



Consultation on the Ministry for the Environment's draft Long-term Insights Briefing
2022

Where to from here? How we ensure the future wellbeing of land and people



Ministry for the
Environment
Manatū Mō Te Taiao



Te Kāwanatanga o Aotearoa
New Zealand Government

Disclaimer

The information in this publication is, according to the Ministry for the Environment's best efforts, accurate at the time of publication. The Ministry will make every reasonable effort to keep it current and accurate. However, users of this publication are advised that:

- The information does not alter the laws of New Zealand, other official guidelines, or requirements.
- It does not constitute legal advice, and users should take specific advice from qualified professionals before taking any action based on information in this publication.
- The Ministry does not accept any responsibility or liability whatsoever whether in contract, tort, equity, or otherwise for any action taken as a result of reading, or reliance placed on this publication because of having read any part, or all, of the information in this publication or for any error, or inadequacy, deficiency, flaw in, or omission from the information in this publication.
- All references to websites, organisations or people not within the Ministry are for convenience only and should not be taken as endorsement of those websites or information contained in those websites nor of organisations or people referred to.

This document may be cited as: Ministry for the Environment. 2022. *Consultation on the Ministry for the Environment's draft Long-term Insights Briefing 2022*. Wellington: Ministry for the Environment.

Published in October 2022 by the
Ministry for the Environment
Manatū Mō Te Taiao
PO Box 10362, Wellington 6143, New Zealand

ISBN: 978-1-99-102572-2 (online)

Publication number: ME 1681

© Crown copyright New Zealand 2022

This document is available on the Ministry for the Environment website: environment.govt.nz.

Contents

Executive summary	6
1 Introduction	8
Purpose of Long-term Insights Briefings	8
New Zealanders' wellbeing is connected to the state of the environment	9
Land and wellbeing	9
Land is shaped by what we value	10
Protecting the whenua through the challenges ahead	11
2 State of the land and drivers of future change	12
Introduction	12
Land is under pressure	12
Drivers of future land change	15
We must respond to drivers of change to create a future that enhances the resilience of the land	21
3 Aspirations for the future of the land	23
Introduction	23
A vision for the future of land	23
Engagement perspectives	25
Limitations	28
Creating the future we want	28
4 Transformational change	29
Introduction	29
Navigating towards a better future	29
Leverage points to influence change	30
Achieving incremental change	31
Supporting transitional change	34
Enabling transformational change	38
Achieving transformational change will require choices about our priorities	43
Have your say	47
How to provide feedback	47
Next steps	47
More information	47
Publishing and releasing submissions	47
Acknowledgements	49

References	50
Appendix 1. Driver mapping workshops	64
Appendix 2. Overview of rangatahi workshops and material generated	66
Appendix 3. Backcasting	73

Tables

Table 1:	List of 24 underlying drivers identified as influencing the future of land	64
----------	--	----

Figures

Figure 1:	Drivers of future land change	16
Figure 2:	Summary illustration of rangatahi aspirations for the future of whenua 2050	26
Figure 3:	Identified leverage points for environmental change	31
Figure 4:	Transformational change	39

Executive summary

Whenua (land) is an intergenerational taonga (treasure). It provides fundamental needs like food, jobs and spaces to live and play. It is also an integral part of Aotearoa New Zealand's culture and identity, for both Māori as tangata whenua and many other New Zealanders.

How we care for the land affects many aspects of our wellbeing.

For many years, Aotearoa New Zealand's land and soil have been facing pressures. These include more intensive agricultural practices, pollution, urban sprawl, rural fragmentation of highly productive land, invasive species and climate change.

If current trends continue, it is likely these pressures will increase. Political, economic and environmental disruptions could harm the land deep into the future. Because land is connected to every part of te taiao (the environment), that will suffer too.

We need to change course, and to do so in a coordinated way. If we do not, the pressures on the land could disrupt the economy, increase inequities between different generations and communities, harm wellbeing and continue to destroy unique species and ecosystems.

How do we ensure a resilient, sustainable future for the land and all New Zealanders?

This draft Long-term Insights Briefing proposes ways that Aotearoa New Zealand can start moving forward. Land is an integral part of the broader environment and society itself. This draft briefing starts a conversation about its future.

Working with multiple rangatahi (youth) groups and the Ministry for the Environment's executive leadership team, and through [public consultation](#), we have created a vision of what the state of the land, and New Zealanders' relationship with it, could look like in 2050.

In this vision, the relationship between people and whenua would be stronger, and people would give back to the land as much as it provides. Iwi and Māori would exercise their kaitiakitanga (stewardship), and people's connections with the land would be reflected in the country's politics, economy and everyday life.

Achieving such a vision would involve major transformations of Aotearoa New Zealand's politics, economy and society. Existing initiatives can only get us partway there. Achieving meaningful transformational change would require confronting the root causes of environmental crises.

Tracing back from an aspirational future to the present situation – a futures-analysis technique known as backcasting – identifies nine pathways we could use to influence change. These are structured across three tiers, with three specific leverage points in each.

Achieving incremental change – leverage points that are effective at increasing resilience and addressing specific events, but which have less effect on overall systemic pressures:

- increasing effectiveness of policy and legislation
- investing in sustainable infrastructure and technology
- empowering communities.

Supporting transitional change – leverage points that go deeper into the origins of the problems and help transition systems and institutions for more widespread change:

- investing in environmental education and knowledge transfer
- investing in science and mātauranga Māori
- embracing collaborative governance and coordination.

Enabling transformational change – leverage points that address the root causes of environmental issues. While more complex and challenging to implement, they have greater ability to bring about long-lasting change:

- embedding environmental responsibility into Aotearoa New Zealand’s institutions
- enhancing equity
- building resilience to global pressures.

We have included case studies to show how New Zealanders are already applying some of these leverage points.

Have your say

Making any kind of transformational change requires participation and collaboration from people across society, including communities, institutions, iwi and hapū, businesses and individuals. It involves openly discussing the benefits and costs, and carefully considering how the choices made will affect government fiscal priorities, economic sectors, communities and generations.

By thinking, planning and acting now, we can better ensure the demands of the present do not outweigh the rights of the future. Inclusive, transparent governance and decision-making that make space for everyone’s input are crucial for ensuring this transition happens in an equitable way.

That is why we want to hear from you about how to ensure a resilient, sustainable future for the land and all New Zealanders.

Your input and feedback will help inform and develop our thinking for the final Briefing that will be submitted to Parliament, as well as the Ministry’s work over the coming years.

1 Introduction

Purpose of Long-term Insights Briefings

Long-term Insights Briefings (LTIBs) present medium- and long-term trends, risks and opportunities that affect the interests of Aotearoa New Zealand and the wellbeing of New Zealanders. They provide impartial analysis and options for addressing these, and are ‘think pieces’, not governmental policy. The briefings are a new requirement of the [Public Service Act 2020](#), and departmental chief executives must release briefings every three years.

The purpose of LTIBs is to spark debate on long-term issues of significance and contribute to future decision-making. This requires all of us to think about, anticipate and act on the future interests and aspirations of New Zealanders.

Futures thinking is critical to the Ministry for the Environment’s role as an environmental steward and system leader under the [Environment Act 1986](#). That Act requires taking a full and balanced account of the needs of future generations, as part of the management of natural and physical resources in Aotearoa New Zealand. Taking a long-term perspective helps us to understand where and how action may be required today to meet our stewardship goals. Futures thinking is also important to future-proof policy design and make sure the needs of future generations are represented within this governance (PCE, 2021; United Nations, 2021a). This is essential for undertaking change that moves beyond short-term gain to engage with long-term challenges (Krznic, 2020).

Ministry for the Environment’s Long-term Insights Briefing

The topic of the Ministry for the Environment’s first LTIB is *He aha ngā mahi ka whai ake ināianei? Me pēhea te whakarite i te toiora o te whenua me te tangata ā muri atu – Where to from here? How we ensure the future wellbeing of land and people*. This places an emphasis on whenua (land) – an intergenerational taonga (treasure). The topic was chosen because land connects every part of te taiao (the environment). How land is cared for affects lakes, rivers, oceans, air, climate and native species. The health of the land and wellbeing of people are also closely interconnected, because land is central to Aotearoa New Zealand’s economy, culture and many other aspects of society. The land must be well looked after to ensure a resilient, sustainable future for everyone.

This LTIB looks towards the year 2050, which represents an important timescale for both climate change and native ecosystems. Aotearoa New Zealand has committed to being carbon neutral by 2050 ([Climate Change Response \(Zero Carbon\) Amendment Act 2019](#)). [Te Mana o te Taiao – Aotearoa New Zealand Biodiversity Strategy](#) outlines a framework for the protection, restoration and sustainable use of indigenous biodiversity through to 2050 (DOC, 2020). This aligns with the [Convention on Biological Diversity](#), which outlines a global vision to combat ecosystem loss (DOC, 2018; United Nations, 1992). While 2050 is the marker point for this LTIB, actions taken today will be felt well beyond this. The Ministry’s aspiration – a flourishing environment for every generation – means looking further into the future at the wellbeing of generations to come.

In this draft LTIB, we propose ways Aotearoa New Zealand can change the relationships it has with the land. Achieving transformational change requires participation and collaboration from people across all areas of society, including institutions, iwi and hapū, businesses, communities and individuals. It is important everyone can contribute. This draft briefing is intended to serve as a conversation starter, to engage New Zealanders on the long-term future of the land. We want everyone's input on what the future should look like, because this will help influence the Ministry's upcoming work.

New Zealanders' wellbeing is connected to the state of the environment

The wellbeing of the environment and that of society are inseparable. While wellbeing has different meanings for different people, broad agreement has been reached that it is closely linked to the environment. If the environment is degraded, human wellbeing suffers as a result (Ausseil et al, 2021; MfE and Stats NZ, 2022; PCE, 2021).

The Treasury's Living Standards Framework (LSF) reports on various statistics that can inform progress on wellbeing from different perspectives. Several relate to the environment and its contribution to both the current and future wellbeing of individuals, whānau and communities (New Zealand Treasury, 2021). This draws from a growing body of scientific evidence that shows the links between the environment and wellbeing in multiple ways. A healthy environment supports livelihoods, provides important services and resources, enhances mental and physical health, and fosters connections and relationships (Dasgupta, 2021; MfE and Stats NZ, 2022).

In te ao Māori, the interdependence between the wellbeing of people and ecosystems is clear. Harmsworth and Awatere (2013) write that Māori "see themselves as a part of ecosystems rather than separated from ecosystems" (p 276). In this worldview, it is impossible to separate the wellbeing of people from that of the environment, because they are the same ([Te Awa Tupua \(Whanganui River Claims Settlement\) Act 2017](#)).

Humans are linked to ecosystems through whakapapa: a connection, lineage or genealogy that situates people in a network of intergenerational relationships with all other animals, plants and parts of the environment. With these relationships comes responsibility. Whakapapa "binds iwi/hapū to the natural environment, ancestral homelands, the wider community, mokopuna or future generations, and empowers mana whenua to carry out their duties as tangata kaitiaki (human guardians) that strengthen those bonds" (Scheele et al, 2016, p 5).

Damage to the environment means a loss of mauri – the energy or spark of life that permeates all living and non-living things (MfE and Stats NZ, 2022). Shifts in the mauri of one part of an ecosystem eventually affect the whole (Harmsworth and Awatere, 2013). Harm to the mauri of a part of the environment also affects the mauri of people who exist within that environment and, therefore, their wellbeing.

Land and wellbeing

The connections people have to the land form an important part of their relationships with the environment. For Māori, the relationship between tangata (people) and whenua is indivisible (Hutchings, 2015). Māori understanding and worldviews emerge from this connection, and

Māori are often referred to as tangata whenua – people of the land (Hutchings et al, 2018). In te reo Māori, the word whenua means both ‘land’ and ‘placenta’. A person’s whenua (placenta) is often buried at a significant place, such as a marae, acknowledging the intimate spiritual and physical connection between land and people (Harmsworth and Awatere, 2013).

Land and soil contribute to wellbeing in many ways, with benefits including food, employment, energy, health, recreation and identity. These connections are explored in the reports [Our Land 2021](#) (MfE and Stats NZ, 2021b) and [Environment Aotearoa 2022](#) (MfE and Stats NZ, 2022).

In many ways, Aotearoa New Zealand’s identity is tied to the land, forests, wild areas, greenspaces and pastoral environments. All contribute to a sense of place. Spending time in nature also enhances our mental and physical wellbeing and connections to other people (Ausseil et al, 2021). Economically, production from the land generated more than \$50 billion in export revenue in the year to June 2022 (MPI, 2022a). While soil is the basis for food production, healthy soils provide many other benefits, such as supplying building materials, filtering nutrients and contaminants, helping store water and mitigate floods, decomposing wastes, and maintaining biodiversity (Dominati et al, 2010).

Land is shaped by what we value

Land provides many benefits, as shown in the examples above. But when land is used in a particular way, it changes what benefits it can provide and has implications for the health and resilience of the wider ecosystem.

For example, using soil in ways that increase food production can boost the economy. However, that may reduce other benefits of healthy soils, such as flood mitigation, biodiversity and nutrition (Ng and Zhang, 2019; Powers et al, 2020; Stronge et al, 2020).

The choices people make depend on how they value the different options available to them, and people bring distinct balances of values to bear on the land. Three value perspectives illustrate how people connect with nature: instrumental, intrinsic and relational (Chan et al, 2020; IPBES, 2022a; Pascual et al, 2017).

- **Instrumental values** refer to the value attributed to nature as a means to an end. They are often measured in monetary terms, emphasising the material and economic benefits that natural resources provide.
- **Intrinsic values** refer to the value of nature for itself, independent of any benefits it provides.
- **Relational values** refer to the importance of meaningful relations between people and nature. People and nature are seen as inseparable, with humans embedded in their environment. This often implies a moral duty of care: that is, because the environment supports us, we have a reciprocal responsibility to take care of it (Arias-Arévalo et al, 2018; Chan et al, 2016). This perspective aligns most closely with Māori understandings of the environment – with humans and ecosystems tied to one another through whakapapa (Harmsworth and Awatere, 2013).

These values all co-exist in individuals and influence people’s choices and behaviours. Recognising the plurality of these values is essential for achieving effective and positive environmental outcomes. All three values should be considered together when making decisions about the future of the land. However, instrumental values are heavily over-

emphasised in studies that examine the value of nature. The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) (2022a) reported that of the studies that value nature, 74 per cent focused on instrumental values, with 20 per cent and only 6 per cent focused on intrinsic and relational values, respectively.

In the [public consultation](#) the Ministry conducted earlier this year, respondents highly valued the mental and physical wellbeing benefits that land provides (MfE, 2022e).

To bring about transformational change in people's relationships with the land, and to enhance the health and wellbeing of both people and nature in the future, we will need to ensure we enable the balanced expression of values. This will involve recognising limits to instrumental and extractive engagement with the whenua: our society cannot continue to take from the land without compromising future generations and nature itself.

Protecting the whenua through the challenges ahead

Aotearoa New Zealand's land and soil, and the ecosystems that depend on them, are facing many pressures. These include land-use change and intensification, invasive species, pollution, natural resource use and climate change (MfE and Stats NZ, 2022). Chapter 2 explores these in more detail. These pressures on and changes to the land result in social and cultural changes, as well as the loss of culture and tradition. Adequately meeting these challenges will require changes in how nature is valued across many parts of society.

This LTIB recognises that achieving these aspirations will require a shift in approach to decision-making. This shift will need to recognise different values and perspectives while looking holistically at the many ways land and people interact. Importantly, it will require making near-term decisions in the context of longer-term outcomes. To inform this process, chapter 2 provides insight into how people's actions and historical legacies are affecting the land today, and the pressures and challenges the land will face in the future. Chapter 3 then lays out an aspirational vision for the wellbeing of people and whenua, based on engagement both within and beyond the Ministry. Finally, chapter 4 proposes a framework for navigating through today's challenges to a better future. It identifies strategic leverage points that together could unlock transformational change to give full play to New Zealanders' inherent values of environmental responsibility.

2 State of the land and drivers of future change

... for young people, the importance is realising that the environment is their future, and it is essential to ensure this intergenerational relationship, not just for short-term gain or because “it’s always been this way” (when it hasn’t), but it is life or death. To accept the state of the environment is to accept that we won’t make it to 2050.

(Rangatahi voice who contributed to the LTIB)

Introduction

People value the land for many different reasons. The focus on economic aspects and short-term benefits has placed considerable pressure on the land. This has flow-on effects on the rest of the environment and various aspects of wellbeing in Aotearoa New Zealand, particularly for future generations.

To reduce these pressures, we first have to know where we are now and the challenges ahead.

This chapter provides a high-level overview of the current pressures on the state of the land, then looks ahead to the important drivers that will bring increasing change and uncertainty in the coming decades.

Land is under pressure

The pressures facing the land are well-documented and include land-use change and intensification, invasive species, pollution, natural resource use and climate change (IPBES, 2019).

The effects of these pressures have been detailed in the Ministry’s environmental reporting series – see the reports [Our land 2021](#) and [Environment Aotearoa 2022](#) (MfE and Stats NZ, 2021b; MfE and Stats NZ, 2022). This section is therefore not intended to be a comprehensive discussion or exclusive list of pressures, but aims to summarise the state of the land and main pressures.

Aotearoa New Zealand’s native plants, animals and ecosystems are under threat

Much of Aotearoa New Zealand’s native wildlife is at risk of extinction, due to pressures from introduced species, pollution, landscape changes and over-harvesting of indigenous species (Craig et al, 2000).

- Just over half of Aotearoa New Zealand’s total land area is used for agriculture, forestry and urban areas. The rest is under native land cover (see indicators: [Exotic land cover](#), [Urban land cover](#), [Indigenous land cover](#)). Around a third of Aotearoa New Zealand’s land area is public conservation land. Current changes in land cover are relatively minor, but the extent of many ecosystems such as wetlands and kauri forests have already been severely diminished (MfE and Stats NZ, 2021b)

- Aotearoa New Zealand is recognised as a global biodiversity hotspot, with many unique species found nowhere else in the world (IPBES, 2018; Myers et al, 2000). Yet more than 4,000 native species are currently threatened with or at risk of extinction (Stats NZ, 2021a). This includes taonga species important to Māori. The loss of these taonga can result in the loss of language, tikanga (customs and protocols) and mātauranga (knowledge) associated with them (Rainforth and Harmsworth, 2019).

Climate change will further disrupt native species and ecosystems and may exacerbate many of the pressures they face. We do not know the exact effects of climate change on Aotearoa New Zealand’s native biodiversity. A lack of data and long-term studies currently limits our ability to understand how species will be affected in the future (IPCC, 2022; Macinnis-Ng et al, 2021).

Amount of highly productive land is shrinking

Fifteen per cent of land in Aotearoa New Zealand, using baseline figures, is classified as highly productive (Land Use Capability (LUC) classes 1, 2 and 3). This land is particularly good for food production, because it has suitable soil for multiple rural land uses, is flat or gently sloping, and has an optimal growing climate. Protecting this land is important because, among other things, it allows more food to be grown with fewer inputs and environmental effects.

- In many areas, the most highly productive land is being subdivided into smaller pieces or turned into urban land, a long-standing issue dating back to at least the 1950s (Hunt, 1959). This shifts highly productive land out of agricultural production (MfE and Stats NZ, 2021b).
- While these trends are being seen across the country, they are escalating in some more densely populated regions. In Auckland, small-sized land parcels (less than 8 hectares) with a dwelling made up 40 per cent, 44 per cent and 25 per cent of the region’s LUC class 1, 2 and 3 land in 2019. This is an increase of 74 per cent, 32 per cent and 44 per cent, respectively, since 2002 (Curran-Cournane et al, 2021) (see indicator: [Land fragmentation](#)).
- The loss of land and soil to development is irreversible. Even with interventions, which are needed to slow the rate of loss, the trend will likely continue due to the challenges of wholly avoiding the development of these soils for housing (MPI and MfE, 2019b). This is particularly an issue for LUC class 1 and 2 land that represents only 0.9 per cent and 4.5 per cent of total land area in Aotearoa New Zealand, respectively, before the loss that has already occurred.

Population growth and the need for more housing puts pressure on the availability of highly productive land. At the same time, consumer demands for locally produced fresh produce incentivises the protection of highly productive land near urban areas, along with the need to ensure a resilient food system for every generation. Aotearoa New Zealand’s export economy, based on primary industries, also needs a good supply of land to grow on (MPI, 2019b; MPI and MfE, 2019a).

Ways the land is used are degrading soil and water

Land-use changes have shaped Aotearoa New Zealand since human settlement. Farming has been a major driver, leading to the deforestation of hill country, increasing Aotearoa New Zealand’s naturally high rates of erosion.

- An estimated 192 million tonnes of soil are lost to erosion every year, of which 44 per cent comes from pasture (McIntyre et al, 2019; Our Land and Water, 2021).
- Over the past 30 years, land use has also intensified, with the shift from sheep and beef farming to dairy farming that requires more resources (MfE and Stats NZ, 2021b).
- Intensive irrigation and fertiliser use also put pressure on the environment. Leaching of nutrients and erosion sediment from agriculture and forestry have caused declines in freshwater and marine quality (MfE and Stats NZ, 2020b).
- Intensive land use can degrade the quality of the soil. Soil quality indicators of monitored sites between 2014 and 2018 showed:
 - signs of compaction at nearly half of sites
 - 40 per cent had too much phosphorus
 - 26 per cent of cropping sites had too little soil carbon, which can be attributed to soil disturbance (see indicator: [Soil quality and land use](#)).
- These soil quality states and pressures have generally persisted since the mid-1990s when the monitoring was first established. While no signs are evident of further degrading, nationally soil quality is not improving either despite promotion of best management practices (MfE and Stats NZ, 2021b).

Climate change puts further pressure on soil degradation, with extreme events such as floods and droughts increasing the risk of erosion and loss of valuable soil. Also, the intensive use of land and soil for production is further driven by the current export market on the limited and diminishing amount of productive land we have (MfE and Stats NZ, 2021b).

The environment in urban areas is polluted

Many cities and towns in Aotearoa New Zealand have polluted air, land and water. The precise extent is not known (MfE and Stats NZ, 2018). This pollution comes from many sources, including home heating, vehicles, historic industries, waste, wastewater and stormwater (MfE and Stats NZ, 2019). A polluted urban environment harms human health and reduces people's ability to engage with nature (Panagopoulos et al, 2016).

