulatory change. Estimates of the net economic costs of regulatory changes vary widely and are highly uncertain.

New Zealand is unusual globally in that a higher share of our greenhouse emissions come from agriculture than in other countries. This means we face unique challenges and effects in responding to rising temperatures and making regulatory changes, and the agricultural sector is being notably affected. Farmers have improved their emissions efficiency and work is being done in the industry to increase afforestation and the like. But it is an ongoing challenge as industries such as meat and dairy adjust, which continues to weigh on sentiment in these industries.

A reduction in the number of livestock would reduce biogenic methane emissions and meet our targets. Alternative solutions such as breeding low-emission animals, using feeds that produce lower emissions, or the use of methane inhibitors, are not deemed necessary to reduce biogenic methane emissions by 24% by 2050, but would be required to meet a more ambitious 47% reduction in the emission level (the upper end of the target range).

Land use change is part of the solution. In order to meet our current obligations under the Paris Agreement there is a need to reduce the area dedicated to livestock and increase the area of land planted in trees and used for horticulture. A reduction in livestock numbers would reduce methane emissions, while planting trees will soak up additional carbon emissions. It is anticipated that future productivity gains from adjusting how we use our land would be able to offset the forecast 15% reduction in livestock numbers, meaning that milk and meat production will be able to be maintained near their current levels. If this can be achieved, it would mitigate the economic risks associated with land use change.

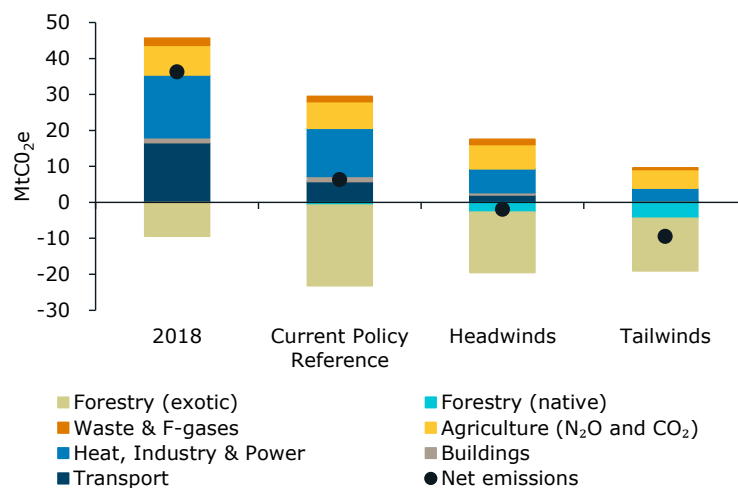
The eventual introduction of agriculture into the ETS will see the cost felt by farmers very directly too, incentivising some of this reduction in livestock numbers, with a current 'price floor' of NZD20/tonne.

Price incentives through the ETS are an important way that firms and households can be incentivised to alter their decisions to reduce emissions. Over time, further adjustments to the scheme may be needed to ensure that incentives are well aligned with desired outcomes. Clearly, an increase in the carbon price in the ETS would be beneficial for some industries and detrimental to others. Airlines, for example, would face increased costs as high emitters, which would erode their profit margins and/or reduce demand if costs were passed through to consumers. On the other hand, the forestry industry would receive greater revenue from the carbon credits they generate. A price floor gives land-owners the certainty needed to invest in afforestation.

Forestry not a complete solution

Afforestation is a key part of addressing climate change, but it is only one part of the solution, with significant adjustments needed in other industries (figure 4). Indeed, the Climate Change Commission's latest advice to the Government warns of the risks of becoming over-reliant on exotic plantations forests to offset emissions from other sectors.

