MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

What would it take to mobilise investment to achieve New Zealand's climate goals?

Findings from key informant interviews

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Abstract

This study, based on in-depth interviews with 33 key informants, explores the question: What would it take to mobilise investment to achieve New Zealand's climate goals? It would take scaled-up and accelerated investment especially in adaptation in which less progress has been made than mitigation, more data and better tools to inform investment decisions, and a wide range of actions to overcome system inertia and shift investment patterns. While there is some momentum towards climate investment, especially for mitigation, much more needs to be done to make climate investment consistent with New Zealand's climate goals.

JEL classification

Q5, G41

Keywords

Climate investment, climate finance

Executive summary

Background

Climate investment is a key enabler in achieving climate goals. For example, spending on low-emissions technologies and energy systems, and climate-friendly business models, can help lower emissions and thus contribute to climate change mitigation goals. Spending on climate-resilient infrastructure and assets can help adapt to some of the effects of climate change and thus contribute to climate change adaptation goals.

Existing (overseas) studies about climate investment tend to highlight the challenges, risks and uncertainties involved. There is less evidence about the solutions to these challenges and how to enact the solutions in the context of Aotearoa New Zealand.

This present study aims to partly address this knowledge gap by exploring the question:

- *What would it take to mobilise investment to achieve New Zealand's climate goals?*

The study is based on interviews with 33 key informants across 24 organisations – people with expertise, knowledge and experience about climate change, climate investment and its financing, and affected industries and groups.

What would it take to mobilise investment to achieve our climate goals?

1. **Much greater and more rapid investment.** The private sector sees considerable opportunities and momentum around mitigation investment, reflecting that markets are thought to be moving strongly towards lower-emissions activities. Despite this, much more investment in mitigation is needed (with some key informants suggesting a several fold increase), and urgently, in order to reach climate goals. Arguably, even more attention needs to be given to investment in adaptation, as, compared with mitigation investment, less progress has been made and fewer private sector opportunities are perceived.
2. **Building on recent policy developments.** The establishment of the overarching regulatory framework for climate change and other recent developments have provided more clarity about the trajectory of climate policy and greater certainty to support long-term investment decision-making. The new disclosure regime is starting to have far-reaching effects across financial institutions, and ultimately will influence businesses' investment behaviours. However, some policies are seen as inconsistent with climate goals and greater clarity is needed in some areas.
3. **Wide-ranging actions across public and private sectors** – see Table 1. Note that for mitigation investment (the top of the table) no single theme dominated. Having said that, in general demand-side issues like regulatory settings were more of a concern than some supply-side ones like access to finance. For adaptation investment (the bottom of the table), improving access to data was the most frequent suggestion. Also note that some suggestions, such as a change in mindsets and partnering with Māori, apply to both mitigation and adaptation investment, and many of the themes are inter-related.

Table 1: What would it take to mobilise investment to achieve New Zealand's climate goals?

Theme	Main issues/barriers/opportunities	Main solutions suggested *(including key actor)*
Mitigation goals		
Increased scale/pace of investment	The current scale and pace of investment is inadequate to achieve climate goals. Much greater and more rapid investment is needed (see opposite for some examples)	Increase public investment in renewable energy and electrification, science in areas like reducing methane emissions and new energy technologies, public transport, and low-emissions hospitals and schools *(central/local govt)*
Greater certainty and clarity of policy	Despite greater clarity around climate policy, some policies are seen as inconsistent with climate goals eg parts of the Emissions Trading Scheme (ETS)	Improve policy coherence around climate goals eg develop long-term policy targets, align the ETS and regulatory settings with climate goals, and provide clear signals and choices in critical markets like energy *(central/local govt)*
The right incentives	The price of carbon and some ETS settings are seen as not fully consistent with climate goals. In addition to the ETS, regulatory and other policy changes are needed to influence investment behaviours	Increase the price of carbon, phase out free allocation of units in the ETS and price agricultural emissions as soon as possible *(central govt).* Amend regulations/policies to encourage investment in low-emissions buildings and transport etc *(central govt)*
Data and tools	There is a lack of awareness of existing data and tools. Some existing tools encourage short-termism and so work against mitigation investment	Improve data on small and medium enterprises' (SMEs)' carbon footprints, and educate SMEs/households about the benefits of mitigation investment and the tools available *(central govt/private sector).* Lower discount rates *(all)*
Access to finance	While access to climate finance is not generally seen as an impediment, some groups may struggle with access. A key gap is early-stage finance in low-emissions technologies not yet commercialised	Improve access to climate finance for Māori, SMEs, start-ups and low-income households that may struggle with access *(central govt/private sector).* Use government's balance sheet to de-risk new technologies ie use public money as a risk guarantee-type instrument *(central govt)*
A change in mindsets	Investors' personal beliefs about climate change heavily influence their investment decisions. Inconsistent policy can make individuals and businesses query why they should invest. It is difficult to change entrenched attitudes and beliefs	Develop a positive narrative about mitigation investment that makes it real for people and the opportunities transparent *(central/local govt).* Signal resoluteness to mitigation action eg by pricing agricultural emissions as soon as possible *(central govt).* Actively consider their own climate beliefs and mitigation investment opportunities *(all)*
Partnering with Māori	Māori have many interests in, and te ao Māori holds many insights for, mitigation investment. Upholding Te Tiriti o Waitangi is a critical consideration. Māori-led solutions are proven to be more effective for Māori	Partner with Māori on mitigation investment in an authentic way, further develop capabilities to do so, and make greater use of te ao Māori in mitigation investment *(all).* Encourage Māori-led solutions to mitigation investment *(central/local govt/Māori communities)*
System-wide change	Urgent, system-wide, action is needed for mitigation investment to be consistent with climate goals. However, lock-in, status quo bias, lobbying by incumbents etc mean it is very difficult to shift investment patterns	Encourage investment in nascent low-emissions technologies/industries by addressing co-ordination and information problems, de-risking early stages etc *(central govt).* Encourage greater partnership across public and private sectors to address hard-to-tackle issues like lock-in and status quo bias *(all)*. Lift capabilities and adopt new policy tools about systems thinking etc *(central govt/all)*
Managing the social consequences	The social consequences of increased mitigation investment and system-wide change include higher prices and the impact of the transition on jobs and communities	Manage the pace of the transition so that households do not face steep price increases and communities can adjust *(central/local govt).* Improve access to finance (see above) *(central govt/private sector)*

Adaptation goals		
Increased scale/pace of investment	Arguably, there is an even greater need to ramp up adaptation investment than mitigation investment given the lack of progress to date	Rapidly scale-up and accelerate adaptation investment *(all*)
Granular, accessible data	Accessible data (and the disclosure of data) about local climate risks and impacts are needed to support adaptation investment decisions. Some valuable climate modelling data are not currently publicly available. Other data sources are disparate	Collect and share data on climate risks and impacts in a comprehensive and harmonised way based on authoritative data sources *(all).* Regulate the disclosure of climate (and other) risks for public assets, commercial buildings, houses, catchments etc *(central govt)*
Local governments having a clear mandate	Local governments face many competing priorities and challenges, may have little incentive to invest in adaptation, and lack a clear mandate to do so	Develop a much clearer legislated mandate for local government around climate change that includes short- and long-term actions that reduce exposure to climate risk *(central govt)*
Better local planning and managed retreat	Proactive planning and anticipatory investment are needed to locate people and activities to low-risk locations. In some cases, managed retreat is also needed to relocate exposed assets and communities	Promulgate "dynamic adaptive pathways", "climate leases" and other adaptation tools *(central/local govt).* Integrate climate risks into planning and asset management decisions *(all).* For new infrastructure and intensification, invest in low-risk locations *(local govt/all)*. For existing infrastructure in locations facing progressive climate risks, start planning now for managed retreat in a staged manner *(local govt/all)*
Community engagement	Councils need to communicate long-term climate risks. They face challenging conversations in communities prone to flooding etc and with Māori who have strong ties to whenua	Engage extensively with local communities, including balancing the need to address top-of-mind issues while avoiding maladaptation *(local govt).* Develop tailored responses that recognise the interests and rights of Māori communities *(local/central govt/Māori communities)*
Sharing and partnering in investment	Difficult decisions like managed retreat require careful consideration around where the benefits and costs of investment fall. There are co-benefits from adaptation investment eg biodiversity, health and safety	Clearly allocate the sharing of the cost of adaptation investment across public and private sectors, especially for managed retreat, as early as possible to avoid mal-adaptation *(all).* Better quantify and communicate the co-benefits from adaptation investment *(central govt)*

Conclusions

Key informants indicated that things are moving in the right direction for climate investment, especially around mitigation investment.

However, they also identified that much more needs to be done and quickly. The list of their suggestions looks somewhat daunting. Perhaps unsurprisingly, many of the suggestions are directed at central government. While some suggestions are covered in the Government's Emissions Reduction Plan (ERP) and National Adaptation Plan (NAP), others, including extensive investment in adaptation, are not. The suggestions should help policymakers as they implement the ERP and NAP and look ahead to what more might be needed.

Overall, a key message is that policies need to align with climate goals and be coherent. Key informants were quick to pick up on inconsistencies in policy and indicated that these inconsistencies could reduce the motivation to invest.

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1.1 Motivation

It is unequivocal that human influence has warmed the atmosphere, ocean and land, and that this has driven widespread and rapid changes (Intergovernmental Panel on Climate Change (IPCC) 2021). There is strong scientific consensus that limiting global warming to well below 2°C requires a transformation in the structure of global economic activity on a massive scale (Krogstrup and Oman 2019).

Aotearoa New Zealand's has set ambitious climate goals. Climate change mitigation goals are set out in the Government's Emissions Reduction Plan (ERP) (New Zealand Government 2022a): reach net zero emissions of long-lived greenhouse gases (GHGs) by 2050 and reduce biogenic methane emissions between 24-47% by 2050. Climate change adaptation goals are set out in the Government's National Adaptation Plan (NAP) (New Zealand Government 2022b): reduce vulnerability to the impact of climate change, enhance adaptive capacity and consider climate change in decisions at all levels and strengthen resilience to climate change.

Investment is a key enabler in achieving mitigation and adaptation goals. For example, spending on low-emissions technologies and energy systems and climate-friendly business models can help lower emissions, and spending on climate-resilient infrastructure and assets can help adapt to climate change effects. We term this broad type of spending "climate investment".

Internationally, climate investment to date has frequently been assessed as inadequate. To better understand what might be holding it back, we undertook a literature review of relevant theories and evidence, with an emphasis on the role of policy in stimulating climate investment (see Pells 2022). The literature review is a companion paper to this present report, and the findings are summarised in section 2. In brief, climate investment faces a range of challenges that are reasonably well understood. What is less well understood are the solutions and how to enact them in the New Zealand context. These are the foci of this present report.

1.2 Objectives and scope

This qualitative study explores what might be done to address some of the challenges facing climate investment and to mobilise (or stimulate) private and public climate investment. The guiding question for the study is:

- *What would it take to mobilise investment to achieve New Zealand's climate goals?*

This question is based on a statement by the Climate Change Commission's Chair, Rod Carr, who said in the context of the Government's economic stimulus investment for Covid-19: "We have reached the point where climate change needs to be our focus for

future investments".[1] The question provides an interesting thought experiment and a useful starting point for this study.

The ultimate aim is to contribute to the evidence base for policies aimed at supporting New Zealand's climate goals, in particular, the implementation of the ERP and NAP.

The study takes a fairly broad view of climate investment. The scope includes climate change mitigation and adaptation, climate investment and its financing, and public and private climate investment. Some of these terms are defined in section 2.

1.3 Approach

We used a qualitative approach – interviews with key informants based on an earlier literature review – to explore the question above (Pells 2022). The rationale for using a qualitative approach was to explore the topic in detail, remain open to unexpected findings, and provide rich examples in the New Zealand context.

The study drew on the knowledge and experience of some New Zealand and overseas experts involved in climate investment. Specifically, it involved in-depth interviews with **33 people across 24 organisations**. The organisations spanned industry associations, peak bodies, financial institutions, iwi and Māori asset owners, research institutions, relevant overseas organisations, and local and central government agencies.[2]

We conducted the interviews via Zoom and each one lasted about one hour.

The fieldwork period was from mid-February 2022 to the end April 2022. One point to note about this timing is that it was after the first draft ERP was released for consultation, which meant that some key informants were familiar with the content of the draft Plan and indeed some had made submissions, but the Plan was not finalised. However, this timing was before the first draft NAP was released.

This study has many of the benefits and limitations of qualitative research in general. One specific limitation is that the sample of iwi and Māori asset owners was very small. Somewhat offsetting this limitation, some of the key informants in other categories had iwi affiliations, and many had been working with iwi, hapū, Māori trusts etc in the context of climate investment.

Note that we aimed to carefully report what we heard, and so have not applied a critical lens to key informants' suggestions. However, in places we provide some interpretation of the findings compared with those from our literature review.

Appendix B describes the method in detail including the sampling method, list of participating organisations, questions, and benefits and limitations of the approach.

[1] https://www.climatecommission.govt.nz/our-work/advice-to-government-topic/six-principles-for-economic-recovery/

[2] To ensure we selected a sample of "true" key informants, we obtained an external peer review of the sample design, drew on a literature review in the initial sample selection, and used a "snowball" sampling technique (where initial interviewees nominate subsequent ones).

2 Literature review

Climate investment plays a key role in achieving climate goals. However, climate investment faces many challenges, including short-termism, physical and transition risks, and deep uncertainty. These challenges mean that global climate investment to date has been limited. Wide-ranging and co-ordinated policy action is needed to kick-start and support climate investment.

2.1 Definitions

The IPCC (2018) defined **climate change** as "a change in the state of the climate that can be identified (eg by using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer". Climate change may be due to natural processes such as volcanic eruptions, or persistent anthropogenic (resulting from human activities) changes in the atmosphere or land use.

Climate change mitigation is "a human intervention to reduce emissions or enhance the sinks of greenhouse gases" (IPCC 2021). **Climate change adaptation** in human systems is "the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities" (IPCC 2021).

Investment can be defined as "the purchase of assets that are used to create future value" based on Parker (2010). This definition emphasises that investment provides a key economic link between the present and the future; the benefits from investment accrue over time and involve giving up something in the near term. We use the term "value" in a broad sense – not just the monetary worth of the benefits arising from the asset, but also environmental and other benefits (and costs).

In this report, **climate investment** means investment aimed at climate change mitigation or adaptation, such as spending on low-emissions technologies and energy systems and climate-friendly business models (mitigation investment), and climate-resilient assets and infrastructure (adaptation investment).

