Te Kura Kāwanatanga – School of Government, Te Herenga Waka – Victoria University of Wellington

POLICY Quarterly

Volume 20 – Issue 4 – November 2024

SPECIAL ISSUE

Environmental Issues in Aotearoa New Zealand

Te Kura Kāwanatanga – School of Government, Te Herenga Waka – Victoria University of Wellington

POLICY Quarterly

Volume 20 – Issue 4 – November 2024

Policy Quarterly (PQ) is targeted at readers in the public sector, including politicians and their staff, public servants and a wide variety of professions, together with others interested in public issues. Its length and style are intended to make the journal accessible to busy readers.

Submissions: The journal welcomes contributions of about 4,000 words, written on any topic relating to governance, public policy and management. Articles submitted will be peer reviewed. Please submit articles to the Editor: jonathan.boston@vuw.ac.nz. Although issues will not usually have single themes, special issues may be published from time to time on specific or general themes, perhaps to mark significant events. In such cases, and on other occasions, contributions may be invited from particular people.

Subscriptions: The journal is available in PDF format on the Institute for Governance and Policy Studies (IGPS) website: https://www.wgtn.ac.nz/igps/publications/policy-quarterly. Readers who wish to receive it by email should register as *PQ* subscribers igps@vuw.ac.nz. This service is free.

For all subscription and membership enquiries please email igps@vuw.ac.nz or post to Institute for Governance and Policy Studies, P.O. Box 600, Wellington.

Electronic Access: The IGPS directs interested individuals to its website: www.igps.victoria.ac.nz where details of the Institute's publications and upcoming events can be found.

ISSN: 2324-1101 (Online)

Volume 20, Issue 4 – November 2024

Copy Editor: Rachel Barrowman

Design & Layout: Aleck Yee, at@alltexdesign.co.nz

Proof Reader: Vic Lipski

Cover Image: Aleck Yee

VICTORIA UNIVERSITY OF WELLINGTON TE HERENGA WAKA | Institute for Governance and Policy Studies
A research institute of the School of Government

Editorial – Perilous times for nature – including humanity

Scientific reports are published almost daily recounting the grim state of one or more components of Earth's life-support system – often with pleas from their authors for urgent remedial action. But humanity remains shockingly deaf, uninterested, distracted or in denial.

Globally, 2024 will almost certainly be the warmest year on the instrument record, and probably the warmest in over 125,000 years. According to the Copernicus Climate Change Service:

- September 2024 was 1.54°C above the pre-industrial level (i.e., the estimated average global temperature between 1850 and 1900) and was the 14th month in a 15-month period for which the global average surface air temperature exceeded 1.5°C above the pre-industrial average.
- The global average temperature between October 2023 and September 2024 was the second highest on record for any 12-month period, at 0.74°C above the 1991–2020 average, or an estimated 1.62°C above the pre-industrial average.
- The global average temperature anomaly during January–September 2024 was 0.71°C above the 1991–2020 average, which was the highest on record for this period, and 0.19°C warmer than the equivalent period in 2023. (Copernicus Climate Change Service, 2024)

Given such results, average global temperature will soon regularly exceed the 1.5°C guard rail embraced by the Paris Agreement in 2015. And, within a few decades, it may also overshoot the higher 2.0°C limit agreed in Copenhagen in 2009.

Unsurprisingly, a report by leading scientists on the state of the planet's climate in 2024 declared:

> We are on the brink of an irreversible climate disaster … Much of the very fabric of life on Earth is imperilled. We are stepping into a critical and unpredictable new phase of the climate crisis … Tragically, we are failing to avoid serious impacts … We find ourselves amid an abrupt climate upheaval, a dire situation never before encountered in the annals of human existence. (Ripple et al., 2024)

Meanwhile, the biennial *Living Planet Report*, published in early October 2024, reveals that global wildlife populations have fallen by an average of 73% since the 1970s, with many ecosystems close to collapse (WWF, 2024). The assessment is based on the 'Living Planet Index', which tracks global trends for around 5,500 species of mammals, birds, fish, amphibians and reptiles.

Yet in Aotearoa New Zealand, despite these bleak global reports, not to mention the nation's own pressing ecological concerns, the coalition government which took office in late 2023 has embarked on what the Environmental Defence Society has called a 'war on nature' (Environmental Defence Society, 2024).

Given these developments, this special issue of *Policy Quarterly* focuses on the environment. The 13 contributions involve several dozen authors. The articles address a wide range of significant contemporary policy issues (e.g., climate change mitigation and adaptation, resource management, freshwater issues, land use change, just transitions, and issues relating to food production and consumption).

Of course, there are many gaps. The global and local biodiversity crisis is one. Other important topics deserving attention in future issues include environmental governance, ocean acidification, plastic pollution, toxic chemicals, waste mitigation and management, and the circular economy.

With the average global temperature likely to overshoot the Paris guard rails within a generation, the question of how to cool the planet later this century and beyond deserves urgent attention. As it stands, the most recent scientific analyses suggest that returning the planet to a safer temperature poses daunting challenges, not least geopolitical, geophysical, economic and technological (see, for instance, Schleussner et al., 2024; Reisinger and Geden, 2023).

Reducing the planet's temperature will require removing vast amounts of carbon dioxide from the atmosphere. But carbon dioxide removal (CDR) is likely to be slow and costly. One estimate suggests that the maximum achievable rate per decade via CDR may be 0.1°C, with 0.05°C being more realistic. If so, then significantly overshooting the 1.5°C limit, let alone 2.0°C, is unlikely to be temporary (i.e., only a few decades). Yet protracted overshooting poses huge risks. Above all, key tipping points in the Earth system will be crossed, with large-scale, severe and irreversible impacts (e.g., multi-metre sea level rise).

Admittedly, cooling the planet could be hastened through big reductions in methane emissions (e.g., from livestock agriculture). But concerted global cooperation for that purpose could prove elusive. Moreover, even if methane emissions from human activities can be cut drastically, these efforts could be negated by higher methane emissions from amplifying feedbacks in the climate system, such as melting permafrost.

Next, CDR and related mitigation tools will be costly, probably several trillion US dollars annually. But who will pay? Almost certainly, OECD taxpayers will be expected to contribute disproportionately. But this raises formidable geopolitical and domestic political challenges.

Undoubtedly, the best approach is to accelerate global decarbonisation, thereby minimising any temperature overshoot. Yet in Aotearoa, many of the coalition government's policy decisions since late 2023 will have the opposite effect, as highlighted by various contributions to this special issue of *PQ*.

Compounding matters, the coalition is not alone. Globally, many other governments, often at the behest of powerful vested interests, are also ignoring the best evidence and advice of the international scientific community.

Realism points to a tragic, dystopian prospect. Truly, a hellish future looms.