Figure 4. Long-lived gas emissions in 2050 by sector under various policy initiatives (2018 for reference)

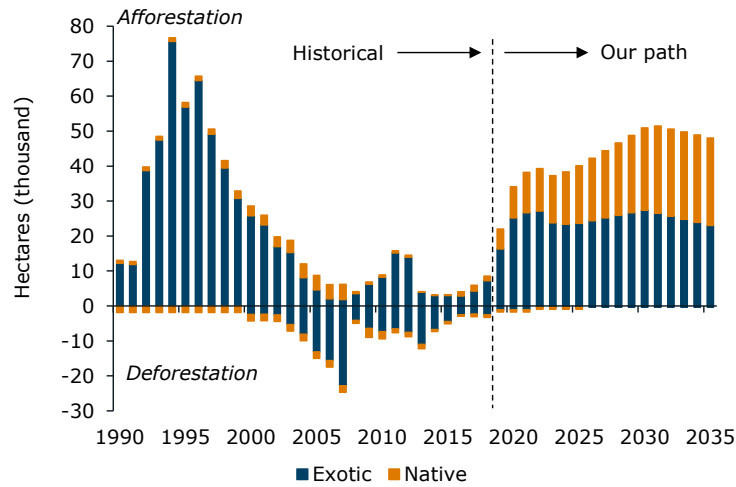


Source: Climate Change Commission

Fast-growing exotic species such as *pinus radiata* soak up vast quantities of carbon but over a relatively short time period. Under the current methodology used in the ETS, *pinus radiata* forests are assumed to actively reduce carbon emissions for only about 20 years. Therefore, they are an interim solution, not a long-term one. By contrast, natives grow more slowly and therefore absorb carbon over a much longer period, so are more suitable to act as a longer-term carbon sink to offset emissions.

Current policy settings are heavily reliant on an increase in the plantings of exotic forests. The pathway recommended by the Commission has a lower reliance on exotic forests and an increased reliance on native plantings. By 2030 there would need to be an additional 25,000 ha planted in natives each year. Current policy favours *pinus radiata* plantations, so a reform of the ETS would be required to encourage enough natives to be planted to meet our longer-term objectives.

Figure 5. Afforestation and deforestation by year

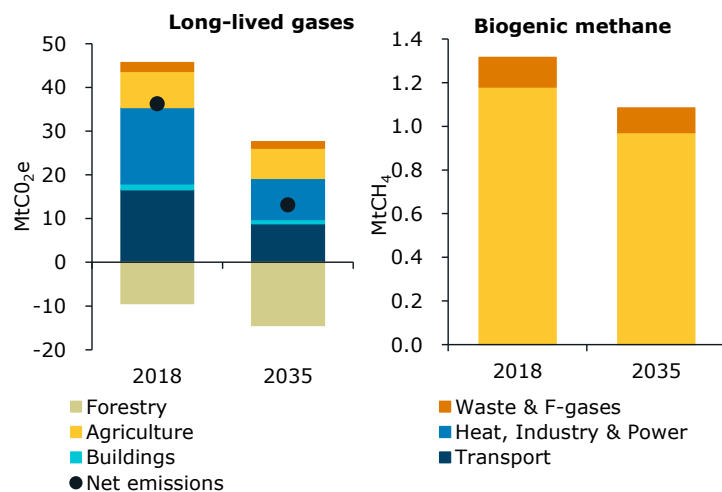


Source: Commission analysis

Additional planting of both exotic and native trees will be needed to reach our climate change goals. If new native forests are planted at a sustained high rate through to 2050, then this could soak up more than 4 million tonne CO₂ per year² - about 10% of the net annual emissions (on a CO₂ e basis) budgeted for 2031-2035. In 2018, forests offset 9.5 million tonnes of CO₂ per year and the aim is to increase this to 14.5 million tonnes by 2035. This would largely be achieved by planting more land in exotics, with natives taking over the 'carbon sink' role in the longer term.

Smaller blocks of native plantings and narrow plantings such as those along riparian margins are not currently able to be registered for carbon credits under the current ETS rules. Policy changes could help to incentivise additional planting of these kinds if there were a revenue stream attached, which will help offset some of the costs of fencing and planting areas for natives.

Figure 6. Path to reduced emissions by type and sector



Source: Climate Change Commission

² 2021 Draft Advice for Consultation, He Pou a Rangi Climate change Commission, 31 Jan 2021.

The cost of living

Regulatory change will not only impact businesses, but also the cost of living for New Zealanders. Regulation, including the ETS, may increase prices for items such as food, travel and utilities.³ Because lower-income households spend a greater proportion of their income on emission-intensive goods, albeit less in dollar-value terms, reform would hit them slightly harder. And with fewer resources, they have less wiggle-room to shift to less emission-intensive consumption if it is more expensive. In the longer term, some of these increased costs may be eroded as industries adapt their production to become less carbon-intensive and alternative products become available, but the short-term price jump would hurt.