- It is estimated almost 18 million tonnes of waste are generated per year, of which 72 per cent goes to landfills (MfE, 2021a). The amount of waste is also increasing. Between 2010 and 2019, it rose 48 per cent. Per capita waste increased more than 27 per cent (from 580 kilograms to 740 kilograms per person) annually over this time (MfE, 2021a). According to analysis of data from the Organisation for Economic Co-operation and Development (OECD), Aotearoa New Zealand ranked 29th out of 38 countries in the OECD in terms of waste management (Sensoneo, 2022). Only about a third of the material put out for kerbside collection is recycled or composted (MfE, 2022b).
- Levels of heavy metals in soil in urban environments are not only influenced by underlying geology but by human activity. For example, of monitored sites in urban Auckland, high-traffic locations were the most highly polluted, compared with native urban forest sites (Curran-Cournane et al, 2015).

Most of Aotearoa New Zealand's future population growth will be in cities, and this will add pressure to pollution and waste in urban environments (MfE and Stats NZ, 2021a; MfE and Stats NZ, 2021b).

Drivers of future land change

The pressures outlined above will continue to affect the state of the land, wider environment, and people's wellbeing. The precise ways these pressures will affect people will shift, along with broader changes in society.

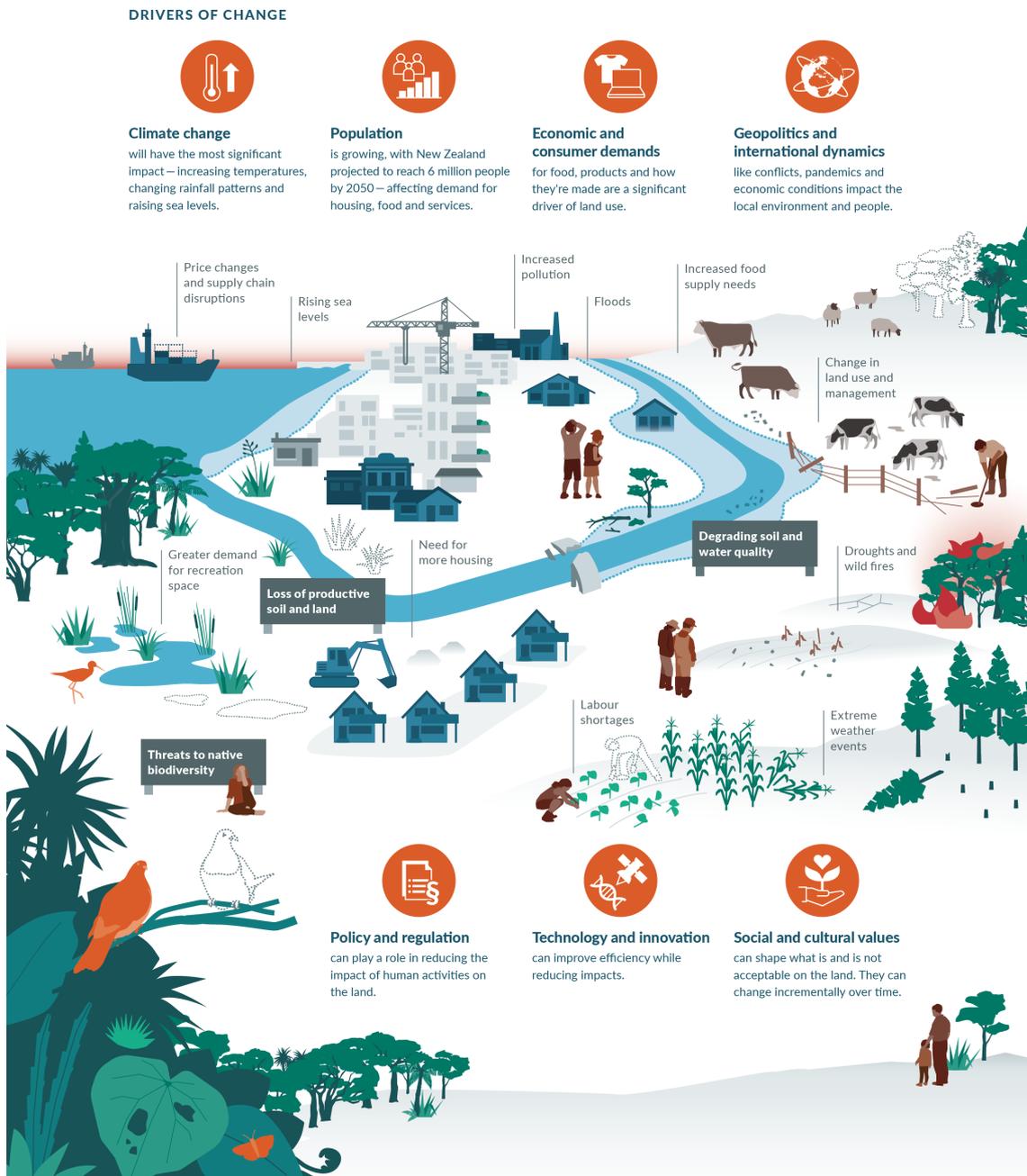
Local and global drivers of change – broad social, demographic and economic developments in societies – will also shape the future of the land in Aotearoa New Zealand. Some will increase pressures and demands on the land, while others may improve conditions. Understanding the likely directions of these trends is essential for understanding what the future might look like and what choices can be made in response.

This section outlines major drivers that will shape people's relationship with the land 30 years into the future (see [appendix 1](#)). Drivers are inherently interconnected; many will have overlapping causes and effects. The list is not exhaustive or exclusive. Our analysis was drawn from a larger list of specific drivers important to the future of land in Aotearoa New Zealand (see [table 1](#) in appendix 1)

Figure 1: Drivers of future land change

Drivers of future land change

Some drivers are local, others are global — all are interconnected.



Climate change is raising temperatures and changing rainfall

The climate is warming at an unprecedented rate, and this will continue (IPCC, 2022). Climate change has been identified as the most important factor influencing land use and the agri-food sectors in Aotearoa New Zealand (Driver et al, 2019). Climate change will also make many existing pressures worse – for example, increasing invasive pests and diseases (MPI, 2015).

Climate change is already affecting Aotearoa New Zealand, through higher temperatures and changing rainfall. The first six months of 2022 were the second warmest on record (NIWA, 2022).

These changes have implications for the way land is used and managed. Climatic changes in some parts of the country may have benefits for agriculture, such as warming temperatures extending growing seasons (Ausseil et al, 2019b). However, any benefits will be far outweighed by negative effects, such as increased rainfall variability, droughts and water shortages, and heat stress to livestock (Ausseil et al, 2019b; Hendy et al, 2018). This will cause major losses to farming operations and negatively affect the wider environment (MfE, 2020a). Some land will no longer be suitable for its current use, due to flooding and sea-level rise (Ausseil et al, 2019b). Disruptions to ecosystems will give invasive species more opportunities to establish and spread, further harming native biodiversity (Macinnis-Ng et al, 2021; MfE, 2020a).

The direct effects of climate change and extreme weather will increase. Long-term plans will be needed to address rising sea levels, increased flooding and drought risks. Some land will become unsuitable for certain crops or for housing (Ausseil et al 2019b; Royal Society of New Zealand, 2016). Because of the high uncertainty over when and how extreme events will happen, planning needs to be flexible and adaptable (MfE and Stats NZ, 2020a).

The best chance of avoiding the worst effects of climate change is to limit global warming. The [emissions reduction plan](#) released earlier this year sets a direction to reduce Aotearoa New Zealand's emissions in line with international efforts to limit the global average temperature increase to 1.5 degrees Celsius (MfE, 2022d). This would require the average young person today to emit eight times less carbon dioxide than their grandparents (Hausfather, 2019).

While every bit of warming we avoid will reduce harm, it is unlikely global warming will stop at 1.5 degrees Celsius (Meinshausen et al, 2022). We will therefore need to adapt to the changes already happening. The [national adaptation plan](#) has policies and actions to adapt to the changing climate and its effects (MfE, 2022c). The emissions reduction plan lays out targets and actions across every part of government and the economy (MfE, 2022d). Investing in resilience and adaptive responses can also reduce some of the more challenging disruptions (MfE, 2022c).

Economics and consumer demand influence what New Zealanders make and use

Consumer demand for food products influences land use. Aotearoa New Zealand's export-driven agricultural sector is influenced by global trends: in 2018, 95 per cent of dairy and 74 per cent of beef and lamb were exported (Soliman and Greenhalgh, 2020). Consequently, international customers play an important role in determining what is produced and how (Saunders et al, 2016). It is likely producers will need to adapt in response to consumer demand for certain types of products or production methods (Leitzmann, 2014; Miller et al, 2014). Some consumer-demand changes will require incremental improvements and innovations, while others will bring more significant disruption.

Consumers are increasingly demanding more ethical and sustainable food products (Lees and Saunders, 2015; Saunders et al, 2016). The value of the organic sector in Aotearoa New Zealand grew by 20 per cent between 2017 and 2020 (OANZ, 2020). Consumer preferences for value over volume (Driver et al, 2022) have also led to greater interest in regenerative

agriculture, which takes account of the diversity of farms in Aotearoa New Zealand (Grelet and Lang, 2021).

Alternative protein products are one potential answer to concerns about the ethics and sustainability of intensive animal farming. While only a small portion of the global market – estimated at 2 per cent in 2020 – this is expected to rise to around 11 per cent by 2035, as price and taste become more comparable to traditional meat and dairy products (Morach et al, 2021). How Aotearoa New Zealand meat and dairy producers respond to these shifts can have a significant effect on farming land (Te Puna Whakaaronui, 2022)

With middle classes growing and emerging around the world, demand for Aotearoa New Zealand's primary sector products is likely to stay strong over the next decade and beyond (MPI, 2019a). Changes in dietary preferences (such as increased meat consumption) and unequal crop-yield changes will also likely drive changes in commodity prices and trade policies, affecting the agricultural sector (MfE and Stats NZ, 2022). Land-use change might also be influenced by carbon prices, likely pushing towards a conversion of sheep and beef land into forestry (Ausseil et al, 2019a; Morgan and Daigneault, 2015; Timar, 2019)

Social and cultural values influence what is acceptable in Aotearoa New Zealand

As discussed in chapter 1, the value systems people use to think about the environment have a large role in shaping the land and people's relationship with it. For example, decisions on changes in land use in the primary sector have been influenced not only by economic pressures, but by societal factors such as age, gender, education, employment, attitudes and values (Journeaux et al, 2017). These values can shift over time. Beliefs and perspectives on issues such as climate change, waste, animal welfare and genetic modification continue to alter our practices and behaviour across generations.

Several examples can be found of changes in social and cultural values in Aotearoa New Zealand in recent years. The movement towards a circular economy is growing, where resources are kept in use as long as possible and reused at the end of their lifecycle, so waste and pollution are minimised (MfE, 2022b). This has been championed at a grassroots level by individuals, community groups, iwi and Māori, and some businesses, as well as at a higher level by central and local government (MfE, 2021b).

This change can be seen in the increasing popularity of reusable containers and widespread public support for banning single-use plastic bags (MfE and Colmar Brunton, 2018; Stats NZ, 2019a). These behaviour changes have been influenced by shifts in values and businesses responding with sustainable alternatives as people become more aware of the environmental impacts of their choices.

Value shifts can be generational. Younger people are more likely to be convinced climate change is a result of human activities and be more worried about its effects. In 2019, the School Strike 4 Climate movement had an estimated 170,000 Aotearoa New Zealand members. Many participants were tamariki (children) and rangatahi (the younger generation), marching to demand further action on climate change (Handford and Maeder, 2020). As these younger people enter the workforce and progress into more influential positions in their communities, it is likely changes will result from these values. Value shifts can and do occur over time in discrete issue areas.

Global pathway scenarios to achieve sustainable futures are often associated with pro-environmental values and a recognition of the diverse values underpinning people's motivations and behaviour. Holding sustainability-aligned values may not be enough, though, with transformative change more likely to occur with empowering conditions for civil society and removal of barriers (IPBES, 2022b).

Population growth influences demand for and disposal of resources

The population of Aotearoa New Zealand is projected to reach 6 million by 2050 – an increase of around 900,000 from 2022 (Stats NZ, 2020). A growing population increases pressure on the land due to greater demand for food and fibre production, energy and clean water, infrastructure for waste recycling and disposal, space for housing and public infrastructure, and recreation opportunities. Even if population growth is slower than projected, an ageing population is likely to increase housing demand through to 2050 (Hong, 2021). A growing population will affect different parts of the country in different ways, depending on where growth is concentrated and how fast it occurs. Decisions about how and where to build new homes and infrastructure will greatly shape impacts on the land.

To meet the needs of the growing population, demand for urban development will increase. A projected 265,000 new dwellings will be consented by the end of 2026 (MBIE, 2021a). To reduce the area that would need to be converted to urban land and decrease pressure on the environment, urban density (rather than city expansion outwards) tends to increase. In the year to March 2022, for the first time in Aotearoa New Zealand's history, more multi-unit homes (25,475) were consented to be built than stand-alone homes (25,383) (Stats NZ, 2022).

Policies are being implemented that have the potential to reduce effects on land around the edges of urban areas (MPI and MfE, 2019a). However, deeper changes to consumption and lifestyle patterns will be needed to significantly reduce pressure on the land and environment stemming from increased demand for food, energy and housing and other needs.

Technology and innovation influence the way people live

Advances in technology can significantly reduce people's impacts on the land. In the agricultural sector, recent advances such as precision soil nutrient and irrigation delivery, genomics, data aggregation and sensors, and effluent treatments, are letting farmers produce more with less environmental impact (Ekanayake and Hedley, 2018). Significant investments in agricultural technology are changing the sector, and experts project this will continue, depending on adequate resourcing for research and implementation (MPI, 2021).

Lowering agricultural greenhouse gas emissions is crucial for reducing climate impacts and ensuring Aotearoa New Zealand's agriculture remains competitive. Reducing methane emissions from sheep and cows is a high priority. Research on an effective vaccine or inhibitor that would suppress the growth of methane-producing microbes in livestock could help reduce methane emissions (NZAGRC, nd).

For their first [Long-term Insights Briefing](#), the Department for Conservation and Toitū Te Whenua Land Information New Zealand (2021) are exploring how innovation in technology and information can support biodiversity to thrive. This will help achieve the ambitious 2050

vision of [Te Mana o te Taiao - Aotearoa New Zealand Biodiversity Strategy 2020: Te mauri hikahika o te taiao – the life force of nature is vibrant and vigorous](#) (DOC, 2020).

Technological innovation will likely continue to improve efficient use of the land. Efficiency gains, however, do not automatically reduce pressures. When innovations increase production, pressures on the land and wider environment can remain the same or even increase (Hertel, 2012; Monaghan et al, 2021). The use of technology needs to be guided by values and policies that reduce pressure on the environment.

Policy and regulation influence how land is used

Governments can use laws and policies to directly influence how land is used. These include zoning and planning regulations that dictate the type and intensity of land use in specific areas. The Ministry for the Environment administers several regulations related to land.

Recent and proposed policy and legislative changes that aim to address challenges facing the land include:

- The [Resource Management System reform](#) (MfE, nda), which aims to provide for more sustainable use of land and better protection of Aotearoa New Zealand’s indigenous biodiversity, and to support the wellbeing of people and the environment for future generations
- the [National Policy Statement for Freshwater Management 2020](#) (MfE, 2020c), which aims to protect and enhance waterways, including managing activities that create pollution and excess sedimentation
- the [proposed National Policy Statement for Indigenous Biodiversity](#) (MfE and DOC, 2022), which aims to protect and restore native ecosystems
- the recently gazetted [National Policy Statement For Highly Productive Land 2022](#) (MfE, 2022f), which aims to protect versatile land by ensuring councils give greater consideration to where urban expansion and rural lifestyle living occurs and avoiding inappropriate subdivision
- [Transforming Recycling](#), which is a set of policy proposals to improve waste collection and recycling by introducing a container-return scheme, improving household kerbside recycling, and separating business food waste (MfE, 2022b). Additionally, the Ministry’s proposed Waste Strategy is intended to transform the waste system (MfE, 2021b). Among other things, it identifies what needs to be focused on over the next 10 to 30 years, to move towards a circular economy from a waste perspective
- the [Emissions Trading Scheme](#) (MfE, ndb) [emissions reduction plan](#) (MfE, 2022d) and [national adaptation plan](#) (MfE, 2022c) will influence how land use will be shaped by the policy and regulatory choices made to both mitigate and adapt to climate change. For example, the Emissions Trading Scheme and emissions reduction plan will influence the extent of planting of native and non-native forests, and potentially the financial incentives for investing in wetlands and other habitat types to sequester carbon.

Government policies have a prominent role in reducing the direct effects of human activities on the whenua. Policy and legislative changes are, however, unlikely to be enough on their own, especially with a changing climate and dependencies on other socio-economic drivers. Multiple factors influence land managers’ decisions, with research showing that policies and regulations alone are unlikely to result in a transition to more sustainable alternatives (Journeaux et al, 2017; Renwick et al, 2022).

The complexity of the challenges and the links between them will require a system-level approach. To achieve enduring, systemic change in an increasingly dynamic context, a wider set of tools will be needed.

Geopolitics and international dynamics influence the local environment

Because of the size of the primary export sector and Aotearoa New Zealand's reliance on global commodities, the wellbeing of the land here is connected to international dynamics. The past few years have highlighted how connected the country is to global events. The COVID-19 pandemic, the war in Ukraine and global inflation have had significant effects. International fuel and fertiliser price increases, labour shortages, supply-chain disruptions and grain shortages are directly affecting local horticulture, agriculture and forestry (Australia and New Zealand Banking Group Limited, 2022). Intensifying global concern for food security may increase pressure on production here, driving up prices and therefore affecting the wellbeing of the environment and Aotearoa New Zealand society (Te Puna Whakaaronui, 2022).

Aotearoa New Zealand's reliance on imports increases its vulnerability to global events. For example, phosphorus fertiliser is considered essential for growing crops. However, imports of rock phosphate needed to produce this fertiliser may be threatened by geopolitics, as well as difficulties along the shipping route (Powers et al, 2019; Wall, 2019). Alternatives are available that could enhance the country's resilience to these pressures, such as recovering phosphorus for fertiliser from waste products, but this would require large investments in technology and infrastructure (Ahuja et al, 2020; Powers et al, 2019).

It is not possible to predict exactly what international pressures and shocks the country will face through to 2050. It is likely Aotearoa New Zealand will remain economically reliant on land use for global markets, as it has for the past century and a half. It is plausible that significant economic, geopolitical or biosecurity disruptions could force changes in the country's economic structure and land-use patterns (OECD, 2021).

We must respond to drivers of change to create a future that enhances the resilience of the land

The main drivers that shape the wellbeing of people and the land are complex. This makes it difficult to predict the likely state of the whenua in 2050. As the COVID-19 pandemic has shown, sudden shocks – whether political, economic or environmental in nature – can dramatically change domestic and international circumstances. However, our understanding of pressures on the land is continually improving, as are the main drivers of change that will be important over the coming decades.

Not everyone will be affected equally by whatever changes come. This therefore adds complexity to understanding the future. People's vulnerability to climate change differs substantially among and within regions (IPCC, 2022). This is driven by patterns of socio-economic development and marginalisation, as well as historical and ongoing patterns of inequity.

Without intervention, climate change will likely make existing inequities worse in Aotearoa New Zealand. Communities that are already vulnerable will probably face increased hardships. Māori will be particularly affected (MfE, 2020a). As tangata whenua, Māori are especially reliant on the environment for cultural, spiritual, social and economic value.

Increased inequities will adversely affect social cohesion, people's sense of identity and belonging, and worsen physical and mental health issues (MfE, 2020a).

This brief outline suggests challenges ahead for the land and the aspects of people's wellbeing which depend on it. To improve the state and resilience of the land, despite these increasing challenges, requires urgent and integrated meaningful action.

If the future impacts of people's actions are not factored into decision-making, prospects for improving the wellbeing of people and the land are limited. As well as looking after the land today, we must all equally ensure it can provide for the wellbeing of future generations. Navigating the forces shaping the land and uncertainties of the future will be challenging. The next step is to work out where we as a country want to go and use that vision to guide us.

3 Aspirations for the future of the land

Introduction

Chapter 2 outlines the issues currently facing the land and the main drivers of change that will affect it into the future. If action is not taken now, and the current trajectory continues, people's wellbeing and that of generations to come will be affected.

Luckily, these trends are not set in stone. By understanding how drivers of change interact, and the possible outcomes, we can proactively build the future we want. At the same time, it is important to improve the resilience of the land, to help protect it from future shocks, both expected and unexpected.

This chapter outlines a possible future for the whenua in Aotearoa New Zealand. What do we as a country want the land, and our relationships with it, to look like in 2050 and beyond?

The aim is not to accurately predict what will happen, but to use a process known as 'futures thinking'. This is a "creative and exploratory process ... seeking many possible answers and acknowledging uncertainty" (DPMC, 2021b).

After identifying an aspirational future, chapter 4 looks backwards from this vision to the present day and outlines a path for how we could get there.

This is part of the Ministry's duty as an environmental steward: to look ahead and provide advice on future challenges and opportunities to move towards a more sustainable future. The Ministry also has a broader role to ensure stewardship for the environmental system as a whole, which is a duty of the Aotearoa New Zealand public service (DPMC, 2022).

A vision for the future of land

This chapter aims to gain some insights into New Zealanders' aspirations for the future of land in Aotearoa New Zealand. To do this, we held workshops with rangatahi and the Ministry's executive leadership. We also conducted an online survey for members of the public to provide input. It is acknowledged that the sample size involved in creating a vision for the future of the land is small and may be affected by bias towards those who share concerns about the environment.

Insights from these targeted engagements provide a vision oriented towards improving and balancing the wellbeing of people and the land. This is linked to outcomes that ground this vision in plausible changes to reduce environmental pressures and bring the wellbeing of people and land into alignment.

The groups we engaged with expressed overlapping visions for the future of the land. One thing that became clear is an emphasis on relational values. Many people see themselves as part of the environment, with a responsibility to give back to the land as much as it provides. While equal weight needs to be given to intrinsic and instrumental values (IPBES, 2022a), a

common theme in the engagement was a strong desire to have reciprocal connections with the land reflected in any decisions.