Jonathan Boston, Editor

References

Copernicus Climate Change Service (2024) 'Copernicus: second warmest September for the globe and Europe – part of Europe hit by extreme precipitation', 7 October, https://climate.copernicus.eu/copernicus-second-warmest-september-globe-and-europe-parts-europe-hit-extreme-precipitation

Environmental Defence Society (2024) 'The government's war on nature goes nuclear', media release, 27 March, https://eds.org.nz/resources/documents/media-releases/2024/fast-track-bill/

Reisinger, A. and O. Geden (2023) 'Temporary overshoot: origins, prospects, and a long path ahead', *One Earth*, 6, 15 December

Ripple, W. et al. (2024) 'The 2024 state of the climate report: perilous times on planet Earth', *Biosciences*

Schleussner, C-F. et al. (2024) 'Overconfidence in climate overshoot', *Nature*, 635, pp.366–73

WWF (2024) 2024 *Living Planet Report: a system in peril*, Gland: WWF

Jonathan Boston

Assessing Aotearoa's Latest 'War on Nature' – or 'Goodbye Freddy'

Abstract

Since taking office in late November 2023, the National/ACT/New Zealand First coalition government in Aotearoa New Zealand has made rapid, comprehensive and far-reaching changes to environmental laws, regulations and policies. Further significant policy reforms are pending. This article outlines the main policy changes and summarises the many concerns that they have generated. It then discusses the coalition's apparent rationale for the changes, focusing particularly on resource management reform. Following this, the article outlines the ecological values and principles that ought to inform environmental policy. It concludes with brief reflections on the longer-term implications of the coalition's approach to environmental governance and management and the wider global failure to tackle the current ecological crises.

Keywords ecological crises, Aotearoa, coalition government, environmental policy changes, rationale, implications

Tears for nature

Reflecting on the abrupt shift in environmental policies since late 2023 in Aotearoa New Zealand, the evocative title of Alan Paton's landmark novel of the late 1940s, *Cry, the Beloved Country*, comes to mind. Paton's book brought international attention to South Africa's tragic history of brutality, gross inequality and racial segregation. Rehearsing the details here is unnecessary. But the plight of a country's government rejecting fundamental ethical norms, such as human equality and dignity, truth, integrity, compassion and justice, has some disturbing local parallels. Of course, unlike Paton's grim experience in South Africa, the current ethical challenges in Aotearoa do not involve the denial of our common humanity; nor has there been a comprehensive disavowal of widely accepted civil and political rights.[1] Rather, what is at stake is the comprehensive deprioritisation, if not denigration, devaluing and occasional disparagement, of fundamental ecological values and principles, and related environmental rights.

Since the formation of the three-party coalition government, involving National, ACT and New Zealand First, in late November 2023, the country has witnessed a breathtaking series of legislative, regulatory and budgetary measures affecting the full range of environmental domains and policy issues (see Appendix). With few exceptions, these measures have prioritised economic goals – notably growth, productivity, efficiency and development – over ecological and sustainability goals. The sheer magnitude, comprehensiveness and relentless rapidity of these measures has been described by the normally moderate and restrained Environmental Defence Society as

Jonathan Boston is Emeritus Professor of Public Policy at Te Herenga Waka Victoria University of Wellington and editor of *Policy Quarterly*.

constituting a 'war on nature'. They represent, according to the EDS, a 'profound retreat from the responsible environmental management of recent Labour and National-led governments' (Environmental Defence Society, 2024, 2023).

Such judgements are not isolated. Multiple other critics, including many leading scientists, have variously castigated the government's changes as 'environmentally damaging', 'environmentally disastrous', 'environmental vandalism', a 'policy bonfire' and 'injurious to human health'. Aside from grave concerns about the likely harmful environmental impacts of the government's measures, some of the proposed changes, especially the Fast-Track Approvals Bill, have also raised serious issues of constitutional propriety, being regarded by leading constitutional experts as 'authoritarian', 'deeply unconstitutional' and 'constitutionally outrageous'. To illustrate, Colin Keating, a former secretary of justice and senior diplomat, described the original version of the bill as 'dangerously radical', 'undemocratic' and 'fundamentally flawed'. It constituted, he argued, a 'classic example of sacrificing an essential constitutional principle in order to achieve an alleged efficiency' (Keating, 2024).

Half a century ago, the formation of a government dismissive, if not at times contemptuous, of important environmental goals, principles and values might not have seemed unusual or morally shameful. But in 2024 humanity is entering a new geological epoch – the Anthropocene (Dryzek and Pickering, 2018) – and faces acute ecological challenges: a deepening climate emergency, a severe biodiversity crisis, large-scale ecological degradation, widespread deforestation, increasing ocean acidification, extensive plastic pollution, and much else (Dasgupta et al., 2021; Hopper et al., 2012; IPCC, 2021, 2022a, 2022b, 2023; Ripple et al., 2022, 2023). According to leading scientists, humanity's ecological footprint (i.e., the quantity of nature required to support current lifestyles) is excessively large (for New Zealand, see Royal Society Te Apārangi, 2013). Numerous safe biophysical boundaries have already been crossed, at multiple scales (Gupta et al., 2023; Rockström et al., 2023; Steffen et al., 2018; see also PIK, 2024). A mass extinction event is underway and rapidly gathering pace (IPBES, 2019). Global warming may be accelerating (Hansen et al., 2023; Jenkins et al., 2022). And the Earth system is approaching a series of critical tipping points, with amplifying feedbacks and potentially serious, widespread and irreversible consequences (Kemp et al., 2022; Lenton et al., 2019, 2022, 2023; OECD, 2022; Wunderling et al., 2023). Hence, the risks to the wellbeing of current and future generations of humanity are immense. The evidence is unequivocal. The reasons for concern are overwhelming. The moral imperative for decisive measures to support ecological sustainability is compelling.

The reference to 'Goodbye Freddy' in the title of this article relates to a flippant, yet callous, remark by Shane Jones, the minister for oceans and fisheries, minister for resources and minister for regional development.

Locally, citizens often take pride in Aotearoa being 'clean and green'. Yet much evidence points strongly to the contrary (Blumhardt and Prince, 2022; Brown et al., 2015; Clarkson, 2022; Joy, 2022; Lawrence et al., 2022; Ministry for the Environment, 2020; OECD, 2017; Treasury, 2023).[2] For instance:

- per capita greenhouse gas emissions remain high by international standards;
- at least 90% of the country's wetlands and over 70% of its native forests have been lost since human settlement;
- about 60 native bird species have already been rendered extinct, with thousands of other native species threatened or at risk due to habitat destruction, introduced predators, climate change and development activities;
- severe soil erosion is compounding flood risk in multiple catchments;
- freshwater quality has deteriorated in many parts of the country over recent decades, with toxic algae now widespread in many lakes and rivers.

Aside from the growing evidence of environmental degradation, the damaging impacts of climate change are escalating, as highlighted by the extraordinary succession of powerful storms and floods that have ravaged many parts of Aotearoa over the past several years, most recently in coastal Otago.

Given this sobering litany, what should be our response to a government making multiple policy reversals, some of an unprecedented kind, that will worsen many environmental outcomes, harming ecological stability and resilience, and placing at risk yet more indigenous species and unique ecosystems? Surely, it deserves a deep groan and remorseful lament: 'Cry, the beloved country'! What on earth – literally – are we doing?

Why 'Goodbye Freddy'?