These economic definitions differ from what many people think of as investment, which is investing in financial assets like stocks and shares. However, stocks and shares etc are picked up in the *financing* of investment. For businesses, investment financing options include debt finance (borrowing from banks etc) and equity finance (issuing new shares of stock either privately or publicly on the stock exchange) (Pells 2020). The UNFCCC defined **climate finance** as "local, national, or transnational financing – drawn from public, private, and alternative sources of financing – that seeks to support mitigation and adaptation actions that will address climate change".[3]

[3] https://unfccc.int/topics/climate-finance/the-big-picture/introduction-to-climate-finance

2.2 Key findings from our literature review

Below is a summary of our companion literature review (see Pells 2022).

- **Climate investment has long time horizons.** Climate investment is shaped by investment decision-makers' expectations of the distant benefits of climate action, weighed up against the near-term costs. Therefore, businesses' and other investors' perceptions, attitudes and awareness of climate change play a key role in climate investment (European Investment Bank 2021). Short-termism in investment decision-making works against climate investment (Hallegatte, et al. 2012).
- **The choice of discount rates is therefore critical.** Discounting is perhaps the most important conceptual issue for climate investment (Nordhaus 2019). A high discount rate tilts decisions towards projects that deliver net benefits in the near term, and a low discount rate tilts decisions towards projects that deliver net benefits over the longer term. In New Zealand, the default public sector discount rate is at the high end of the spectrum (Parliamentary Commissioner for the Environment 2021), which works against climate investment.
- **Climate investment involves risks and uncertainties.** There are two main risks: physical risks such as from extreme weather events or sea level rise; transition risks such as from policy, legal, technology, and market changes aimed at reducing emissions (mitigation) and adjusting to climate change impacts (adaptation) (Task Force on Climate-related Financial Disclosures 2017). As well as risks, climate change also introduces deep uncertainty to investment decision-making, which means there is disagreement about the probability distributions of key parameters in models or the values of outcomes (Lempert, et al. 2003, cited in Fay, et al. 2015). These risks and uncertainties work to lower and postpone climate investment.
- **Other challenges include lock-in and stranded assets.** Lock-in arises through a combination of systemic forces that perpetuate high-emissions infrastructure despite known environmental externalities and the existence of cost-effective remedies (Unruh 2000). Stranded assets are ones that suffer from unanticipated or premature write-downs, devaluations or conversion to liabilities during the transition to a low-emissions economy or due to climate change impacts (Koomey 1989, cited in Curtina, et al. 2019). Lock-in and stranded assets highlight the role of *dis*investment in achieving climate goals.
- **The scale of global climate investment reflects these challenges.** While there has been some growth in climate investment and its financing, most estimates of the scale of investment come to broadly similar conclusions – that both climate investment and its financing, while growing, fall far short of what is needed. For example, green bonds have developed rapidly but represented less than 1% of the global market in 2018 (OECD/The World Bank/UN Environment 2018). The IPCC (2022) estimated that globally, average annual mitigation investment for 2020 to 2030 would need to be a factor of three to six times greater than current levels to limit warming to 2°C or 1.5°C. Even less progress has been made in adaptation which accounted for less that 10% of global climate finance flows in recent years.

- **Government plays a key role in climate investment.** The main rationale for intervention is the negative externality that arises due to the damage inflicted by emissions and maladaptation. Other market failures include incomplete and imperfect capital markets, information and co-ordination failures, the market power of incumbents, and positive knowledge spillovers from climate innovation (Krogstrup and Oman 2019).
- **A systemic approach to climate investment policy is often suggested.** This reflects that the deep transformation in investment patterns and behaviours needed to achieve climate goals requires wide-ranging and co-ordinated policy action. New policy frameworks and toolkits may be needed to achieve the required transformation (Krogstrup and Oman 2019).
- **Such a policy approach involves complementing a robust carbon price with a suite of other measures,** which for mitigation investment includes: regulatory measures when emissions pricing is not efficient or too low; specific measures to bring low-emission technologies to commercialisation; addressing barriers in the financial system such as a lack of information on low-emissions investment; improving governance across the financial system as a whole to address financial incentives that favour short-termism; government acting as a market shaper/maker by providing "patient" (long-term) capital or being first purchaser (OECD/The World Bank/UN Environment 2018). The overall aim is to kick-start climate investment and overcome system inertia (Stern and Valero 2021).
- **While some progress has been made internationally, policy efforts to stimulate climate investment have been assessed as vastly inadequate.** Europe in particular is making progress on some of the foundational work needed to support mitigation investment, such as developing taxonomies and improving disclosure regimes (European Investment Bank 2021). However, global finance and investment for mitigation remain marginal, and ultimately global emissions are high and rising (Krogstrup and Oman 2019). Even less progress has been made in adaptation.
- **Aotearoa New Zealand is at the start of our climate investment policy work.** Progress to date includes establishing the overarching framework for climate change policy (see Climate Change Commission 2021) and improving the disclosure regime. However, New Zealand lacks even basic data on climate investment and has yet to assess the scale and pace of investment needed. In addition, the lack of a robust carbon price historically (OECD 2022), the absence of pricing of agricultural emissions, and high public sector discount rates likely inhibit climate investment. Like other countries, New Zealand has made less progress in adaptation policy than in mitigation policy.
- **The overall implication is that much more needs to be done regarding climate investment.** In New Zealand, this work could include improving basic data and reporting, recognising the systemic nature of climate investment and the comprehensive and co-ordinated package of policies needed, and seriously considering fundamental issues such as carbon pricing, pricing of agricultural emissions, and public sector discount rates.

3 What would it take to mobilise investment to achieve New Zealand's mitigation goals?

Mobilising investment to achieve our mitigation goals would involve wide-ranging actions across public and private sectors. These actions would build on recent policy developments which have provided greater certainty to support long-term investment decision-making, and on the momentum for mitigation investment in the private sector. However, much more needs to be done for investment to be consistent with climate goals.

3.1 Introduction

This section covers what we heard from key informants about mitigation investment (investment to reduce emissions) in response to our high-level question: *What would it take to mobilise investment to achieve New Zealand's climate goals?* Also included are the findings from other mitigation questions including ones about the types of investment shifts needed to achieve mitigation goals, barriers and opportunities for mitigation investment, and how the principles of Te Tiriti o Waitangi can be enacted in the context of mitigation investment. We grouped all the findings into broad themes per the sub-sections below.

Note that:

- no single theme dominated – each one covers comments from multiple key informants
- there is much overlap between the themes as the issues are often inter-related
- some of the themes also relate to adaptation; adaptation is considered in section 4
- a breakdown of the findings by sector, community group etc is provided in Appendix A and the list of questions we asked is provided in Appendix B.

3.2 Increased scale and pace of investment

3.2.1 The scale and pace of investment in mitigation is seen as inadequate

The majority of key informants considered that, while some progress is being made in mitigation investment, much more needs to be done and quickly. They used phrases like "we should have started yesterday" and "we're going terrible". Some considered that the scale of investment would need to be increased by several orders of magnitude to achieve New Zealand's climate goals and that the pace of investment is far too slow. Reasons for this assessment included that the vast majority of New Zealand businesses and households are not yet making significant investments in

mitigation, climate finance is growing but from a very small base, and the urgency of the climate crisis requires a rapid acceleration in the pace of mitigation investment. These findings align with those from international literature (see Pells 2022) – that currently both climate investment and its financing fall far short of what is needed.

However, a few key informants commented that it is hard to know how New Zealand is tracking on investment in mitigation and climate finance as we lack a formal assessment of the quantum of investment needed to achieve climate goals – a point noted in our companion literature review (Pells 2022).

Some key informants noted the practical constraints to ramping up climate investment quickly in some areas such as new technologies. One example was offshore wind. Realising the benefits from offshore wind is likely to be a long way off, as steps include developing the regulatory framework and the consenting process before companies can deploy this technology. Other constraints included the need to manage the social consequences (section 3.10) and the fact that shifting attitudes towards climate change takes time (section 3.7).

3.2.2 Much greater public investment is needed in some areas

Key informants discussed several areas where they considered much greater public investment is needed to achieve mitigation goals.

Firstly, significant investment is needed in renewable energy to support the transition away from fossil fuels and build on New Zealand's already strong record in renewables. This shift includes increasing electricity capacity to cope with increased demand arising from electric vehicles and the electrification of industry. Other energy investments were discussed, including solar, onshore and offshore wind (areas in which New Zealand was seen as having some natural advantages) and green hydrogen (a contentious topic – see Appendix A).

Some key informants commented that assessing the optimal mix of renewable energy sources and the investment needed is a complex area that involves considerable expertise. Others suggested that New Zealand's experience in renewable energy and integrated grid management represents a significant opportunity for New Zealand in terms of attracting R&D and entrepreneurial talent in this area. Yet others welcomed the development of a new energy strategy to make some of government's choices around new technologies and the direction of travel more explicit.

Secondly, greater investment in science is needed in critical areas of emissions reduction. Probably the most frequent example was investing more in science to reduce methane emissions. Arguments (which mainly, but not exclusively, came from key informants related to the dairy and agricultural sector) included New Zealand's significant exports in dairy, that agriculture accounts for around half of New Zealand's gross emissions, and that there are significant challenges to reducing emissions in dairy and other parts of agriculture. In particular, more science is needed around methane inhibitors in the New Zealand context. Overseas technologies require an animal to have an additive eaten at the end of every meal; adopting this technology is challenging in New Zealand as cows are not generally kept in barns.

Other opportunities for greater science investment included: new horticultural and other relatively low-emissions food industries; new energy technologies like green hydrogen; better understanding how to optimise electricity generation; new carbon capture technologies; technologies to decarbonise (hard-to-abate) steel, concrete and stone; and mātauranga Māori. Arguments for this type of investment included focusing on emerging industries and technologies rather than existing ones.

Some key informants suggested that different approaches to science investment might be needed to tackle a complex challenge like climate change. Suggestions included:

- developing a strategy for science investment in climate change, as currently, this falls between the cracks of various National Science Challenges
- adopting Mazzucato's "mission" approach (see for example Mazzucato 2021) that galvanises public and private investment around a (climate) goal[4]
- reviewing existing public science portfolios to assess if each investment is aligned with climate goals, in the same way that banks and institutional investors etc are doing in response to the new disclosure regime.

Thirdly, investment in public transport needs to be increased to reduce emissions from petrol cars and vehicles. Key informants argued that this investment needs to be combined with greater subsidisation of public transport and more careful planning of the transport network to incentivise the uptake of public transport and make it easier for people to make low emissions travel and investment choices.

Fourthly, public investment in hospitals and schools should be low-emissions. Reasons included not only the direct reduction in emissions, but also that exemplary investments by the public sector help shift mindsets and thicken markets for low-emissions products, thus lowering the cost for the private sector due to scale effects.

3.2.3 The pace of mitigation investment should be accelerated

In terms of what could be done to accelerate mitigation investment, some key informants discussed the political will, ambition and mindset shift needed (see section 3.7). Some drew a comparison with the Covid-19 pandemic and argued that large public and private investments can be galvanised quickly where there is a political will and a clear goal. However, climate investment has been much slower to ramp up due to a lack of sense of urgency and/or lack of understanding about the cost of delay.

> *There was a much greater ownership taken by governments globally and you just think about the fiscal response to Covid in New Zealand, it was quite dramatic and quite swift, which was needed. But I think that is a risk we've got is that we view climate change as something that's not right here and now, even though the reaction needs to happen now to address it because of the time lag of response to outcome. (Investor/financial services)*

[4] A mission-based approach to innovation is being taken in climate innovation platforms – see New Zealand Government (2022a).

Some key informants suggested some practical things that government could do to accelerate the pace of mitigation investment in the short term, including:

- further incentivising forestry through the ETS, as there are few technological barriers to overcome compared with some other sectors (although note the concerns about forestry discussed in sections 3.7 and above)
- progressing already-consented windfarms and other energy projects
- speeding up procurement processes of large infrastructure projects by de-risking the early stages and undertaking the legal and consenting aspects.

3.3 Greater clarity of policy direction

3.3.1 Certainty is critical to long-term climate investment

Many key informants, especially those in the private sector, emphasised the importance of certainty in investment decision-making. Greater certainty provides confidence to investment decision-makers and reduces some of the risks inherent in climate investment. Certainty is particularly significant for long-lived assets like infrastructure and those in sectors such as the utilities and forestry with long investment horizons. These findings broadly echo those from our literature review (Pells 2022) – that *un*certainty is the enemy of investment and works to lower and postpone investment.

Key informants frequently commented on the role that policy plays in providing greater certainty. They discussed the need for long-term policy targets, clear signals about the broad direction of travel of policy, cross-party agreement, regulatory settings that align with climate goals, and clear signals and choices in critical markets like energy.

> *Well, I guess I would say what anyone in the business community would probably say, which is just certainty. You know, having certainty. Particularly around things that have, at times, been quite politically charged and therefore prone to swings as the incumbent Government changes and sort of political flavour and is very unhelpful to giving you certainty to invest. And so we were very pleased to see the climate change act come in, under the last government. You know the sort of bipartisan approach that was taken… We absolutely think it's the right thing. (Industry association/peak body)*

3.3.2 Recent policy developments are seen as positive

A number of recent policy developments were mentioned favourably in terms of providing more certainty for mitigation investment decision-making:

- the establishment of an independent Climate Change Commission which looks beyond electoral cycles (frequently mentioned)

- the establishment of the overarching regulatory framework (Climate Change Response (Zero Carbon) Amendment Act), including long-term climate goals and commitments (frequently mentioned)
- the new climate-related disclosures regime (discussed in section 3.5)
- the development of the ERP and NAP
- the development of a new energy strategy
- other policy developments such as improvements in the disclosure regime and the clean car feebate.

Overall, many key informants felt that things are moving in the right direction to provide greater clarity around where policy is heading. For example, a number of key informants pointed out that it is clear that fossil fuels will be phased out eventually, which strengthens the case for investment in "cleantech" etc.

3.3.3 However, some policies undermine certainty and clarity

Some key informants commented that policy positions have waxed and waned with successive changes of Government. Others expressed concerns that regulatory and policy settings are not always consistent with climate goals, undermining the clarity and certainty needed to support long-term investment decision-making. Examples included:

- limited cross-party support for climate action (although some key informants felt this had improved in recent years)
- the ETS failing to provide a clear long-term investment signal
- agriculture (a key source of New Zealand's emissions) not being included in the ETS
- regulatory settings in the energy sector not being conducive to long-term investments (eg current regulations result in long lead times to establish new wind farms), non-network solutions and other non-traditional investment
- indirect subsidies to emitting sectors, like emergency funding to help the farming sector recover from natural hazards
- cuts in petrol excise duty in response to the cost of living crisis.