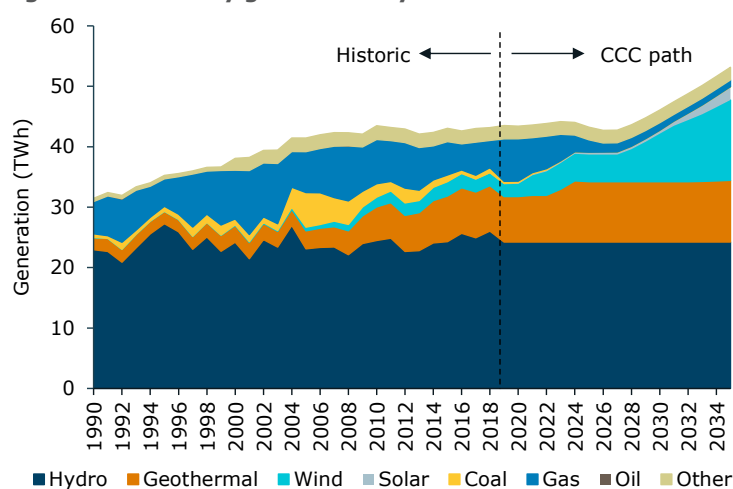
The Climate Change Commission report suggests that wholesale electricity prices are unlikely to increase but admits there is a lot of uncertainty regarding future prices, depending on how quickly new electricity capacity is built. The path of household electricity prices also depends on a range of other factors, so the impact is uncertain overall.

Electrifying our future

To meet our climate change goals there is a clear need to reduce reliance on fossil fuels and increase the use of greener energy sources. Increased reliance on electric vehicles and electricity for cooking and heating homes would help to reduce emissions. In 2018, transport emissions accounted for 36.3% of total long-lived gas emissions and the aim is to virtually halve these emissions by 2035.

The Commission's proposed path would see 50% of light travel powered by electricity, including 40% of light private vehicles. Imports of internal combustion engine light vehicles would be banned after 2032. There would also be a focus on reducing demand for transport by improving public transport and encouraging more people to walk, cycle and work from home. Creating more compact cities, through denser centrally-located housing developments, will help reduce demand for transport. The Climate Change Commission assumes the average travel distance per person can be reduced by 7% by 2030.

Figure 7. Electricity generation by fuel



Source: Climate Change Commission

³ <https://www.mfe.govt.nz/sites/default/files/media/Climate%20Change/emissions-charges-and-other-climate-change-polices.pdf>

There are concerns that the cost of purchasing an electric vehicle (EV) will prohibit their uptake. The Climate Change Commission acknowledges their plan is ambitious, but the economics of owning an EV is expected to improve as the cost of EVs fall and they become cheaper to run relative to vehicles powered by petrol or diesel. The Commission also expect the Government to provide targeted support to low income families to assist with access to low-emission transport options.

There are also concerns that the EV's currently available are not suited to carrying heavy loads or access rugged locations meaning they are not well suited to some business and recreational uses. However, the Commission says there are cost-effective, low-emission solutions available now, or will be in the next few years. Access to a reliable electricity supply is also a concern as some regions of New Zealand still regularly experience electricity outages.

Overall, energy use is forecast to increase 22% by 2035 and during this time a drastic reduction in reliance on gas and coal is also planned. Hydro-energy production is forecast to be stable while use of geothermal energy is forecast to increase by 36%. A massive 535% increase in the use of wind energy is projected. This means that the number of wind turbines dotting the skyline on our windswept hills and coastal areas will need to more than double from the 490 existing turbines. Most of the turbines installed recently are able to generate between 3 and 4.3 megawatts of electricity, about three times the amount produced by some of the smaller turbines. If the path proposed by the Commission is followed, then 25% of New Zealand's electricity could be generated by wind by 2035.

Shaping decisions

Over time, indirect economic effects such as changing consumer preferences, the rise of 'green' investment and shifting opportunities for business investment will become increasingly prominent, and could impact which industries grow or contract.