The reference to 'Goodbye Freddy' in the title of this article relates to a flippant, yet callous, remark by Shane Jones, the minister for oceans and fisheries, minister for resources and minister for regional development. Speaking in Parliament in December 2023, shortly after the coalition government took office, Jones commented that 'if there is a mineral, if there is a mining opportunity and it's impeded by a blind frog, goodbye, Freddy' (Jones, 2023). Clearly, from the minister's perspective, frogs are much less precious than gold – and that includes at-risk native species.

The context of the minister's remark is important. As it happens, there are over 7,000 species of frog globally, with new ones

still being discovered. But Aotearoa has only three native frog species or pepeketua: Archey's frog, Hamilton's frog and Hochstetter's frog. They belong to the genus *Leiopelma*, which is an ancient species, little changed in 70 million years. All three species are currently classified as either 'threatened' or 'at risk' under the IUCN's Red List and New Zealand's threat classification (Burns et al., 2017). Unlike frogs elsewhere in the world, they don't croak regularly and two of the three species lack a tadpole stage. It appears that Jones was referring, in his parliamentary comments, specifically to Archey's frog, which is the country's smallest native frog. These frogs, which are found in the Coromandel, thrive in an area believed to contain large seams of gold (Milne, 2022). A mining company, OceanaGold, has been seeking to develop an underground mine in the area for several years. A key question is whether, and to what extent, such a development would impact negatively on the conservation land above the mine and the habitats of the affected flora and fauna, including the Archey's frog. For instance, there are concerns about how the vibrations generated by the mining operations would affect the frogs, along with the possible impacts of heavy metals and hydrological changes. Moreover, there is continuing uncertainty over precisely how many Archey's frogs remain, with estimates varying sharply.

Whatever the risks to the Archey's frog from future gold mining, the minister's reference to 'blind frogs' is intriguing. Many frogs have particularly good night vision. While their eyes come in many different shapes and sizes, most frogs have bulging eyes which enable them to see simultaneously in several directions – forwards, to their sides, and to a limited extent behind. Hence, unlike some politicians, they have a broad and expansive view of their immediate environment. Mercifully, too, they are not wilfully blind.

Environmental policy changes – the record since November 2023

The Appendix summarises the main environmental policy changes undertaken by the coalition government since late November 2023 and foreshadows other reforms that are in the pipeline. As the Appendix highlights, the list is long. It is also sobering. Changes have been made to every environmental domain (i.e., air, atmosphere and climate, fresh water, land and marine) and every significant environmental policy area (resource management, climate change mitigation, climate change adaptation, fresh water, energy, transport, agriculture, forestry, fishing, etc.). Also, the government has signalled changes to important policy-related accountability practices (e.g., corporate climate-related disclosures) and substantially reduced public expenditure on multiple environmental policy initiatives (see Treasury, 2024). Moreover, while some changes are relatively minor and even inconsequential, many are highly significant, if not fundamental.

Several features of environmental policymaking since late 2023 deserve emphasis. First, many of the changes have been undertaken at great speed, thus providing only limited opportunities for public consultation, debate and reflection. To compound matters, some of the legislative amendments have been enacted under parliamentary urgency, thus circumventing proper select committee reviews. For good constitutional reasons, urgency should be used sparingly. Plainly, the current government believes otherwise.

Second, and related to this, the government has pursued a radically different policy approach to its predecessors regarding its obligations under te Tiriti o Waitangi, on matters of both process and substance. Notably, it has rejected the inclusion of important Māori concepts, such as 'te mana o te wai', in environmental legislation and dismissed the proposition that public authorities should 'give effect to the principles of te Tiriti o Waitangi'. Accordingly, it has discarded the concept of 'te oranga o te taiao', the upholding of which was fundamental to the purpose statement in section 3 of the ill-fated Natural and Built Environment Act 2023. The concept in question refers, among other things, to the health of the natural environment and the importance of sustaining the capacity for life. Unsurprisingly, the coalition's policies since late 2023 have prompted repeated claims to the Waitangi Tribunal alleging that the Crown has breached its obligations under the Treaty and caused harm to Māori/iwi/hapū. A proper discussion of such matters is beyond the scope of this article. But the government's actions have undoubtedly strained Crown/Māori relations, threatened significant Māori rights and interests, caused deep disquiet in legal circles, and almost certainly worsened race relations.

> … the past year has witnessed an increasingly consistent pattern of ministers disregarding or dismissing the best available evidence across multiple policy domains – health, housing, transport, energy, fishing, road safety, and much else.

Third, some, if not many, of the environmental policy changes implemented since late 2023, as well as various environmental reforms that have been foreshadowed, run contrary to the advice the government has received from independent experts, such as the Climate Change Commission (2023) and the Parliamentary Commissioner for the Environment, as well as from its own departmental advisers, including the prime minister's chief science advisor.

Of course, governments are at liberty to reject expert advice; that is their right and privilege. But the past year has witnessed an increasingly consistent pattern of ministers

disregarding or dismissing the best available evidence across multiple policy domains – health, housing, transport, energy, fishing, road safety, and much else. Such an approach poses significant risks. Not only is it likely to generate harmful – or, at least, less desirable – policy outcomes, but it may also undermine public trust and confidence in our democratic institutions. Aside from this, it is demoralising for scientific experts and professional policy advisers – and dispiriting for all those who value robust evidence and careful, rigorous, objective analysis.

Fourth, remarkably, the minister for the environment, Penny Simmonds, is not a member of the cabinet. This is the first time since the environment portfolio was created in 1972 that the minister responsible has not been represented at the highest level of government. Significantly, too, at the time of writing (early October 2024) the position of the prime minister's chief science advisor remained vacant: Dame Juliet Gerrard stood down in June 2024 after six years in the role.

Finally, at a time when major economic transformations, with significant societal implications, are vital for both environmental sustainability and risk mitigation, it is lamentable that the government has largely abandoned any mention of, let alone strong support for, the concept of 'just transitions'. It is no accident, therefore, that the 'Just Transitions' programme in the Ministry of Business, Innovation and Employment has been discontinued. Yet, as highlighted by several contributors to this special issue of *Policy Quarterly* (see, for instance, the articles by Milena Bojovic and Gradon Diprose et al.), there is a compelling ethical and political case for distributive justice, especially in times of deep uncertainty and increasing risk and when large-scale transitions are unavoidable. Otherwise, the economic adjustments required for decarbonisation, along with the planned relocation of communities exposed to growing climate-related risks, are more likely to be resisted, and thus delayed. Equally, their impacts are bound to fall disproportionately and undeservedly on our most vulnerable citizens. But perhaps the government's failure to endorse the concept of just transitions simply reflects its overall lack of concern for distributive justice, together with a limited understanding – or even denial – of the gravity and urgency of humanity's sustainability challenges.

While [Chris Bishop] speech focused primarily on resource management issues, many of his arguments apply equally to other policy changes, such as those affecting climate change mitigation and adaptation, energy and transport matters.

The rationale for the coalition's environmental policy changes

The extraordinary scope, scale and speed of the coalition's environmental policy changes prompt an obvious question: wherein lies their logic or rationale? Put differently, what are their main justifications and why has the government questioned, if not abandoned, so many of the assumptions and values of its predecessors?