These findings imply the need for greater policy consistency and coherence around climate goals, a point raised by many key informants.

3.4 The right incentives

3.4.1 The ETS plays a crucial role in incentivising mitigation investment

Many key informants, especially those in the private sector, felt that prices should do the "heavy lifting" regarding incentivising mitigation investment. Arguments revolved around economic efficiency in terms of market players responding to price signals and determining optimal investment decisions that "internalise the emissions externality".

The rise in the carbon price in recent years has resulted in real changes in forestry investment,[5] for example, commented some. This upward trajectory in the carbon price is only expected to continue, which strengthens the case for "cleantech" and other low-emissions investment. Thus, there is real momentum towards mitigation investment.

Other key informants argued that the price of carbon has been volatile historically and is still far too low. Suggested changes to the ETS to further incentivise climate investment, some of which are in train,[6] included:

- managing the supply of emissions units and the price control settings in the ETS to drive higher unit prices so that prices are consistent with New Zealand's climate goals and have a meaningful impact on climate investment (a frequent suggestion)
- phasing out free allocation
- pricing agricultural emissions/bringing agriculture into the ETS as soon as possible
- carefully thinking about the role of forestry in the ETS which includes:
    - not overly relying on carbon offsets from forestry as this can disincentivise the fundamental changes in investment behaviour needed to cut emissions
    - considering the effects of the proposal to remove pine on Māori
    - expanding the species covered.

3.4.2 But the ETS alone is insufficient

Some key informants considered that, while the ETS plays an important role in incentivising mitigation investment, much more needs to be done. They supported the Climate Change Commission's position – that a package of complementary policies is needed to reduce emissions. Reasons included that:

- the price of carbon, while increasing in recent years, would have to be orders of magnitude higher to have a meaningful impact on mitigation investment and does not reflect what is needed for long-lived infrastructure which should be based on the (higher) future price

[5] While key informants tended to use term "carbon pricing", strictly speaking the term should be "greenhouse gas (GHG) pricing" to pick up long-lived GHG gases other carbon, as well as short-lived gases such as biogenic methane.
[6] See Leining (2022) for an outline of some of the changes planned for the ETS.

- if such a rise in the carbon price were achieved it could have significant social consequences in terms of increased prices for consumers (see section 3.10)
- inelasticities, or a lack of responsiveness of climate investment to changes in carbon prices, limits the effectiveness of the ETS in some markets
- the need to scale up and accelerate investment at the innovation frontier which would take too long using price mechanisms
- the need to address non-market barriers such as those around changing mindsets (section 3.7), shifting the status quo (section 3.9) etc.

3.4.3 It needs to be easier for people to invest in mitigation

Some key informants commented that, in addition to the ETS, a number of drivers are already encouraging New Zealand businesses to invest in mitigation. These drivers include increased pressure from consumers, shareholders and other parts of the supply chain. Examples included Nestlé putting pressure on Fonterra to reduce emissions, and changes in regulations in other countries – especially Europe – driving changes to New Zealand exporters' investment decisions.

However, some key informants considered that New Zealand should take a much more proactive approach to incentivise mitigation investment rather than relying on reactive drivers like pressure from overseas markets. In particular, more is needed to accelerate investment given the urgency to reduce emissions.

One of the main themes about the incentives for investment behaviour was to make it much easier for people to make low emissions investment choices. This reflects that there are a range of behavioural and other barriers which include that:

- climate-friendly transport choices are challenging in Auckland which is very spread out and there are limited public transport options (a frequent comment)
- some assets like solar panels involve considerable time and effort in terms of analysing the costs and benefits, identifying providers etc
- recycling often involves considerable effort with much waste ending up in landfills partly due to a lack of infrastructure for recycling.

> *[People] want to make a difference, but they still have to drive the kids to school and to netball and go to the supermarket on the way home and they have no idea how to bridge the gap. What we're asking people at the moment to do is to make individual choices and change. But they're having to do it completely against the grain. Because the infrastructure isn't in place for people to make a shift personally… And so therefore, to me, the only solution is that we imagine we look at all the technologies that are available and we back all those things that would make a radical difference. We invest very, very heavily in new infrastructure that is going to make it easy for people to change their lifestyles and that are going to decarbonize a city. (Government agency)*

3.4.4 Regulatory and other changes are also needed

Key informants made wide-ranging suggestions about changes to regulations, standards and other policies to encourage climate investment:[7]

- amending building regulations to make new houses and commercial buildings more energy-efficient and include solar panels (or being capable of doing so)
- regulating the disclosure of the carbon footprint of houses, commercial buildings and large infrastructure projects to encourage low-emissions investment choices
- amending design standards, labelling rules, grading rules etc of household and commercial assets to make them low-emissions
- introducing congestion charges, and increasing the subsidisation of public transport to encourage climate-friendly transport choices (alongside greater investment in public transport – see section 3.2)
- negotiating trade agreements to open up new markets for low-emissions businesses and to secure goods and assets that support the transition
- ensuring regulatory reforms currently underway are consistent with climate goals and encourage mitigation investment eg:
    - resource management reforms (frequently mentioned), especially where national interests (investment in wind farms and other infrastructure to reduce emissions) rub up against local interests (local communities being resistant to large infrastructure projects in their vicinity)
    - regulations to streamline planning processes and speed up urban development, as there was a concern that decisions would be rushed and the climate impacts not considered
    - Three Waters reform, which potentially presents an opportunity to resolve some of the tensions between local and national interests
- expediting regulations around new technologies that can reduce emissions eg:
    - the offshore wind farm regulatory framework
    - compounds that reduce nitrous oxide in the dairy industry
    - new building products aimed at lowering emissions
- ensuring that critical markets like energy do not face impediments to investment in mitigation; some key informants expressed concerns that this may not be the case, due to the structure of the energy market which means energy companies might not face the right incentives for long-term climate investment
- more fundamentally, “running a ruler” over existing regulations to ensure they align with New Zealand’s climate goals and encourage mitigation investment; reasons included that existing regulations may be status quo biased.

[7] Note that some of these suggestions are in train.

3.4.5 The public sector also needs to face appropriate incentives

Some key informants commented that government agencies might not always face the right incentives to either direct public investment towards mitigation or to create a policy environment conducive to climate investment. Reasons included a lack of incentives in the public sector to take risks and experiment, siloes preventing the cross-agency policy work needed for climate investment and challenges around small agencies influencing larger ones.

Suggested changes to further encourage public sector (policy around) mitigation investment included:

- changing the mandate of some agencies so they are consistent with climate goals, as some key informants felt this is not always the case currently
- developing personal performance targets for CEs tied to climate goals or the transition
- developing shared goals across agencies around climate change
- encouraging a culture of experimentation in the public sector.

3.5 Data and tools to support investment decisions

3.5.1 Data is the lubricant of investment decision-making

Key informants discussed the critical role that information plays in investment decision-making, regarding the ability of businesses, households, government agencies etc to assess the full benefits and costs of a potential investment. For climate investment, this information includes understanding climate risks and the impact of specific assets and activities on emissions.

The benefits of transparency as a result of disclosure were also noted. For example, making businesses' (lack of) green credentials publicly available puts pressure on them to change their behaviours.

Some key informants commented on the challenges around "greenwashing" and the lack of consistency of definitions and determining what is "green". For example, one key informant commented that even wind farms vary in their environmental impact.

3.5.2 The new climate-related disclosure regime is already having effects

Many key informants discussed New Zealand's progress with disclosure, as well as the progress that Europe is making in terms of developing a taxonomy or classification system of environmentally sustainable economic activities. Some noted that New Zealand is the first country to mandate disclosures in line with the work of the Task Force on Climate-related Financial Disclosures (TCFD), with legislation being introduced

in 2021.[8] However, as one key informant commented, one likely reason for this progress is that previously New Zealand was quite far behind in disclosures and reporting on climate impacts and so, compared with European countries, for example, was more readily able to pick up the relatively recent work of the TCFD.

The new regime was seen by many as a very positive move. The benefits include providing an important signal to markets about the broad direction of travel and driving significant behaviour change across sectors. As a result of the new disclosure regime, banks and other financial institutions have been (or anticipate):

- gearing up and resourcing for the new regime
- assessing their climate risks and exposures in terms of the businesses and assets they have on their books, including using data from transactions to estimate the emissions per dollar spent in different categories
- amending their strategies and products in light of the regime (see section 3.6)
- working with businesses to help them transition and reduce their emissions, and/or removing "dirty" businesses and assets from their books (discussed further below)
- ultimately, influencing the investment behaviour of businesses through the above.

> *Because you know, if you're a bank, you've got to actually go through your own assets... to assess the risk. And then what they're doing now the next step is for the lenders to require those customers to have done a climate risk assessment on their own. And it'll be varying degrees, but it's essentially filtered right down so anything that is being recorded and the banks and the institutions and the insurers are pushing it down right down to the borrowers. It's a very broad impact, I mean, that's why it's been so successful. (Academic/expert)*

Key informants noted the effects of disclosure regarding how "dirty" assets like coal, oil and gas are being dealt with. There are two broad approaches. Firstly, banks and institutional investors can remove them from their books. In this case, the assets may be taken up by unregulated investors with "less concern about their reputations than the main banks" as one key informant put it. In other words, while these assets may no longer appear in the records of banks and institutional investors they still exist.

Secondly, banks and institutional investors can work with high-emissions businesses to help them transition towards low-emissions assets and business models. This type of collaboration tended to be seen as the preferable approach. However, some key informants questioned the extent to which it is happening/likely to happen in practice, as it is relatively costly for banks to help businesses to transition. Moreover, there are so many opportunities for "clean" investment that banks and institutional investors can easily afford to shed "dirty" businesses.

[8] The Financial Sector (Climate-related Disclosures and Other Matters) Amendment Act - see https://www.beehive.govt.nz/release/nz-becomes-first-world-climate-reporting.

3.5.3 But more work is needed to improve data and information

Despite the progress described above, key informants suggested wide-ranging improvements about how data and disclosure could better support mitigation investment which included:

- providing information to businesses to show the benefits of and business case for mitigation investment, to give them the data and the tools to make better decisions
- improving data on small and medium enterprises' (SMEs') emissions profiles, and developing a "light" certification process for SMEs who may not face the incentives to gain a full carbon certification and for whom costs are disproportionately high
- making the data on farmers' emissions through He Waka Eke Noa publicly available so that information can be used by banks, insurers and other investors[9]
- sharing proprietary information that has public benefits eg some data about Hydro generation which are currently under non-disclosure agreements
- making operational carbon emissions inventories for commercial buildings publicly available, as is the case in Australia
- improving international comparability of climate data by adopting the EU taxonomy for example, to facilitate foreign investment
- providing information targeted at citizens to make it easy for them to assess the full costs and benefits of investing in low-emissions assets like solar panels, EVs etc
- developing a resource hub with information about builders who are experienced in building low-emissions homes, solar panel installers, EV servicing mechanics etc
- regulating the disclosure of the carbon footprint of buildings and other assets eg houses to carry a real energy efficiency and emissions ranking.

A few key informants raised the question: How much information is enough for investment decision-making? They were concerned that a lack of data can sometimes be used as an excuse to avoid cutting emissions and argued that sufficient data to support investment decisions are already available.

3.5.4 Investment decision-making tools also need to be improved

As well as data, investors need methods and tools that support mitigation investment. Some of the problems identified with traditional discounted cashflow techniques, credit risk models and other methods used in investment decision-making are that they:

- encourage short-term investment rather than long-term investment
- do not tend to take account of emissions externalities or the benefits of decarbonisation

[9] He Waka Eke Noa is New Zealand's primary sector climate action partnership aimed at implementing a framework by 2025 to reduce agricultural greenhouse gas emissions and build the agriculture sector's resilience to climate change – see https://hewakaekenoa.nz/.

- do not tend to recognise the co-benefits of decarbonisation in terms of improved health, biodiversity etc
- do not accurately price climate risk
- are backwards-looking (ie based on historic data), whereas climate change is forwards-looking
- do not recognise that offsets by forestry are not biologically equivalent to reductions in emissions
- are inconsistently adopted and applied.

> *Another huge shift, I think, that would make a big difference is changing how investors understand the return on investment and that's basically the time horizon for expecting a return and the discount rate that gets applied…But the problem is just ridiculous that people have really profitable energy efficiency investments, but they may have a three year return or a five year return like, why is that your measure for return? This is crazy. The emissions that we're putting up into the atmosphere will be a problem for centuries and you're worried about a three year return on an energy efficiency benefit? I mean, come on. (Academic/expert)*

Suggested changes to investment decision-making tools included:

- lowering public and private sector discount rates to encourage long-term climate investment (a point much discussed in the literature – see Pells 2022)
- ensuring government agencies use consistent approaches and data sources for infrastructure and other investment decisions
- developing tools to consider the full lifetime costs of assets such as embodied costs, and to determine whether to "sweat" the assets longer or use planned obsolescence
- adopting the principle used in Europe "Primo, non nocere" – not undoing with one hand what we are trying to fix with the other
- drawing on tools from mātauranga Māori which focus on "blended returns" and have a long-term inter-generational focus
- reconsidering the idea of investing where abatement is cheapest first; sometimes (in particular, if all sectors eventually need to decarbonise) it makes sense to start with the most expensive option, for example where mitigation investment in one sector relies on that in another
- (macro-economic modelling) taking into account some of the distributional effects of mitigation investment
- improving the capability to use these tools, and educating farmers and small businesses to use the tools that are already available.

3.6 Access to finance

3.6.1 Access to finance for mitigation investment is growing and generally considered adequate

In general, key informants considered that there were relatively few impediments to businesses and households accessing finance for mitigation investment. Key informants commented on the growth in climate finance in recent years, partly reflecting the new disclosure regime and the movement of financial and other markets in New Zealand and internationally toward decarbonisation. Banks, small private capital investors, some non-profit organisations and other financial institutions in New Zealand have developed/are looking to develop specific climate finance products:[10]

- "green mortgages" and zero/low interest loans for solar panels, heatpumps etc (although one key informant commented that green buildings etc are perceived to be riskier and more costly and complicated to finance than traditional ones, which in practice can result in banks charging *higher* rates for these investments compared to traditional ones)
- sustainability-linked financing which involves specific targets – if the business meets the target it gets a discount and if it fails to do so it gets charged more
- "green bonds" issued for climate investment projects
- apps to help small businesses calculate their emissions profiles.