This relational view of environmental responsibility aligns in many ways with Māori understandings of te taiao. The following whakataukī (saying) sums up this connection:

Ko au te whenua, ko te whenua, ko au.

I am the land, and the land is me.

From these collective insights, four main challenges emerged that could reshape people's relationships with the land – that is, how might we:

- empower tangata whenua to exercise kaitiakitanga?
- protect, revitalise and make the land more resilient?
- enable action and responsibility for improving land?
- ensure all New Zealanders are connected with nature?

Overall, a desire exists to create a future that focuses on:

Deep environmental responsibility and reciprocity as a core uniting societal value in Aotearoa.

These challenges, and the future outcomes gained if they are met, are explored in further detail in the following sections.

Empower tangata whenua to exercise kaitiakitanga

In the aspirational future, Te Tiriti o Waitangi is honoured. Mātauranga and tikanga Māori are authentically incorporated into the way people interact with the whenua and te taiao.

Māori have led climate change adaptation action to sustain and grow their spiritual, cultural, and economic connections to the whenua. Māori are supported and empowered to exercise their kaitiaki role to protect the whenua.

Protect, revitalise, and make the land more resilient

Action has been taken to ensure the land is more resilient to the effects of climate change. This includes helping native species adapt when the changing climate creates new threats, such as new or more widespread invasive species.

Similarly, steps have been taken to limit human impacts on native ecosystems. Ecosystems have been revitalised and restored to be resilient to future change, to fulfil environmental functions and be valued by local communities. This includes restoring the conditions of native ecosystems in ways that support mauri, and understanding of the whenua as a living entity that regenerates health and vitality to support life. Urban sprawl has been limited, as has conversion of vulnerable areas to farmland or plantation forestry. Suitable land uses have been matched to the capability of the land, and non-productive land has been returned to nature while ensuring an equitable transition by supporting rural communities. Action has also been taken to protect and restore productive soil ecosystems, and efforts have been made to both protect highly productive land and prevent people's pollutant and contaminant impact on the land.

Enable action and responsibility for improving the land

Environmental impacts of people's choices are made clear in decision-making at all levels of society. At a systemic level, steps have been taken to shift the economy from one that is linear and extractive to one that is transparent, circular and sustainable. This involves moving away from a short-term, growth-oriented society to one where the ecological footprint has been minimised.

Agriculture, forestry and food systems continue to provide material and economic needs while simultaneously working to further restore and enhance the sustainability of land and soil ecosystems. These changes recognise the land can contribute in different ways to both the economy and identity of Aotearoa New Zealand and that sustaining the land into the future is essential for the physical, mental and economic wellbeing of every generation.

Proactive planning has made communities better able to deal with the already unavoidable effects of climate change, while allowing people to reduce their emissions in the future.

Ensure all New Zealanders are connected with nature

People's lives are more in tune with the environment and are on a path towards deeper environmental care. All communities are empowered to live sustainable lives that are affordable and promote health and wellbeing. People value their connections to the land and the responsibilities of kaitiakitanga that come with it.

Everyone in society, including people with disabilities, has ample access to nature in a way that improves their wellbeing. These enhanced connections to the land also contribute to its protection and restoration. Environmental education and knowledge-transfer opportunities are accessible to everyone, especially tamariki and rangatahi.

Engagement perspectives

The groups we spoke with had strong commonalities in their visions for the future of the land. Some differences in areas of emphasis were expressed and are briefly summarised below.

Workshops with rangatahi

We intentionally undertook targeted engagement with different rangatahi, because we need to deliver more for young people and succeeding generations. The long-term state of the whenua will be a core part of their lived experience. Therefore, it is essential we understand young people's aspirations for building the future.

Our engagement with rangatahi was mostly in the form of workshops but also included less-formal hui and discussions. We held sessions with the following groups.

- I. Lead Youth with Disabilities
- Young people from ethnic communities, in collaboration with the Ministry for Ethnic Communities
- BLAKE Leader Alumni (young environmental leaders)
- The Hive (youth policy engagement group)

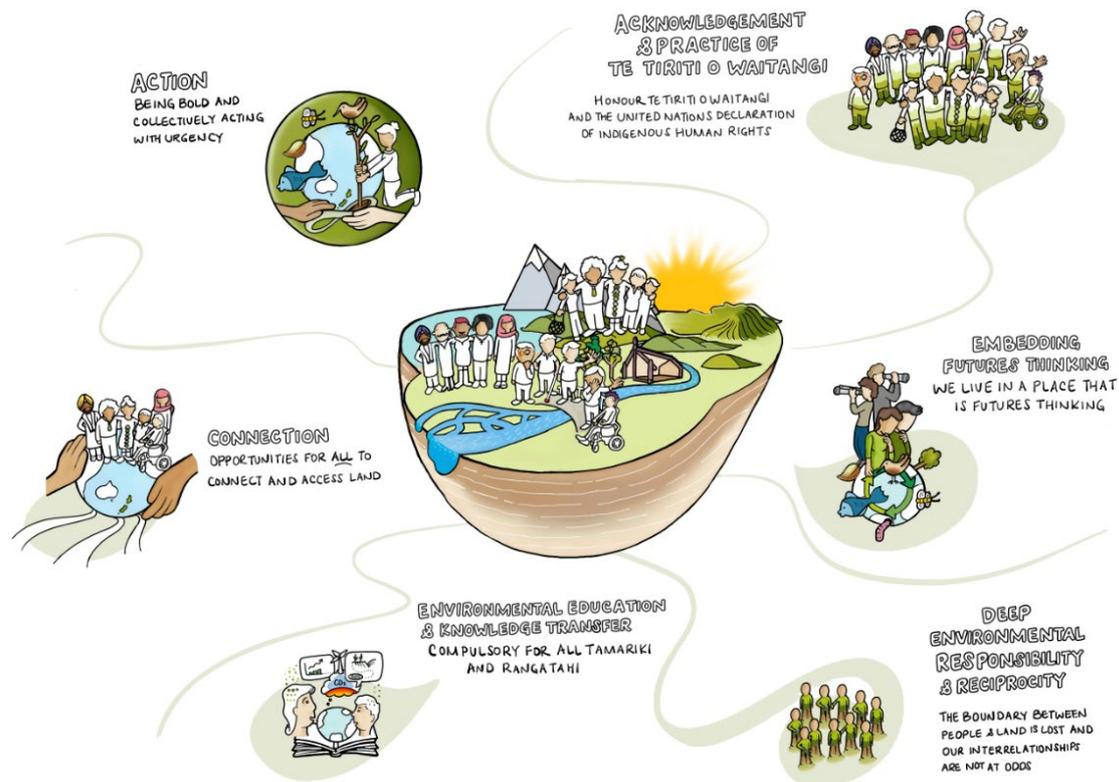
- Young Māori designers and strategic partners within Jasmx

Six main themes emerged from the workshops (shown in [figure 2](#)).

1. **Action** – being bold and collectively acting with urgency.
2. **Connection** – opportunities for all to connect to and access land.
3. **Deep environmental responsibility and reciprocity** – the boundary between people and land is lost, and our interrelationships are not at odds.
4. **Environmental education and knowledge transfer** – environmental education is embedded into the curriculum for all tamariki and rangatahi.
5. **Acknowledgement and practice of Te Tiriti o Waitangi** – honour Te Tiriti and put into practice the [United Nations Declaration on the Rights of Indigenous Peoples](#).
6. **Embedding futures thinking** – we live in a place that is futures thinking.

Further details of the rangatahi engagement workshops are in [appendix 2](#).

Figure 2: Summary illustration of rangatahi aspirations for the future of whenua 2050¹



¹ An illustrator from Sketchability attended each workshop or hui with rangatahi to capture shared insights ([appendix 2](#)), before summarising the main themes that materialised, as shown in [figure 2](#).

Darren Yates, Pou Urungi at Jasmax, shared this reflection on changing our worldview:

I think the current environmental issues, crises, that we are seeing, are a manifestation of a worldview that sees humans at the centre of the universe and separate from their environment. ... Ānei te mate i te taiao, this is one of our main problems when it comes to any environmental issue. Nō reira he aha te rongoā? So what's the remedy?

Mōku ake, I think the remedy is to focus on our own collective transformation. Focus on education programmes for our rangatahi, tamariki, that (in our context) normalise a te ao Māori worldview, one that's underpinned by Māori philosophical assumptions about the universe and our position in our universe. A te ao Māori worldview is deep and long, deep in knowledge and understanding, but also long in understandings of time.

Thinking a thousand years into the past is normal, and therefore when planning, thinking a thousand years into the future is also normal. Knowing (through knowing your histories) how your tūrangawaewae was a thousand years ago, five hundred years ago, a hundred years ago, and then seeing it today and what has changed over that time, helps one see things from a much broader perspective. Knowing how things were, and how things could be, gives one a belief in what is possible. Koinei te mea matua, to me this is the main thing, transforming our worldview. We can't help our taiao using the same thinking that is hurting her, we need to reconnect to her and start listening again.

Ministry vision

The Ministry's role as an environmental steward gives it an active part in helping realise New Zealanders' aspirations for their relationships with the environment and moving towards a more sustainable future. The Ministry's vision for the future is captured in its strategic framework. This was explored further through a workshop with members of Te Pūrengi, the Ministry's leadership team, and one-on-one engagement with the Secretary for the Environment.

The main themes that emerged from these engagements were:

- embedding environmental responsibility as a core social value
- enabling concrete actions to protect and restore the land
- taking responsibility for the benefits we draw from te taiao
- embarking on a path towards a deeper environmental stewardship role for all New Zealanders.

Public consultation

To gain the views of a broader range of New Zealanders, we ran a public consultation seeking people's input on the future of the land. The consultation was in the form of an online survey and received 49 responses, consisting of both closed- and open-ended questions (MfE, 2022a). This is a small sample size and not representative of the Aotearoa New Zealand population.

Some main findings that emerged from the consultation were as follows.

- People acknowledge that the land supports their wellbeing in many ways, with physical and mental wellbeing most prominently mentioned.

- Respondents want the legacy of this generation to be an improved natural environment where native species are protected, with a condensed urban form and reduced pollution.
- Relational values were emphasised, with respondents feeling people should embrace the role of kaitiaki and be more in tune with nature.
- People feel that making sustainable choices should be made easier, with technology and infrastructure identified as the main barriers.

See the [LTIB consultation summary of submissions](#) for further details (MfE, 2022e).

Following the public consultation, the Ministry was contacted by Ngāi Tahu and Manaaki Whenua Landcare Research, wanting to learn more about the LTIB and offering incredibly helpful support as we prepared the draft. Various conversations and hui followed, with sharing of insights, that are intended to continue throughout the next phase of the LTIB journey.

Limitations

It is noted that this is ‘an’ aspiration for the future of whenua by 2050 and does not represent all voices or visions of the people of Aotearoa New Zealand. The sample size from both public consultation and tailored workshops was small, with a likely bias towards those who are already knowledgeable and concerned about the environment. Such a vision should be viewed in this context and cannot be extrapolated to the wider population. We can still draw from these shared insights. People already engaged with environmental issues are likely to have thought about potential futures, which is why they were prioritised for this first round of engagement. But we need to be mindful of this limitation. The second round of public consultation aims to seek input from a broader cross-section of New Zealanders and interest groups.

Creating the future we want

The people we engaged with in our consultations shared a vision for the future of the land that involves enhanced roles for all New Zealanders. This includes an increased role for Māori, as kaitiaki, and for protection and revitalisation of the environment and deeper connections with nature. Many of these outcomes are in line with what is already being implemented by public sector agencies. For example, Te Mana o Te Taiao – Aotearoa New Zealand Biodiversity Strategy (DOC, 2020), Fit for a Better World (MPI, 2020), and the Ministry’s strategic priorities (MfE, 2020b). The outcomes also reflect a large body of evidence that highlights the need to move away from extractive and polluting activities to stay within a safe operating space for people and the planet (for example, Seaby Andersen et al, 2020).

To achieve the change required, more concerted, strategic effort is needed across all levels of government and wider society. Chapter 4 identifies some main areas of change that can allow New Zealanders to come together to take practical steps to bring this future to life.

4 Transformational change

Introduction

Chapter 3 shared insights on an aspirational vision for the future of the land in Aotearoa New Zealand. In this future, through increased environmental responsibility, the whenua is rejuvenated and resilient, and the wellbeing of people is enhanced.

At present, many existing policy initiatives are addressing challenges facing the land, and technological innovation has the potential to reduce people's impacts. Individuals, community groups, and iwi, hapū and whānau throughout the motu (country) are working to protect and revitalise te taiao. These initiatives provide targeted solutions to specific challenges facing the land. Our current knowledge of the state of the land and drivers of change, however, suggests that these will not be enough. There is a significant risk that on our current path – given the pressures of climate change, population growth and consumption patterns – the state of the land will continue to degrade, with human wellbeing diminishing along with it.

An aspirational vision for the land highlights outcomes that could contribute to avoiding this risk: moving towards a circular economy and achieving a more sustainable relationship with the land, where people's wellbeing is enhanced while improving that of the land. This chapter identifies leverage points – important areas where changes can be made – that could advance us along this path.

Navigating towards a better future

The vision outlined in chapter 3 gives us a destination. A next step is to work backwards to understand what is needed to get there. To achieve sustainable pathways, we need to identify the most important places in society where changes can be made. This can be through **levers**, such as incentives, laws, coordination and capacity-building. Information is also required to pinpoint where these interventions need to occur in the political and economic system. These are known as **leverage points**.

Levers can be applied at multiple leverage points and by various actors, including government, iwi, citizens, community and business (Chan et al, 2020). A wealth of research and international initiatives have focused on identifying leverage points to create sustainable pathways (Abson et al, 2017; Chan et al, 2020; Eliasson et al, 2022; Fischer and Riechers, 2019; IPBES, 2022a; United Nations, 2021a).

We used **backcasting** to help identify what potential leverage points might be needed to achieve transformational change. This is an analytical technique that works backwards from a desirable future to determine the actions and intervention points we need to focus on now (DPMC, 2021b Inayatullah and Milojević, 2021). A backcasting workshop was held with more than a dozen subject-matter experts from across the Ministry ([appendix 3](#)). This included specialists in te ao Māori, land and soil science, food systems, climate change, economics, ecology, and political and behavioural science. From this process, we identified a set of leverage points of change ([figure 3](#)).

We refined these leverage points into nine high-level areas with the potential to move Aotearoa New Zealand towards an aspirational future. They may not be the only ones that will be needed. The complexity of the drivers, the pressures facing the land, and the scale of changes needed mean many pathways are possible. Most are not radical departures from the work already underway in Aotearoa New Zealand. They reflect our insights on important initiatives that need to be enhanced and coordinated to scale up change at the speed required to meet our goals.

With these leverage points, we hope to provoke discussion about how Aotearoa New Zealand can transition to a more sustainable relationship with the land. As part of our consultation process, we invite comments from the Aotearoa New Zealand public about these leverage points, and the opportunities and costs they present.

Leverage points to influence change

Achieving meaningful change means confronting the root causes of multiple environmental crises. Significant among these causes is an over-reliance in the economy and society on extractive and polluting activities, without these costs being captured in decision-making. Systemic issues span many domains, from the biophysical to the social, economic and legal factors that continue to harm the environment (Abson et al, 2017). As has been seen, these issues intersect with and influence one another and are compounded by future pressures and uncertainties. This increases the complexity of the challenge, but also provides many points of entry to change things.

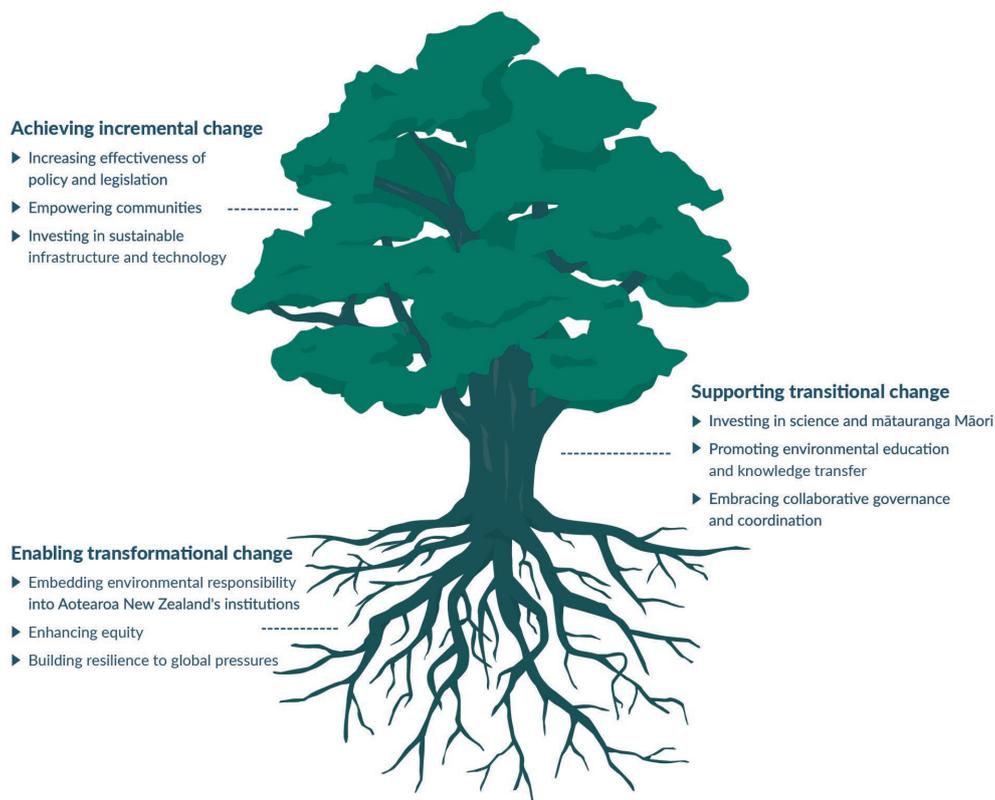
Three tiers of leverage points can be used to influence change (Abson et al, 2017; Betley et al, 2021; Koskimäki, 2021), as shown in the diagram of the tree (see [figure 3](#)).

- The top tier, represented by the leaves and branches, corresponds to interventions that could be most easily actioned **and help achieve incremental change**. These leverage points are effective at enhancing resilience and addressing specific events but have less impact on the system as a whole (Abson et al, 2017; Meadows, 1999).
- The middle tier, represented by the trunk, could help achieve **transitional change**. These leverage points go deeper into the origins of environmental problems and help transition systems and institutions for more widespread change.
- The deepest tier, represented by the tree roots, could help achieve **system transformational change**. These leverage points address the root causes of Aotearoa New Zealand's environmental issues. While more complex and challenging to implement, they have greater ability to bring about long-lasting change (Chan et al, 2020).

We identified three leverage points for each tier. Some points may involve deeper changes to society than others and can potentially apply to multiple tiers. We assigned leverage points at the tier where their influence can be greatest. Each of the nine leverage points is explored in more detail below.

Two case studies are included, to show some of the leverage points in operation on the ground and highlight how they could be applied in practice.

Figure 3: Identified leverage points for environmental change



Achieving incremental change

Increasing effectiveness of policy and legislation

Policy and legislation are important tools in protecting and ensuring the resilience of the land. Aotearoa New Zealand is well served by an active agenda of policies, strategies and legislation that are directly addressing the specific pressures on the land today (see chapter 2). Policy effectiveness can be enhanced through more robust monitoring and implementation, and by expanding the scope of existing tools to new areas.

A robust policy-effectiveness monitoring system is needed to ensure laws and policies are doing what they are supposed to. This will provide evidence to show whether a policy is justified, or further shifts are needed to achieve the intended outcome. Effectiveness monitoring also provides an overview of whether different policies are working together, ensuring a holistic systems approach rather than isolated initiatives. Understanding the complex factors that influence decisions about land-use change is important when deciding which tools to use (Renwick et al, 2022).

In the future, policy and legislation will continue to directly address issues in how the land is managed. Additionally, further scope exists to apply policy tools more broadly to indirectly protect and ensure the resilience of the land. Economic incentives, which include taxation, financing and trading schemes, are an important example. Economic incentives are designed to affect the decisions of consumers and producers by offering additional benefits for desirable behaviour, or penalties for undesirable choices (Opschoor and Turner, 1994).

Aotearoa New Zealand already has significant experience using economic incentives in environmental policy. Prominent examples include the Emissions Trading Scheme and national waste disposal levy. Many areas exist where the use of economic incentives could be expanded. For example, long-standing analysis by the OECD has highlighted the potential of biodiversity incentives across 22 countries (OECD, 1999). Efforts are underway exploring the possible introduction of national biodiversity incentives in Aotearoa New Zealand, and markets for biodiversity have been proposed under the draft implementation plan for the National Policy Statement for Indigenous Biodiversity (MfE et al, 2022). The potential exists for these tools to further incentivise nature-based solutions.

Potentially, economic incentives could be used to speed up the transition to a circular economy, which could reduce pressure on the land because resources and materials would continually be reused (European Commission, 2020). This could include incentives for the development and uptake of new technologies, and penalties for continued use of polluting technologies (Karacaoglu, 2015). International precedents exist for such policies. For example, as part of a broad effort to reduce material and energy waste from the automotive sector, China has implemented various subsidies for companies that collect and remanufacture automotive parts, while offering incentives to consumers who purchase these remanufactured parts. The incentives have helped reduce landfill usage, encouraged expansion of the secondary market in parts, and led to the emergence of the remanufactured industry as a strategic sector that is decoupled from resource use (Ellen MacArthur Foundation, 2022).

Policy and legislation will be important mechanisms for the government to use to support and roll out other leverage points for change.

Investing in sustainable infrastructure and technology

Integrating sustainable infrastructure and technology as they emerge is essential for reducing people's impacts on the land (Chan et al, 2020). Many existing infrastructure and technology systems are oriented towards unsustainable land use and environmental practices. With better regulation and planning, investment can be deployed in technology and infrastructure to reduce people's impacts on the land, while retaining and enhancing resilient connections to it.

Aotearoa New Zealand already faces a deficit in both infrastructure funding, and investment in research and development (OECD, 2022a). Increasing spending in these areas is part of the solution but does not guarantee improved outcomes for people and the land. It is critical that government institutions incentivise investments that will lead the country towards a sustainable future, because the market will not do so unregulated (Chan et al, 2020).