In a speech to the New Zealand Planning Institute in March 2024, the minister for resource management reform, Chris Bishop, helpfully outlined the rationale for some of the government's main environmental policy changes (Bishop, 2024b). While his speech focused primarily on resource management issues, many of his arguments apply equally to other policy changes, such as those affecting climate change mitigation and adaptation, energy and transport matters. The minister's principal claims, arguments and priorities can be summarised as follows:

- The country's economic growth has been too slow. Enhancing the growth rate will require going 'as hard as we can'.
- Growth is necessary not only for better living standards, but also for environmental protection. 'Wealthy countries look after their environment because they can afford to, and they have the resources to make a difference.'
- 'The welfare of current [and] future generations … depends on more than a sustainable environment, important as that is.'
- The planning system governed by the RMA has 'consistently failed to deliver better outcomes, both for development and the natural environment'. Among other things:
  a. it has been 'too hard and expensive', as well as too slow, 'to get things done'; this applies especially to large-scale infrastructure projects, the development of renewable energy resources, and housing construction;
  b. it has locked up too much land, contributing significantly to the country's housing shortage and property price inflation;
  c. it has had a breadth and complexity that is too great for councils to implement effectively;
  d. it has lacked the tools needed for sound environmental management;
  e. the 'purpose statement of the RMA puts the environment above development and other land use. That makes the RMA fundamentally incompatible with what people want by establishing a presumption against land use';
  f. plans and consents, while important, 'should not run economies … or trade off social, cultural, economic and environmental outcomes'.
- For such reasons, the planning system needs reform, thereby 'unlocking

development capacity' and 'investment' and ending the current 'gridlock'. It needs to be simpler, with solutions linked to problems, 'clear rules', and a 'purpose statement that is consistent with human welfare'. The 'enjoyment of property rights' should be 'its guiding principle', with the goal being to 'maximise the welfare of current and future generations of people'. At the same time, development and land use must be 'within environmental limits' and in accordance with national standards.

- Legislation protecting the environment will be separate from that governing the process of urban and spatial planning. The experiment with integrated management under a single statute – the RMA – will cease.
- The previous government 'talked big and achieved basically nothing'; 'we intend to deliver'.

Subsequent speeches by the minister during 2024 elaborated on these ideas, including a joint speech in September to the Resource Management Law Association with Simon Court, an ACT MP and the parliamentary under-secretary to the minister responsible for resource management reform (Bishop and Court, 2024; see also Bishop, 2024a).

Any proper assessment of the claims and arguments advanced in such speeches would be a major undertaking. Several brief comments must suffice.

Improving environmental policymaking

No doubt many of the minister's criticisms of the RMA have validity (Randerson et al., 2020; Palmer and Clarke, 2022). But the legislation that his government repealed was not the RMA; it was legislation that had taken five years of painstaking policy work and extensive public consultations to formulate, draft and enact, namely, the Natural and Built Environment Act and the Spatial Planning Act 2023. While the two new Acts were far from perfect, they addressed many of the coalition government's concerns. Had they been implemented, there would have been:

- a national planning framework providing more consistent government objectives and policy directions;
- fewer and clearer plans, faster plan-making processes, and a fast track for renewables;
- fewer consents;
- stronger compliance provisions;
- better spatial planning.

By abruptly repealing the two Acts, the government has increased policy uncertainty and almost certainly delayed by several years the long hoped-for benefits of reform. Further, the idea of separating, from a statutory perspective, the goals of environmental protection and development raises multiple issues, not least how governmental priorities will be determined and conflicting goals resolved.

Aside from this, the proposition that planning legislation should have 'the enjoyment of property rights' as its 'guiding principle' is highly problematic, as Ben France-Hudson eloquently explains in this special issue of *Policy Quarterly*. After all, the reason that planning legislation is needed is that many people, while enjoying their property rights, can cause harm to other people and the wider natural world – and, regrettably, this harm can be severe, widespread and irreversible. Hence, arguably the fundamental logic for planning legislation is not to enable 'the enjoyment of property rights' but rather to constrain the exercise of these rights, thereby protecting the public interest and the natural environment.

The negative impact of poor environmental management on economic growth

Without question, the country's productivity growth has been relatively slow by OECD standards for many decades. The current government has good reason to be concerned. But whether economic growth should be, as the minister asserts, the 'main goal' (Bishop and Court, 2024), raises multiple philosophical questions. Also, the extent to which the RMA and other environmental regulations have 'stifled' and 'resisted' growth and thus contributed to Aotearoa's sluggish economic performance is open to debate. After all, many other factors can readily be identified. Collectively, their impact has been far more important than the RMA, as various independent reviews by the OECD, the recently abolished Productivity Commission, and the Treasury have highlighted over many years. Such factors include:

- the country's relative isolation geographically and hence its distance from major international markets;
- the small size of the country's domestic market, which constrains opportunities for economies of scale and reduces competition;
- a relatively high risk of damage from natural hazards, along with increasing climate-related risks which are contributing to higher insurance costs;
- a long history of low public and private investment in research and development;
- a low ratio of capital per worker and significant skill mismatches;
- a significant proportion of the economy in sectors with low productivity growth (e.g., tourism);
- a tax system which has encouraged property investment for capital gains rather than productive investment;

> Unfortunately … several of the coalition's policy decisions, such as the large reduction in public investment in research and development, risk undermining future productivity growth.

- inadequate investment in high-quality public infrastructure at all levels of government.

Obviously, some of these factors are beyond the government's capacity to control. Unfortunately, however, several of the coalition's policy decisions, such as the large reduction in public investment in research and development, risk undermining future productivity growth.

That said, from the perspective of *long-term* human wellbeing across all its multiple dimensions, many significant questions relating to economic growth arise. One of these is whether continuing growth is actually feasible or desirable on a finite planet with constrained natural resources and the limited capacity of the biosphere to absorb waste (Boston, 2022; Hagens, 2020; Hickel, 2021; Hickel and Hallegette, 2022; Jackson, 2009, 2022). Another relates to the form any such growth can and should take. In other words, what kind of growth is most likely to be desirable and sustainable over many generations and under what conditions? After all, if growth occurs at the expense of environmental sustainability, then by definition it will ultimately be unsustainable. For instance, particular patterns of growth can cause a range of negative environmental externalities. These, in turn, will subsequently impede, if not eventually undermine, long-term prosperity. Currently examples of such externalities include higher greenhouse gas emissions and related planetary warming, increased ocean acidification, lower freshwater quality in lakes and rivers, greater chemical contamination of groundwater, a higher rate of soil erosion, the extensive loss of fertile agricultural and horticultural land, greater damage to natural habitats from predators and land development, and so forth. Over time, such outcomes impose additional financial and non-financial costs on property owners, taxpayers and ratepayers. Indeed, this is happening now – and the costs of poor environmental regulation are already large, with some destined to be massive (see, for instance, the contribution of Emily Carr and her colleagues in this special issue of *Policy Quarterly*).