Therefore, key informants tended to consider access to finance to be less of an issue than some of the other themes discussed earlier in this section (although note that our literature review – see Pells 2022 – found that climate finance is growing but from a very small base). For example, one key informant commented that it is important to ensure that regulatory setting are conducive to climate investment, so that if access to credit is increased for SMEs it will result in "clean" rather than "dirty" investment.

> *But I always like to start by saying if there's a fundamental funding gap then the answer is not yet more sophisticated product. That's not going to close that gap. The demand side is crucial, the regulatory environment is crucial. (Academic/expert)*

3.6.2 However, access to finance could be improved for some groups

Some key informants commented that, despite the growing availability of finance for climate investment, some specific groups can struggle to access finance in general and in particular for climate investment:

[10] Also note the work of Toitū Tahua: Centre for Sustainable Finance – see https://www.sustainablefinance.nz/.

- Māori businesses and whānau, to whom banks tend to have a poor record of lending (some noted the work of the Reserve Bank to improve this),[11] or who can struggle to obtain finance for investment relating to collectively-owned land
- small businesses and start-ups, about which banks may have less information than established businesses and for which the costs of managing the relationship are proportionately higher
- low-income households for whom affordability is a key issue.

A few key informants discussed products available in other countries to make climate investment more affordable. One example was the Energy Performance Contracting model developed in the US. This approach involves no upfront cost to buy solar panels etc. Instead, the costs are paid back to the lender over time out of energy savings.

3.6.3 A particular gap is early-stage finance in new technologies not yet commercialised

Some recent policy developments such as the establishment of New Zealand Green Investment Finance (NZGIF) and the Elevate and Aspire funds were seen as positive moves in the early-stage financing of climate investment.

However, some public investors were seen by some key informants to be overly conservative, slow to act, and making decisions based on commercial outcomes rather than public benefit. One key informant provided several examples such as one business for which the funding process took over 12 months, and other businesses which had been put off from progressing applications altogether due to the onerous processes.

Obtaining finance for new technologies not yet commercialised was considered the main financing gap. One example was a new technology to feed dried seaweed to cows as a possible way of reducing methane. This technology is still relatively untested, but if it was to be commercialised at speed, there was a concern that obtaining finance could be challenging as it is an unproven commercial project.

A few key informants suggested how the public sector could better fill this gap in early-stage climate finance to get new technologies through the "valley of death". There were two main suggestions. Firstly, government could use public money as a risk guarantee-type instrument to de-risk projects. This form of investment would involve the government using its balance sheet to provide bank guarantees to climate tech businesses to accelerate the commercial pathway. This approach was considered a better option than government directly providing loans which can be a slow and onerous process as described above. One key informant with expertise in this area commented that relatively small amounts of public funds can significantly de-risk energy and infrastructure projects.

Secondly, government could provide direct grants and subsidies etc that recognise the risks involved in R&D and early stage "cleantech" innovation where there is no obvious and immediate revenue stream.

[11] https://www.rbnz.govt.nz/have-your-say/improving-maori-access-to-capital

3.6.4 There is no recognition for the public benefit from climate finance

A few key informants commented that, other than disclosure and wanting to "do the right thing", banks and other financial institutions face little incentive to offer products that support climate investment and indicated that banks may have to reduce their margins for sustainable or climate finance. Banks also have to hold the same amount of capital to finance climate investment as they do for fossil fuel-based ones. These key informants argued that there is no recognition from government of the public benefit derived from banks' and other financial institutions' climate finance and decarbonisation efforts.

This is in contrast to European countries, where the European Investment Bank's (EIB's) role is to make financing decisions based on the public benefit from climate finance. In addition, the reserve banks of those countries have adjusted their risk weightings of the capital that has to be held against a certain asset.

Therefore, a few key informants suggested that there should be some recognition or incentive for climate finance.

3.7 A change in mindsets

3.7.1 Attitudes about climate change heavily influence investment decisions

Many key informants felt it would take a fundamental mindshift to mobilise mitigation investment – that investors' personal attitudes and beliefs around climate change strongly influence perceptions of climate action's benefits, costs and risks.

Some key informants felt that attitudes are changing for the positive. They discussed the "generational divide" and commented that young people tend to have greater awareness of climate change; over time, young people's attitudes will prevail. Even among older people and business owners who grew up in an age of high consumerism and may be "climate sceptics", there is growing awareness of the role humans are having on the climate. The positive role played by the media in lifting awareness and profiling climate change was also discussed.

However, other key informants talked about the continued challenges around changing mindsets that underpin mitigation investment:

- a lack of understanding and awareness about the "ticking time bomb" of climate change, tipping points, irreversibilities, etc
- "cognitive dissonance", "status quo bias" and other behavioural challenges that mean humans are very poor at addressing systemic issues like climate change
- inconsistent policy (see section 3.2) causing the public to query why they should invest in mitigation, and undermining New Zealand's "clean green" image overseas
- long-term climate action tending to be crowded out by day-to-day priorities, especially economic issues like rising living costs

- public resistance to the “painful” parts of climate action such as higher costs
- the role of forestry and (in particular) agriculture in our “mitigation psyche”.

> *I think our reliance on forestry as a quick fix you know we're kind of going for the sugar rush of mitigation options here and not thinking about what's really needed. You know, when Europe was looking at this, it was all about how do we get the emission price high enough for carbon capture and storage to become economic. And our approach is how many trees can we plant…I think that there's this perception that we can't do anything about our agricultural emissions and the rest of the economy needs to pay for that. I think that's one of the other strategic disadvantages that we have. So I think it's those three things - it's the least cost outlook, the refusal to look at agriculture and the reliance on trees that's diverting investment into other things. (Academic/expert)*

3.7.2 Te ao Māori provides a useful mental model

Many key informants commented that te ao Māori and mātauranga Māori offer insights that are extremely valuable in terms of thinking about mitigation investment. This “natural overlay” of te ao Māori and mitigation investment includes:

- a long-term, inter-generational focus rather than a short-term one
- a collectivist focus rather than an individualistic one
- a holistic view rather than a narrow one
- the concept of kaitiakitanga – that people protect the planet.

One key informant provided an example of te ao Māori in flax harvesting. The centre of the flax is called the child, and the outside leaves the mother and father, grandparents and so on. At harvesting, the child is never touched, only the grandparent or outside leaves. And during harvesting, care is taken to avoid disrupting or damaging the plant itself, for example, by cutting away from the centre so that water doesn't rot the plant. The overall message from this example is that harvesting is done sustainably and respectfully, and there is much to learn from te ao Māori.

Key informants therefore felt there was an opportunity for investment decision-makers to better understand te ao Māori and integrate the ideas into mitigation investment.

> *My observation is, I think that if we really embraced te ao Māori and the Māori worldview of interactions of people and planet, then I think it'd be very, very helpful. So when Māori have thought about this they generally look for intergenerational decision making and long term thinking. There is a recognition that the health of people and the planet are not two separate things and so like that's quite a helpful perspective to take. (Investor/financial services)*

3.7.3 Changing mindsets involves deep-seated action

Key informants commented that changing mindsets around mitigation investment requires ongoing, wide-ranging action to change entrenched attitudes. Suggestions about how to bring about this change spanned government, businesses and citizens and included:

- having the political will, leadership and vision around mitigation investment; for example, considering the example of California which chose to define itself as a state of low emission innovators
- continuing to build cross-party support for climate action
- developing a positive narrative and articulating the benefits of mitigation investment in a way that makes it real for people, as often people don't know where to start; transport was frequently mentioned as an example where people can understand how mitigation strategy can be put together
- signalling New Zealand's resoluteness to addressing mitigation by pricing agricultural emissions
- learning the lessons from the Covid-19 pandemic in terms of galvanising action around a goal and educating people about complex topics
- businesses actively thinking about their purpose and the role they play in emissions reduction, rather than being purely commercially driven
- citizens thinking about their carbon footprint and advocating for system change.

> *I think it's a gentle process. So for every, it's a generalisation here, but for every Nimby Baby Boomer who just wants to know whether it's the 1600 dollar Dyson or the 1400 dollar Dyson they should buy, they all have grandchildren and gently explaining that yep you should be free to choose whatever product you want...But also don't forget your grandkids are gonna inherit a world full of landfills… so you should really think about that. So gently bringing it home to the individual. (Industry association/peak body)*

3.8 Partnering with Māori

3.8.1 Māori have a very strong interest in mitigation investment

Iwi, hapū, Māori organisations and Māori businesses and people have many interests in mitigation investment. In addition, mitigation investment decisions by others affect Māori in many ways. Key informants identified a number of facets to this.

Firstly, te ao Māori has a natural alignment with climate goals (see section 3.7). The main implication is that there is much to learn from Māori in terms of thinking about climate investment.

Secondly, Māori are significant landowners. In particular, iwi and Māori organisations have significant investments in forestry, both pine and native forests, and have a strong interest in the ETS. This interest includes exploiting opportunities to develop marginal land for forestry due to rising carbon prices. It also includes an interest in the proposal to remove the ability for permanent pine forests to earn credits in the ETS, which could have significant implications for Māori forest owners. Iwi and Māori organisations are also heavily exposed to sheep and beef farming, dairy and other parts of agriculture, which means they are part of the He Waka Eke Noa partnership.

Thirdly, many Māori have strong ties to whenua and an interest in protecting the land – kaitiakitanga. Iwi and hapū are involved in local infrastructure planning, such as new windfarms and other local developments. Strong ties to the land also have important implications for investment in adaptation, discussed in section 4.6.

Fourthly, like other New Zealanders, Māori are consumers and small business owners. Moreover, Māori are over-represented in low-income households and thus are disproportionately affected by rising prices from mitigation investment (section 3.10).

The overall message is the need for a nuanced approach to thinking about Māori interests and involvement in mitigation investment, a point made by several key informants.

3.8.2 Upholding Te Tiriti o Waitangi is a critical consideration in mitigation investment, including the need for the Crown to partner with Māori

Key informants at government agencies and other organisations described how they are enacting the principles of Te Tiriti o Waitangi in the context of mitigation investment, and in particular how they are partnering with Māori. The overall message was that, while things are improving and there is commitment, growing momentum and increased resourcing from agencies and organisations to partner with Māori, there is still a long way to go in terms of increasing their capability to do so and being a true Treaty partner. Some key informants also commented that there are many calls on the time of iwi and Māori business leaders to engage in significant policy developments like the Three Waters and resource management reforms. There is limited capacity in some cases.

Some key informants described what they see as the critical features of true partnership under the Treaty. In particular, this included things like co-governance and joint decision-making, rather than consulting after the fact, which has often been the case to date. It also included ongoing relationship building and Māori being involved at every step of the policy process. Some key informants commented that mitigation investment presents a good opportunity to enact the principles of the Treaty because there is a natural alignment between climate goals and te ao Māori.

For example, one key informant described an example in a policy context other than mitigation investment of what he considered true partnership. The key informant commented that the standard approach involves government agencies sending out "waves of officials" to consult around the country. In contrast, this more successful approach involved Māori (rather than government agencies) organising meetings with

Ministers who had the mana and power to make decisions. 80 Māori iwi and business leaders attended the first meeting, 150 the second meeting, and 300 the third meeting. The meetings were so popular that in the end, the number of ministers attending had to be limited.

> *I just reckon in every decision that gets made around climate change at a central government level those [Treaty] principles or decisions are rolled out across every Ministry in Government. And then they are rolled out across down into regional government and local government. And that is the basic principle of being a true partner under the Treaty. But this [climate change] is the biggest single issue probably that that the world, New Zealand, communities and Māori are facing. And the Treaty really provides an umbrella that says, Māori not just another stakeholder to be consulted with, Māori are a partner. (Investor/financial services)*

3.8.3 Māori-led solutions are needed to climate investment

Many key informants discussed the importance of Māori developing their own solutions – rangatiratanga – around climate investment decisions. In particular, this related to the need to develop community-led solutions to adaptation (see section 4.6), but also to mitigation investment in low-carbon farming, housing, etc. Some pointed to the success of Māori-led "by Māori for Māori" solutions in other settings, such as the Whānau-first approach adopted by Oranga Tamariki. Others pointed to the importance of having more Māori professionals involved in the practical aspects of climate investment, such as assessing businesses' carbon footprint, the legal aspects of climate investment etc.

One example of a successful Māori-led approach related to a financial education programme targeted at Māori landowners. Rather than the traditional Western approach of a classroom lecture, this approach involved wrap-around support and bringing in many different experts. This holistic approach was considered to be highly effective.

3.9 System-wide change

3.9.1 Mitigation investment is a systemic issue requiring a systemic response

Some key informants argued that mitigation investment is a systemic issue – it is complex, dynamic, involves multiple actors, and operates at various levels. These key informants, therefore, considered that mitigation investment requires a systemic response. Reasons included that lock-in, status quo bias, lobbying by established industries and local interest groups, and the market power of incumbents mean it is very difficult to shift investment patterns. This links to the points in section 3.7 – that there are cognitive challenges to addressing a complex, systemic issue like mitigation investment, and changing mindsets is critical. These findings also align with those from our literature review (see Pells 2022) about the systemic nature of climate investment.

If you go back to the case of the incentives for infrastructure they are not symmetric in the location that we put them, and the asymmetry of that is driven by the fact that existing patterns of settlement are protected by those that enjoy them and this is baked into many of the sort of land use rules that we see around the country. There's been a little bit of pushback on those more recently. But you know, I think that if you are sort of wanting to go and search for policies that are preventing us from changing I would say, look at things that are sort of bound to the status quo and protecting existing patterns of development because, ultimately, what we're talking about here is quite a substantial shift in where we locate things and how we go about our daily lives, right. (Government agency)

Some key informants discussed the need to shift the New Zealand economy from the existing high-emissions industry structure to a low-emissions one, and issues such as status quo bias which hinder the shift. For example, one key informant described the challenges a farmer faced in being a first mover in the quinoa industry – a relatively new and relatively low-emissions industry. These challenges included a lack of available information about markets, difficulties in securing finance in a new area, and limited availability of skills and capability. The farmer indicated it would have been much easier to establish a dairy farm that benefits from the scale, support, established processes and markets etc of an incumbent industry. The key informant commented that government can play an important role in the early establishment of nascent low carbon industries and technologies by addressing co-ordination problems, undertaking science, providing information, and de-risking early-stage investment (see section 3.6).

Relatedly, some key informants suggested there is a need for increased land use planning at a national level. They argued that land use patterns should change over time from incumbent (high-emissions) industries such as dairy towards newer (low emissions) ones such as some newer horticultural industries, reflecting growing demand for plant-based food and environmental concerns. These key informants suggested that greater land use planning at a national level, and identifying the suitability of land for specific uses, would support both mitigation and adaptation investment decisions and balance a range of objectives such as food security and biodiversity as well as emissions reduction.