A number of possibilities exist to ensure infrastructure and technology investment leads people in the right direction. One option to explore could be incentivising technologies that reduce the direct impacts of humans on the land from both food production and urban expansion (Karacaoglu, 2015). For example, the Riddet Institute, an Aotearoa New Zealand Centre of Research Excellence, is receiving funding to undertake a research programme on 'Future Foods in Harmony with Nature'. It is focusing on the deployment of emerging technologies to allow for a transformation of Aotearoa New Zealand's food system to be less carbon and resource intensive, while enhancing nutrition outcomes (Massey University, 2022).

A second option could be the development of accessible, active, affordable and low-impact transportation solutions which link increasingly urbanised populations with the whenua (Mandic et al, 2020).

Empowering communities

People's interactions with the land start in their communities. Enabling actions at the local level is an effective tool for creating resilience to and changing the trajectory of pressures on the land over the long term. Community mobilisation could help Māori support the mauri of the whenua (Hond et al, 2019). How communities drive sustainable relationships with the land is ultimately determined by the communities themselves.

Improving access to long-term funding would support increased community action on environmental issues (Cawthron Institute, 2022). Investment in leadership and capacity-building will also help build and sustain networks (as seen in the Thriving Southland case study below). Supporting capacity development within Māori communities at both the iwi and hapū level could also enable more effective community responses (Williams et al, 2018).

Fundamentally, government could evaluate its role in creating a supportive environment that fosters community relationships with the whenua. That might involve being more receptive to community interests and helping communities to take a greater lead in stewardship of the land to which they are connected. This is also true for youth groups. Research and feedback from community groups suggest several important tools that central government could deploy to support community mobilisation and action (Superu, 2015). One growing initiative involves Para Kore partnering with iwi and others to transform waste management in marae and Māori communities, with a vision of zero waste. The initiative aims to increase reuse, recycling and composting of materials, and is supported through the Waste Minimisation Fund (MFE, 2021b).

Farming communities an exemplar of collective action: Thriving Southland

Thriving Southland is a community-led group that brings farming communities together to identify challenges and solutions for farming businesses into the future. The group is an enabler of change, supporting farmers to learn new knowledge and skills together, resulting in practical changes on farms. Because they engage with future-focused projects, farmers are building resilience and gaining a more positive outlook.

The project highlights the value in investing in communities. Thriving Southland supports 32 local catchment groups, with 1,300 farmers and community members in the network making positive, lasting change on farms to meet the needs of the future. The project has received funding from the Productive and Sustainable Land Use Package and the Change and Innovation Project, administered by the Ministry for Primary Industries.

Facilitating the transfer of relevant knowledge is important. Many farming communities want to better understand and respond to environmental, economic, regulatory and consumer challenges. They are also keen to access new relevant science to help with informed decision-making. Robust science-driven data drives decisions as farmers respond to regulations and new policies.

Investment in science is delivered in highly engaging ways for farmers. As one catchment group member explained, science was a catalyst for "bringing a catchment together to find information and fix the issue". Catchment groups are also creating stronger relationships: connecting with Māori to socialise iwi values, and working with scientists, local government, and other farmers helps embed sustainable change.

Thriving Southland's support is targeted and responsive. It has resulted in catchment groups building farmer resilience, supporting wellbeing, and helping create a greater sense of

community and shared purpose. Farmers see solutions emerge from collaboration: “a problem shared is a problem halved, and seeing farmers put their heads together and talk things out and collaborate.... is fantastic!” (Thriving Southland 2021 Annual Survey Respondent).

Thriving Southland discovered that a holistic approach is vital, because connections between farming, communities and the environment are highly complex. Changes in the environment are linked to animal welfare, the farming business model, and the people who live and work in farming communities.

Implementing these complex and interlinked changes in farming approaches takes time, and environmental outcomes may not be realised for 10 to 20 years. However, even in two years of Thriving Southland support, clear examples can be seen of how their help has inspired community action and enabled farmers to become active participants in creating a better and exciting farming future.

Thriving Southland is unique, acknowledging the need to look at all the pieces of the puzzle and work out the pathways forward, with the land user at the centre. Southland’s future is exciting, as the rural community engages in localised solutions to bring about change, simultaneously motivating collective actions and allowing people to learn from one another. Thriving Southland is inspiring the whole country.

Both images attributed to Thriving Southland



Supporting transitional change

Promoting environmental education and knowledge transfer

Education, and broader opportunities to share knowledge, ideas and skills, are essential for building environmental responsibility. The benefits of increased environmental knowledge can build up across generations. People’s knowledge about their place within the environment and their effects on it help them make choices in line with environmental values.

Education is also important in enabling people to evaluate sources and navigate the volume of information they encounter. Misinformation is becoming more prevalent, and misinformation about the environment especially so (Classification Office, 2021). Providing people with the tools to better interrogate information has the potential to allow more informed personal choices, strengthen community cohesion and enhance public engagement.

Simply raising awareness through providing factual information, while necessary, is not enough to help people shift their behaviour in a more sustainable direction (Park, 2020). Information and education initiatives should tailor messaging to different population groups based on their respective barriers, motivators and preferred messengers or platforms. Along

with raising awareness, initiatives should emphasise how people can take action in their own social context (Kollmuss and Agyeman, 2002).

Education initiatives work together with other leverage points, such as policy change. For example, dietary guidelines need to be reformed both nationally and internationally to align with both environmental and health targets (Springmann et al, 2020). The effectiveness of new guidelines will need to be supported by not only clear and consistent policy, but targeted promotion programmes to help better inform people's choices (Alexander et al, 2010).

In schools, embedding sustainability and environmental issues in the Aotearoa New Zealand Curriculum can be more effective when combined with participatory and action-oriented approaches to focus on changing long-term habits that will help empower students (MOE, 2019).

Education is not a one-way transfer of knowledge. More inclusive knowledge-building approaches through active learning can strengthen pride in a common environmental heritage across both urban and rural landscapes. This helps to build greater environmental responsibility (Sinner et al, 2022; Our Land and Water, nd). Embracing mātauranga and kaupapa Māori values and approaches to stewardship of the land, without appropriation, is an important part of this.

Environmental education has focused on empowering young people as kaitiaki of the future (DOC et al, 2017; Williams, 2012). To embed a deeper sense of environmental responsibility across society, these efforts may need to expand in scale to reach all New Zealanders, while being adaptive to many different life situations. Efforts should focus on building capability to lift marginalised communities and enable them to take effective stewardship of their environment. A timely opportunity is also available for the Ministry to influence or engage with the current curriculum refresh (Te Kete Ipurangi, 2022).

Additionally, Aotearoa New Zealand's ageing demographic means older people are likely to represent an increasingly large segment of society (Stats NZ, 2020). Support through education could be provided for those in leadership positions in business, government and communities to make decisions that take into account the longer term.

Investing in science and mātauranga Māori

Aotearoa New Zealand has a unique opportunity to benefit from the insights of both science and mātauranga Māori to support the wellbeing of the land and all New Zealanders. Investment in research and the deployment of innovations could enable and empower New Zealanders to collectively adopt sustainable land- and resource-management approaches (Boston and Lawrence, 2018; CCE, 2022).

Mātauranga Māori offers a complementary approach to Western science and provides essential insights into the whenua of Aotearoa New Zealand. Investing in indigenous knowledge, practices, institutions and values in local communities enhances quality of life, and benefits society through nature conservation, restoration and sustainable use of resources (IPBES, 2019).

Development of innovations requires significant investment. Investment in research and development in Aotearoa New Zealand is low by international standards. Although increasing, this growth mostly comes from business, as public spending on research and development has

stagnated over the past decade (MBIE, 2021b). Because innovations tend to have a high failure rate, businesses are likely to underinvest in them for collective benefits that have limited scope for profit. In 2021, only 15 per cent of research and development in the business sector was for the benefit of society (Stats NZ, 2021b).

Landowners and consumers must have confidence in the effectiveness of innovations before they will be used (McDowell et al, 2021). Increased investment in applied research and outreach could support land managers and guardians in adopting sustainable management practices, including those based on te ao Māori, mātauranga and tikanga. Such investments may need longer-term commitments to help overcome the fragmented, disconnected and incremental nature of the science system that is largely driven by short-term projects (Bardsley et al, 2020). This is particularly relevant to environmental research, collections and databases (PCE, 2020).

Therefore, increased public investment in science and mātauranga Māori, including applied science, would be beneficial (Koolen-Bourke and Peart, 2022). Equally important is the successful delivery and application of investment which, in many circumstances, requires robust long-term environmental monitoring to assess progress. Co-investment funding between government and communities or businesses is one way to increase applied innovations in land management for the public good. Existing examples of this include [Sustainable Food and Fibre Futures funding](#) (MPI, 2022b) and the [innovation fund for sustainable marine activities](#) (Sustainable Seas National Science Challenge, 2022). The Ministry for Business, Innovation and Employment has also released a green paper, [Te Ara Paerangi – Future Pathways](#), to open conversation on how to deliver a future-focused research system that is connected, resilient and adaptable, to help solve environmental challenges (MBIE, 2021c).

Embracing collaborative governance and coordination

The challenges facing the land are highly complex and have no simple solutions. Different people and groups may understand issues in conflicting ways, which can generate tensions and undermine long-term sustainable solutions (Dentoni et al, 2018; Head, 2022). Achieving enduring change that responds to the current context requires people to be actively engaged. Getting ownership of collective action means enabling a greater level of collaboration. Having an approach that lets everyone participate and ensures all voices are heard allows for a greater understanding of the complex and interconnected causes of environmental problems. It also allows for the development of more enduring solutions that work for the entire community (Ayala-Orozco et al, 2018; Butcher et al, 2019).

Many examples exist of successful collaborative governance in Aotearoa New Zealand (DPMC, 2021a). These could be scaled up. The role of government agencies is to make sure the systems, structures and resources are in place that allow the necessary networks and relationships to be built and maintained over time. These collaboration networks can be called upon to identify specific issues and navigate pathways for change.

Important areas of focus in building capacity for collaboration are:

- embedding an authentic partnership model with Māori to uphold obligations under Te Tiriti o Waitangi and ensure te ao Māori and mātauranga Māori are included in the development of any response
- fostering youth leadership and the youth voice in decision-making (Krznicaric, 2020; United Nations, 2021a)

- increasing coordination within and between government departments, particularly at the strategic decision-making level, to ensure agencies working across the environmental system are collaborating to create new solutions (Crowley et al, 2021; Scott and Gong, 2021). The new tool of interagency boards under the [Public Service Act 2020](#) could be explored further
- building public trust through increased engagement and participation in decision-making about the land (the focus of the [Public Service Commission's LTIB](#) (Public Service Commission, 2022))
- building better relationships between central and local government and businesses, especially those in the primary sector and those directly affected by potential responses.

Aotearoa New Zealand's largest harbour restoration programme a collaborative effort

The Kaipara Moana is the largest natural harbour in the southern hemisphere and one of global significance. It is home to rare and threatened species, including migratory birds from the northern hemisphere, and contains some of the rarest ecosystems in Aotearoa New Zealand, including sand dunes, sea grass, freshwater and estuarine wetland ecosystems.

The Kaipara Moana also has deep cultural and economic significance. The harbour is home to several iwi and hapū groups, with local taonga species providing food and medicine, underpinning cultural practices and connecting people to place. The Kaipara Moana is also the breeding ground for the country's valuable snapper fishery.

However, decades of deforestation and land-use intensification have degraded the catchment. Today, less than 10 per cent of original native forest cover and 5 per cent of wetlands remain, leading to a seven-fold increase in soil erosion and associated sediment washing into rivers and the harbour.

On 9 November 2020, the Ministry for the Environment, Ngā Maunga Whakahii o Kaipara, Te Rūnanga o Ngāti Whātua, Te Uri o Hau, Northland Regional Council and Auckland Council signed a memorandum of understanding to establish Kaipara Moana Remediation (KMR) – the largest catchment restoration programme in Aotearoa New Zealand.

Less than two years later, efforts to revitalise the mauri of the Kaipara Moana are scaling up rapidly. During its first full year of operations, KMR worked with 285 land owners to deliver 205 new sediment reduction plans covering over 40,000 hectares of land and committing land owners to an additional 380,000 plants and 238 kilometres of fencing. This is more than the distance from Whangārei to Auckland. By 30 June 2022, 253 land owners were putting sediment reduction plans into action, with a focus on fencing land and planting native trees near waterways.

KMR has a dual focus on growing people into new 'green economy' jobs. Since November 2021, KMR has developed training courses to upskill over 50 local 'KMR field advisors', including tangata whenua, to work alongside land owners. KMR also accredited 17 nurseries and 22 local contractors, and generated more than 60,000 hours of work, bringing tangible benefits to local communities.

Crucial to KMR's success has been its focus on enhancing both environmental and social outcomes. According to Pou Tātaki Justine Daw, "the KMR kaupapa is to invest in local people

to develop and sustain meaningful, nature-based employment, and support people who whakapapa to the Kaipara returning home to work on the project”.

“KMR operates on a collaborative governance model to ensure that all of the founding parties’ views are understood and factored into decision-making,” says Justine Daw. “This inclusive approach helps ensure that KMR can effectively support community-led environmental action. Over a 6,000 square kilometre catchment, genuine partnership is key to achieving our goal of planting 20 million trees in the catchment over 10 years. By investing in communities, KMR is growing social equity and more sustainable, long-term relationships with the whenua.”

Image on the LHS attributed to Auckland Council and to the RHS attributed to Kaipara Moana Remediation staff member Griffin Hope.



Enabling transformational change

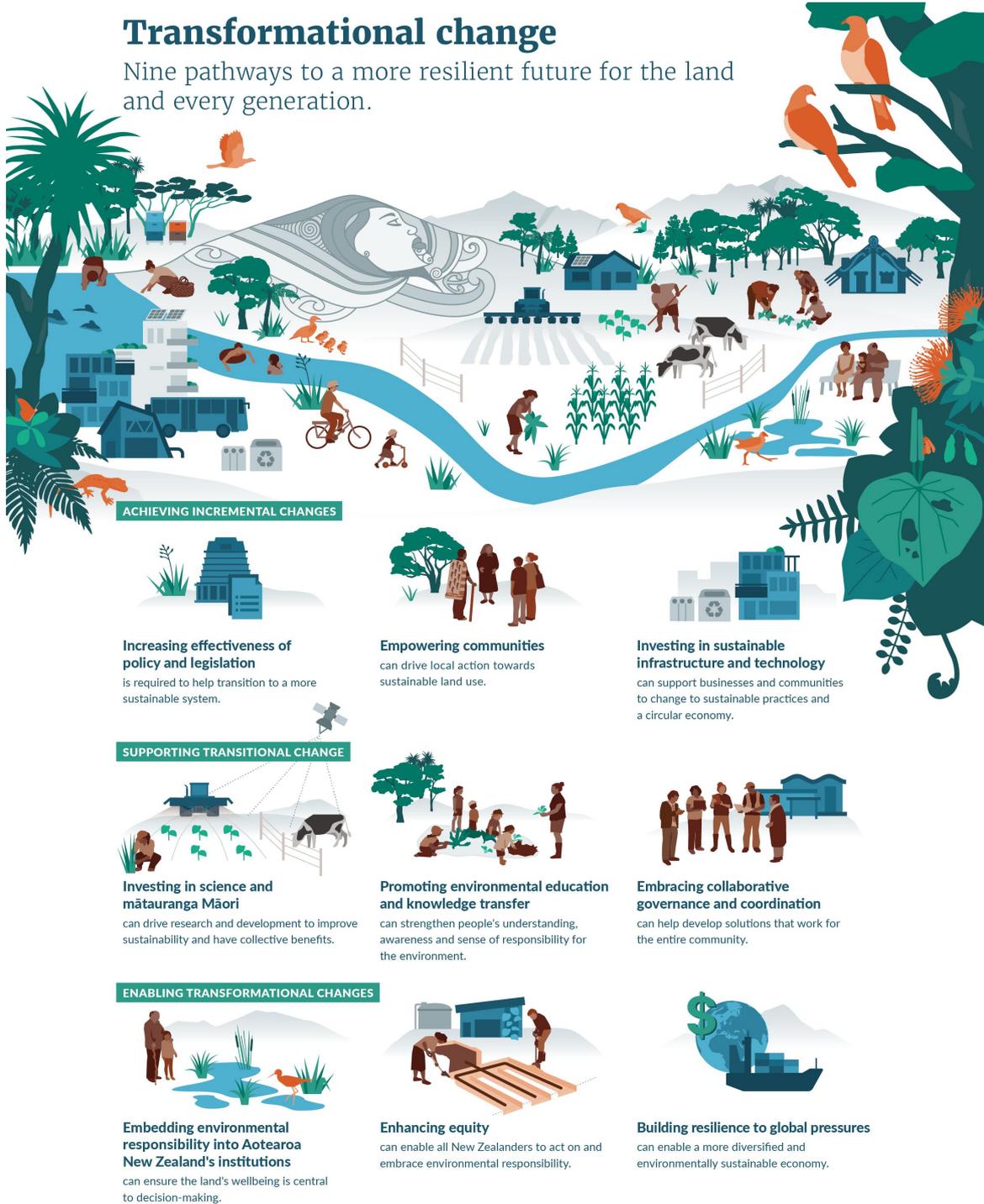
The six leverage points discussed so far could go a long way to improving the condition of the whenua and enhancing New Zealanders’ wellbeing along with it. In themselves, however, the leverage points may not be enough to put the country on the path towards achieving the change that is needed to sustain a resilient future for the land and every generation. While making the changes above will result in incremental shifts, they are largely anchored within existing systems.

To get on the path to a sustainable future for the land, investigation may be needed on how to systematically transform our current structures, systems and institutions so that they better align with this goal (Abson et al, 2017; Atkinson, 2011; Chan et al, 2020; Lindblom, 1979). The aspirational vision for the environment shows people hold environmental values that cannot be delivered by the current way of doing things.

Organisations and research communities globally have identified the need for transformational change. The International Panel on Climate Change (2022) places a particular emphasis on transformation, defined as “change in the fundamental attributes of natural and human systems” to enable people to prevent the worst climate impacts and adapt to the already inevitable changes (p 7, note 16). Limiting global warming requires deep social changes related to practical, political and personal spheres (O’Brien, 2018). This is echoed in reports on the biodiversity crisis (DOC, 2020; IPBES, 2019, 2022a), the challenges facing the food system that also intersect with public health and ecological crises (Slater et al, 2022; The Aotearoa Circle, 2021; The Food and Land Use Coalition, 2021), and the failure to achieve the targets in the sustainable development goals (Naidoo and Fisher, 2020).

It is recognised that the pathway of perpetual growth cannot continue indefinitely on a finite planet that is already over-exploited (Carney, 2021; Rockstrom et al, 2009; Seaby Andersen et al, 2020; Steffen et al, 2015). Moving towards a more ecologically embedded circular economy and society (Daly, 2005) requires a deeper look at root-level opportunities to achieve social change (see figure 4). Such an approach may also provide further opportunities for Aotearoa New Zealand to lead the world in achieving a better relationship with nature, and with the land in particular.

Figure 4: Transformational change



Embedding environmental responsibility in Aotearoa New Zealand's institutions

To achieve the vision of enhanced connection with nature and taking responsibility for people's impacts requires a societal shift. Strengthening environmental responsibility requires rebalancing how economic and political systems value the land. Specifically, this could mean moving away from the dominance of an instrumental focus on land *use* within institutions, to a greater recognition of the intrinsic value of the land, and the value people draw from their relationship with it (Arias-Arévalo et al, 2018; IPBES, 2022a).

This builds on how New Zealanders already engage with the land. Our public engagement and other public opinion data show that New Zealanders hold strong environmental values (MfE and Colmar Brunton, 2018). Pro-environmental attitudes are a core part of Aotearoa New Zealand's national identity (Milfont et al, 2020), and a *te ao Māori* perspective has always recognised that humans and their environment are inseparable from one another. A strong foundation is in place to build on, and many examples exist of actions across different sectors, including the primary sector.

A core way of further enabling these values could be to enhance personal connections to the land. This would allow people to become more intimately aware of the effects that degradation of the land are having on the land itself, as well as on the relationships they hold with it (Hine et al, 2016; Knight, 2020). Regular interactions with the environment are associated with increased stewardship values and can raise people's willingness to take action to protect it (Allen and Ferrand, 1999; Pooley and O'Connor, 2000; Schultz, 2000).

Systematically increasing the personal connections of New Zealanders to the environment requires increasing accessibility and opportunity, making it easier for people to directly experience nature. This is especially needed for those with disabilities and lower-income households who are more likely than other New Zealanders to find it 'difficult' or 'very difficult' to get to their nearest park or greenspace (Stats NZ, 2019b). Urban planning and transportation policy may need to give higher priority to these considerations. Making environmental connections a central part of people's lived environments has the potential to transform their engagement with the land (Kruize et al, 2019). Providing people with other ways to connect, through investment platforms, education and active learning in nature, and access within urban communities could further strengthen these connections.

Fundamentally, the connection between environmental values and societal institutions needs to be supported. Embedding these values formally at the foundation of the legal, political, economic and education systems could help ensure the wellbeing of the land becomes a central element in governance and decision-making processes at all levels of society (IPBES, 2022a; Kauffman and Martin, 2021). Doing so will build on progress already being made in embedding environmental responsibility.

The United Nations has identified several potential actions that could be taken by these different actors to address environmental and human wellbeing together: transform the food, water and energy system, and transform the economic and financial systems (United Nations, 2021a). For instance, budgetary decisions could properly reflect the value derived from the environment and the effects of investment decisions as part of a process to increase transparency and accountability – a point raised by the Parliamentary Commissioner for the Environment (2021).

In Aotearoa New Zealand, one option might be to make decisions that are governed by respect for the rights of the land. This was first pioneered in the recognition of personhood of the Whanganui River and of Te Urewera (New Zealand Parliament, 2017), an approach that considers nature first. This acknowledges a shift in what these entities are seen as being, from “instrumental things to persons with which an ongoing relationship exists” (Geddis and Ruru, 2019).