Take the case of anthropogenic climate change: this is projected to cause significant sea level rise over the coming century and beyond due to thermal expansion and the melting of the planet's large ice sheets, as explained by Tim Naish and his colleagues in this special issue of *Policy Quarterly* (see also IPCC, 2021; Lenton et al., 2023). Among other things, sea level rise exacerbates the damage caused by extreme events and generates multiple hazards (e.g., higher storm surges, more severe coastal floods, rising groundwater, and saltwater intrusion into soils and aquifers). There is the potential for multi-metre sea level rise within a century depending on the path of global greenhouse gas emissions, with devastating consequences for many coastal cities, towns and communities. Yet even half a metre of sea level rise, which is likely well before 2100, will cause substantial costs in coastal nations like Aotearoa (e.g., through damage to public and private property, disruption to economic activity, and the need to relocate at-risk communities).

But long-term economic damage, whether from woefully weak global governance of Earth's atmosphere and oceans or dismal environmental management nationally, is not the only concern: a failure to apply sensible environmental regulations can also hamper economic activity in the short-to-medium term. For instance, serious traffic congestion in Auckland, Tauranga and Wellington is currently inflicting significant daily costs on citizens and businesses.

Similarly, a failure to impose adequate environmental regulations may harm offshore consumer demand for some of the country's exports and reduce access to international markets where treaty obligations have been breached. It has been estimated that around 80% of Aotearoa's exports by value are destined for markets where mandatory reporting of environmental, social and governance (ESG) matters (e.g., mandatory carbon-related disclosures) is already in force or has been proposed (Aotearoa Circle, 2024). From 2026, for example, the European Union's Carbon Border Adjustment Mechanism will be operative and other countries can be expected to establish similar tariff arrangements to protect their local producers against unfair competition from jurisdictions deemed to be environmental laggards.

… a failure to impose adequate environmental regulations may harm offshore consumer demand for some of the country's exports and reduce access to international markets where treaty obligations have been breached.

Of particular concern locally in this context is the coalition's repeal of the 2018 ban on new offshore oil and gas exploration: according to legal advice from the Ministry of Foreign Affairs and Trade, such action is 'likely' to breach the country's legal obligations in recent free trade agreements (see Daalder, 2024). Whether such a breach results in legal challenges, however, remains uncertain. Be that as it may, the greater part of Aotearoa's export earnings, including those from international tourism, and most of its major commodity exports depend on natural capital and the ecosystem services this capital provides. Ignoring such facts would be foolish.

In sum, going for economic growth 'as hard as we can', to quote Chris Bishop, will eventually be counterproductive if the type of growth that occurs damages ecosystem services and undermines long-term environmental sustainability, thereby destroying the conditions for human flourishing (Hagens, 2020; Helm, 2023; Petrie, 2021). But poor environmental regulation can also have negative short-term economic impacts. Unfortunately, for

Aotearoa the costs of imprudent environmental management over many generations are already high – and given the coalition government's policy settings, they are destined to grow substantially, potentially at an accelerating pace.

The failure to improve environmental outcomes

To be sure, as Bishop has observed, the RMA and other environmental statutes have failed to deliver better outcomes for the natural environment or adequately address the growing pressures of development on critical natural resources. But why is this? The minister mentions several specific reasons – such as bad design, broad scope, high compliance costs, undue complexity, lengthy delays, and an excessive reliance on the courts – but not others. Among the reasons overlooked, but which have been emphasised over the years by many independent reviews of environmental governance and management, are the following:[3]

- a failure of governments for several decades following the enactment of the RMA to provide adequate national direction to assist decision making by local councils;
- related to this, a lack of clear environmental protections, in particular, insufficient or poorly specified environmental limits;
- insufficient spatial planning, again resulting from weak national direction;
- inadequate public investment in environmental monitoring, reporting and policy-relevant research, resulting in insufficient or poor-quality information, and a lack of capacity and capability in central and local government to fulfil their expected roles;
- a failure to address issues of resource allocation and cumulative effects;
- poor compliance monitoring and enforcement;
- inadequate system oversight and weak public accountability for outcomes;
- the power of vested interests, including in some cases regulatory capture by commercial interests.

If these are among the main reasons for the country's poor environmental legacy, will the government's reform agenda address them? The answer, almost certainly, is 'no'. Virtually nothing that the government has announced to date or foreshadowed over the next few years is likely to enhance outcomes in the main environmental domains. On the contrary, it is reasonable to anticipate that further ecological degradation, deterioration and losses will occur, some of which may be irreversible.

Deeper philosophical issues

Aside from the reasons why Aotearoa's track record for environmental management has been indifferent, if not poor, the minister's remarks raise several deeper philosophical issues. One of these concerns the overarching moral framework that should guide all public and private behaviour. A related question is whether there are any moral bottom lines or non-negotiable limits. In other words, are there any certain 'goods' (e.g., rights, norms, outcomes, etc.) that are, for one reason or another, sacrosanct, non-derogable, inalienable or inviolable? Yet another issue concerns the ethical principles that should guide policymakers when faced with an inevitable clash of values, such as a conflict between protecting an endangered species and developing a resource in the interests of greater employment opportunities, better infrastructure or improved financial returns. Again, a few brief comments must suffice.

Underpinning the minister's policy approach is his evident embrace of utilitarian ethics. This is reflected in his proposition that the core goal of public policy should be to 'maximise the welfare of current and future generations'. Utilitarianism, of course, is a broad 'church', so to speak, and has multiple types (e.g., act, rule, etc.). But every type of utilitarian ethics are open to most of the same objections and concerns (Carney, 2021; Gushee, 2014; Rawls, 1971). Whether utility is thought of as 'welfare', 'wellbeing', 'pleasure', 'the satisfaction of a desire, interest or preference' or something else, what does it really mean and why are such things deemed to have inherent value? Moreover, if concepts like welfare or wellbeing have many different components or dimensions, as is usually contended, how should they be interpreted, measured and weighted?

> … while a policy goal such as 'maximising the welfare of current and future generations' is easy to state and appears superficially attractive, in practice it can mean almost anything. As such, it is essentially useless as a guide for decision making.

Next, what about the welfare of non-human species, along with their diverse ecosystems? Do they have intrinsic value? If so, how does a utilitarian framework accommodate such claims, notwithstanding its anthropocentric roots? If not, are all non-human species only of instrumental value? In that event, their value depends solely on the extent to which they contribute somehow to human welfare. Further, as a consequentialist creed, utilitarianism faces numerous formidable assessment problems: e.g., determining which specific consequences matter and why; determining the discount rate to apply to consequences that occur over long periods of time; determining how to deal with the unequal, and arguably unfair, distribution of the consequences; and determining how to reach a justifiable consequentialist calculus in the context of limited information, deep uncertainty and multiple risks (Kay and King, 2020). Hence,

while a policy goal such as 'maximising the welfare of current and future generations' is easy to state and appears superficially attractive, in practice it can mean almost anything. As such, it is essentially useless as a guide for decision making.

That is not to say that moral frameworks of a non-utilitarian or non-consequentialist nature lack problems. All ethical theories – such as rights-based, needs-based and capability approaches – along with the world views on which they depend, whether Western, indigenous, religious or otherwise, are open to objections. But utilitarianism is particularly ill-suited to the field of environmental ethics. It provides few meaningful insights to deal with challenging conflicts of values, such as determining whether a specific development proposal is morally justified, notwithstanding its negative ecological impacts.