3.9.2 Greater partnership is needed to address systemic challenges

Some key informants felt that it was important to recognise the respective roles that each part of the system plays in mitigation investment. For example:

- Central government's role includes providing:
    - system leadership and overall direction
    - clear signals, regulation, standards, emissions pricing and other incentives to mobilise private investment

    - systemic soft infrastructure investments such as data, information tools, skills and training that are best done at a central level
    - systemic hard infrastructure investments, such as public transport, schools and hospitals, that are better done at a central level
    - market shaping through procurement and investment in new technologies.
- Local government's role includes:
    - developing community-led solutions to mitigation through planning etc
    - investing in local hard and soft infrastructure.
- Private sector's role includes:
    - responding to opportunities and risks around climate change and to incentives for mitigation
    - thinking about their overall purpose and strategies around climate change.

However, some key informants felt that a complex, systemic issue like climate change requires the public sector, private sector, third sector, iwi and local communities working much more closely than has happened historically. This could include:

- determining the appropriate balance of national and local interests for large energy and other infrastructure projects which have national benefits but local impacts
- investigating opportunities and bottlenecks for mitigation investment in critical markets like energy
- considering greater use of public-private partnerships and other joint funding approaches for major infrastructure investment
- determining the approach for the management of "dirty" assets like coal, oil, gas and coal-fired boilers, including central government's role in prematurely stranding assets owned by local government or the private sector
- shifting mindsets, a challenging issue that encompasses all New Zealanders
- addressing systemic issues like lock-in and shifting investment patterns from incumbent industries to low-carbon ones.

3.9.3 New approaches and capabilities are also needed

Some key informants suggested that a systemic, complex area like climate investment requires new policy tools to address them. Suggested tools included Mazzucato's (2021) "mission" approach, and greater use of systems thinking tools and co-design. Also important is learning from the rest of the world, especially Europe, which is making significant progress in climate investment.

Investing in capability was a related suggestion. Key informants commented on New Zealand's small size and lack of capability and capacity in some areas related to climate investment. Small councils in particular were considered to face challenges in terms of limited capability to deal with a complex issue like climate change.

One of the issues we face in New Zealand is a human capital issue that we don't have enough people to really push all of this forward even in the finance area never mind in everything else that goes with it. And there's a tendency sometimes to say Oh well, if we create this government pot of $50 billion, we need to have a big new organisation to run it. But we don't have the people to run it. It's proving quite difficult and we do have to be a little bit careful in New Zealand about our human capital capabilities…We need to train we need to adapt, rather than just assuming you can buy something shiny and new to do it. (Academics/experts)

3.10 Managing the social consequences

3.10.1 Concerns were expressed about the social effects of investment

Many key informants commented that, while mitigation investment needs to be accelerated, the social consequences of such investment also need to be carefully managed. The social consequences include:

- increased prices eg higher electricity prices to pay for infrastructure and due to increased electricity demand, higher housing costs due to energy efficiency improvements, and higher food costs when agricultural emissions are priced
- changes in industry structure and a shift from high-emissions to low-emissions jobs
- the effects on local communities when a large emitting employer closes down
- limited public transport options for (low income) people on night shifts etc
- the mental health of farmers who are facing increasing pressure to transition
- the effects on local communities of new wind farms etc
- the impacts on developing countries of buying offsets overseas.

Some key informants discussed the tension between not moving too quickly to manage the social consequences, and the need for urgency discussed in section 3.2. Also discussed was the tension between equity and efficiency goals. For example, key informants commented that price signals are critical in influencing investment choices, so it is important not to mask them too much while protecting vulnerable groups.

3.10.2 Suggested solutions included managing the pace of transition

There were three main suggestions to address some of the social consequences of mitigation investment above. Firstly, the main suggestion was to manage the pace of the transition. There needs to be a balance between moving quickly for the reasons discussed above, but not moving so quickly that households face steep price increases. For example, while the move towards EVs is seen as inevitable, time is needed for the prices of EVs to fall, and to allow people to replace their petrol vehicles with EVs.

Secondly, access to finance should be improved. This included some of the suggestions in section 3.6 – providing support for low-income groups and others who struggle to access finance, introducing Energy Performance Contracting models etc.

Thirdly, targeted, local solutions were suggested. For example, transport solutions need to reflect the reality of local conditions; public transport may be feasible in major centres but less so in locations like Northland where settlements are spread out.

3.11 Summary

In some ways, key informants painted a positive picture about mitigation investment. They indicated that things are moving in the right direction, especially in terms of greater clarity around the policy trajectory and the effects of the new disclosure regime. Importantly, markets are seen to be moving strongly towards decarbonisation. This provides greater certainty for long-term investment decision-making. Overall, key informants identified more opportunities for mitigation investment than our literature review (Pells 2022), which mainly identified the risks and challenges involved.

And yet key informants also made wide-ranging and far-reaching suggestions about mitigation investment. Interestingly, many of the suggestions are demand-side rather than supply-side ones. For example, a key suggestion was that regulatory settings (which affect the demand for investment) need to be consistent with climate goals and incentivise mitigation investment. In contrast, access to finance (which affects the supply of investment) was generally seen as less of a problem. Some international evidence supports this idea that stimulating demand has a greater effect on cleantech than improving access to finance (see van den Heuvel and Popp 2022).

Clearly, key informants' suggestions are likely to reflect their own interests and perspectives to some extent. In particular, these differing interests and perspectives are reflected in comments about specific industries. For example, some key informants argued that public science investment and other policies should aim to reduce emissions in existing industries in which New Zealand has proven strengths such as dairy, while others argued that efforts would be better targeted to support the development of emerging low-emissions industries. Note that our sampling approach (see Appendix B) aimed to limit the effect of "capture" by any particular interest group.

The key informant interviews were undertaken before the final version of the first Government ERP was released. It is encouraging to see that some of the issues and suggestions discussed by key informants are covered (or are planned) in the ERP. However, key informants' more substantial suggestions, such as ones around the need for a higher carbon price and reviewing wider regulatory settings, do not appear to be fully covered in the ERP. This present report should help policymakers and others as the current ERP is implemented and future ones developed.

4 What would it take to mobilise investment to achieve New Zealand's adaptation goals?

Mobilising investment to achieve New Zealand's adaptation goals would involve preparing for the future – providing better and more accessible data and information about climate risks and adaptation options to inform investment decisions (the most frequent suggestion), more anticipatory planning to avoid increased exposure to climate risks and shift activities and communities over time, and investing in climate-resilient infrastructure and assets. However, mobilising adaptation investment also involves rectifying the problems of the past including investment in managed retreat.

4.1 Introduction

This section covers what we heard from key informants about adaptation investment (investment to adjust to the effects of climate change) arising from our high-level question: *What would it take to mobilise investment to achieve New Zealand's climate goals?* Also included are the findings from other questions about adaptation investment. We grouped all the findings into broad themes per the sub-sections below.

Note that:

- the theme about granular, accessible data probably elicited the most comments
- as with the previous section, many of the issues are inter-related
- the themes overlap with those around mitigation investment; rather than repeat material, we cross-refer to relevant parts of section 3
- many (but not all) key informants were less familiar with, or involved in, adaptation compared with mitigation, and so had less to say about adaptation investment; this likely reflects that, in New Zealand and elsewhere, action around adaptation tends to be less advanced (see Pells 2022)
- this section is shorter than the one about mitigation investment for the reasons in the two preceding bullets, and because the adaptation themes came through slightly more strongly and were less diverse than those about mitigation
- some key informants commented that New Zealand's goals around adaptation are less clear cut than those for mitigation
- a breakdown of the findings by sector, community group etc is provided in Appendix A and the list of questions we asked is provided in Appendix B.

4.2 Increased scale and pace of investment

4.2.1 There are arguments for even greater acceleration of investment in adaptation than in mitigation

Key informants discussed that, as with mitigation, the scale and pace of investment in adaptation needs to be significantly increased to achieve New Zealand's climate goals. Some argued that adaptation may need even more investment and attention than mitigation because:

- less progress has been made around adaptation policy and adaptation investment
- climate change has direct impacts on the wellbeing of New Zealand communities, whereas New Zealand's mitigation efforts have relatively little impact on global emissions (although all nations need to participate to achieve global emissions reductions)
- mobilising investment for adaptation is more challenging (see section 4.7).

4.2.2 The scale of investment required could be significant

Some key informants commented on the significant costs involved in adaptation investment, while others discussed the incomplete understanding New Zealand has of the scale of investment required to meet climate goals. Urgency around the pace of adaptation investment was also discussed so that problems do not worsen over time. For example, one key informant commented that some climate change impacts are ongoing for centuries and status quo approaches will not enable adaptation; these are big ticket items and current thinking will create maladaptation and greater costs for future generations. [12]

Despite the lack of an assessment of the scale of adaptation investment needed, some key informants did provide some illustrative examples. One example related to a community that was facing managed retreat where a back-of-the-envelope estimate of the cost of public infrastructure and affected homes was around $10 billion.[13]

Ultimately, the costs of managed retreat and adaptation investment need to be covered by private or public sectors or a combination of both. While more effective planning and policy might be able to head off future problems, significant investment will be needed to manage poor decisions of the past.

> *I think it [adaptation] is an elephant in the room and I think it's probably almost a little too scary to actually sit down and think about it, because if you costed it out it would be quite daunting to look at what we might need to do in the future. (Investor/financial services)*

[12] Maladaptation is actions that may lead to increased risk of adverse climate-related outcomes, increased vulnerability to climate change, or diminished welfare, now or in the future.
[13] Managed retreat is the "purposeful, coordinated movement of people and assets (eg buildings, infrastructure) away from risks" (New Zealand Government 2022b).

4.2.3 Careful consideration needs to be given to how the costs of adaptation investment are shared

Some key informants commented that the costs of adaptation need to be carefully thought through.

> *We need to plan. And that's a big plan, I call it a Marshall Plan. Because you know we're not going to conquer that, clearly, and the people who are least able to move are the ones that will bear the greatest cost. (Academic/expert)*

Key informants discussed considerations for the appropriate sharing across public and private sectors of the cost of adaptation investment in things like managed retreat. Arguments included that:

- where the benefits of protecting private properties are clearly localised there should be no real distortion in the market and property owners should pay for investment
- where adaptation has significant positive spillover (environmental, social, health and safety and other) benefits, the public sector plays a key role in paying for investment
- the public sector should avoid bailouts that distort insurance and other price signals for exposed properties, as these signals play an important role in relocating communities over time to lower risk locations
- central government can play a role in stranding or developing key strategic infrastructure and assets that might be central to catalysing the relocation of communities (see section 4.5)
- central/local government are likely to be involved in managed retreat eventually anyway, so it is better for them to invest early to avoid greater damages
- one way of thinking about sharing the costs of adaptation is in terms of liability – when adaptation fails and disaster happens, who will have to pay to fix it?

Overall, a key take-out is the need for early clarity around how adaptation investment costs are shared. An orderly process around managed retreat is needed that shares the costs over time, recognising that managed retreat is not something that happens all at once as it can be staged.

4.3 Granular, accessible data

4.3.1 Data and information need to be highly disaggregated, accessible and forward-looking

The most frequent comments by key informants about adaptation investment revolved around the need for more data and information on physical climate risks and climate change impacts to support investment decisions. These data need to be highly disaggregated spatially (ideally community- or catchment-specific) and forwards-looking (ie about future risks). Examples included data to support:

- local and regional councils for their planning decisions and risk mitigation plans (the most frequent example)
- energy and other infrastructure owners for their planning decisions
- households who are considering building or buying homes in coastal and other regions affected by climate change
- farmers for planning their crops and adapting their farming systems
- the Department of Conservation and other land stewards for protecting natural eco-systems
- iwi and hapū for protecting their communities and managing their assets
- insurance companies for pricing insurance risks of houses, commercial buildings etc
- banks for lending on houses, commercial buildings etc.

4.3.2 Currently, the required data are not always publicly available

Some key informants commented that the National Institute of Water and Atmospheric Research (NIWA) holds extremely valuable data about climate risks and impacts. These key informants queried why a publicly-funded research institution like a Crown research institute (CRI) is charging for data that have public benefits.

We spoke to a representative at NIWA who advised that historical and up-to-date climate observational data and summary statistics at different locations around New Zealand are publicly available free of charge from NIWA. In addition, NIWA makes climate change maps and other climate-related information freely available on its website. However, NIWA charges for some data products and visualisations derived from the raw observational data to recover analysis and production costs. NIWA also charges for data from its climate models which project what the climate could look like in 2040 or 2090, when the use of these data is not for ongoing scientific research, to recover analysis and production costs.

The NIWA representative explained some of the reasons for charging for some of these data. The reasons included that: CRIs are not fully publicly funded and are part-funded from revenue from businesses; CRIs are obliged to act as a responsible business under the Companies Act; and unlike some other data sets for which CRIs are stewards,

climate modelling data are not recognised as a nationally significant database and therefore do not attract ring-fenced funding.

The NIWA representative also pointed out that to address these issues to some extent, a one-off procurement has been undertaken so that NIWA's next iteration of climate modelling outputs for New Zealand, based on the most recent output from the IPCC's global climate models, will be made publicly available free of charge. The IPCC updates its assessment of global model outputs once every seven to eight years, so the climate modelling that NIWA bases on these global models should have a reasonable shelf-life. NIWA's climate model provides data disaggregated to a five-kilometre resolution, which means the modelling is useful for understanding the effects of climate change on river flows and catchments etc.

Data collected by insurance companies about losses as a result of climate change impacts were also mentioned as another very valuable data source. While these data may be proprietary, backwards-looking and do not provide a complete picture of total economic loss, they are very useful as in many ways insurance companies are ahead of others in assessing climate risks, as some key informants commented. Exploring whether these data could be made publicly available would therefore be useful.

Other frequently-mentioned sources of climate risk data, modelling and research included a number of National Science Challenges and overseas providers.

4.3.3 Further improvements to data and information and tools are needed

Key informants made a number of suggested improvements about adaptation data:

- develop a "single source of truth" which would lead to more consistent adaptation investment decision-making, and would support councils' abilities to make challenging decisions like relocating communities/managed retreat; this would involve data from both the private and public sectors (including NIWA's data discussed above) being recorded, collected and shared in a comprehensive and harmonised way to create a single authoritative data source, and a nominated steward and policies to keep the information up to date
- develop data infrastructure (eg portal) to support the open accessible provision of data, possibly along the lines of other data sources managed by Stats NZ
- improve adaptation modelling, risk assessment and adaptation tools towards "asset level modelling".[14]

A few key informants also commented that while improved data is essential, the lack of perfect and complete data should not be used as an excuse to avoid difficult adaptation decisions.