While rights of nature policies are not common across the world, they are an example of how to incorporate diverse values of nature into local and national laws, and have promising potential to support transformation (IPBES, 2022a). Other transformative instruments representing diverse values could include the scaling up of collaborative governance regimes, such as those shown in the Kaipara Harbour case study. Further opportunities highlighted in international analysis include developing payments for ecosystem services and other area-based conservation measures (IPBES, 2022a). This could extend to the incorporation of “triple depreciation line” accounting methods that capture the use and degradation of natural resources as part of corporate accounting practices (Rambaud and Richard, 2015).

Enhancing equity

While many people hold environmental values, they often find it difficult to act on them, at least in the short term. Changes to the economic system may be needed to create the right incentives for acting in an environmentally responsible way that takes a long-term view. These could include prices that send appropriate signals to guide environmental decisions, better information around the long-term impacts of choices, and systems and infrastructure that reward being environmentally responsible. Achieving this holds major potential for meeting the country’s environmental challenges.

New Zealanders already show commitment to living sustainably (Kantar and Sustainable Business Council, 2022). In people’s day-to-day lives, however, environmental issues are often crowded out by other concerns, such as the COVID-19 pandemic or cost of living pressures (O’Shea, 2022). Lack of time and money constrain people’s abilities to act in line with their underlying environmental values. Geography matters, too – for example, people in rural areas have less access to public transport (Seyfang and Paavola, 2008). Reducing inequality could create space for people to embrace more sustainable benefits (European Commission, 2020). Further, research suggests that inequality can affect the abilities of societies to be effective stewards of resources, while greater equality tends to support sustainable management of collective resources (Islam, 2015).

Businesses also face structural pressures that encourage unsustainable practices. While they cater to their customers’ needs, they make choices as to how to use resources and produce their goods and services. These decisions have a flow-on effect by way of investment, technology and supply-chain choices. However, decisions about production and environmental impacts also influence how their products and services are viewed and embraced by consumers and the wider community.

A growing number of businesses are recognising the importance of informing their broader community of stakeholders about the environmental costs associated with their economic activity. With this comes action to reconfigure their business practices to minimise these costs and incorporate them into the price of goods and services. Recognising that the economy is inseparable from the environment is a minimum step towards using markets to achieve transformational change. In doing so, it is necessary to ensure these changes apply equally to

domestic production and imports, so a level playing field exists for environmentally responsible behaviour.

It is also necessary to ensure that these changes do not make already disadvantaged people worse off, which is why the focus on reducing inequality is so important. Growing disparities already exist for Aotearoa New Zealand's most vulnerable when it comes to accessing healthy food, and climate-friendly diets come with additional costs (Kidd et al, 2021; Mackay et al, 2018). Any move towards a more sustainable future must make sure no one gets left behind (United Nations, 2021b).

Māori continue to face systemic disadvantages in Aotearoa New Zealand (Pearson, 2011). In light of the partnership embodied in Te Tiriti o Waitangi, it is particularly important these efforts focus on enhancing and empowering Māori to lead in environmental stewardship.

Enhancing equity also concerns intergenerational equity and justice. This asks New Zealanders to forge a sense of care and responsibility for future people and prioritising long-term needs over short-term gains (Krznaric, 2020). As quoted in Krznaric (2020, p 63), Johan Rockström has summarised this challenge:

We are the first generation to know that we face unprecedented global environmental risks, but at the same time we are the last generation with a significant chance to do something about it.

An opportunity exists for people to work together to improve wellbeing, become more productive, increase resilience and reduce inequity. All New Zealanders can benefit from the changes needed to transition to an economy that works for both the land and people. It is a chance to create new jobs through low-emissions industries, lower the cost of living and raise living standards (MfE, 2022d).

Specific actions to enhance equity include acting on trade agreements, eliminating perverse subsidies and taxes that promote harmful use of natural resources, and investing in urban green spaces (United Nations, 2021a).

Building resilience to global pressures

Aotearoa New Zealand's economy is likely to remain heavily reliant on primary sector exports. How people engage with the land in Aotearoa New Zealand is shaped by the country's position within the global food economy. Transforming people's relationships with the land towards sustainable production within environmental limits would create new opportunities, such as a shift towards higher-value products and the regeneration of natural capital (Burggraaf et al, 2021; Dalziel et al, 2018; Grelet and Lang, 2021).

The high volume of production needed for Aotearoa New Zealand's export markets has meant more intensive land use in order to remain profitable (Saunders et al, 2016). Opportunities may be available to shift the export sector's emphasis to value (and values) rather than volume and sell high-quality products that reach consumers directly (Dalziel et al, 2018). This could enable primary producers to reduce their impact on the land while regenerating land and soil ecosystems (Grelet and Lang, 2021).

This transition could be helped by also building up other economic sectors, particularly in advanced manufacturing and global services. This would minimise economic disruption and achieve greater resilience in the economy to smooth the transition towards less-extractive economic activities (Greenaway-McGrevy et al, 2020). A value shift to a more circular economy

is possible. This would see changes across production sectors and continued development of innovative products (Wreford et al, 2019). Any transition of this type would have to be carefully managed to ensure social equity and inclusiveness.

The current economic structure does leave Aotearoa New Zealand exposed to global disruption. The high market concentration in key primary and service export sectors creates significant risks when trade with these markets is changed. A more diversified, less environmentally impactful export sector would bring greater resilience to the country's economic position (Islam, 2015; van Rensburg, 2019). Government has an important role in facilitating these changes. For example, MBIE is currently developing a draft advanced manufacturing industry development plan for the industry's contribution to a circular, diversified low-emissions economy (MBIE, 2022). The [Fit for a Better World](#) strategy from the Ministry for Primary Industries also highlights essential action points to help build resilience in the primary sector (MPI, 2020).

Achieving transformational change will require choices about our priorities

Through the nine leverage points outlined earlier in the chapter, we have laid out various opportunities to transform people's relationships with the land.

If acted on, they will put the country on a course in line with people's hopes and visions for how they interact with the environment. This transition will have major benefits but will also involve costs. These costs will not be distributed equally, and will require difficult choices, as resources are reallocated and different economic sectors are prioritised. When making these choices, it is important to ensure that different values are considered in a balanced manner and long-term intergenerational benefits are factored in.

During the second phase of consultation, the Ministry would like to hear more from New Zealanders on how it should address hard decisions that support the environment, and what the priorities should be. We outline here some of the main areas for discussion.

- Central government could consider how it allocates funding over multiple budget periods, to prioritise environmental investment. This is already becoming apparent in the required costs of climate change adaptation and mitigation (MfE, 2020a). At this stage, the Parliamentary Commissioner for the Environment has concluded that the budget process does not have a good way of accounting for the environment, including that the "process is insufficient to facilitate investment in environmental expenditure that is orientated towards intergenerational wellbeing" (PCE, 2021, p 43). Environmental data and knowledge are also lacking to make explicit the link between the environment and people's wellbeing.
- Some parts of the economy are affected more than others through the various stages of change. Some businesses may face stronger regulatory limits on their activities and may have to make changes to the way they operate. This would result in costs to affected businesses, workers and consumers.
- Most New Zealanders understand and value the importance of the wellbeing of the land. Ensuring transformative change occurs, however, may require those values to be embedded in the foundations of communities, businesses and institutions (IPBES, 2022a). By building on the values New Zealanders have, momentum for change could be generated by bringing environmental responsibility into decision-making at all levels.

- As noted in chapter 1, people value the environment in multiple ways. In the future, it will be important to recognise and engage with these values and knowledge systems, and to embrace them in a constructive way. Uplifting and valuing mātauranga and te ao Māori will be particularly important in Aotearoa New Zealand.
- Impacts on the land are linked to consumption practices, and so are disproportionately driven by those with higher incomes (Islam, 2015). Those with the greatest impacts would have to do the most by way of reduction.
- Advancing these changes implies a more active role for government. Working towards environmental responsibility is ultimately empowering of individuals and communities in their relationship to the land. However, regulations would reduce the autonomy of some individuals and businesses in specific areas.

Principles for managing the transition

Several approaches can be used to help navigate complex issues, and research indicates key principles that can help manage this process (Chan et al, 2020; United Nations, 2021a).

Given the interconnectedness of the pressures the land is facing, it is important to provide an integrated and collaborative approach to tackle the complex social, economic and environmental dynamics that shape people’s relationships with the land.

- **Integration** – Making sure different policies work together across multiple areas (for example, climate change mitigation and adaptation, and biodiversity loss) is needed to ensure sustainable use of the land and that multiple wellbeing priorities are being addressed in an integrated way (Karacaoglu, 2015; Scholes et al, 2018).
- **Transparency** – Increasing transparency will provide a view of both the harm being caused by current practices, and the choices required to achieve change (Campbell et al, 2010; Galafassi et al, 2017). Recommendations by the Parliamentary Commissioner for the Environment on the budgetary process will help increase visibility of impacts on the environment (PCE, 2021). Trade-offs are unavoidable, and being clear about people’s choices is necessary to enable different decisions (Daw et al, 2015).
- **Intergenerational focus** – Embedding a long-term and intergenerational focus in governance systems can help prioritise investment and prevent further degradation of the land (Upton, 2022). A better conceptualisation of the environment as a critical part of wellbeing for future generations is needed. Te ao Māori perspectives in this regard are more aligned with intergenerational views that look out for many generations ahead (PCE, 2021).
- **Inclusivity** – Creating spaces to allow marginalised voices to be heard will highlight the true impacts of the choices involved in transformation on those most affected. This will better enable a full range of costs and benefits to be considered (Galafassi et al, 2017; Hirsch and Brosius, 2013). In Aotearoa New Zealand, enhanced inclusion of tangata whenua will be vital. To date, youth voices in particular have been marginalised, yet youth are experiencing increasing climate anxiety, and will have to live with the long-term consequences of decisions made now (Wu et al, 2020). For central government, space must be made in legislation and policy development for marginalised voices to balance those of established and better-resourced stakeholders.
- **Connectivity** – Actively connecting all actors, including iwi, communities, and members of the public and private sectors will help identify ways forward. Other countries and organisations have started creating forums for discussion and communities of practice to

share knowledge for futures thinking – for example, [Scotland’s Futures Forum](#) (Scottish Parliament, 2022), and the OECD’s [International Futures Programme](#) (OECD, 2022b).

- **Embracing innovation** – In the face of growing change and uncertainty, it is important Aotearoa New Zealand develops and promotes innovative responses to these challenges. Innovation is a significant enabler of competitive advantage and for achieving more sustainable outcomes (López-Cabarcos et al, 2021). Aotearoa New Zealand’s pathway through this transition will need to be flexible and actively encourage developing and applying new ways of doing things. This means that people will have to be comfortable with a degree of uncertainty and risk in how specific opportunities are taken advantage of to advance this vision.

Conclusion

With the demands and pressures facing the land now and in the future, it is important that long-term thinking is instilled in people’s decision-making.

To ensure the wellbeing of the land in Aotearoa New Zealand is resilient for generations to come, it is vital to think out to at least 2050. Longer-term thinking of 100 years or more would be beneficial. By thinking, planning and acting now, it is possible to better ensure the demands of the present do not outweigh the rights of the future.

This draft LTIB is intended to be the start of a conversation that will need to take place over the coming years and decades, notwithstanding that urgent and integrated action is needed today.

This draft LTIB has suggested ways Aotearoa New Zealand can start on the pathway towards transformational change. Achieving transformational change requires input, participation and collaboration from all areas of society, including institutions, iwi and hapū, businesses, communities and individuals.

We would like to hear the views and ideas of all New Zealanders. The input and feedback we receive will help inform and develop the final briefing that will be submitted to Parliament and influence the Ministry’s upcoming work.

We would like your views

To help inform the final briefing, we would like to hear your thoughts on how to ensure a resilient, sustainable future for the land and all New Zealanders.

Chapter 2

In chapter 2, we outlined seven main drivers that could affect the state of the land over the coming years.

Are there any other main drivers you think should be included?

Chapter 3

In chapter 3, we outlined a possible future for the land and New Zealanders' relationship with it. In this vision, all New Zealanders would share a sense of deep environmental responsibility and give back to the land as much as it provides.

To help illustrate the vision, we describe what the future could look like if Aotearoa New Zealand addresses four main challenges:

- empowering tangata whenua to exercise kaitiakitanga
- protecting, revitalising and making the land more resilient
- enabling action and responsibility for improving land
- ensuring all New Zealanders are connected with nature.

How well does the way we describe what the future could look like align with your aspirations for the land and New Zealanders' relationship with it?

(Scale response: 1 strongly agree; 2 agree; 3 somewhat agree; 4 disagree; 5 strongly disagree; 6 don't know)

Would you add to or change anything about the descriptions of what the future could look like?

Chapter 4

In chapter 4, we outlined nine pathways (or leverage points) to a more resilient future for the land and every generation.

For each leverage point, what could we do to make them effective?

Are there any other leverage points you think should be included?

Do you have any final comments you would like to share about our draft briefing?

Have your say

The Ministry welcomes your submission on this consultation document. The questions in this document are a guide only and all comments are welcome. You do not have to answer all questions.

This consultation starts on 5 October and ends on 18 October 2022.

How to provide feedback

You can make a submission through Citizen Space, our online consultation hub:
<https://consult.environment.govt.nz/insights/future-wellbeing-land-and-people>

Submissions close at 11.59pm, 18 October 2022.

Next steps

The feedback received from this consultation will help the Ministry refine what is covered in the final briefing. It is expected that the briefing will be presented to the Minister for the Environment before the end of 2022. The Minister will then submit the briefing to Parliament's Environment Committee for consideration and debate.

More information

Please direct any queries to:

Email: insights@mfe.govt.nz

Post: Long-term Insights Briefing, Ministry for the Environment, PO Box 10362,
Wellington 6143

Publishing and releasing submissions

All or part of any written submission (including names of submitters) may be published on the Ministry for the Environment's website, www.environment.govt.nz. Unless you clearly specify otherwise in your submission, the Ministry will consider that you have consented to website posting of both your submission and your name.

Contents of submissions may be released to the public under the Official Information Act 1982 following requests to the Ministry for the Environment (including via email). Please advise if you have any objection to the release of any information contained in a submission and, in particular, which part(s) you consider should be withheld, together with the reason(s) for withholding the information. We will take into account all such objections when responding to requests for copies of, and information on, submissions to this document under the Official Information Act 1982.

The Privacy Act 2020 applies certain principles about the collection, use and disclosure of information about individuals by various agencies, including the Ministry for the Environment. It governs access by individuals to information about themselves held by agencies.

Acknowledgements

The Ministry for the Environment would like to thank the following for support with the development of the draft Long-term Insights Briefing.

- Melissa Clark-Reynolds from the Futures Centre for support, leadership and advice in the development of the draft Long-term Insights Briefing
- Meg Melvin from Sketchability for support and sketch work at Rangatahi workshops
- Rangatahi involved with the Ministry workshopping
- Elisapeta Heta, Principal & Kaihautū Whaihanga, and Darren Yates, Pou Urungi, at Jasmox
- Ministry for Ethnic Communities – in particular, Hisham Eldai, Yasir Demirbas, Saba Afzal and Enatha Musabe
- Shannon Prevett, Youth Engagement Manager, from Yes Disability for support with the I.Lead workshop
- Thriving Southland, in particular, Lee Cowan, Richard Kyte and Sandra Campbell
- Kaipara Moana Remediation Programme, in particular Justine Daw and Ben Hope
- Dumpark Information Design for infographics in chapters 2 and 4
- Ministry subject matter experts for their time and insights during various workshops to help inform the draft Long-term Insights Briefing
- Internal and external peer reviewers whose contributions improved the quality and clarity of the draft Long-term Insights Briefing

References

- Abson DJ, Fischer J, Leventon J, Newig J, Schomerus T, Vilsmaier U, von Wehrden H, Abernethy P, Ives CD, Jager NW, Lang DL. 2017. Leverage points for sustainability transformation. *Ambio* 46(1): 30–39. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5226895/>
- Ahuja I, Dauksas E, Remme JF, Richardsen R, Løes A-K. 2020. Fish and fish waste-based fertilizers in organic farming – With status in Norway: A review. *Waste Management* 115: 95–112. <https://doi.org/10.1016/j.wasman.2020.07.025>
- Alexander GL, McClure JB, Calvi JH, Divine GW, Stopponi MA, Rolnick SJ, Heimendinger J, Tolsma DD, Resnicow K, Campbell MK, Strecher VJ, Johnson CC, MENU Choices Team. 2010. A Randomized Clinical Trial Evaluating Online Interventions to Improve Fruit and Vegetable Consumption. *American Journal of Public Health* 100(2): 319–326. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2804654/>
- Allen JB, Ferrand JL. 1999. Environmental Locus of Control, Sympathy, and Proenvironmental Behavior: A Test of Geller’s Actively Caring Hypothesis. *Environment and Behavior* 31(3): 338–353 <https://journals.sagepub.com/doi/10.1177/00139169921972137>
- The Aotearoa Circle. 2021. *Mana kai: A framework for kōrero on enhancing Aotearoa New Zealand’s food system*. Auckland: The Aotearoa Circle. <https://www.theaotearoacircle.nz/mana-kai-initiative>
- Arias-Arévalo P, Martín-López B, Gómez-Baggethun E. 2018. Exploring intrinsic, instrumental, and relational values for sustainable management of social-ecological systems. *Ecology and Society* 22(4): 43. <https://doi.org/10.5751/ES-09812-220443>
- Atkinson MM. 2011. Lindblom’s lament: Incrementalism and the persistent pull of the status quo. *Policy and Society* 30(1): 9–18. <https://doi.org/10.1016/j.polsoc.2010.12.002>
- Ausseil A-G, Collins A, Greenhalgh S, Booth P, Samarsinghe O. 2021. *Environmental stewardship and well-being*. Prepared for the Ministry for the Environment by Manaaki Whenua – Landcare Research. Wellington: Ministry for the Environment. https://www.landcareresearch.co.nz/uploads/public/Publications/Working-papers-and-reports/LC3901_TechnicalReport.pdf
- Ausseil A-GE, Daigneault AJ, Frame B, Teixeira EI. 2019a. Towards an integrated assessment of climate and socio-economic change impacts and implications in New Zealand. *Environmental Modelling & Software* 119(September): 1–20. <https://doi.org/10.1016/j.envsoft.2019.05.009>
- Ausseil A-G, van der Weerden T, Beare M, Teixeira E, Baisden T, Lieffering M, Guo J, Keller L, Law R, Noble A, Edwards P. 2019b. *Climate change impacts on land use suitability*. Prepared for Deep South and Our Land and Water National Science Challenge by Manaaki Whenua. <https://deepsouthchallenge.co.nz/wp-content/uploads/2021/01/Climate-change-impacts-on-land-use-suitability.pdf>
- The Australia and New Zealand Banking Group Limited. 2022. *ANZ Research AGRI FOCUS June 2022: Global food shortage looms*. <https://www.anz.co.nz/content/dam/anzconz/documents/economics-and-market-research/2022/ANZ-AgriFocus-20220610.pdf>
- Ayala-Orozco B, Rosell JA, Merçon J, Bueno I, Alatorre-Frenk G, Langle-Flores A, Lobato A. 2018. Challenges and Strategies in Place-Based Multi-Stakeholder Collaboration for Sustainability: Learning from Experiences in the Global South. *Sustainability (Switzerland)* 10(9): 3217. <https://doi.org/10.3390/su10093217>
- Bardsley A, Coates B, Goldson S, Gluckman P, Kaiser M. 2020. *The future of food & the primary sector: The journey to sustainability*. Prepared for Koi Tū: The Centre for Informed Futures. <https://informedfutures.org/wp-content/uploads/The-Future-of-Food-The-Primary-Sector.pdf>
- Betley E, Sterling EJ, Akabas S, Paxton A, Frost L. 2021. Introduction to Systems and Systems Thinking. *Lessons in Conservation* 11(1): 9–25.

<https://www.amnh.org/content/download/329205/5034202/version/1/file/Betley-et-al-2021-Introduction-to-Systems-and-Systems-Thinking.pdf>

Boston J, Lawrence J. 2018. Funding Climate Change Adaptation – the case for a new policy framework. *Policy Quarterly* 14(2): 40–49.

https://www.victoria.ac.nz/_data/assets/pdf_file/0008/1500857/Boston_Lawrence.pdf

Burggraaf VT, Mazzetto AM, Romera AJ, Mercer GJK, Ledgard SF. 2021. Application of circular economy principles to pastoral farming: development of an assessment framework. *Animal Production Science* 62: 721–725. <https://doi.org/10.1071/AN21167>

Butcher JR, Gilchrist DJ, Phillimore J, & Wanna J. 2019. Attributes of effective collaboration: insights from five case studies in Australia and New Zealand. *Policy Design and Practice* 2(1): 75–89.

<https://doi.org/10.1080/25741292.2018.1561815>

Campbell BM, Sayer JA, Walker B. 2010. Navigating Trade-Offs: Working for Conservation and Development Outcomes. *Ecology and Society* 15(2): 16.

<https://www.ecologyandsociety.org/vol15/iss2/art16/>

Carney M. 2021. *Value(s). Building a better world for all*. New York: HarperCollins.

Cawthron Institute. 2022. *Waterways groups want simpler funding processes, survey finds*. Retrieved from <https://www.cawthron.org.nz/our-news/waterways-groups-want-simpler-funding-process/> (29 September 2022)

Chan KMA, Balvanera P, Benessaiah K, Chapman M, Díaz S, Gómez-Baggethun E, Gould R, Hannahs N, Jax K, Klain S, Luck GW, Martín-López B, Muraca B, Norton B, Ott K, Pascual U, Satterfield T, Tadaki M, Taggart J, Turner N. 2016. Opinion: Why protect nature? Rethinking values and the environment. *Proceedings of the National Academy of Sciences* 113(6): 1462–1465.

<https://doi.org/10.1073/PNAS.1525002113>

Chan KMA, Boyd DR, Gould RK, Jetzkowitz J, Liu J, Muraca B, Naidoo R, Olmsted P, Satterfield T, Selomane O, Singh GG, Sumaila R, Ngo HT, Boedhihartono AK, Agard J, de Aguiar APD, Armenteras D, Balint L, Barrington-Leigh C, Cheung WWL, Díaz S, Driscoll J, Esler K, Eyster H, Gregr EJ, Hashimoto S, Hernández Pedraza GC, Hickler T, Kok M, Lazarova T, Mohamed AAA, Murray-Hudson M, O’Farrell P, Palomo I, Saisel AK, Seppelt R, Settele J, Strassburg B, Xue D, Brondízio ES. 2020. Levers and leverage points for pathways to sustainability. *People and Nature* 2(3): 693–717.