This, in turn, raises the vexed, but fundamental, issue of environmental limits, a concept which Bishop affirmed, albeit fleetingly, in his March 2024 speech and addressed somewhat more fully in September. Without environmental bottom lines or biophysical constraints, there are no hard and fast restrictions on human activities: everything is, in effect, permitted; nothing is sacrosanct. But as is evident from long experience in Aotearoa and elsewhere, setting rigorous, quantified and effective environmental limits is a deeply contested matter. This includes the issues of deciding whether and when environmental limits are needed, determining what such limits should be, and then agreeing on a time frame and process for implementation.

Based on the government's policy decisions and proposals thus far, it is evident that setting environmental limits, let alone enforcing them, are not high priorities. After all, ministers repealed the Natural and Built Environment Act 2023 within weeks of taking office. Yet Part 4 of the Act, for the first time in the country's history of environmental management, required the government to set limits in six areas: air, indigenous biodiversity, coastal water, estuaries, fresh water and soil. It also specified the processes for doing so. Equally important, the Fast-Track Approvals Bill makes no mention of environmental limits, whether in relation to the RMA or to any of the other statutes it overrides.

Without environmental bottom lines or biophysical constraints, there are no hard and fast restrictions on human activities: everything is, in effect, permitted; nothing is sacrosanct.

Moreover, if the government holds that environmental considerations should not be prioritised over development and land use, as the minister has contended, then it is probable that the provisions for limits (however quantified and specified) in future resource management or related environmental legislation will be less demanding than those in Part 4 of the Natural and Built Environment Act. If so, then any new environmental limits that might be imposed seem destined to be weak, distant and inconsequential. Indeed, to quote Simon Court:

> No environmental limit should make it impossible to build housing, produce food or energy, or provide transport … If development cannot occur within environmental limits in one area, then development *must* [my emphasis] occur in another. (Bishop and Court, 2024)

Bear in mind, too, that a crucial goal of the coalition's system of environmental regulation is that it 'will work better because it has less to do'; that is because it 'will be narrower in scope and the effects its controls' (ibid.). It is hard not to conclude that 'less' in this context means less environmental protection, less conservation and less restoration – and ultimately less ecological resilience, less adaptability and less sustainability, and thus less long-term prosperity.

Political economy considerations

Leaving aside the specific goals of, and justifications for, the coalition's environmental policies, how might the political economy of the government's agenda best be explained? Put differently, whose interests are being served? Three matters deserve comment.

First, the multiple policy reversals and proposed new directions will largely benefit those whose activities cause disproportionate environmental harm. This may be in the form of higher greenhouse gas emissions, greater damage to natural habitats, extra stress on fisheries, or the additional contamination of freshwater resources from livestock waste and the run-off of fertiliser and other chemicals into streams, rivers and lakes. Lighter regulation, other things being equal, will lower compliance costs and enhance (short-term) economic returns.

Second, the main economic benefits are likely to be concentrated in the hands of a small minority of citizens, while the costs will be widely dispersed and spread relatively thinly across the whole population – and the wider natural world. Politically, where the benefits are concentrated and the costs are dispersed, the incentive structure in a democracy favours the beneficiaries. In relative terms they have more to gain and thus stronger incentives to influence governmental decision making. Selective campaign donations and regulatory capture, after all, can generate large returns. Aside from this, nature does not have a vote. Hence, the relevant asymmetries are formidable.

Third, there is an important inter-temporal dimension: the main beneficiaries of lighter regulation are alive now. By contrast, those bearing the costs of additional environmental degradation will be spread across multiple generations, including those yet unborn. Again, in a democracy, when inter-temporal trade-offs arise, the political calculus typically favours

short-term interests. Countering these politically salient asymmetries is hard, as explained by Marie Doole and her colleagues in this special issue of *Policy Quarterly*, and will require a specific focus over the coming years.

A different ethical framework and an alternative future

Given the severity of the ecological crises afflicting the world, along with the numerous significant environmental challenges currently confronting Aotearoa, a different policy approach is urgently needed, one based on a different ethical framework, together with different mindsets and ways of thinking. Such an approach would give priority to vital environmental goals, principles and rights. It would take biophysical constraints seriously at all relevant spatial scales. And it would incentivise nature-based solutions where appropriate. Arguably, too, the kind of approach required would take seriously the nation's founding constitutional charter – te Tiriti o Waitangi – and give proper weight to Māori ethical insights and perspectives, including such values as kaitiakitanga (guardianship), manaakitanga (hospitality, generosity and social responsibility), whanaungatanga (relationships) and kotahitanga (solidarity and collaboration). Bear in mind, too, that a different policy approach is necessary not only for sound ecological reasons; it is also essential for long-term prosperity.

What would embracing such an approach mean in practice? First, it would entail reversing most, but not all, of the environmental policies currently being pursued by the coalition government. Second, it would entail affirming and seeking to uphold a specific set of ethical values and considerations. Above all, it would recognise:

- the intrinsic value of all life forms independent of their instrumental value to human beings, including the value of every species, genetic variability and unique habitat, and hence the moral imperative to care for, protect and restore natural systems even when there appears to be little or no direct human benefit;
- the interconnectedness and interdependence of all living organisms and the biophysical systems of which they are part;
- the value of biodiversity in enabling ecosystems to be resilient and adaptable in the face of perturbations and stresses;
- the importance of environmental sustainability in the sense of ensuring that ecosystems remain healthy, diverse and productive, and thus able to supply a wide range of ecosystem services on an enduring basis;
- the critical need to apply the precautionary principle, especially in the context of deep uncertainty and ecologically significant tipping points;
- the importance of protecting environmental justice and rights, including the right of all people to participate in environmental decision making and enjoy equitable access to a healthy environment;
- the importance of ensuring that the substantial costs of the required transitions to environmental and economic sustainability are allocated in accordance with well-established principles of justice, not least the costs associated with rapid decarbonisation and climate change adaptation, including the planned relocation of at-risk communities (see Expert Working Group on Managed Retreat, 2023);
- the importance of pursuing intergenerational justice, including ensuring that all future generations have a habitable planet and the resources to meet their needs.

A policy framework based on such values and considerations is not incompatible with ongoing economic, social and cultural development, including extensive investment in public infrastructure, housing and commercial activities. Indeed, as argued previously, healthy and productive ecosystems, and the multiple services they provide, are essential for long-term prosperity. But this means that future development must be consistent with clearly specified and properly enforced environmental limits, with such limits being applied in multiple domains and at multiple scales. The relevant limits should, among other things, be designed to:

- honour New Zealand's international treaty obligations;
- prevent the loss of indigenous biodiversity, and especially the irreversible loss of distinct species;
- enhance the resilience of indigenous biodiversity to adverse impacts, such as the effects of climate change;
- prevent the irreversible loss of unique and highly distinctive ecosystems, including 'keystone species', and the ecosystem services they provide;
- maintain the self-sustaining capacity of ecosystems, thus preventing abrupt 'regime shifts' resulting from the crossing of environmental thresholds (where such thresholds apply);
- maintain biophysical capacity locally, regionally and nationally;
- prevent significant harm to human health (i.e., harm that is serious, extensive, permanent, etc.).