Concern for the state of the environment is increasingly being reflected in consumer behaviour. A recent survey by Accenture found that 72%⁴ of consumers are buying more environmentally-friendly products than they were five years ago; this is putting increased pressure on producers to stand for issues of 'greater good'. In 2018, products that were sustainability-marketed grew 5.6 times faster than those that were not⁵ – showing that consumer intent is flowing through into their purchasing decisions.

Consumers globally are becoming increasingly aware of how their food is produced and are increasingly demanding low-emission food production systems. New Zealand is better placed to provide these low-emission systems than some of our international counterparts, so we should make the most of this opportunity.

Meanwhile, investor demands are expanding outside financial returns. With the rise of sustainability reporting, green bonds and social impact funds, investors are demanding sustainability. Investment in these products has risen rapidly in recent times, up 34% in 2019 from 2016, to the value of USD30.7 trillion according to Bloomberg⁶. This means businesses are being socially and financially motivated to take action.

⁴ <https://www.businesswire.com/news/home/20190604005649/en>

⁵ <https://hbr.org/2019/06/research-actually-consumers-do-buy-sustainable-products>

⁶ <https://www.bloomberg.com/graphics/2019-green-finance/>

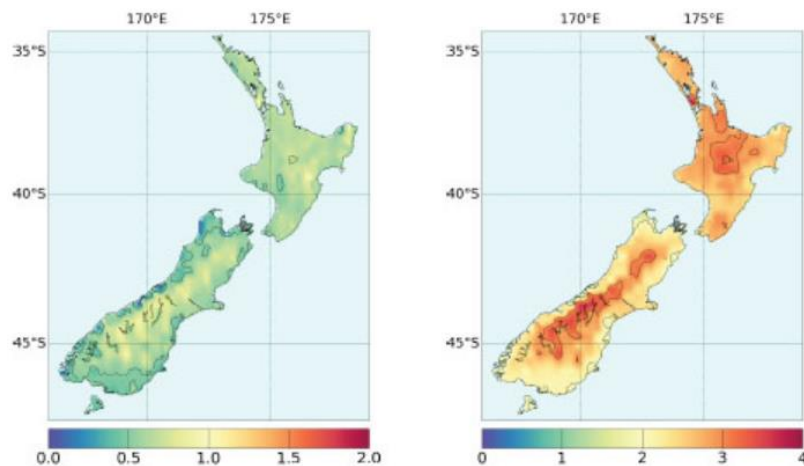
Nonetheless, there are fears that environmental uncertainty could put a brake on some forms of investment. Will fuel cars be banished with a breakthrough in transport technology? Are consumers still going to use air travel? Could sea level rise infiltrate waterfront infrastructure? The inability to answer such questions could make investors wary, resulting in less risk-taking. On the other hand, there are new opportunities in mitigating and adapting technologies, opportunities that could gain traction the worse climate change becomes – such as electric vehicles and renewable power storage. It is, of course, uncertain how these investment forces will balance out in the long term.

Direct impacts of climate change

Quite separate from regulatory impacts and behavioural change, there are the direct impacts of climate change that we must brace for. Projections for climate change impacts vary a lot, depending on where emissions head from here. Figures 8 & 9 show the difference between the projected impacts on temperatures and rainfall in low versus high emissions scenarios – with even a low scenario producing notable changes, especially in temperature.

Figure 8. Annual average temperature changes by 2090

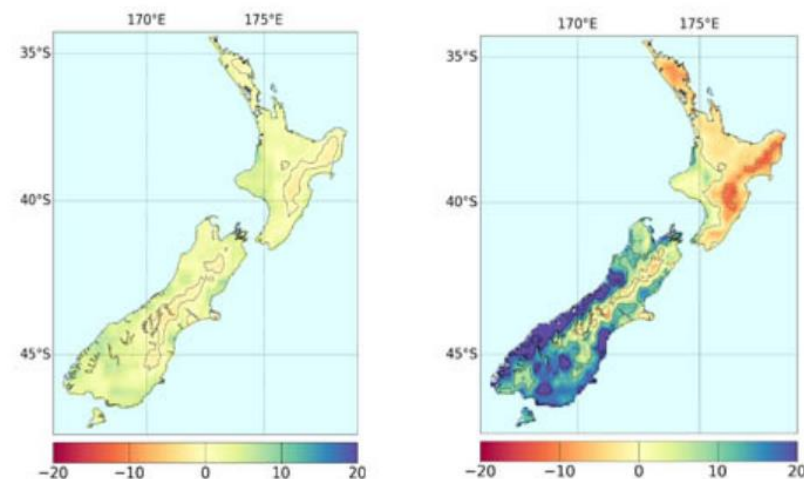
Under a low emissions scenario (left) and a high emissions scenario (right) compared to 1995 baseline