[14] Asset level modelling is the end-to-end process for using asset data to make decisions.

4.3.4 Data need to be disclosed and used

A few key participants suggested that, ideally, there should be a broad principle of full disclosure of climate risks for major assets held by New Zealand citizens, businesses and the public sector. Such a shift might include following Europe's lead in terms of compulsory climate risk assessment for any infrastructure or building. For example, for houses, this would include information about climate risks, disclosed at point of sale to inform prospective house buyers, reflected in insurance premiums, and used by banks. This would provide an incentive to reduce risk exposure.

Some key informants commented that ideally information about climate risks would be provided (and used) well in advance of climate impacts, so that markets can adjust, the transition can be smoothed and big shocks that create social problems avoided. However, they also expressed concerns that this may not be happening in practice.

> *Data is really powerful if you can consistently and transparently share it in a way that's actionable so it's understood and it's clear. So at the moment we are aware of a few Councils around the country they do specific things but it's a small number... So there isn't any one comprehensive source of truth, so a national platform that would allow you to search an individual address. Just imagine as a property owner how powerful that would be…It seems to be a real opportunity to share that in a transparent, open consistent way and really drive that more informed behaviour. (Industry association/peak body)*

4.4 Local government having a clear mandate

4.4.1 Councils face considerable challenges around adaptation investment

Key informants discussed, and indeed some expressed sympathy for, a number of challenges that local councils face around adaptation investment:

- funding challenges arising from rates/population-based funding, with councils increasingly being asked to do more, exacerbated by increasing climate risk
- ageing infrastructures that are expensive to replace and ill-equipped to cope with climate impacts, with water networks being the most frequent example
- limited capacity and capability to deal with climate change adaptation and its complex flow-on effects, which is a particular challenge for small councils
- three-year electoral cycles and ten-year planning horizons which are inadequate to deal with long-lived infrastructure decisions, and which encourage short-termism
- challenging conversations in communities that are prone to flooding and other climate impacts and a fear of litigation around managed retreat (see section 4.6)
- overall, lack of a clear mandate around climate change.

But then you know your little pot of money like, do we reseal the roads, do we build a new library, do we build a convention centre. Climate change is generally sort of it's pushed down the list. So that is prioritisation. So when everybody declared the climate emergency in 2019 everyone jumped on the bandwagon. Under the Civil Defense Act declaring an emergency generally is followed with a pot of cash and an action plan which didn't really transpire in the climate emergency. So look we've got the badge but haven't followed through with a plan. (Industry association/peak body)

4.4.2 Councils need a clearer mandate around climate change

Some key informants suggested that councils need a much clearer legislated mandate around adaptation and mitigation. This would involve setting out the relative priority of climate change among the many competing priorities for local government. Critically, this clearer mandate would provide more incentive for councils to address the many and difficult challenges they face around adaptation investment.

4.5 Better local planning and managed retreat

4.5.1 Local planning needs to include anticipatory investment and managed retreat

Some key informants discussed managed retreat. Managed retreat tends to be used in relation to existing infrastructure and assets in response to progressive climate risks like sea level rise. One widely cited example in relation to these risks was the need to manage water infrastructure in locations prone to flooding and sea level rise, where the pipes go out to sea and backfill with salt water.

Other key informants commented that it is easier to plan *future* infrastructure than to shift existing communities. As one key informant expressed it, “anticipatory investment” is needed that enables people to relocate away from floodplains and low-lying coastal areas etc and means that new infrastructure is located in low-risk areas.

One key informant described planning for adaptation using an analogy of a mosaic. The existing mosaic of land use comprises layers of risk and opportunity. For adaptation investment, the aim is to shift the mosaic over time according to the changing risk profile. This might involve identifying significant properties and assets in high-risk areas that are owned by either the Crown or Council. These strategic assets can be used to shift activity and development over time and to provide a demonstration effect. The challenge is that there are many pieces in the mosaic, including the backdrop of the transport system, and risks change over time.

Overall, a key point is that early action and careful planning can avoid increased exposure to climate risks.

4.5.2 However, in practice planning decisions may reflect other priorities

Some key informants expressed concerns about the extent to which managed retreat and anticipatory investment is happening/likely to happen in practice. These concerns included:

- councils making short term decisions such as "tossing rocks at the beach" to stop erosion and protect properties from sea level rise, and continuing to develop in floodplains etc
- planning rules and planning capabilities may be status quo biased and therefore do not encourage adaptation investment
- the reforms currently in train to streamline planning processes in urban areas may result in planning ecisions being rushed and therefore not taking account of climate and other risks; other concerns about these reforms included mitigation ones around the sale of green spaces and therefore loss of carbon sinks, and the generation of emissions though new buildings (see section 3.4)
- challenges that councils face around adaptation investment such as limited funding and capabilities, ageing infrastructure, and lack of a clear mandate around climate change (see section 4.4).

4.5.3 Adaptive pathways and other tools are helpful

Key informants made a number of suggestions about approaches that could help with adaptation planning and investment.

"Dynamic adaptive pathways" was the most frequently mentioned example. This tool helps decision-makers identify policy options in the face of deep uncertainty due to climate change and a range of other hazards and risks. The aim is to think ahead and reduce risk by assessing when each option will fail and having a plan to shift to another pathway. As one key informant put it, the basic idea is to keep as many options on the table as long as possible, then drop them out and move to something else as risks change without locking in investment and stranding assets.

Another approach to adaptation investment came from an international case study about cultural farmland that was deliberately allowed to flood, and the farmers compensated, to prevent flooding in the township. A similar approach used in Balclutha involved paying farmers to let their land flood. In this case the flooding happened at a time of year that allowed for the rotting rather than burning of wheat stubble, and so there were additional positive environmental impacts. The implication was that some investments are not hugely expensive and can have significant payoffs.

The key take-outs overall were that there should be greater investment in these tools and approaches, and the tools and approaches should be shared and adopted more widely across councils. As one key informant emphasised, some climate change impacts will be ongoing for centuries and status quo approaches will not enable adaptation. There is therefore a risk that current thinking will create maladaptation and greater costs for future generations.

4.5.4 New tools are also being developed around managed retreat

Some key informants commented that the social effects of adaptation do not happen when the physical impacts like flooding and erosion are felt, but many years before when it is no longer viable for local government to provide services to properties.

Relatedly, others commented that the private sector is much further advanced than the public sector in assessing and managing climate risks. While the impacts of climate change may be some time away, they are already being priced into insurance and mortgage markets. Insurance premiums and other signals play an important role in discouraging investment in high-risk areas and in managed retreat. Some key informants pointed out that it is important these signals are not diluted too much.

> *It's an absolute nightmare at the moment and we're caught in this space of needing to be more restrictive in areas that we know are going to be more at risk, but if we actually go out to market or make any public statements on how we are changing or becoming more restrictive, we have the problem of actually causing the outcome that hasn't yet actually eventuated. And we're waiting for the government to say hey you know these communities need to move, these are the rules in place. If we wait too long and that happens we're overexposed, right. (Investor/financial services)*

However, concerns were also expressed about the effects of insurance retreat on local communities. Once insurance is unavailable, property buyers will find it difficult to borrow money to purchase a property, and existing owners may need to make expensive modifications to their homes or may struggle to sell their properties which will have little value.

A potential solution to insurance retreat, discussed by a couple of key informants, is the work of Belinda Storey on "climate leases".[15] Essentially local or central government purchases exposed properties and leases the properties back to the owners for a defined period after which the properties are demolished and the council stops providing infrastructure and services. While eventually the property has no value, for a period of time it will have some value so rather than government stepping in at the end and compensating it buys the property earlier and receives some return.

4.6 Community engagement

4.6.1 Managed retreat involves challenging conversations with communities

Climate risks vary considerably by location. For example, key informants described how increased droughts, rising temperatures and increased flooding are causing farmers in certain parts of the country to adapt their farming systems. One example was Northland where crop farming may no longer be viable.

[15] https://www.wgtn.ac.nz/cedcc/our-people/belinda-storey

One particular local risk which was widely discussed was that of communities in coastal areas that are regularly being flooded or are prone to erosion. Examples included Westport, south Dunedin, Hawke's Bay and Wellington. Key informants commented that many people have strong emotional connections to their properties and to specific locations. This is particularly the case for Māori who have a strong attachment to their land for cultural reasons.

Key informants described the challenging conversations councils are having in affected communities including around managed retreat. One frequently cited example was the resistance that Kapiti Coast Council faced some years ago when it included climate risks in some Land Information Memorandum (LIM) reports and was challenged in legal action by some residents.

4.6.2 Extensive engagement with local communities is needed

Insights from key informants about how to manage these difficult conversations included:

- investing the time and effort to have ongoing communication with affected communities
- balancing the need to address flooding and other issues that are top of mind for communities, while avoiding maladaptation or lock-in to particular pathways
- using scientists and other experts to present the latest evidence on climate risks, ideally based on a "single source of truth" (see section 4.2)
- "winning hearts and minds" – understanding stakeholders' aspirations, motivations and values, as well as educating them about climate risks
- identifying heritage and other important sites that communities want to protect or relocate
- entering conversations in good faith.

> *We want to help educate people on climate risk…what's the trajectory of that risk. So the status quo isn't going to last forever, essentially, everything's going to get worse, right. Change is normal - land is not static, the climate is not static, the risk is not static. Just because we've been living on reclaimed land for 150 years in a particular way, doesn't mean you can continue doing that forever. So we want communities to understand that change is occurring all around, all the time, and the issue now is the rate of change – which is quickly speeding up. Yes, we need to mitigate immediate short term risks – the issues that are top of mind for people – and then grow that permission space and to talk about the longer term. But those longer-term changes will be here before we know it. (Government agency)*

4.6.3 Partnering and engaging with Māori communities is particularly important

Partnering and engaging with iwi, hapū and Māori communities is a key consideration in adaptation investment. As noted in section 3.8, Māori are significant landowners and have strong ties to whenua. They are therefore disproportionately impacted by localised climate risks and have particular interests around managed retreat and changing land use patterns. Tailored responses are therefore needed in recognition of the interests and rights of Māori communities.

> *The one size fits all approach of just saying you're going to be flooded, this land you can't live there. I don't think it works in that context, when it is the connection with ancestry and the land or something like that. So I think we need to be a bit more nuanced to recognise a different approach is needed. (Investor/financial services)*

Some key informants also commented that strong connection with whenua and other aspects of Māori culture (see section 3.8) mean there is much to be learned from te ao Māori and mātauranga Māori (see section 3.7) in terms of long-term change and adaptation.

4.7 Sharing and partnering in investment

4.7.1 Adaptation investment faces considerable challenges and limited (perceived) opportunities

Key informants discussed some of the challenges and (lack of) opportunities that they see for adaptation investment.

Firstly, many key informants saw limited opportunities for private sector investment in adaptation. One oft-cited example was seawalls – while affected property owners would benefit from investing in a seawall, the private returns from financing this type of investment to avoid damages were seen as limited. This is in contrast with mitigation investment, for which key informants in the private sector saw many opportunities in terms of strong returns from “cleantech” etc and the general shift of markets towards decarbonisation (see section 3).

However, some key informants (in particular academics) pointed out the significant benefits of adaptation investment. They argued that while investing in resilient, climate-proof infrastructure and assets may cost slightly more initially, it pays off in the long term. These benefits include avoided damages, and apply to both private and public asset holders.

There are also wider benefits from adaptation investment, such as increased biodiversity from restoring wetlands and improved health and social outcomes from new housing developments in low-risk locations. Some argued that adaptation is, therefore, not just an environmental policy but also a health and safety and disaster

risk reduction policy. One key informant suggested that it is vital to better quantify the co-benefits from adaptation investment and to better communicate them to decision-makers and practitioners to improve take-up.

Secondly, like mitigation, adaptation investment faces challenges around mindsets, especially about relocating communities. These challenges affect perceptions about the benefits and costs of adaptation investment and include: "loss aversion" and people's emotional attachments to their properties and locations (see section 4.6); government agencies and others having some discomfort around adaptation as it may be seen as "admitting defeat" about mitigation efforts; and cognitive dissonance among decision-makers (see section 3.7), especially in terms of balancing short-term costs against longer-term benefits and risk reduction.

Thirdly, some key informants considered that there is still some uncertainty about the exact location of where climate impacts will be felt. These key informants discussed a reluctance to invest in defences and managed retreat in one location when the impact might manifest in a different location. These finding link to those in section 4.3 ie divergent views about the extent to which the data to support decisions about adaptation investment are currently available.

The overall implication is that careful consideration needs to be given to how the costs of adaptation investment are shared – see section 4.2.

4.7.2 Adaptation investment involves clarity around respective roles

Some key informants considered it important to recognise the respective roles that each part of the system plays in adaptation investment. For example:

- central government's role includes:
    - ensuring that regulation and public investment take into account disaster risk and progressive risks due to climate change to avoid creating new exposure
    - developing core data infrastructure, tools etc that benefit from centralisation and standardisation
    - developing disclosure regimes so that climate risks are factored into the planning of private and public investment decisions
    - ensuring policy coherence overall to avoid both moral and charity hazard
- local government's role includes:
    - incorporating climate risks into infrastructure and planning decisions (see section 4.5)
    - engaging with local communities to understand their aspirations, identify vulnerabilities and communicate risks etc (see section 4.6)
- private sector's role includes:
    - incorporating climate risks into their investment decision-making

- considering innovative finance products that might support adaptation investment.

The key take-out overall is the need to clearly allocate adaptation responsibilities, and for co-operation at all levels. One key informant commented that it is misguided to think of adaptation investment as a local government issue and mitigation investment as a central government issue; both require co-ordinated action across the public and private sectors.

4.8 Summary

Key informants painted a less positive picture overall about adaptation investment than mitigation investment. They saw fewer opportunities for private investment and highlighted the risks and challenges involved. In particular, New Zealand faces some difficult decisions around investment for managed retreat.

The key informant interviews were undertaken before the draft of the first Government NAP was released.[16] It is encouraging to see that many of the issues and suggestions discussed by key informants are covered in the NAP. This includes improved data infrastructure, planning tools and guidance, and legislation to support managed retreat. However, the NAP also notes that the Climate Emergency Response Fund (CERF), established to address climate challenges, does not currently include funding for adaptation actions. This appears to be an important omission, as our findings suggest that significant investment will be needed for adaptation.