<https://doi.org/10.1002/pan3.10124>

Classification Office. 2021. *The Edge of the Infodemic: Challenging Misinformation in Aotearoa*. Classification Office: Wellington, New Zealand.

https://www.classificationoffice.govt.nz/media/documents/The_Edge_of_the_Infodemic.pdf

Climate Change Commission (CCE). 2022. *Ināia tonu nei: A low emissions future for Aotearoa*.

<https://ccc-production-media.s3.ap-southeast-2.amazonaws.com/public/Inaia-tonu-nei-a-low-emissions-future-for-Aotearoa/Inaia-tonu-nei-a-low-emissions-future-for-Aotearoa.pdf>

Craig J, Anderson S, Clout M, Creese B, Mitchell N, Ogden J, Roberts M, Ussher G. 2000. Conservation Issues in New Zealand. *Annual Review of Ecology and Systematics* 31(November): 61–78.

<https://doi.org/10.1146/annurev.ecolsys.31.1.61>

Crowley K, Stewart J, Kay A, Head B. 2021. *Reconsidering Policy: Complexity, Governance and the State*. Bristol: Policy Press. <https://policy.bristoluniversitypress.co.uk/reconsidering-policy>

Curran-Cournane F, Carrick S, Barnes MG, Ausseil A-G, Drewry JJ, Bain IA, Golubiewski NE, Jones HS, Barringer J, Morell L. 2021. Cumulative effects of fragmentation and development on highly productive land in New Zealand. *New Zealand Journal of Agricultural Research* (5 May 2021)

<https://doi.org/10.1080/00288233.2021.1918185>

Curran-Cournane F, Lear G, Schwendenmann L, Khin J. 2015. Heavy metal soil pollution is influenced by the location of green spaces within urban settings. *Soil Research* 53(3): 306–315.

<https://doi.org/10.1071/SR14324>

- Daly HE. 2005. Economics in a Full World. *Scientific American* 293(3): 100–107. <https://doi.org/10.1038/scientificamerican0905-100>
- Dalziel P, Saunders C, Saunders J. 2018. *The New Zealand Food and Fibre Sector : A Situational Analysis*. Prepared for the Primary Sector Council. Lincoln University: Agribusiness and Economics Research Unit. <https://www.mpi.govt.nz/dmsdocument/33457-The-New-Zealand-Food-and-Fibre-Sector-A-Situational-Analysis-Report>
- Dasgupta P. 2021. *The Economics of Biodiversity: The Dasgupta Review*. London: HM Treasury. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/962785/The_Economics_of_Biodiversity_The_Dasgupta_Review_Full_Report.pdf
- Daw TM, Coulthard S, Cheung WWL, Brown K, Abunge C, Galafassi D, Peterson GD, McClanahan TR, Omukoto JO, Munyi L. 2015. Evaluating taboo trade-offs in ecosystems services and human well-being. *Proceedings of the National Academy of Sciences* 112(22): 6949–6954. <https://doi.org/10.1073/pnas.1414900112>
- Dentoni D, Bitzer V, Schouten G. 2018. Harnessing Wicked Problems in Multi-stakeholder Partnerships. *Journal of Business Ethics* 150(June): 333–356. <https://doi.org/10.1007/s10551-018-3858-6>
- Department of Conservation (DOC). 2019. *New Zealand’s Sixth National Report to the United Nations Convention on Biological Diversity. Reporting period: 2014–2018*. <https://www.doc.govt.nz/globalassets/documents/about-doc/role/international/nz-6th-national-report-convention-biological-diversity.pdf>
- Department of Conservation (DOC). 2020. *Te Mana o Te Taiao: Aotearoa New Zealand Biodiversity Strategy 2020*. <https://www.doc.govt.nz/globalassets/documents/conservation/biodiversity/anzbs-2020.pdf>
- Department of Conservation (DOC), Ministry for the Environment (MfE), Ministry of Education (MOE). 2017. *Mātauranga Whakauka Taiao: Environmental Education for Sustainability: Mahere Rautaki Strategy and Action Plan*. <https://www.doc.govt.nz/Documents/getting-involved/students-and-teachers/environmental-education-for-sustainability-strategy-and-action-plan.pdf>
- Department of Conservation (DOC), Toitū Te Whenua Land Information New Zealand (Toitū Te Whenua). 2021. *Long-term Insights Briefing: How can innovation in the way we use information and emerging technology help biodiversity thrive? – Consultation on the proposed Long-term Insights Briefing*. <https://www.doc.govt.nz/contentassets/4a6414ec062949aaaa998ae59163d04/ltib-consultation-document.pdf>
- Department of the Prime Minister and Cabinet (DPMC). 2021a. *Community engagement*. Retrieved from <https://dPMC.govt.nz/our-programmes/policy-project/policy-methods-toolbox/community-engagement> (29 September 2022)
- Department of the Prime Minister and Cabinet (DPMC). 2021b. *Futures thinking*. Retrieved from <https://dPMC.govt.nz/our-programmes/policy-project/policy-methods-toolbox/futures-thinking> (29 September 2022)
- Department of the Prime Minister and Cabinet (DPMC). 2022. *Stewardship*. Retrieved from <https://dPMC.govt.nz/our-programmes/policy-project/policy-advice-themes/stewardship> (29 September 2022)
- Dominati E, Patterson M, Mackay A. 2010. A framework for classifying and quantifying the natural capital and ecosystem services of soils. *Ecological Economics* 69(9): 1858–1868. <https://doi.org/10.1016/j.ecolecon.2010.05.002>
- Driver T, Duff S, McIntyre T, Saunders C. 2022. *The Matrix of Drivers: 2022 Update*. Prepared for Our Land and Water National Science Challenge by Agribusiness & Economics Research Unit (AERU), Lincoln University. https://ourlandandwater.nz/wp-content/uploads/2022/05/OurLandandWater_MatrixofDrivers4_2022.pdf

- Driver T, Saunders C, Duff S, Saunders J. 2019. *Matrix of Drivers: 2019 Update*. Prepared for Our Land and Water National Science Challenge by Agribusiness & Economics Research Unit (AERU), Lincoln University. <https://ourlandandwater.nz/news/matrix-2019/>
- Ekanayake JC, Hedley CB. 2018. Advances in Information Provision from Wireless Sensor Networks for Irrigated Crops. *Wireless Sensor Network* 10(4): 71–92. <https://doi.org/10.4236/wsn.2018.104004>
- Eliasson K, Wiréhn L, Neset T-S, Linnér B-O. 2022. Transformations towards sustainable food systems: contrasting Swedish practitioner perspectives with the European Commission’s Farm to Fork Strategy. *Sustainability Science* (24 June 2022). <https://doi.org/10.1007/s11625-022-01174-3>
- Ellen MacArthur Foundation. 2022. *Advancing vehicle remanufacturing in China: the role of policy*. Retrieved from <https://emf.thirdlight.com/link/3y8pa2m8xw2q-b5b4x4/@/preview/1?o> (29 September 2022)
- European Commission. 2020. *Communication from the Commission to the European Parliament, The Council, The European Economic and Social Committee and the Committee of the Regions: A New Circular Economy Action Plan for a Cleaner and More Competitive Europe*. Brussels: European Commission. https://eur-lex.europa.eu/resource.html?uri=cellar:9903b325-6388-11ea-b735-01aa75ed71a1.0017.02/DOC_1&format=PDF
- European Commission. 2021 *Reducing inequalities is essential to ensure sustainable development benefits all, especially those furthest behind*. European Commission International Partnerships. Retrieved from https://international-partnerships.ec.europa.eu/news-and-events/stories/reducing-inequalities-essential-ensure-sustainable-development-benefits-all-especially-those_en (29 September 2022)
- Fischer J, Riechers M. 2019. A leverage points perspective on sustainability. *People and Nature* 1(1): 115–120. <https://doi.org/10.1002/pan3.13>
- The Food and Land Use Coalition. 2021. *Accelerating the 10 Critical Transitions: Positive Tipping Points for Food and Land Use Systems Transformation*. London: Food and Land Use Coalition. <https://www.foodandlandusecoalition.org/wp-content/uploads/2021/07/Positive-Tipping-Points-for-Food-and-Land-Use-Systems-Transformation.pdf>
- Galafassi D, Daw TM, Munyi L, Brown K, Barnaud C, Fazey I. 2017. Learning about social-ecological trade-offs. *Ecology and Society* 22(1): 2. <https://www.jstor.org/stable/26270049>
- Geddis A, Ruru J. 2019. Places as Persons: Creating a New Framework for Māori-Crown Relations. In: JNE Varuhas and SW Stark (eds), *The Frontiers of Public Law*. Oxford: Hart Publishing. Pp 255–271.
- Greenaway-McGrevy R, Grimes A, Maloney T, Bardsley A, Gluckman P. 2020. *New Zealand’s economic future: COVID-19 as a catalyst for innovation*. Prepared for Koi Tū: The Centre for Informed Futures. <https://informedfutures.org/wp-content/uploads/nzs-economic-future.pdf>
- Grelet G, Lang S. 2021. *Regenerative agriculture in Aotearoa New Zealand – research pathways to build science-based evidence and national narratives*. Prepared for Our Land and Water National Science Challenge. https://mro.massey.ac.nz/bitstream/handle/10179/16144/Grelet_Lang_Feb-2021_Regen_Ag_NZ_White_ePaper.pdf?sequence=1
- Handford S, Maeder R. 2020. The origins of School Strike 4 Climate NZ. In C Henry, J Rockström, N Stern (eds), *Standing up for a Sustainable World*. Cheltenham: Edward Elgar Publishing Limited. Pp 219–231. <https://doi.org/10.4337/9781800371781.00037>
- Harmsworth GR, Awatere S. 2013. Indigenous Māori knowledge and perspectives of ecosystems. In JR Dymond (ed), *Ecosystem services in New Zealand – conditions and trends*. Lincoln, New Zealand: Manaaki Whenua Press. Pp 274–286. https://www.landcareresearch.co.nz/uploads/public/Publications/Ecosystem-services-in-New-Zealand/2_1_Harmsworth.pdf
- Hausfather Z. 2019. Analysis: Why children must emit eight times less CO2 than their grandparents. *CarbonBrief: Clear on Climate* 10 April. <https://www.carbonbrief.org/analysis-why-children-must-emit-eight-times-less-co2-than-their-grandparents/>

- Head BW. 2022. *Wicked Problems in Public Policy: Understanding and Responding to Complex Challenges*. Cham: Springer Nature. <https://library.oapen.org/handle/20.500.12657/53360>
- Hendy J, Ausseil A-G, Bain I, Blanc É, Fleming D, Gibbs J, Hall A, Herzig A, Kavanagh P, Kerr S, Leining C, Leroy L, Lou E, Monge JF, Reisinger A, Risk J, Soliman T, Stroombergen A, Timar L, van der Weerden T, White D, Zammit C. 2018. Land-Use Modelling in New Zealand: Current Practice and Future Needs. *SSRN Electronic Journal* (November). <https://doi.org/10.2139/ssrn.3477050>
- Hertel TW. 2012. *Implications of Agricultural Productivity for Global Cropland Use and GHG Emissions : Borlaug vs. Jevons*. GTAP Working Paper No. 69. Retrieved from <https://gtap.agecon.purdue.edu/resources/download/6110.pdf> (29 September 2022)
- Hine DW, Phillips WJ, Cooksey R, Reser JP, Nunn P, Marks ADG, Loi NM, Watt SE. 2016. Preaching to different choirs: How to motivate dismissive, uncommitted, and alarmed audiences to adapt to climate change? *Global Environmental Change* 36(January): 1–11. <https://www.sciencedirect.com/science/article/pii/S0959378015300662>
- Hirsch PD, Brosius JP. 2013. Navigating complex trade-offs in conservation and development: An Integrative Framework. *Issues in Interdisciplinary Studies* (31): 99–122. [http://oakland.edu/Assets/upload/docs/AIS/Issues-in-Interdisciplinary-Studies/2013-Volume-31/08_Vol_31_pp_99_122_Navigating_Complex_Trade-Offs_in_Conservation_and_Development_an_Integrative_Framework_\(Paul_D._Hirsch_and_J._Peter_Brosius\).pdf](http://oakland.edu/Assets/upload/docs/AIS/Issues-in-Interdisciplinary-Studies/2013-Volume-31/08_Vol_31_pp_99_122_Navigating_Complex_Trade-Offs_in_Conservation_and_Development_an_Integrative_Framework_(Paul_D._Hirsch_and_J._Peter_Brosius).pdf)
- Hond R, Ratima M, Edwards W. 2019. The role of Māori community gardens in health promotion: a land-based community development response by Tangata Whenua, people of their land. *Global Health Promotion* 26(3): 44–53. <https://doi.org/10.1177/1757975919831603>
- Hong L. 2021. *The need to build : The demographic drivers of housing demand*. Wellington: The New Zealand Initiative. <https://www.nzinitiative.org.nz/reports-and-media/reports/the-need-to-build/>
- Hunt DT. 1959. Market gardening in metropolitan Auckland. *New Zealand Geographer* 15(2): 130–155. <https://doi.org/10.1111/j.1745-7939.1959.tb00278.x>
- Hutchings J. 2015. *Te Mahi Māra Hua Parakore: A Maori Food Sovereignty Handbook*. Ōtaki: Te Tākupu, Te Wānanga o Raukawa. <https://jessicahutchings.org/maori-food-sovereignty-handbook/>
- Hutchings J, Smith J, Harmsworth G. 2018. Elevating the mana of soil through the Hua Parakore Framework. *MAI Journal: A New Zealand Journal of Indigenous Scholarship* 7(1): 92–102. <https://doi.org/10.20507/maijournal.2018.7.1.8>
- Inayatullah S, Milojević I. 2021. *Mauri Ora ki Mua – Visions of wellbeing for Aotearoa New Zealand 2050-2070: A summary from workshops with Chief Science Advisors*. Prepared for the Infrastructure Commission Te Waihangā and the Ministry of Transport Te Manatū Waka. <https://www.transport.govt.nz/assets/Uploads/Futures-report-Oct-11th-.pdf>
- Intergovernmental Panel on Climate Change (IPCC). 2022. *Climate Change 2022: Impacts, adaptation and vulnerability: Summary for Policymakers*. Working Group II Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press. https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_SummaryForPolicymakers.pdf
- Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). 2018. *Summary for policymakers of the IPBES regional assessment report on biodiversity and ecosystem services for Asia and the Pacific*. Bonn: IPBES Secretariat. https://www.ipbes.net/system/tdf/spm_asia-pacific_2018_digital.pdf?file=1&type=node&id=28394
- Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). 2019. *The global assessment report on biodiversity and ecosystem services: Summary for policymakers*. Bonn: IPBES Secretariat. <https://doi.org/10.5281/zenodo.3553458>
- Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). 2022a. *Methodological assessment regarding the diverse conceptualization of multiple values of nature and its*

- benefits, including biodiversity and ecosystem functions and services. Bonn: IPBES Secretariat. <https://ipbes.net/values-assessment>
- Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). 2022b. *Methodological assessment of the diverse values and valuation of nature of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. Bonn: IPBES Secretariat. <https://doi.org/10.5281/ZENODO.6522523>
- Islam SN. 2015. *Inequality and Environmental Sustainability*. United Nations Department of Economic and Social Affairs. Working Paper No. 145. Prepared for Department of Economic & Social Affairs. https://www.un.org/esa/desa/papers/2015/wp145_2015.pdf
- Journeaux P, van Reenen E, Manjala T, Pike S, Hanmore I. 2017. *Analysis of drivers and barriers to land use change*. A Report prepared for the Ministry for Primary Industries. <https://www.mpi.govt.nz/dmsdocument/23056-ANALYSIS-OF-DRIVERS-AND-BARRIERS-TO-LAND-USE-CHANGE>
- Kantar, Sustainable Business Council. 2022. *Better Futures 2022*. <https://www.sbc.org.nz/resources/reports/sbc-reports/better-futures-2022-report>
- Karacaoglu G. 2015. *The New Zealand Treasury's Living Standards Framework – Exploring a Stylised Model*. Working Paper 15/12. Wellington: The Treasury. <https://www.econstor.eu/bitstream/10419/205690/1/twp2015-12.pdf>
- Kauffman CM, Martin PL. 2021. Managing People for the Benefit of the Land in New Zealand. In CM Kauffman and PL Martin (eds). *The Politics of Rights of Nature: Strategies for Building a More Sustainable Future*. Cambridge, Massachusetts: MIT Press. Pp 141–162. <https://doi.org/10.7551/mitpress/13855.003.0008>
- Kidd B, Mackay S, Vandevijvere S, Swinburn B. 2021. Cost and greenhouse gas emissions of current, healthy, flexitarian and vegan diets in Aotearoa (New Zealand). *BMJ Nutrition, Prevention & Health* 4(1): 275–284. <https://doi.org/10.1136/bmjnph-2021-000262>
- Knight C. 2020. *Nature and Wellbeing in Aotearoa New Zealand – Exploring the Connection*. Ashhurst: Totara Press.
- Kollmuss A, Agyeman J. 2002. Mind the Gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research* 8(3): 239–260. <https://doi.org/10.1080/13504620220145401>
- Koolen-Bourke D, Peart R. 2022. Science for Policy: *The role of science in the National Policy Statement for Freshwater Management*. Prepared for Our Land and Water National Science Challenge by the Environmental Defence Society. <https://ourlandandwater.nz/pathways-to-transition/science-in-freshwater-policy-development/>
- Koskimäki T. 2021. Places to Intervene in a Socio-Ecological System: A Blueprint for Transformational Change. *Sustainability (Switzerland)* 13(16): 9474. <https://doi.org/10.3390/su13169474>
- Kruize H, van der Vliet N, Staatsen B, Bell R, Chiabai A, Muiños G, Higgins S, Quiroga S, Martinez-Juarez P, Aberg Yngwe M, Tsihlias F, Karnaki P, Lima ML, García de Jalón S, Khan M, Morris G, Stegeman I. 2019. Urban Green Space: Creating a Triple Win for Environmental Sustainability, Health, and Health Equity through Behavior Change. *International Journal of Environmental Research and Public Health* 16(22): 4403. <https://doi.org/10.3390/ijerph16224403>
- Krznaric R. 2020. *The good ancestor: A radical prescription for long-term thinking*. New York: The Experiment.
- Lees N, Saunders C. 2015. *Maximising Export Returns (MER): Communicating New Zealand's Credence Attributes to International Consumers*. Research Report 334. Lincoln: Lincoln University. <http://dspace.lincoln.ac.nz/handle/10182/6550>
- Leitzmann C. 2014. Vegetarian nutrition: past, present, future. *American Journal of Clinical Nutrition* 100(1): 496S–502S. <https://doi.org/10.3945/ajcn.113.071365>

- Lindblom CE. 1979. Still Muddling, Not Yet Through. *Public Administration Review* 39(6): 517–526. <https://www.jstor.org/stable/976178>
- López-Cabarcos M^Á, Piñeiro-Chousa J, Quiñoá-Piñeiro L, Santos-Rodrigues H. 2021. How Can Cultural Values and Entrepreneurship Lead to the Consideration of Innovation-Oriented or Non-Innovation-Oriented Countries? *Sustainability* 13(8): 4257. <https://doi.org/10.3390/SU13084257>
- McDowell RW, Monaghan RM, Smith C, Manderson A, Basher L, Burger DF, Laurenson S, Pletnyakov P, Spiekermann R, Depree C. 2021. Quantifying contaminant losses to water from pastoral land uses in New Zealand III. What could be achieved by 2035? *New Zealand Journal of Agricultural Research* 64(3): 390–410. <https://doi.org/10.1080/00288233.2020.1844763>
- McIntyre T, Wilson MMJ, Saunders C, Childerhouse PHJ, Dalziel P, Kaye-Blake W, Kingi T, Mowat A, Reid J, Saunders J. 2019. *Governing Value Creation and Capture in New Zealand Agribusiness Value Chains: A Case Study*. Research Report 335. Lincoln University: Agribusiness and Economics Research Unit. https://ourlandandwater.nz/wp-content/uploads/2019/08/IVC_RR355.pdf
- Macinnis-Ng C, Mcintosh AR, Monks JM, Waipara N, White RS, Boudjelas S, Clark CD, Clearwater MJ, Curran TJ, Dickinson KJ, Nelson N, Perry GLW, Richardson SJ, Stanley MC, Peltzer DA. 2021. Climate-change impacts exacerbate conservation threats in island systems: New Zealand as a case study. *Frontiers in Ecology and the Environment* 19(4): 216–224. <https://doi.org/10.1002/fee.2285>
- Mackay S, Buch T, Vandevijvere S, Goodwin R, Korohina E, Funaki-Tahifote M, Lee A, Swinburn B. 2018. Cost and Affordability of Diets Modelled on Current Eating Patterns and on Dietary Guidelines, for New Zealand Total Population, Māori and Pacific Households. *International Journal of Environmental Research and Public Health* 15(6): 1255. <https://doi.org/10.3390/ijerph15061255>
- Mandic S, Jackson A, Lieswyn J, Mindell JS, Bengoechea EG, Spence JC, Coppell K, Wade-Brown C, Wooliscroft B, Hinckson E. 2020. Development of key policy recommendations for active transport in New Zealand: A multi-sector and multidisciplinary endeavour. *Journal of Transport & Health* 18(September). <https://doi.org/10.1016/j.jth.2020.100859>
- Massey University. 2022. *Continued CoRE funding for the Riddet Institute*. Retrieved from <https://www.massey.ac.nz/about/news/continued-core-funding-for-the-riddet-institute/> (29 September 2022)
- Meadows D. 1999. *Leverage Points – Places to Intervene in a System*. Hartland: The Sustainability Institute. https://donellameadows.org/wp-content/userfiles/Leverage_Points.pdf
- Meinshausen M, Lewis J, McGlade C, Gütschow J, Nicholls Z, Burdon R, Cozzi L, Hackmann B. 2022. Realization of Paris Agreement pledges may limit warming just below 2 °C. *Nature* 604(April): 304–309. <https://doi.org/10.1038/s41586-022-04553-z>
- Milfont TL, Osborne D, Yogeewaran K, Sibley CG. 2020. The role of national identity in collective pro-environmental action. *Journal of Environmental Psychology* 72(December). <https://doi.org/10.1016/j.jenvp.2020.101522>
- Miller S, Driver T, Velasquez N, Saunders C. 2014. *Maximising Export Returns (MER): Consumer behaviour and trends for credence attributes in key markets and a review of how these may be communicated*. Research Report 332. Lincoln University: Agribusiness and Economics Research Unit. <https://researcharchive.lincoln.ac.nz/bitstream/handle/10182/6349/Maximising%20Exports%20Returns%20report%20July%202014.pdf?sequence=1&isAllowed=y>
- Ministry for Primary Industries (MPI). 2015. *Effects of climate change on current and potential biosecurity pests and diseases in New Zealand*. MPI Technical Paper No: 2015/25. Wellington: Ministry for Primary Industries. <https://www.mpi.govt.nz/dmsdocument/10979-Effects-of-climate-change-on-current-and-potential-biosecurity-pests-and-diseases-in-New-Zealand>
- Ministry for Primary Industries (MPI). 2019a. *Global Middle Class 2030 Trends towards 2030 and opportunities for New Zealand primary sector exports*. Wellington: Ministry for Primary Industries. <https://www.mpi.govt.nz/dmsdocument/38747-Global-middle-class-2030>

Ministry for Primary Industries (MPI). 2019b. *Proposed National Policy Statement – Highly Productive Land: Indicative Cost-Benefit Analysis*. MPI Technical Paper No: 2019/10. Wellington: Ministry for Primary Industries. <https://www.mpi.govt.nz/dmsdocument/36618-Proposed-National-Policy-Statement-Highly-Productive-Land-Indicative-Cost-Benefit-Analysis-Technical-Paper>

Ministry for Primary Industries (MPI). 2020. *Fit for a better world – Accelerating our economic potential*. 24. Wellington: Ministry for Primary Industries. Retrieved from <https://www.mpi.govt.nz/about-mpi/our-work/fit-for-a-better-world-accelerating-our-economic-potential/> (29 September 2022)

Ministry for Primary Industries (MPI). 2021. *Situation and Outlook for Primary Industries*. Wellington: Ministry for Primary Industries. <https://www.mpi.govt.nz/dmsdocument/45451-Situation-and-Outlook-for-Primary-Industries-SOPI-June-2021>

Ministry for Primary Industries (MPI). 2022a. *Situation and Outlook for Primary Industries*. Wellington: Ministry for Primary Industries. <https://www.mpi.govt.nz/dmsdocument/51754-Situation-and-Outlook-for-Primary-Industries-SOPI-June-2022>

Ministry for Primary Industries (MPI). 2022b. About sustainable food and fibre futures. Retrieved from <https://www.mpi.govt.nz/funding-rural-support/sustainable-food-fibre-futures/about-sustainable-food-and-fibre-futures/> (30 September 2022).