Source: Ministry for the Environment

Figure 9. Annual average rainfall changes by 2090

Under a low emissions scenario (left) and a high emissions scenario (right) compared to 1995 baseline



Source: Ministry for the Environment

Sea level rise, more rain in wet areas and less rain in dry areas, increased frequency and severity of extreme weather events (such as storms, droughts and fires), ocean acidification, biodiversity loss and glacial melt are all environmental effects that are expected to arise in some form. These will come at a cost, though there may also be benefits.

As temperatures rise, some land will become less suited to its traditional agricultural or horticultural use. In some areas, climate change could extend the growing season or introduce new product opportunities. But in less fortunate cases, areas might become too hot, or too wet, or too volatile to support stock or crops. This could force a change in land use at substantial cost (new infrastructure, lost revenue and new skill development).

Some crops currently limited to North Island production will be able to be grown further south, while Northland is already showing signs of successfully producing crops currently associated with warmer climates, such as peanuts. But warmer temperatures combined with higher rainfall and more high impact weather events will further exacerbate erosion and slipping of hill country. This will increase the need to fully retire some blocks of grazing land and alter management practices in other areas, including more pole planting (trees planted intermittently to stabilise soils).

Environmental changes are likely to put a strain on key infrastructure across the country, particularly in coastal areas. With more extreme rainfall, flooding and storm surges, our wastewater and storm water infrastructure is facing mounting pressure. Most of New Zealand's piping infrastructure is designed to handle a 1-in-100-year flood, yet by 2050 some vulnerable coastal zones could experience a 1-in-100-year flood almost every single year, according to Deep South National Science Challenge.

Based on modelling by NIWA and the Deep South National Science Challenge, an additional 7,000 buildings, 133km of roads and 10km of rail line are at risk of flooding for every 10cm of sea level rise, with another 80cm of sea level rise expected by the end of the century based on median projections. That means that by the end of the century, \$38 billion worth of buildings (currently inhabited by 150,000 people) would be at risk of coastal flooding. Separately, \$135 billion worth of buildings (inhabited by 675,000 people) could be at risk of extreme flooding from rivers.

The precise impact is highly uncertain, but we can expect a loss of valuable private and public assets – local councils themselves are looking at a loss of up to \$14 billion in infrastructure, in addition to the value of at-risk homes, businesses, roads, schools or hospitals. Disruption and productivity costs as communities adjust could be significant.

Property, insurance and financial stability

Given the increasing likelihood of flooding associated with sea level rise and more extreme weather events, increased risk is increasingly being assessed by insurance companies and included in property LIMs. Securing insurance is expected to become costlier and more difficult, especially in coastal areas.

A report from the Deep South National Science Challenge investigated coastal properties that currently experience inundation once every 100 years. Evidence suggests that insurance companies start to partially retreat from insurance coverage when coastal inundation occurs every 50 years and fully withdraw when events occur every 20 years. Based on this, at least 10,000 properties in New Zealand's four largest cities are expected to be uninsurable by 2050, with many, many more homes across the country likely to experience a sharp rise in premiums and/or a full or partial loss of insurance over the same period. For the vulnerable properties considered in the report, partial loss of insurance is

expected to begin within the next 15 years, meaning homeowners will increasingly bear more risk and cost, with insurance estimated to increase as much as four times before these properties become uninsurable. Global weather events could also lead to higher reinsurance costs for New Zealand insurance companies, with flow-on effects to insurance premiums and availability more broadly.

Insurance is a cost of owning property, so changes in the cost or availability of insurance can be expected to affect property values directly. This could be quite material if insurance becomes completely unavailable. Loss of insurance also makes it harder to borrow, so there could be flow-on impacts to house prices via reduced credit availability.