A policy framework based on such values and considerations is not incompatible with ongoing economic, social and cultural development, including extensive investment in public infrastructure, housing and commercial activities.

Formulating and applying such limits would, of course, be hard – analytically, technically and politically. It would require a much greater public investment in environmental information,

monitoring, reporting, analysis and enforcement (Brown, 2017) and much-improved public accountability for performance. And it would need robust environmental legislation of the kind proposed by Sir Geoffrey Palmer and Richard Clarke (2022), based on the full range of principles embodied in international environmental law since the 1970s and incorporating much-improved provision for independent policy advice and enhanced environmental governance.

Additionally, as Dieter Helm (2023) and Murray Petrie (2021, 2022) have underscored, the proper integration of economic and environmental policy is essential. This must include the extensive 'greening' of fiscal policy (see OECD, 2024) and a strong focus on maintaining and, where possible, restoring aggregate stocks of renewable natural capital. Thus far, the coalition's fiscal strategy, as reflected in Budget 2024 (Treasury, 2024), shows little evidence of such an approach, whether with respect to climate change (see Hamill, Hughes and Bealing, 2024) or to other important environmental issues.

The challenge, of course, is not merely to design and implement a much more integrated policy framework; such a framework also needs to be effective and enduring. For this goal to be realised, according to Simon Upton, the Parliamentary Commissioner for the Environment, and his colleagues (see their contribution to this special issue of *Policy Quarterly*), nothing less than a 'fundamental shift in mindset, values and behaviours' will be required. But how might such a 'fundamental shift' be secured? What might trigger a profound and lasting 'ecological revolution'? Clearly, the severity of the current ecological crises, including the increasingly damaging impacts of climate change, has thus far been insufficient to generate the desired transformation, whether in Aotearoa or elsewhere. And this is despite dedicated and persistent advocacy for policy reform and lifestyle changes by multiple civil society groups and the patient endeavours and compelling findings of myriads of scientists, globally and locally.

Perhaps, sadly, much greater ecological damage will be required and widely experienced before any 'fundamental shift' becomes a reality. But by then, of course, much of value in the natural world will have been irretrievably lost or be in the process of irreversible decline. That is a grim conclusion. But given the ongoing decisions of the current coalition government, and some of its counterparts elsewhere in the world, it is probably a realistic assessment. Furthermore, we should be wary of assuming that greater ecological damage will trigger a series of positive societal responses resulting in self-reinforcing feedbacks (Lenton et al., 2022). It is equally, if not more, likely that negative societal forces and tipping points will come into play, with the risk – globally and locally – of more extensive and disruptive migration, more climate-related economic shocks, worsening food insecurity, increased civil unrest, reduced liberties and greater despotism.

> To return to 'goodbye Freddy': unquestionably, the Freddies of the natural world need more human friends, ideally ones with passion, practical wisdom and political influence.

Conclusion

Humanity has entered an era of 'long problems', 'long emergencies' and 'slow-moving catastrophes' (Boston, 2024; Hale, 2024). There is no ready escape. Ecologically, we face unavoidable path dependence across multiple domains. Tragically, the legacies of past policy failures will haunt multiple generations. Future inhabitants will no doubt puzzle over and grieve the reckless and protracted sins of their forebears.

To compound matters, narrow short-term commercial interests, scientific illiteracy and wilful blindness continue to exercise a disproportionate influence on policymakers across the globe. Regrettably, therefore, the coalition's environmental policy choices since late 2023 are but a microcosm of a wider international malaise. To be sure, not all countries are putting their environmental protections into rapid reverse like Aotearoa, or endeavouring to evade non-negotiable biophysical realities. But few countries are responding to the current ecological crises with the seriousness and urgency required. A collective failure of extraordinary significance is unfolding.

Fortunately for the rest of the world, what policymakers in Aotearoa decide, for good or ill, will have minimal global consequences. But the ecological implications locally will matter, as will their harmful economic impacts, both short-term and long-term. Under the coalition's approach, Aotearoa will likely witness higher gross and per capita greenhouse gas emissions than otherwise, greater urban spawl, an increased loss of native habitats, poorer freshwater quality, more sediment and chemical pollution, weaker protection of coastal and marine environments, more ecosystems with limited biodiversity (e.g., more exotic forests), an over-reliance on carbon offsetting, and much else. Importantly, too, losing species and unique ecosystems, whether this occurs in Aotearoa, Angola, Algeria or Alaska, constitutes a moral tragedy, especially so when such losses are avoidable.

Prior to the change of government in late 2023, after decades of weak, ineffective policy measures, Aotearoa was beginning to implement a series of laws, regulations and fiscal initiatives to mitigate its environmental woes. Much of this agenda has now been delayed, abandoned or weakened. How long the new agenda will last is uncertain. But even if the current government were to be short-lived, the ecological consequences will likely be much more enduring. Equally, the events of the past year will make it harder to

develop a new societal and political consensus based on a compelling set of ecological values, principles and priorities, and related institutions for sound environmental governance.

To return to 'goodbye Freddy': unquestionably, the Freddies of the natural world need more human friends, ideally ones with passion, practical wisdom and political influence. But whence will such friends come? Meanwhile, their adversaries are at large and unabashed. Yet the problem is not simply a disordered or external 'them'. On the contrary, we all contribute, albeit to varying degrees, to ecological harm. We thus all share the shame and guilt of the associated loss and damage to 'our common home', as Pope Francis laments in *Laudato Si'*.[4] And while robust laws and sound policies are essential, so too – as many theologians contend (Bauckham, 2010; Bouma-Prediger, 2019; Sacks, 2020; Southgate, 2008) – are transformed hearts and minds.

1. At the same time, the proposed Treaty Principles Bill certainly does not keep faith with the provisions of te Tiriti o Waitangi, especially Article 2.
2. See, for instance, https://environment.govt.nz/facts-and-science/environmental-reporting/.
3. See, for instance, numerous publications of the Parliamentary Commissioner for the Environment and the Environmental Defence Society, and Randerson et al., 2020; and in particular Upton, 2020.
4. https://www.vatican.va/content/francesco/en/encyclicals/documents/papa-francesco_20150524_enciclica-laudato-si.html.
5. This includes policies that affect, or could affect, indoor environmental quality.
6. See, for instance, https://environment.govt.nz/assets/publications/Work-Programme-for-Reforming-the-Resource-Management-System.pdf; https://environment.govt.nz/news/rm-reform-update-september-2024/.
7. https://budget.govt.nz/budget/pdfs/summary-initiatives/b24-sum-initiatives.pdf.

Acknowledgements

Various people kindly commented on an earlier version of this article or suggested relevant material, especially for the appendix. I would particularly like to thank Paul Blaschke, Hannah Blumhardt, Ralph Chapman, Ben France-Hudson, Chris Livesey, Marie Doole, Liam Doyle, Mary Hutchinson, Grace Macaulay, Sam Macaulay, Sir Geoffrey Palmer, Raewyn Peart, Murray Petrie, Dame Anne Salmond, Greg Severinsen, Jolyon Swinburn and Ken Taylor.