Ministry for Primary Industries (MPI), Ministry for the Environment (MfE). 2019a. *Valuing highly productive land: A discussion document on a proposed national policy statement for highly productive land*. Wellington: Ministry for Primary Industries. <https://www.mpi.govt.nz/dmsdocument/36624-discussion-document-on-a-proposed-national-policy-statement-for-highly-productive-land>

Ministry for Primary Industries (MPI), Ministry for the Environment (MfE). 2019b. *Valuing highly productive land: A summary of the proposed national policy statement for highly productive land*. Wellington: Ministry for Primary Industries. <https://www.mpi.govt.nz/dmsdocument/36621-Valuing-highly-productive-land-a-summary>

Ministry for the Environment (MfE). nda. *Resource Management System Reform*. Retrieved from <https://environment.govt.nz/what-government-is-doing/areas-of-work/rma/resource-management-system-reform/> (30 September 2022)

Ministry for the Environment (MfE). ndb. *New Zealand Emissions Trading Scheme*. Retrieved from <https://environment.govt.nz/what-government-is-doing/areas-of-work/climate-change/ets/> (30 September 2022)

Ministry for the Environment (MfE). 2020a. *National Climate Change Risk Assessment for New Zealand: Technical report – Arotakenga Tūraru mō te Huringa Āhuarangi o Aotearoa: Pūrongo Whaihangā*. Wellington: Ministry for the Environment. <https://environment.govt.nz/assets/Publications/Files/national-climate-change-risk-assessment-technical-report.pdf>

Ministry for the Environment (MfE). 2020b. *Statement of Intent: Tauāki Whakamaunga Atu*. Wellington: Ministry for the Environment. <https://environment.govt.nz/assets/Publications/Files/Ministry-for-the-environment-statement-of-intent-2020-2025-final.pdf>

Ministry for the Environment (MfE). 2020c. *National Policy Statement for Freshwater Management 2020*. Wellington: Ministry for the Environment. <https://environment.govt.nz/assets/Publications/Files/national-policy-statement-for-freshwater-management-2020.pdf>

Ministry for the Environment (MfE). 2021a. *Estimates of waste generated in Aotearoa New Zealand*. Retrieved from <https://environment.govt.nz/facts-and-science/waste/estimates-of-waste-generated/> (29 September 2022)

Ministry for the Environment (MfE). 2021b. *57Te kawē i te haepapa para. Taking responsibility for our waste. Proposals for a new waste strategy: issues and options for new waste legislation*. Wellington: Ministry for the Environment. https://consult.environment.govt.nz/waste/taking-responsibility-for-our-waste/supporting_documents/wastestrategyandlegislationconsultationdocument.pdf

Ministry for the Environment (MfE). 2022a. *People and place: Ensuring the wellbeing of every generation: Consultation on the topic for the Ministry for the Environment's Long-term Insights Briefing 2022*. Wellington: Ministry for the Environment. <https://environment.govt.nz/publications/people-and-place-ensuring-the-wellbeing-of-every-generation-consultation-on-the-topic-for-the-ministry-for-the-environments-long-term-insights-briefing-2022/>

Ministry for the Environment (MfE). 2022b. *Te panoni i te hangarua. Transforming recycling. Proposal for a New Zealand Container Return Scheme*. Powerpoint presentation. Retrieved from <https://environment.govt.nz/assets/what-government-is-doing/waste/crs-29-March-2022.pdf> (29 September 2022)

Ministry for the Environment (MfE). 2022c. *Urutau, ka taurikura: Kia tū pakari a Aotearoa I ngā huringa āhuarangi. Adapt and thrive: Building a climate-resilient New Zealand – New Zealand's first national adaptation plan*. Wellington: Ministry for the Environment. <https://environment.govt.nz/publications/aotearoa-new-zealands-first-national-adaptation-plan/>

Ministry for the Environment (MfE). 2022d. *Aotearoa New Zealand's first emissions reduction plan– Chapter 3: Equitable transition*. Wellington: Ministry for the Environment. <https://environment.govt.nz/publications/aotearoa-new-zealands-first-emissions-reduction-plan/equitable-transition/>

Ministry for the Environment (MfE). 2022e. Long Term Insights Briefing consultation phase I: Summary of submissions. Wellington: Ministry for the Environment. <https://environment.govt.nz/assets/publications/Files/Long-term-Insights-Briefing-consultation-phase-I-Summary-of-submissions.pdf>

Ministry for the Environment (MfE). 2022f. *National Policy Statement for Highly Productive Land 2022*. Wellington: Ministry for the Environment. <https://environment.govt.nz/assets/publications/National-policy-statement-highly-productive-land-sept-22-dated.pdf>

Ministry for the Environment, Colmar Brunton. 2018. *Environmental Attitudes Baseline*. Wellington: Ministry for the Environment. <https://environment.govt.nz/assets/facts-and-science/science-and-data/new-zealanders-environmental-attitudes.pdf>

Ministry for the Environment (MfE), Department of Conservation (DOC), Te Kāwanatanga o Aotearoa. 2022. *National policy statement for indigenous biodiversity: Exposure draft 2022*. <https://environment.govt.nz/assets/publications/NPSIB-exposure-draft.pdf>

Ministry for the Environment (MfE), Statistics New Zealand (Stats NZ). 2018. *Our land 2018: New Zealand's Environmental Reporting Series*. Wellington: Ministry for the Environment. <https://environment.govt.nz/assets/Publications/Files/Our-land-201-final.pdf>

Ministry for the Environment (MfE), Statistics New Zealand (Stats NZ). 2019. *Environment Aotearoa 2019. New Zealand's Environmental Reporting Series*. Wellington: Ministry for the Environment. <https://environment.govt.nz/assets/Publications/Files/environment-aotearoa-2019.pdf>

Ministry for the Environment (MfE), Statistics New Zealand (Stats NZ). 2020a. *Our atmosphere and climate 2020: New Zealand's Environmental Reporting Series*. Wellington: Ministry for the Environment. <https://environment.govt.nz/assets/Publications/Files/our-atmosphere-and-climate-2020.pdf>

Ministry for the Environment (MfE), Statistics New Zealand (Stats NZ). 2020b. *Our freshwater 2020. New Zealand's Environmental Reporting Series*. Wellington: Ministry for the Environment. <https://environment.govt.nz/assets/Publications/Files/our-freshwater-2020.pdf>

Ministry for the Environment (MfE), Statistics New Zealand (Stats NZ). 2021a. *Our air 2021: New Zealand's Environmental Reporting Series*. Wellington: Ministry for the Environment. <https://environment.govt.nz/assets/publications/our-air-2021.pdf>

Ministry for the Environment (MfE), Statistics New Zealand (Stats NZ). 2021b. *Our land 2021: New Zealand's Environmental Reporting Series*. Wellington: Ministry for the Environment. <https://environment.govt.nz/assets/Publications/our-land-2021.pdf>

- Ministry for the Environment (MfE), Statistics New Zealand (Stats NZ). 2022. *Environment Aotearoa 2022: New Zealand's Environmental Reporting Series*. Wellington: Ministry for the Environment. <https://environment.govt.nz/assets/publications/environment-aotearoa-2022.pdf>
- Ministry of Business, Innovation and Employment (MBIE). 2021a. *National Construction Pipeline Report 2021*. Wellington: Ministry of Business, Innovation and Employment. <https://www.mbie.govt.nz/dmsdocument/18150-national-construction-pipeline-report-2021>
- Ministry of Business, Innovation and Employment (MBIE). 2021b. *The Research, Science and Innovation Report — 2021*. Wellington: Ministry of Business, Innovation and Employment. <https://researchscienceinnovation.nz/pdf/research-science-and-innovation-system-performance-report-2021.pdf>
- Ministry of Business, Innovation & Employment (MBIE). 2021c. *Te Ara Paerangi Future Pathways Green Paper*. Wellington: Ministry of Business, Innovation and Employment. <https://www.mbie.govt.nz/dmsdocument/17637-future-pathways-green-paper>
- Ministry of Business, Innovation & Employment (MBIE). 2022. *Advanced Manufacturing Draft Industry Transformation Plan: Consultation Draft*. Wellington: Ministry of Business, Innovation and Employment. <https://www.mbie.govt.nz/dmsdocument/21243-advanced-manufacturing-draft-industry-transformation-plan>
- Ministry of Education (MOE). 2019. *How environmentally aware are New Zealand students?* Wellington: Ministry of Education. https://www.educationcounts.govt.nz/_data/assets/pdf_file/0010/193564/He-Whakaaro-How-environmentally-aware-are-New-Zealand-students.pdf
- Monaghan R, Manderson A, Basher L, Spiekermann R, Dymond J, Smith C, Muirhead R, Burger D, McDowell R. 2021. *Quantifying contaminant losses to water from pastoral landuses in New Zealand II . The effects of some farm mitigation actions over the past two decades*. New Zealand Journal of Agricultural Research, 64(3): 365–389. <https://doi.org/10.1080/00288233.2021.1876741>
- Morach B, Witte B, Walker D, von Koeller E, Grosse-Holz F, Rogg J, Brigl M, Dehnert N, Obloj P, Koktenturk S, Schulze U. 2021. Food for Thought: The Protein Transformation. *Industrial Biotechnology* 17(3): 125–133. <https://doi.org/10.1089/ind.2021.29245.bwi>
- Morgan FJ, Daigneault AJ. 2015. Estimating Impacts of Climate Change Policy on Land Use: An Agent-Based Modelling Approach. *PLOS ONE* 10(5). <https://doi.org/10.1371/journal.pone.0127317>
- Myers N, Mittermeier RA, Mittermeier CG, da Fonseca GAB, Kent J. 2000. Biodiversity hotspots for conservation priorities. *Nature* 403: 853–858. <https://www.nature.com/articles/35002501>
- Naidoo R, Fisher B. 2020. Sustainable Development Goals: pandemic reset. *Nature* 583: 198–201. https://www.zoology.ubc.ca/conservation/wp-content/uploads/2021/10/Naidoo_COVID_2021.pdf
- National Institute of Water and Atmospheric Research (NIWA). 2022. *2022 off to a searing start*. Retrieved from <https://niwa.co.nz/news/2022-off-to-a-searing-start> (29 September 2022)
- New Zealand Agricultural Greenhouse Gas Research Centre (NZAGRC). Nd. *Methane vaccine*. Retrieved from <https://www.nzagrc.org.nz/domestic/methane-research-programme/methane-vaccine/> (29 September 2022)
- New Zealand Parliament. 2017. *Innovative bill protects Whanganui River with legal personhood*. Retrieved from <https://www.parliament.nz/en/get-involved/features/innovative-bill-protects-whanganui-river-with-legal-personhood/> (29 September 2022)
- New Zealand Treasury – Te Tai Ōhanga (Treasury). 2021. *The Living Standards Framework 2021*. Wellington: New Zealand Treasury. <https://www.treasury.govt.nz/sites/default/files/2021-10/tp-living-standards-framework-2021.pdf>
- Ng EL, Zhang J. 2019. The Search for the Meaning of Soil Health: Lessons from Human Health and Ecosystem Health. *Sustainability* 11(13): 3697. <https://doi.org/10.3390/su11133697>

- O'Brien K. 2018. Is the 1.5°C target possible? Exploring the three spheres of transformation. *Current Opinion in Environmental Sustainability* 31: 153–160. <https://doi.org/10.1016/j.cosust.2018.04.010>
- O'Shea R. 2022. New Zealanders struggling to prioritise sustainability due to rising cost of living. *Consumer*. <https://www.consumer.org.nz/articles/sustainable-consumption-in-a-cost-of-living-crisis>
- Opschoor H, Turner K (eds). 1994. *Economic Incentives and Environmental Policies*. Dordrecht: Springer Dordrecht. <https://link.springer.com/book/10.1007/978-94-011-0856-0>
- Organics Aotearoa New Zealand (OANZ). 2020. *New Zealand Organic Market Report 2020/21*. Auckland: Organics Aotearoa New Zealand. <https://www.oanz.org/market-reports>
- Organisation for Economic Co-operation and Development (OECD). 1999. *Handbook of Incentive Measures for Biodiversity*. Paris: OECD. <https://doi.org/10.1787/9789264173903-en>
- Organisation for Economic Co-operation and Development (OECD). 2021. *OECD-FAO Agricultural Outlook 2021–2030*. Rome/Paris: OECD Publishing <https://www.fao.org/documents/card/en/c/cb5332en>
- Organisation for Economic Co-operation and Development (OECD). 2022b. *Gross domestic spending on R&D*. Retrieved from <https://data.oecd.org/rd/gross-domestic-spending-on-r-d.htm> (29 September 2022)
- Organisation for Economic Co-operation and Development (OECD). 2022b. International Futures Programme (IFP) publications and studies. Retrieved from <https://www.oecd.org/sti/futures/ifppublicationsandstudies.htm> (30 September 2022).
- Our Land and Water. nd. *What You Can Do In Your Catchment*. Retrieved from <https://ourlandandwater.nz/get-involved/in-your-catchment/> (29 September 2022)
- Our Land and Water. 2021. *A More Accurate Picture of Where Soil Erosion Is Likely*. Retrieved from <https://ourlandandwater.nz/news/a-more-accurate-picture-of-where-surface-erosion-is-likely/> (29 September 2022)
- Panagopoulos T, González Duque JA, Bostenaru Dan M. 2016. Urban planning with respect to environmental quality and human well-being. *Environmental Pollution* 208(A): 137–144. <https://doi.org/10.1016/j.envpol.2015.07.038>
- Park T. 2020. Behavioural insights for conservation and sustainability. In WJ Sutherland, PNM Brotherton, ZG Davies, N Ockendon, N Pettorelli, & JA Vickery (eds). *Conservation Research, Policy and Practice*. Cambridge University Press. pp 293–308. <https://doi.org/10.1017/9781108638210.018>
- Parliamentary Commissioner for the Environment (PCE). (2020). *A review of the funding and prioritisation of environmental research in New Zealand*. Wellington: Parliamentary Commissioner for the Environment. <https://www.pce.parliament.nz/media/197111/report-environmental-research-funding-review-pdf-32mb.pdf>
- Parliamentary Commissioner for the Environment (PCE). 2021. *Wellbeing budgets and the environment: A promised land?* Wellington: Parliamentary Commissioner for the Environment. <https://www.pce.parliament.nz/media/197166/wellbeing-budgets-and-the-environment-report.pdf>
- Pascual U, Balvanera P, Díaz S, Pataki G, Roth E, Stenseke M, Watson RT, Başak Dessane E, Islar M, Kelemen E, Maris V, Quaas M, Subramanian SM, Wittmer H, Adlan A, Ahn SE, Al-Hafedh YS, Amankwah E, Asah ST, Berry P, Bilgin A, Breslow SJ, Bullock C, Cáceres D, Daly-Hassen H, Figueroa E, Golden CD, Gómez-Baggethun E, González-Jiménez D, Houdet J, Keune H, Kumar R, Ma K, May PH, Mead A, O'Farrell P, Pandit R, Pengue W, Pichis-Madruga R, Popa F, Preston S, Pacheco-Balanza D, Saarikoski H, Strassburg BB, van den Belt M, Verma M, Wickson F, Yagi N. 2017. Valuing nature's contributions to people: the IPBES approach. *Current Opinion in Environmental Sustainability* 26–27: 7–16. <https://doi.org/10.1016/j.cosust.2016.12.006>
- Pearson D. 2011. Ethnic inequalities. *Te Ara – The Encyclopedia of New Zealand*. Retrieved from <http://www.TeAra.govt.nz/en/ethnic-inequalities> (29 September 2022)

- Pooley JA, O'Connor M. 2000. Environmental Education and Attitudes: Emotions and Beliefs are What is Needed. *Environment and Behavior* 32(5): 711–723. <https://doi.org/10.1177/0013916500325007>
- Powers BF, Ausseil A-G, Perry GLW. 2020. Ecosystem service management and spatial prioritisation in a multifunctional landscape in the Bay of Plenty, New Zealand. *Australasian Journal of Environmental Management* 27(3): 275–293. <https://doi.org/10.1080/14486563.2020.1768165>
- Powers SM, Chowdhury RB, MacDonald GK, Metson GS, Beusen AHW, Bouwman AF, Hampton SE, Mayer BK, McCrackin ML, & Vaccari DA. 2019. Global Opportunities to Increase Agricultural Independence Through Phosphorus Recycling. *Earth's Future* 7(4): 370–383. <https://doi.org/10.1029/2018EF001097>
- Public Service Commission. 2022. *Te Kirirautanga: Te Whai Wāhitanga Tūmatanui ki Te Kāwanatanga Anamata Enabling Active Citizenship: Public Participation in Government into the Future*. Wellington: Public Service Commission. <https://ssc.govt.nz/assets/DirectoryFile/Long-Term-Insights-Briefing-Enabling-Active-Citizenship-Public-Participation-in-Government-into-the-Future.pdf>
- Rainforth HJ, Harmsworth GR. 2019. *Kaupapa Māori Freshwater Assessments: A summary of iwi and hapū-based tools, frameworks and methods for assessing freshwater environments*. Taupō: Perception Planning Limited. <https://www.nrc.govt.nz/media/n0ip2ksp/kaupapa-maori-assessments-final-jan-2019.pdf>
- Renwick A, Dynes R, Johnstone P, King W, Holt L, Penelope J. 2022. Balancing the push and pull factors of land-use change: a New Zealand case study. *Regional Environmental Change* 22: 17. <https://doi.org/10.1007/s10113-021-01865-0>
- Rambaud A, Richard J. 2015. The “Triple Depreciation Line” instead of the “Triple Bottom Line”: Towards a genuine integrated reporting. *Critical Perspectives on Accounting* 33: 92–116. <https://doi.org/10.1016/j.cpa.2015.01.012>
- Rockstrom J, Steffen W, Noone K, Persson A, Chapin III FS, Lambin E, Lenton TM, Scheffer M, Folke C, Schellnhuber HJ, Nykvist B, de Wit CA, Hughes T, van der Leeuw S, Rodhe H, Sorlin S, Snyder PK, Costanza R, Svedin U, Falkenmark M, Karlberg L, Corell RW, Fabry VJ, Hansen J, Walker B, Liverman D, Richardson K, Crutzen P, Foley J. 2009. Planetary Boundaries: Exploring the Safe Operating Space for Humanity. *Ecology and Society* 14(2): 32. <https://www.ecologyandsociety.org/vol14/iss2/art32/>
- Royal Society of New Zealand. 2016. *Climate change implications for New Zealand*. Wellington: Royal Society of New Zealand. <https://www.royalsociety.org.nz/assets/documents/Climate-change-implications-for-NZ-2016-report-web3.pdf>
- Saunders C, Dalziel P, Wilson MJ, McIntyre T, Collier H, Kaye-Blake WH, Mowat A, Olsen T, Reid JD. 2016. *How value chains can share value and incentivise land use practices: A white paper*. Lincoln University: Agribusiness and Economics Research Unit. <http://researcharchive.lincoln.ac.nz/handle/10182/8398>
- Scheele S, Carswell F, Harmsworth G, Lyver P, Awatere S, Robb M, Taura Y, Wilson S. 2016. *Reporting Environmental Impacts on Te Ao Māori: A Strategic Scoping Document*. Wellington: Ministry for the Environment. <https://environment.govt.nz/assets/Publications/Files/priorities-for-te-ao-maori-reporting.pdf>
- Scholes R, Montanarella L, Brainich A, Barger N, ten Brink B, Cantele M, Erasmus B, Fisher J, Gardner T, Holland TG, Kohler F, Kotiaho JS, Von Maltitz G, Nangendo G, Pandit R, Parrotta J, Potts MD, Prince S, Sankaran M, Willemen L (eds). 2018. *Assessment report on land degradation and restoration assessment— summary for policymakers*. Bonn: IPBES Secretariat. <https://ipbes.net/assessment-reports/ldr>
- Schultz PW. 2000. New Environmental Theories: Empathizing With Nature: The Effects of Perspective Taking on Concern for Environmental Issues. *Journal of Social Issues* 56(3): 391–406. <http://dx.doi.org/10.1111/0022-4537.00174>
- Scott I, Gong T. 2021. Coordinating government silos: challenges and opportunities. *Global Public Policy and Governance* 1(1): 20–38. <https://doi.org/10.1007/s43508-021-00004-z>