Impacts on property values, if significant in scale, could have financial stability implications too. If homeowners found themselves in negative equity positions, negative feedback loops could occur via credit availability, lower collateral values and falling house prices. In such a scenario, it is possible that business assets could also be affected, given that small business loans are often secured against residential property. In a bad scenario, bank balance sheets could also come under pressure due to lower collateral values, while insurance companies could also face significant strain, particularly if the risks of damage have not been appropriately priced.

Yet despite clear risks associated with property damage, reduced insurance availability and lower property values, New Zealanders remain fixated on coastal property and values keep rising. Quotable Value recently reported that coastal property remains the “hottest of hot commodities”, with no signs that the kiwi obsession is abating. Overall, it is possible that we are seeing a mispricing of risk in the property market, which could lead to a significant re-pricing in future.

On the flip side, less-vulnerable inland areas could experience a boost to economic activity as they become more attractive places to live, resulting in population growth, rising house values and increased business presence. Over time, it is likely that parts of the population have to shift further inland and urban areas and infrastructure have to be rebuilt. This might generate some economic activity, though would divert resources away from other productive uses.

Over the long term, movement of population is likely to weigh on property values in affected areas, while property in unaffected areas is likely to become relatively more valuable, boosted by displacement of people both from domestic coastal areas and potentially other affected countries.

Higher population flows and pressure on the existing housing stock are possible too, which could put upward pressure on property prices. The effects of climate change are expected to be relatively benign in New Zealand compared to the globe as a whole. This, as well as our close proximity to highly vulnerable nations, makes us particularly susceptible to ‘climate migration’. In some Pacific nations, such as Kiribati, people are increasingly acknowledging that relocation may be inevitable. There is also a possibility that we see higher voluntary immigration if people perceive New Zealand to be safer (or simply more comfortable) in this changing climate. Economic growth would be boosted from increased migration, as it drives greater spending and brings additional skills to the labour force, but it would also put additional pressure on housing and infrastructure. The risk is that we could face more rapid immigration than we are equipped to handle.

On the whole, it is possible that house prices in aggregate are not actually affected much, but there is much uncertainty and regional divergences should be expected, with periods of adjustment and pockets of financial distress possible.

The cost of doing nothing

If we do nothing to mitigate climate change then we are simply imposing a higher cost on the next generation. If New Zealand doesn't meet its climate change targets, then carbon credits will need to be sourced from offshore, which could come at a substantial cost to the country. The Climate Change Commission recommends that no offshore credits should be purchased before 2035, and advises this option should only be used for unforeseeable situations such as a major volcanic eruption or fire that impacts our ability to produce low-emission electricity and therefore reduces our ability to meet our Paris Agreement targets.

We can expect some substantial changes to our environmental and economic landscapes at the hand of climate change over the coming decades. And it's hard to say exactly what that will look like. What we do know, is that positive environmental action from households, businesses and government has the potential to reduce the feared economic adversity. It will take a global effort, but it's one that we can all play a part in.



Contact us

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Sharon Zollner
Chief Economist

Follow Sharon on Twitter
[@sharon_zollner](#)

Telephone: +64 27 664 3554
Email: sharon.zollner@anz.com

General enquiries:
research@anz.com

Follow ANZ Research
[@ANZ_Research](#) (global)



David Croy
Senior Strategist

Market developments, interest rates, FX, unconventional monetary policy, liaison with market participants.

Telephone: +64 4 576 1022
Email: david.croy@anz.com



Susan Kilsby
Agricultural Economist

Primary industry developments and outlook, structural change and regulation, liaison with industry.

Telephone: +64 21 633 469
Email: susan.kilsby@anz.com



Liz Kendall
Senior Economist

Research co-ordinator, publication strategy, property market analysis, monetary and prudential policy.

Telephone: +64 27 240 9969
Email: elizabeth.kendall@anz.com



Miles Workman
Senior Economist

Macroeconomic forecast co-ordinator, fiscal policy, economic risk assessment and credit developments.

Telephone: +64 21 661 792
Email: miles.workman@anz.com



Kyle Uerata
Economic Statistician

Economic statistics, ANZ proprietary data (including ANZ Business Outlook), data capability and infrastructure.

Telephone: +64 21 633 894
Email: kyle.uerata@anz.com



Natalie Denne
PA / Desktop Publisher

Business management, general enquiries, mailing lists, publications, chief economist's diary.

Telephone: +64 21 253 6808
Email: natalie.denne@anz.com



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