[16] https://environment.govt.nz/assets/publications/Draft-national-adaptation-plan.pdf

5 Conclusions

This study has clarified and advanced our understanding on issues, barriers and opportunities related to climate investment in Aotearoa New Zealand. The participants in this study made thoughtful, wide-ranging suggestions about what more might be done to mobilise investment to achieve New Zealand's climate goals.

Some suggestions by key informants have far-reaching implications and look potentially challenging to address. These include ones about the system-wide changes that are needed to tip the balance towards climate investment, and which essentially involve increasing the cost of the status quo and reducing the cost of change. Progress in Europe demonstrates that it *is* possible to initiate this type of system-wide change when there is sufficient public and political support. There is much to learn from the experience in Europe and other countries, especially for a small country like New Zealand, which often relies on adopting and adapting ideas from elsewhere.

Other suggestions look relatively easier to address. These include ones around improved data provision, tools and guidance, all of which are important for robust investment decision-making. In particular, developing and adopting better tools for local planning and anticipatory adaptation investment seems a sensible way of avoiding further problems around stranded communities and managed retreat.

An important high-level finding is the need for more investment in adaptation and for urgent consideration of how the costs of that investment might be shared. This reflects a lack of progress to date in adaptation investment, action and policy in New Zealand (and elsewhere), and a seeming lack of willingness from the private sector to invest.

A further key take-out is the importance of policy coherence around climate investment. Policy that is moving in a consistent direction creates greater certainty to support long-term climate investment decision-making. Coherence is also important in changing mindsets; key informants seemed quick to pick up on inconsistencies in policy and indicated that these inconsistencies may reduce the motivation to invest.

The timing of the interviews was after the first draft Government ERP was released for consultation and just before the first draft NAP was released. This means that some key informants were familiar with, and indeed had contributed to, the content of the ERP and NAP. In turn, many – but not all – of the ideas and suggestions in this report are covered to some extent in the ERP and NAP. Some of the more novel findings are those about the opportunities for mitigation investment (which is in contrast to much of the literature on this topic), and about how the new disclosure regime is working in practice.

Overall, this report contributes to the evidence base about climate investment in New Zealand and should help policymakers as they implement the ERP and NAP and look ahead to what more might be needed. In terms of further research, it would be valuable to prioritise research about broader Māori input and perspectives, as our sample of iwi and Māori asset holders was small and te ao Māori holds valuable insights for climate investment.

References

Climate Change Commission. 2021. *Ināia tonu nei: a low emissions future for Aotearoa.* Wellington: Climate Change Commission.

Curtina, J., C. McInerney, B. Ó Gallachóir, C. Hickey, P. Deane, and P. Deeney. 2019. "Quantifying stranding risk for fossil fuel assets and implications for renewable energy investment: A review of the literature." *Renewable and Sustainable Energy Reviews 116 (2019).*

European Investment Bank. 2021. *Investment report 2020/2021: Building a smart and green Europe in the COVID-19 era.* Kirchberg, Luxembourg: European Investment Bank.

Fay, M., S. Hallegatte, A. Vogt-Schilb, J. Rozenberg, U. Narloch, and T. Kerr. 2015. *Decarbonizing Development: Three Steps to a Zero-Carbon Future.* Washington DC: World Bank.

Gioia, D. 2021. "A Systematic Methodology for Doing Qualitative Research." *The Journal of Applied Behavioral Science, 57(1), 20–29,* 20–29.

Hallegatte, S., A. Shah, R. Lempert, C. Brown, and S. Gill. 2012. *Investment decision making under deep uncertainty -- application to climate change,".* Policy Research Working Paper Series 6193, World Bank.

IPCC. 2022. *Climate Change 2022: Mitigation of climate change.* Geneva: Intergovernmental Panel on Climate Change.

IPCC. 2018. *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change.* Geneva: Intergovernmental Panel on Climate Change.

IPCC. 2021. "Summary for Policymakers." In *Climate Change 2021: The Physical Science Basis*, by Intergovernmental Panel on Climate Change. Cambridge, UK: Cambridge University Press.

Kirchherr, J., and K. Charles. 2018. "Enhancing the sample diversity of snowball samples: Recommendations from a research project on anti-dam movements in Southeast Asia." *PLoS ONE 13(8): e0201710.*

Krogstrup, S., and W. Oman. 2019. *Macroeconomic and financial policies for climate change mitigation: A review of the literature.* Working Papers, No. 140, Copenhagen: Danmarks Nationalbank.

Leining, C. 2022. *A Guide to the New Zealand Emissions Trading Scheme: 2022 update.* Wellington: Motu Economic and Public Policy Research.

Mazzucato, M. 2021. *Mission Economy: A Moonshot Guide to Changing Capitalism.* London: Allen Lane.

New Zealand Government. 2022a. *Te hau mārohi ki anamata: Towards a productive, sustainable and inclusive economy. Aotearoa New Zealand's first emissions reduction plan.* Wellington: Ministry for the Environment.

New Zealand Government. 2022b. *Urutau, ka taurikura: Kia tū pakari a Aotearoa i ngā huringa āhuarangi. Adapt and thrive: Building a climate-resilient New Zealand.*

Aotearoa New Zealand's first national adaptation plan. Wellington: Ministry for the Environment.
Nordhaus, W. 2019. "Climate Change: The Ultimate Challenge for Economics." *American Economic Review 2019, 109(6):* 1991–2014.
OECD. 2022. *OECD Economic Surveys: New Zealand 2022.* Paris: OECD.
OECD/The World Bank/UN Environment. 2018. *Financing Climate Futures: Rethinking Infrastructure.* Paris: OECD.
Parker, J. 2010. *Theories of Investment Expenditure.*
Parliamentary Commissioner for the Environment. 2021. *Submission on Infrastructure for a Better Future.* Wellington: Parliamentary Commissioner for the Environment.
Patton, M. 2002. *Qualitative research and evaluation methods (3rd ed).* Thousand Oaks, CA: Sage.
Pells, S. 2020. *Business investment in New Zealand: a literature review.* Wellington: MBIE.
Pells, S. 2022. *How can policy help stimulate climate investment? A literature review.* Wellington: MBIE.
Stern, N., and A. Valero. 2021. "Chris Freeman special issue innovation, growth and the transition to net-zero emissions." *Research Policy, 50 (2021).*
Task Force on Climate-related Financial Disclosures. 2017. *Recommendations of the Task Force on Climate-related Financial Disclosures.* Basel: Task Force on Climate-related Financial Disclosures.
Unruh, G. 2000. "Understanding carbon lock-in." *Energy Policy 28 (2000)* 817-830.
van den Heuvel, M., and D. Popp. 2022. "The role of Venture Capital and Governments in Clean Energy: Lessons from the First Cleantech Bubble." *NBER Working Paper 29919.*

Appendix A: Findings by sector, investor group etc

Table 2 provides a breakdown of some of the key findings by sector, and Table 3 provides a breakdown by investor/community group. Note that the possible solutions are not necessarily enacted by the particular sector/investor/community group but might be potential actions for central government, local government and other actors.

By sector

Table 2: Findings by sector

Sector	Issue/barrier/opportunity	Possible solution
Forestry	• Forestry offsets offer significant opportunities to achieve New Zealand's climate goals, especially in the short term before other mitigation efforts ramp up • Greater use of wood products like cross-laminated timber and biofuels can help lower emissions • However, focusing too heavily on forestry/net emissions provides little incentive to change underlying mitigation investment behaviours (a frequent comment) • The ETS tables have a limited number of species, and don't take account of riparian planting of trees, pre-1990 planting or co-benefits like biodiversity • As the price of carbon increases, there is less incentive to harvest forests for production • Increased wildfires, droughts etc due to climate change may mean carbon storage from forestry is not reliable, especially in (less actively managed) native forests • Reductions in emissions are not equivalent to offsets by forestry biologically and this is not properly reflected in models • Māori are significant investors in both native and pine forests	• Consider opportunities for greater use of wood products and biofuels • Avoid relying too heavily on forestry/net emissions, and use removals for hard-to-abate sectors and agriculture • Consider updating ETS tables for new tree species like redwoods, riparian planting and pre-1990 planting etc • Consider opportunities for limited harvesting of native forests, partly so native forests are actively managed • Build "equivalence" into climate models • Partner with Māori on changes to the ETS
Agricult-ure	• Agriculture is a key export sector, food security is important, and it is challenging to reduce emissions in dairy and some other parts of agriculture • Agriculture (mainly dairy) accounts for around half of New Zealand's gross emissions and emissions are not currently priced • The current lack of pricing agricultural emissions can make other sectors and households query why they should invest in mitigation • Because farmers are not facing emissions pricing, they may not be aware of some of the opportunities	• Price agricultural emissions/bring agriculture into the ETS as soon as possible (a frequent suggestion) • Educate farmers about opportunities from lowering their emissions • Expedite regulations around new nitrous oxide technologies that can reduce emissions • Invest more in science for methane reduction per the

	available such as integrated farm management • While there are some proven technologies to reduce nitrous oxide in the dairy industry, reducing methane emissions is more challenging as technologies developed in other countries require an animal to have an additive eaten at the end of every meal; adopting this technology is challenging in New Zealand as cows are not generally kept in barns • Land use patterns should change over time from incumbent (high emissions) industries such as dairy towards newer (low emissions) ones such as new horticultural industries, reflecting growing demand for plant-based and other low-emissions food and environmental concerns • Nascent (low emissions) horticultural and other industries can face challenges establishing and scaling up • Greater land use planning at a national level, and identifying the suitability of land for specific uses, would support mitigation and adaptation investment decisions and balance a range of objectives (food security, biodiversity etc)	Biological Emissions Reductions Science Accelerator • Support investment in nascent horticulture and other comparatively low-emission agriculture industries eg by addressing co-ordination problems, investing in science, providing information, de-risking early stages etc • Consider developing a national land use strategy
Transport	• Transport accounts for a significant share of New Zealand's emissions • Electrifying transport from renewable energy sources offers significant opportunities to reduce emissions, but requires considerable investment in renewable energy and in infrastructure for EVs etc • Greater use of public transport also offers significant opportunities to reduce emissions • However, currently it is not always easy for people to take public transport or to make low emission transport investment decisions • Electrified transport not only reduces emissions, but also reduces air pollutants • There may be supply issues, bottlenecks and constraints in the EV market which inhibit investment in EVs	• Increase investment in renewable energy so that emissions reduction from the electrification of transport is maximised • Invest more in infrastructure for EVs to encourage investment • Increase investment in public transport, further subsidise public transport, invest in multimodal hubs to avoid road use, and improve urban design to increase uptake of public transport • Introduce congestion charges and use other methods to smooth network demand and reduce the amount of embodied emissions from building new roads • Better understand, and take account in investment decisions, the co-benefits from electrifying transport • Investigate supply issues, bottlenecks and constraints in the EV market, and explore opportunities in trade negotiations

Energy	• Increased use of renewable energy offers significant emission reduction opportunities for example in transport (see above) and heating • New Zealand already has a relatively large proportion of (electricity) energy from renewables compared with other countries; other countries could learn from our experience in integrated grid management • New Zealand has natural advantages in wind and solar power, but currently no offshore wind for example • There may be some barriers in the energy market to investing in major infrastructure projects like wind farms and in non-network solutions and other non-traditional investment • Large infrastructure projects like windfarms have national benefits in terms of emissions reduction but impacts on local communities • Green hydrogen is an emerging opportunity with some advantages (New Zealand is well placed to take advantage due to hydro, hydrogen is useful for some applications eg heavy vehicles and industrial process heating) and disadvantages (less proven and less efficient than other technologies in terms of energy conversion) • Given the range of potential options and new technologies for renewables, it is not clear which ones will take off	• Invest more in renewable energy and electrification to reflect increased demand from EVs etc • Attract overseas innovators/ investors interested in integrated grid management • Expedite regulatory framework for offshore wind • Investigate any barriers in the energy market to investment in wind farms, non-network solutions, new technologies etc • Ensure resource management reforms balance national interests against local interests • Speed up procurement processes of large infrastructure projects by de-risking the early stages and making the process as simple as possible by undertaking the legal and consenting aspects • Catalyse investment in new renewable energy sources/ technologies, and support these through the "valley of death" for example by using the Crown's balance sheet to de-risk projects • Better understand how to optimise generation of electricity and deal with intermittency • Develop a (new) energy strategy which includes clear signals about which renewable energy sources will be publicly supported through investment in science for example
Other sectors	• There are barriers to recycling and waste reduction including a lack of infrastructure and lack of national alignment; these factors make it hard for people to recycle • Keeping products in circulation for as long as possible can reduce waste and therefore emissions • Buildings account for a significant proportion of New Zealand's emissions • There may be barriers in the housing supply market to the uptake of new green technologies like hempcrete	• Invest more in recycling and waste management infrastructure, and align waste management nationally to improve efficiency of investment • Amend regulations and standards such as design rules to keep products in circulation as long as possible • Amend building code to improve energy efficiency of buildings • Investigate barriers in the housing supply market to the uptake of new green technologies