- Scottish Parliament. 2022. Beyond the electoral cycle. Retrieved from <https://www.scotlandfutureforum.org/> (30 September 2022).
- Seaby Andersen L, Gaffeny O, Lamb W, Hoff H, Wood A. 2020. *A safe operating space for New Zealand/Aotearoa: Translating the planetary boundaries framework*. Prepared for the Ministry for the Environment by the Potsdam Institute for Climate Impact Research, the Stockholm Resilience Centre and the Mercator Research Institute on Global Commons and Climate Change. Wellington: Ministry for the Environment. <https://environment.govt.nz/assets/Publications/Files/a-safe-operating-space-for-nz-aotearoa.pdf>
- Sensoneo. 2022. *Global Waste Index 2022: These are the biggest waste producers in the world*. Retrieved from <https://sensoneo.com/global-waste-index/> (29 September 2022)
- Seyfang G, Paavola J. 2008. Inequality and sustainable consumption: bridging the gaps. *Local Environment* 13(8): 669–684. <http://dx.doi.org/10.1080/13549830802475559>
- Sinner J, Tadaki M, McCarthy A, Challies E, Thomson-Laing J. 2022. *Catchment and community environment groups in Aotearoa New Zealand: goals, activities and needs*. Cawthron Report No. 3733. Prepared for the Ministry for the Environment by the Cawthron Institute. https://www.cawthron.org.nz/wp-content/uploads/2022/02/CawRpt_3733_Catchment_community-groups-goals-activities-needs.pdf
- Slater S, Baker P, Lawrence M. 2022. An analysis of the transformative potential of major food system report recommendations. *Global Food Security* 32(March). <http://dx.doi.org/10.1016/j.gfs.2022.100610>
- Social Policy Evaluation and Research Unit (Superu). 2015. *Effective community-level change: What makes community-level initiatives effective and how can central government best support them?* Prepared for the Ministry of Social Development and Superu by Quigley and Watts Ltd. <https://thehub.swa.govt.nz/assets/Uploads/Community-level-change-summary-0.pdf>
- Soliman T, Greenhalgh S. 2020. *Rethinking NZ's food security in times of disruption*. Policy Brief 27. https://www.landcareresearch.co.nz/assets/Publications/Policy-Briefing-Guidance-Papers/Policy-brief-27_Rethinking-NZs-food-security.pdf
- Springmann M, Spajic L, Clark MA, Poore J, Herforth A, Webb P, Rayner M, Scarborough P. 2020. The healthiness and sustainability of national and global food based dietary guidelines: modelling study. *British Medical Journal* 370(July). <https://doi.org/10.1136/bmj.m2322>
- Statistics New Zealand (Stats NZ). 2019a. *It's in the bag – Kiwis react to banning single-use plastic bags*. Retrieved from <https://www.stats.govt.nz/news/its-in-the-bag-kiwis-react-to-banning-single-use-plastic-bags> (29 September 2022)
- Statistics New Zealand (Stats NZ). 2019b. Wellbeing statistics: 2018. Retrieved from <https://www.stats.govt.nz/information-releases/wellbeing-statistics-2018> (29 September 2022)
- Statistics New Zealand (Stats NZ). 2020. New Zealand's population could reach 6 million by 2050. Retrieved from <https://www.stats.govt.nz/news/new-zealands-population-could-reach-6-million-by-2050> (29 September 2022)
- Statistics New Zealand (Stats NZ). 2021a. Extinction threat to indigenous land species. Retrieved from <https://www.stats.govt.nz/indicators/extinction-threat-to-indigenous-land-species> (29 September 2022)
- Statistics New Zealand (Stats NZ). 2021b. Research and development survey: 2021. Retrieved from <https://www.stats.govt.nz/information-releases/research-and-development-survey-2021/> (29 September 2022)
- Statistics New Zealand (Stats NZ). 2022. Multi-unit homes lead rise in home consents. Retrieved from <https://www.stats.govt.nz/news/multi-unit-homes-lead-rise-in-home-consents/> (29 September 2022)
- Steffen W, Richardson K, Rockström J, Cornell SE, Fetzer I, Bennett EM, Biggs R, Carpenter SR, De Vries W, De Wit CA, Folke C, Gerten D, Heinke J, Mace GM, Persson LM, Ramanathan V, Reyers B, Sörlin S. 2015. Planetary boundaries: Guiding human development on a changing planet. *Science* 347(6223): 736. <https://doi.org/10.1126/SCIENCE.1259855>

- Stronge DC, Stevenson BA, Harmsworth GR, Kannemeyer RL. 2020. A Well-Being Approach to Soil Health – Insights from Aotearoa New Zealand. *Sustainability* 12(18): 7719. <https://doi.org/10.3390/su12187719>
- Sustainable Seas National Science Challenge. 2022. Innovation Fund. Retrieved from <https://www.sustainableseaschallenge.co.nz/our-research/innovation-fund/> (30 September 2022).
- Te Kete Ipurangi. 2022. *Refreshing the New Zealand Curriculum*. Wellington: Ministry of Education. Retrieved from <https://nzcurriculum.tki.org.nz/Refreshing-the-New-Zealand-Curriculum> (29 September 2022)
- Te Puna Whakaaronui. 2022. *The global food system: The current state of the international food supply and consequences for New Zealand: Insight Report – 30th April 2022*. <https://fitforabetterworld.org.nz/assets/Global-food-report-30-April-2022.pdf>
- Timar L. 2019. Climate and Land-Use Change: A Synthesis of Lurnz Modelling. *Economic and Public Policy Research* 35(May): 1–9. <https://www.motu.nz/assets/Documents/our-work/environment-and-agriculture/environmental-modelling/Climate-and-Land-Use-Change.pdf>
- United Nations. 1992. *Convention on Biological Diversity*. Retrieved from <https://www.cbd.int/doc/legal/cbd-en.pdf> (29 September 2022)
- United Nations. 2021a. *Making Peace with Nature. A scientific blueprint to tackle the climate, biodiversity and pollution emergencies*. Nairobi: United Nations Environment Programme. <https://doi.org/10.18356/9789280738377>
- United Nations. 2021b. *Our common agenda – Report of the Secretary-General*. New York: United Nations. <https://doi.org/10.18356/9789210010122>
- Upton S. 2022. Wellbeing Budgets and the Environment. *Policy Quarterly* 18(3): 9–13. <https://doi.org/10.26686/pq.v18i3.7710>
- van Rensburg M. 2019. *MEI Special Topic: New Zealand’s Increasing Export Concentration*. Retrieved from <https://www.treasury.govt.nz/publications/research-and-commentary/rangitaki-blog/mei-special-topic-new-zealands-increasing-export-concentration> (29 September 2022)
- Wall T. 2019. Phosphate ship the Venture Pearl arrives in Tauranga after allegedly “hiding” its destination. *Stuff*. Retrieved from <https://www.stuff.co.nz/business/114476208/phosphate-ship-the-venture-pearl-arrives-in-tauranga-after-allegedly-hiding-its-destination#:~:text=A%20ship%20carrying%2055%2C000%20tonnes,and%20berthed%20at%20the%20port> (29 September 2022)
- Williams EK, Watene-Rawiri EM, Tipa GT. 2018. Empowering Indigenous Community Engagement and Approaches in Lake Restoration: An Aotearoa-New Zealand Perspective. In D Hamilton, KJ Collier, JM Quinn, C Howard-Williams (eds). *Lake Restoration Handbook*. Switzerland, Springer Cham. pp 495–531 <https://doi.org/10.1007/978-3-319-93043-5>
- Williams P. 2012. Educating for Sustainability in New Zealand: Success Through Enviroschools. In M Robertson (ed.). *Schooling for Sustainable Development, Vol 3*. Dordrecht: Springer. https://doi.org/10.1007/978-94-007-2882-0_3
- Wreford A, Bayne K, Edwards P, Renwick A. 2019. *Enabling a transformation to a bioeconomy in New Zealand*. A think piece conducted for the Our Land and Water National Science Challenge 2017. Christchurch: Scion. <https://ourlandandwater.nz/wp-content/uploads/2019/04/BioeconomyResearchPolicy-1.pdf>
- Wu J, Snell G, Samji H. 2020. Climate anxiety in young people: A call to action. *The Lancet* 4(10): 135–436. [https://doi.org/10.1016/S2542-5196\(20\)30223-0](https://doi.org/10.1016/S2542-5196(20)30223-0)

Appendix 1. Driver mapping workshops

The list and description of drivers outlined in chapter two is not exhaustive or exclusive. Their inclusion was informed by a body of literature (eg, Abson et al, 2017; Chan et al, 2020; Driver et al, 2022; Meadows, 1999) and speaks to underlying drivers that came from two internal driver-mapping workshops held in May 2022. More than a dozen (combined) subject-matter experts from the Ministry for the Environment attended these interactive workshops spanning different perspectives, such as land and soil science, ecology, climate change, te ao Māori, economics, waste, and political and social science. Participants were asked to identify the main drivers they consider will influence the future of the land. The two workshops generated over 190 driver concepts that were then collated by themes into 24 underlying drivers (table 1).

Table 1: List of 24 underlying drivers identified as influencing the future of land

Derived underlying driver	Driver definition
Global primary sector investment and market trends	The extent of global consumer demand and investment for the products that the Aotearoa New Zealand primary sector specialises in
Balance of social and political values in Aotearoa New Zealand	The extent to which the mainstream of social and political values deviates from the individualist, anthropocentric status quo
Distribution of power and resources within Aotearoa New Zealand	The distribution of governance authority, as well as control over key resources (specifically land)
Patterns of primary sector land use	The scale and make up of New Zealand's primary sector, as shaped by the values and motivations for engaging with the land
Aotearoa New Zealand's engagement with Te Tiriti o Waitangi and te ao Māori	The extent to which Aotearoa New Zealand engages in a substantive and equal manner with Māori rangatiratanga, aspirations and worldview
Impacts of climate change	The nature, scale and distribution of impacts of a changing global climate on Aotearoa New Zealand, including biophysical, physical and socio-economic impacts
Aotearoa New Zealand consumer demand trends	The nature, scale and composition of Aotearoa New Zealand consumer demand for primary sector products
Aotearoa New Zealand's economic paradigm	The extent to which mainstream social and political values deviate from the neoliberal capitalist status quo
Aotearoa New Zealand's policy and legislative settings	The extent of changes from current policy settings and legislative frameworks
Responses to climate change	The nature, scale and pace of adaptation responses to climate change
Scarcity of natural resources	The scarcity, both globally and locally, of important natural resources, particularly as they pertain to the primary sector
Aotearoa New Zealand's economic dynamics	The trajectory of growth, inflation and employment in Aotearoa New Zealand

Derived underlying driver	Driver definition
State of food-system technologies	The level of practical deployment of technologies with systemic implications for global food production
Global geopolitical dynamics	The composition and severity of international geopolitical competition as it pertains to Aotearoa New Zealand's interests
Level and composition of migration and immigration	The level and composition of migration and immigration
Levels of education, cultural and technical knowledge	Levels of education, cultural and technical knowledge, with a particular focus on the primary sector
State of building and energy technologies	The level of practical deployment of technologies with systemic implications for urban construction and energy provision
State of transportation technologies	The level of practical deployment of technologies with systemic implications for transportation of people and resources within and beyond Aotearoa New Zealand
Social cohesion and stability	The level of social stability and cohesion relative to the current status quo
Population age structure	Population age structure
State of communication technologies and social media	The level of practical deployment of technologies with systemic implications for communications, with a particular focus on those enabling remote work and telecommuting
Health and biosecurity dynamics	The effect of primary product consumption on New Zealanders and the effect of overseas health threats to Aotearoa New Zealand's primary production
Patterns of urbanisation and population distribution	The extent and character of population distribution across the motu, including the balance of urban and rural development
Population size	Population size

Appendix 2. Overview of rangatahi workshops and material generated

The breakdown and details of the rangatahi workshops and discussions are listed below.

- I. Lead Youth with Disabilities (workshop: n=4 participants including facilitator – 31 May 2022)
- Young people from ethnic communities in collaboration with the Ministry for Ethnic Communities (workshop: n=9 including senior advisors from MEC – 31 May 2022)
- BLAKE Leader Alumni and The Hive (workshop: n=4 – 1 June 2022)
- Young Māori designers and strategic partners within Jasmax (discussion and correspondence: n=2 – 8 June 2022)

Three additional youth groups/audiences were invited to participate in workshops but never responded.

Individual workshops and discussions ran for 60–90 minutes. The same facilitator and representative from the Ministry were present for each engagement, along with the live illustrator to capture the narrative in sketch format. For each engagement, a series of questions was posed to rangatahi.

1. As stewards for the environment, what are your aspirations for the future of land?
2. What might our descendants, or future generations, thank us for when it comes to the stewardship of the land?
3. What might our descendants, or future generations, wish we had done better?
4. What would make it easier for us to be better stewards for land?

At the workshops, rangatahi had access to a mural board and responded to each question using virtual post-its. Any additional notes were taken by hand, as was the case for discussion engagement. Responses were analysed thematically across the questions and generated six themes, summarised below.

A selection of sketches, encompassing insights shared from mural board activities from each interactive workshop and discussion with rangatahi, are included further below.

Summary of six main themes generated from rangatahi sharing of aspirations for the future of land and legacies they want to create for their descendants or future generations

Action: Being bold and collectively acting with urgency

- We have fought for te taiao and were proactive with our action before it was too late.
- We have moved away from an emphasised extractive, capitalised society that values materialism to one where our ecological footprint has been minimised, allowing nature to be revived, preserved and sustained.

- A strong sense of social citizenship has ensued, with everyone playing their part, collaborating and unifying with a common goal of a thriving taiao. The rhetoric has changed, and caring for te taiao is now applauded, if not incentivised, and part of being human.
- Stronger and braver legislation stems from the top, with policy based on fact and science instead of perpetual economic-growth interests.
- The climate crises are no longer a worry for future generations, or the worst effects of the climate crises have been mitigated. More climate-friendly transport options are available. Pressure was placed on big polluters to act in favour of the environment, and fossil fuels industries have been shut down, transforming our energy systems. We are fully decarbonised before 2030.

Connection: Opportunities *for all* to connect and access land

- We have implemented indigenous methods allowing Māori to reconnect with the whenua.
- A stronger relationship between disabled rangatahi and government ensures that those with accessibility needs have better access and connection with the whenua, nature reserves and te taiao.
- Social inequities have reduced, resulting not only in better social systems (for example, health, housing, education), but also allowing people the time to care and connect with the whenua and te taiao.
- Better access, connection and relationships with the whenua, that equally meet nourishable needs, have prevailed.

Deep environmental responsibility and reciprocity: The boundary between people and land is lost, and our interrelationships are not at odds

- *“I am the environment and the environment is me”* – recognition that we are not separate from the environment, nor do we sit at centre stage of the universe. Tupu-ā-nuku is not a god of land, but she is the land and soil.
- The health of the whenua and te taiao, a marker of our health as people, has been defended with passion and vehemence.
- We care for land and are responsible for the biodiversity it sustains, ensuring indigenous species are thriving and no longer going extinct.
- With the adoption of entrenched systems thinking, the earth’s system is in natural balance, having listened to its previous signals.

Environmental education and knowledge transfer: Environmental education is compulsory *for all* tamariki and rangatahi

- Real-life, on-the-ground localised curriculum has ensued in the educational system, encompassing learning to grow vegetables and to respect and care for the whenua and te taiao – all of which have equal standing, with inclusion of merits, in terms of the wider curriculum.
- Through environmental education, a shared responsibility for looking after the planet has prevailed. This also includes acknowledging warnings from scientists and knowledge around predictions that people have for the land, as well as intergenerational passing of knowledge and skills.

- Honouring and normalising mātauranga and tikanga Māori is included in the environmental education curriculum.
- All are empowered to live a sustainable, affordable lifestyle that leads to a sustainable future.

Acknowledgement and practice of Te Tiriti: The actual Te Tiriti and the United Nations Declaration on the Rights of Indigenous Peoples is put into practice and honoured

- Colonisation and conflict over land has ended.
- Society is working authentically with Māori.

Embedding futures thinking: We live in a place that is futures thinking

- Intergenerational leadership has ensured that our descendants' health and voices are recognised in decisions allowing all people and all generations to be happy and healthy.
- Young people, including Māori, ethnic people and those with disabilities, are actively listened, to allowing an authentic voice to be heard.
- Leaders are being elected who prioritise better stewardship of the land.
- By standing back, listening and asking ourselves "*If this is the best we can do to have a liveable planet*", the creation of a new strategy unfolded that led to a transformational worldview change.

YOUNG ETHNIC PEOPLE

31 MAY 2022



SOMETHING FUTURE GENERATIONS WOULD THANK US FOR



NATURAL ORGANIC PRODUCE



LEARNING TO GROW VEGETABLES

ALWAYS THINKING ABOUT THE FUTURE & NEVER TAKING EVERYTHING FOR OURSELVES



REDUCE CHEMICALS USED ON LAND & WITH ANIMALS

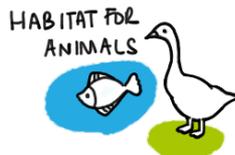


LEAVING SPACE FOR PLAYGROUNDS

PRESERVING NATIONAL PARKS & RESERVES



THAT WE TOOK THE STEP BACK, LISTENED, AND CREATED A NEW STRATEGY

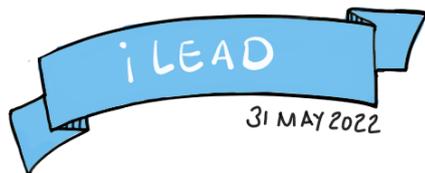


HABITAT FOR ANIMALS

FUTURE ARCHITECTS TO BE MORE CONSIDERATE OF NATURE



BOTANICAL GARDENS



FUTURE PROOF
FOR MANY YEARS



FULLY ACCESSIBLE
& CONSTANTLY ADAPTING
TO THE NEEDS OF PEOPLE
WITH DISABILITIES



REVIVE
NATURE
LANDS



TO BE THRIVING WITHOUT
NEED FOR EXCESS HUMAN
INTERVENTION



LEAVE A CLEAN
& GOOD ENVIRONMENT
FOR OUR CHILDREN
& GRANDCHILDREN

AS STEWARDS OF THE ENVIRONMENT,
WHAT ARE YOUR ASPIRATIONS FOR
THE FUTURE OF LAND?

The HIVE
BLAKE INSPIRE

1 JUNE 2022





SOMETHING FUTURE GENERATIONS WOULD THANK US FOR



SOMETHING YOU WISHED WE HAD DONE

WHAT IS THE WHAKAPAPA OF THOUGHT THAT GOT YOU TO WHERE YOU ARE?



TE TIRITI O WAITANGI



TE AO MĀORI WORLD VIEW

PAKEHA WORLD VIEW

“ DEEP IN KNOWLEDGE & UNDERSTANDING BUT ALSO LONG IN UNDERSTANDING OF TIME ”

WHENUA CONNECTS PEOPLE & PLACE

TUPU-A-NUKU IS NOT A GOD 'OF THE' BUT 'IS THE' LAND

7 GENERATIONS OF PETU RETURNED TO PEEL CONNECTED TO WHENUA

THINKING 1000 YEARS INTO THE PAST IS NORMAL... THEREFORE PLANNING 1000 YEARS INTO THE FUTURE IS ALSO NORMAL

The FUTURE? BETTER ACCESS TO KAI 'JUST WALK OUT THE DOOR'



AS STEWARDS OF THE ENVIRONMENT, WHAT ARE YOUR ASPIRATIONS FOR THE FUTURE OF LAND?

MAKE IT EASIER FOR US TO DO THE RIGHT THING



Appendix 3. Backcasting

Backcasting is a useful tool to help identify the transformation required to ensure a visionary future where:

Deep environmental responsibility and reciprocity is a core uniting societal value in Aotearoa (chapter 3).

We often underestimate the size of the changes required to achieve our aspirations. Backcasting allows us to identify a range of leverage points that can be cumulative and staggered from the present into the future.

Backcasting starts with an inventory of the present/now (Horizon 1). For this work, we assumed the 'now' to be the next five years. The policies, work programmes, and investment for this period are fundamentally set. The second step is to ensure a rich description of the preferred future (chapter 3). In this case, the future (Horizon 3) is 2050. The third step is to define the transformation that needs to occur in order for that future to be inevitable (Horizon 2).

To help identify what potential leverage points would be required to achieve the transformational change, a backcasting workshop was convened and was attended by over a dozen subject-matter experts from across the Ministry. It covered perspectives ranging from land and soil science, food systems, climate change, economics, ecology and te ao Māori, to political and behavioural science.

It was an interactive workshop using a mural board where an aspirational future (chapter 3) was shared with participants, who were asked to identify what needed to be achieved to reach the preferred future, with a focus on Horizon 2. Participants shared over 150 posts. These were thematically analysed, generating eight areas of leverage.

1. Changes to legislation
2. Education and knowledge transfer
3. Investment in science, research, mātauranga Māori and innovation
4. Investment in infrastructure and technology
5. Investment in community group resourcing
6. Collaboration
7. Social and cultural value change
8. Global drivers/dependence

Subsequent body of evidence investigation by the LTIB team resulted in these areas being honed to nine indicative (but not exhaustive) leverage points for change.

1. Increasing effectiveness of policy and legislation
2. Investing in sustainable infrastructure and technology
3. Empowering communities
4. Investing in science and mātauranga Māori
5. Promoting environmental education and knowledge transfer

6. Collaborative governance
7. Embedding environmental responsibility into Aotearoa New Zealand's institutions
8. Enhancing equity
9. Building resilience to global pressures