By investor/community group

Table 3: Findings by investor/community group

Sector	Issue/barrier/ opportunity	Possible solution
Māori	• Upholding Te Tiriti o Waitangi is a critical consideration in mitigation and adaptation investment • There is a natural overlay of te ao Māori and climate investment including a long-term, inter-generational focus by Māori • Māori have significant interests in mitigation and adaptation investment – they are significant landowners, have strong ties to whenua and an interest in protecting the land • In particular, Māori are heavily exposed to forestry which creates some opportunities with the rising price of carbon, but also creates challenges eg around the proposal to ban permanent pine from the ETS • Strong ties to whenua for cultural and other reasons mean that Māori are disproportionately impacted by localised climate risks and have particular interests around managed retreat and changing land use patterns • Māori are also consumers and are over-represented in low-income groups, and therefore disproportionately affected by rising energy and other prices from transition • Banks tend to have a poor record of lending to Māori. Iwi, Māori trusts and Māori businesses can struggle to obtain finance for investment including in relation to collectively-owned land	• Partner with Māori on climate investment in an authentic way which upholds Treaty principles, further develop capabilities to do so • Make greater use of te ao Māori in climate investment decision-making • Increase investment in mātauranga Māori • Encourage Māori-led solutions and develop tailored investment responses that recognise the interests and rights of Māori communities in mitigation and adaptation investment eg managed retreat • Improve access to climate finance for Māori
Small businesses/ start-ups	• Much of the New Zealand economy comprises small businesses, so their investment decisions affect mitigation and adaptation efforts • In some ways, small businesses can be grouped with households in terms of their knowledge of climate change and their personal beliefs about climate change influencing investment decisions • Compared with larger businesses, SMEs	• Provide information to SMEs about benefits of mitigation investment and the tools available • Improve data on SMEs' emissions profiles and carbon footprints, and develop a "light" certification process for SMEs • Improve access to climate finance for SMEs • Encourage new low-carbon

	may not face the same incentives to gain a full carbon certification and the costs of doing so are disproportionately high • Compared with larger businesses, SMEs may struggle to access finance as banks may have less information about them and the costs of managing the relationship are proportionately higher • New low-carbon technologies/industries can struggle to scale up and suffer from co-ordination problems, a lack of information, lack of finance • A particular finance gap is early-stage finance in new technologies not yet commercialised	technologies/industries by addressing co-ordination problems, providing information, de-risking early stages etc • Use government's balance sheet to de-risk new technologies
Households and communities	• Households are investors in houses, cars, consumer durables and other assets that affect emissions. Their transport and other choices also affect emissions • Individuals' personal beliefs about climate change heavily influence their investment decisions • Mitigation investment by others affect consumer prices, jobs etc • People often have strong emotional attachments to their properties and locations. Some coastal and other communities face significant climate risks	• Amend building regulations and standards on household products etc to encourage low-emission household investment • Make it easier for people to make low-emissions investment decisions by improving public transport etc • Improve access to finance to lower the barriers to investing in EVs, solar panels etc for low-income households • Develop a positive narrative about mitigation investment that makes it real for people • Manage the pace of the transition so that households do not face steep price increases and communities can adjust • Disclose climate risks for houses at point of sale
Local govt	• Local govt plays a key role in mitigation investment through local roading and infrastructure investment • Local communities are affected when a major emitting employer closes down, when a new windfarm is being developed etc, or from climate risks • Local govt plays a key role in adaptation investment through local planning and local govt's own investment decisions • Local governments face many competing priorities and challenges, may have little incentive to invest in adaptation and lack	• Develop community-led solutions to mitigation investment through planning • Develop a much clearer legislated mandate for local government around adaptation and mitigation • Engage with local communities to understand their aspirations and concerns about climate risks • Improve planning through the use of "dynamic adaptive pathways", "climate leases" and other tools

	a clear mandate to do so • Better planning and anticipatory investment is needed to locate people and activities to low-risk areas. In some cases, managed retreat is also needed to relocate exposed communities	• Integrate climate risks into infrastructure planning and asset management
Central govt	• Central govt plays a key role in mitigation investment through system leadership and overall direction, clear signals, regulation, standards, emissions pricing and other incentives to mobilise private investment, and through public investment in infrastructure like energy and transport, hospitals and schools, science investment, data infrastructure • Some policies are seen as inconsistent with climate goals eg some aspects of the ETS, indirect subsidies to emitting sectors • Central govt may not always face the right incentives for mitigation investment (policy) eg some agencies' mandates do not include climate change, a lack of risk appetite, siloes • Much greater public mitigation investment is needed in certain areas • Lock-in, status quo bias, lobbying and the market power of incumbents mean it is very difficult to shift investment patterns. A complex, systemic issue like mitigation investment requires greater partnership and may require new policy tools • Central govt plays a key role in adaptation investment including developing core data infrastructure, developing disclosure regimes, and through regulations • Difficult decisions like managed retreat require careful consideration around where the benefits and costs of investment fall	• Improve policy consistency and coherence around climate goals • Increase investment in renewable energy and electrification, science in critical areas like reducing methane emissions, public transport, and green hospitals and schools • Change the mandate of some agencies so they are consistent with climate goals, develop shared goals across agencies, encourage a culture of experimentation • Foster greater partnership in hard-to-tackle areas and adopt new policy tools like systems thinking and mission-based innovation • Develop a "single source of the truth" for data on climate risks • Consider the appropriate sharing across public and private sectors of the cost of adaptation investment in things like managed retreat

Appendix B: More information on the method

Overview

This qualitative study involved in-depth interviews with a sample of key informants.

The basic rationale was to build on the findings from a literature review (Pells 2022, summarised in section 2) by drawing on the expertise and experience of some New Zealanders and overseas experts involved in climate investment. A qualitative approach was selected to explore the topic in detail, help address key knowledge gaps identified from the literature, remain open to unexpected findings, and provide rich examples in the New Zealand context.

As well as being informed by the literature review, the study's design was peer-reviewed by academics at Motu Economic and Public Research and Victoria University of Wellington with expertise in climate change policy and qualitative research.

The questions were informed by the literature review (see Pells 2022). For example, much of the (mainly international) literature around climate investment has focused on the risks, uncertainties and challenges involved. Therefore, the questions, and much of the interview time, was focused on solutions, with a particular emphasis on concrete examples in the New Zealand context. The interviews started with either the set of questions about mitigation or the ones about adaptation, depending about which the key informant indicated they had more knowledge and experience.

The achieved sample was **33 people across 24 participating organisations**. The organisations spanned industry associations, peak bodies, financial institutions, iwi and Māori asset owners, research institutions, relevant overseas organisations, and local and central government agencies – see Table 4 below.

Two MBIE researchers ("we") conducted the interviews via Zoom. Each interview lasted about one hour.

The fieldwork period was from mid-February 2022 to the end of April 2022. A key point to note about this timing is that it was after the first draft Government ERP was released for consultation, which meant that some key informants were familiar with the content of the draft Plan, and indeed, some had made submissions. However, this timing was before the first draft Government NAP was released.

Sampling approach and list of key informants

We used a "snowball" sampling approach to identify people with expertise, first-hand knowledge and experience in climate change, climate investment and its financing, and affected industries and groups. This sampling approach involves an early interviewee giving the researcher the name of at least one more potential interviewee and so on, with the sample growing like a rolling snowball (Patton 2002) .

This approach had the benefit of discovering relevant key informants about which we were not initially aware. One potential risk with this approach is over-representing those key informants and their respective networks that are interviewed first – "anchoring". We addressed this risk by starting with a diverse sample (Kirchherr and Charles 2018), and ensuring that we were filling in key gaps in subsequent rounds.

The sample structure and initial selection was also informed by our literature review (see Pells 2022). For example, when considering which sectors to target, we focused on some identified by the Climate Change Commission (2021) as being important for emissions reduction, such as agriculture, energy and forestry. The initial selection was also based on advice from our peer reviewers.

In the initial sample selection, we generally targeted organisations rather than specific individuals. Within these organisations we targeted senior people with expertise, knowledge and experience about climate change, climate investment and its financing, and affected industries and groups. The individuals we interviewed were mainly CEs or senior leaders in their organisations. The reason that more than one individual was selected for some organisations is that these organisations wished to include people with different types of expertise.

However, we did target some individuals in the initial sample selection – mainly academics with known expertise in climate change and related policy. We also targeted individuals in later rounds through our snowballing approach (ie the first round of interviews identified specific individuals we targeted for subsequent rounds). Often the same person was mentioned by multiple first-round interviewees.

We had a very high acceptance rate for our invitation to participate in the study – 24 of the 30 organisations we approached agreed to participate. However, one group for which we struggled to recruit a sample and would have liked greater representation was iwi and Māori asset owners. This may reflect that, at the time of the fieldwork, government was making many calls on the time of iwi – a point discussed in section 3.

In qualitative research the aim is generally to reach a sample size that achieves data saturation – where an extra interview yields little to no new information. We continued with various rounds of interviews, using the snowball approach, until we considered we had reached this point.

Overall, the design of the initial sample (based on our literature review and peer review process), the high participation rate, the seniority of the individuals, and the fact that some individuals were mentioned by multiple first-round interviewees, all provide confidence that the achieved sample represents a "true" group of key informants.

Table 4 below lists the organisations that participated in the study. The first column describes the categories which we were aiming to cover in the sampling approach. The third column identifies the descriptor we used about the participating organisation when we have provided direct quotes of what people said. The reason we used these descriptors rather than the categories is to preserve anonymity – the former are broader groupings, so it is less likely that the quote can be directly attributed to a single organisation.

Table 4 List of key informants

Category	Organisation	Descriptor in quotes	# key informants
Investors by sector	Electricity Network Association	Industry association/ peak body	1
	DairyNZ		2
	NZ Forest Owners Association		1
	Tourism New Zealand		1
Investors by type	Consumer NZ		1
	Local Government New Zealand (LGNZ)		1
	Dunedin City Council	Govt agency	3
	Te Waihanga New Zealand Infrastructure Commission		1
	NZ Super Fund	Investor/financial services	1
Financial institutions/ insurers	Kiwibank		1
	ANZ		4
	Insurance Council (ICNZ)	Industry association/ peak body	2
Māori asset owners	Te Rūnanga o Ngāi Tahu	Investor/financial services	1
	Te Arawa Fisheries Group		1
Govt agencies	Ministry for the Environment (MfE)	Govt agency	1
	Ministry for Primary Industries (MPI)		2
	New Zealand Trade and Enterprise (NZTE)		1
Academics and experts	Motu Economic and Public Policy Research	Academics/experts	1
	Victoria University of Wellington		1
	National Institute of Water and Atmospheric Research (NIWA)		1
	Sustainable Finance Centre		2
	Te Whakahaere		1
Overseas orgs	Delegation of the European Union to NZ		1
	European Investment Bank		1
Total	**24**		**33**

Analysis, reporting and interpretation

We recorded and transcribed the interviews. The research approach adhered to MBIE's ethics guidelines. The recordings and other identifiable information were stored securely on MBIE's system and used only for the purposes of the research, after which they were destroyed.

To ensure anonymity and confidentiality, each participant's responses were combined with those from others so that individuals were not identifiable. In Table 4 we list participating organisations, rather the individuals, to ensure individuals' anonymity. While we have included some verbatim quotes from individuals and provided an indication of the individuals' affiliation, the descriptor we have used for the

organisation (see Table 4) includes a minimum of five organisations to ensure some degree of anonymity.

We analysed the data thematically using NVivo, a standard software used in qualitative analysis. We used a grounded approach – the themes emerged from the data rather than being based on theory. A thematic analysis and identifying common features is widely used for qualitative research (Gioia 2021).

When reporting we have tried to provide an indication of the weight of opinion and the extent to which a particular view was held across key informants. We have done this through the use of terms like "many" (roughly ten or more key informants), "some" (roughly four to ten individuals) and "a few" (two or three key informants). On occasion, such as to provide specific examples, we have included a comment from only one individual. Given that our questions were very broad, and that we generally probed for clarification purposes and to elicit specific examples rather than to prompt on specific points/hypotheses, even a fairly small number of (unprompted) comments constitutes a theme.

When analysing and reporting the findings, we tried to carefully capture the main points we heard. We provided key informants with an opportunity to review an earlier draft of this report to ensure we had fairly represented their views. However, this approach means we have not applied a critical lens to key informants' suggestions. Clearly, key informants' suggestions are likely to reflect their own (or their organisation's) interests and perspectives to some extent. In places (mainly at the end of each section), we have provided some interpretation of the findings compared with those from the literature review for example.

Benefits and limitations of the approach

This study has many of the benefits (ability to explore a topic in-depth, remain open to and unearth unexpected findings, find meaning in actions etc) and limitations (inability to generalise) of qualitative research in general.

One specific limitation is that the sample of iwi and Māori asset owners was very small. Having said that, some of the key informants in other categories had some iwi affiliations, and many had been working with iwi, hapū, Māori trusts etc in the context of climate investment.

Also note the points above – that we have not applied a critical lens to key informants' suggestions and that, to some extent, individuals were likely to promote their own perspectives and interests. While the number of key informants covering a particular sector or interest group was small, we found that some key informants from outside a sector or interest group had some knowledge and commented about it, and so we were often able to triangulate a range of perspectives. Our sampling design, and the relatively large sample size for qualitative research, also helped mitigate against the risk of "capture". When reporting, we have highlighted when a particular view was held more strongly by a particular group of key informants.

Topic guide

Introduction

Thank you for agreeing to participate in this research. We are both researchers at MBIE [introduce ourselves].

The research aims to explore topics such as barriers to investment in climate change mitigation and adaptation, opportunities for investment, practical examples of these, and how to enact the principles of Te Tiriti o Waitangi. We've done a literature review on these topics so we are keen to get some concrete examples in the New Zealand context.

In terms of the scope of what we're talking about - we define 'investment' as the purchase of assets that are used to create future value. These assets include physical assets like buildings, machinery and equipment, infrastructure and intangible assets like R&D and new technologies – any assets where the benefits arise in future years. We include the financing of investment too.

The scope in relation to climate change includes both mitigation or actions to reduce emissions, and adaptation or adjusting to the effects of climate change. We have a set of questions about both mitigation and adaptation – are both equally relevant to you/your organisation?

The interview should take up to one hour. We will be keeping time throughout.

We would like to record the interview. Are you happy for us to do so? We will switch on the recorder now. I believe you have completed the consent form? In the report we prepare following the interviews, if there is the possibility that you may be identifiable, we will provide you with the opportunity to preview parts of the draft report.

Do you have any questions before we start?

Background

1. We know your organisation is X and your role is Y – is there anything else you'd like to share or think we should be aware of before we get into the main questions?

Main question

Our central research question is based on a statement by Rod Carr, Chair of the Climate Change Commission in the context of the Government's economic stimulus investment post-COVID-19: *"We have reached the point where climate change needs to be our focus for future investments".*

2. What would it take to mobilise investment to achieve New Zealand's climate goals? What are your initial thoughts and reactions to this question?
3. Just thinking about different groups of investors – what differences do you see between mobilising investment to achieve New Zealand's climate goals for businesses, households, local government and central government?

Climate change mitigation

Our next set of questions relate to climate change mitigation – actions to reduce emissions.

4. What types of investment shifts do you think might be needed to reach New Zealand's mitigation goals?
    a. investment motivation?
    b. types of assets?
    c. scale of investment?
    d. timeframes involved?
    e. financing of these investments?
5. What are some of the barriers to these shifts? How do you think these barriers might best be overcome? Are you aware of any practical examples in your organisation/sector or elsewhere of how these barriers have been overcome? What influenced investment decision-making?
6. What are some opportunities for investment? Are you aware of any practical examples in your organisation/sector or elsewhere of how these opportunities have been capitalised on?
7. Turning to Te Tiriti o Waitangi – how can the principles of Te Tiriti be enacted in the context of investment for climate change mitigation?

Climate change adaptation

[Repeat questions above but for adaptation instead]

Conclusion

8. What do you see as the main implications of what we've been discussing?
9. Who else would it be useful to talk to about this topic?
10. Is there anything else you would like to say in connection with what we've been talking about?

Thank you for your time. As we talked about at the start, your responses will be combined with those from others we interview. We will send you a report of the findings once it is available.

New Zealand Government