References

Aotearoa Circle (2024) *Protecting New Zealand's Competitive Advantage: a snapshot of global sustainability reporting and trade trends*, Chapman Tripp

Bauckham, R. (2010) *Bible and Ecology: rediscovering the community of creation*, London: Darton, Longman & Todd

Bishop, C. (2024a) 'Replacing the Resource Management Act 1991', Cabinet paper, https://environment.govt.nz/assets/publications/Cabinet-papers-briefings-and-minutes/MfE-Proactive-Release-Replacing-the-RMA.pdf

Bishop, C. (2024b) 'Speech to the New Zealand Planning Institute', 22 March, https://www.beehive.govt.nz/speech/speech-new-zealand-planning-institute

Bishop, C. and Court (2024) 'Speech on replacing the Resource Management Act', 20 September, https://www.beehive.govt.nz/speech/speech-replacing-resource-management-act

Blumhardt, H. and L. Prince (2022) 'From lines to circles: reshaping waste policy', *Policy Quarterly*, 18 (2), pp.71–80

Boston, J. (2022) 'Living within biophysical limits: green growth versus degrowth', *Policy Quarterly*, 18 (2), pp.81–92

Boston, J. (2024) *A Radically Different World: preparing for climate change*, Wellington: Bridget Williams Books

Bouma-Prediger, S. (2019) *Earthkeeping and Character: exploring a Christian ecological virtue ethic*, Grand Rapids: Baker Academic

Brown, M. (2017) 'Last line of defence: a summary of an evaluation of environmental enforcement in New Zealand', *Policy Quarterly*, 13 (2), pp.36–40

Brown, M. et al. (2015) *Vanishing Nature: facing New Zealand's biodiversity crisis*, Auckland: Environmental Defence Society

Burns, R.J. et al. (2017) *Conservation Status of New Zealand Amphibians, 2017*, Wellington: Department of Conservation, https://www.doc.govt.nz/Documents/science-and-technical/nztcs25entire.pdf

Carney, M. (2021) *Value(s): building a better world for all*, London: William Collins

Clarkson, B. (2022) 'Reversing biodiversity decline in New Zealand', *Policy Quarterly*, 18 (2), pp.61–70

Climate Change Commission (2023) 2023 *Advice on the Direction of Policy for the Government's Second Emissions Reduction Plan*, Wellington: Climate Change Commission

Daalder, M. (2024) 'Government advised repealing gas ban likely to breach trade deals', Newsroom, 1 October, https://newsroom.co.nz/2024/10/01/govt-advised-repealing-gas-ban-likely-to-breach-trade-agreements/?utm_source=Newsroom&utm_campaign=3c3921b2b6-Daily_Briefing+02.10.2024&utm_medium=email&utm_term=0_71de5c4b35-3c3921b2b6-97981445&mc_cid=3c3921b2b6&mc_eid=bfbafb8c1c

Dasgupta, P. et al. (2021) *The Economics of Biodiversity: the Dasgupta Review*, London, HM Treasury

Dryzek, J. and J. Pickering (2018) *The Politics of the Anthropocene*, Oxford: Oxford University Press

Environmental Defence Society (2023) 'New government crashes environment', 3 December, https://eds.org.nz/resources/documents/media-releases/2023/new-government-crashes-environment/

Environmental Defence Society (2024) 'The government's war on nature goes nuclear', media release, 27 March, https://eds.org.nz/resources/documents/media-releases/2024/fast-track-bill/

Expert Working Group on Managed Retreat (2023) *Report of the Expert Working Group on Managed Retreat: a proposed system for te hekenga rauora/planned relocation*, Wellington: Expert Working Group on Managed Retreat

Gergersen, N.H. (2001) 'The cross of Christ in an evolutionary world', *Dialog: A Journal of Theology*, 40 (3), pp.192–07

Gupta, J. et al. (2023) 'Earth system justice needed to identify and live within Earth system boundaries', *Nature Sustainability*, 6, pp.630–8

Gushee, D. (2014) *In the Fray: contesting Christian public ethics, 1994–2013*, Eugene: Cascade Books

Hagens, N. (2020) 'Economics for the future: beyond the superorganism', *Ecological Economics*, 169, 106520

Hale, T. (2024) *Long Problems: climate change and the challenges of governing across time*, Princeton: Princeton University Press

Hamill, D., T. Hughes and M. Bealing (2024) 'How congruent is Budget 2024 with New Zealand's climate commitments?', NZIER Insight 113/2024

Hansen, J. et al. (2023) 'Global warming is accelerating. Why? Will we fly blind?', 14 September, http://www.columbia.edu/~jeh1/mailings/2023/FlyingBlind.14September2023.pdf

Helm, D. (2023) *Legacy: how to build the sustainable economy*, Cambridge: Cambridge University Press

Hickel, J. (2021) Less is More: how degrowth will save the world, London: Penguin Random House

Hickel, J. and S. Hallegatte (2022) 'Can we live within environmental limits and still reduce poverty? Degrowth or decoupling?', *Development Policy Review*, 40 (1), pp.1–24

Hopper, D. et al. (2012) 'A global synthesis reveals biodiversity loss as a major driver of ecosystem change', *Nature*, 486, pp.105–9

IPBES (2019) *Global Assessment Report on Biodiversity and Ecosystem Services*, Bonn, https://www.ipbes.net/global-assessment

IPCC (2021) *Climate Change 2021: the physical science basis, contribution of Working Group I to the sixth assessment report of the Intergovernmental Panel on Climate Change: summary for policymakers*, Cambridge: Cambridge University Press

IPCC (2022a) *Climate Change 2022: impacts, adaptation and vulnerability, contribution of Working Group II to the sixth assessment report of the Intergovernmental Panel on Climate Change*, Cambridge: Cambridge University Press

IPCC (2022b) *Climate Change 2022: impacts, adaptation and vulnerability: summary for policymakers*, Cambridge: Cambridge University Press

IPCC (2023) *Climate Change 2023: synthesis report: summary for policymakers*, https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_SPM.pdf

Jackson, T. (2009) P*rosperity without Growth: economics for a finite planet*, London: Earthscan

Jackson, T. (2022) *Post Growth: life after capitalism*, Cambridge: Polity Press

Jenkins, S. et al. (2022) 'Is anthropogenic global warming accelerating?', *Journal of Climate*, 35, pp.7873–90

Jones, S. (2023) Address in Reply debate, 12 December, https://www.parliament.nz/mi/pb/hansard-debates/rhr/document/HansS_20231212_057225000/jones-shane

Joy, M. (2022) 'Changing freshwater management in New Zealand', *Policy Quarterly*, 18 (2), pp.18–22

Kay, J. and M. King (2020) *Radical Uncertainty: decision-making for an unknowable future*, London: Bridge Street Press

Keating, C. (2024) 'Submission on the Fast-Track Approvals Bill', 14 April, https://www.parliament.nz/resource/en-NZ/54SCENV_EVI_083f0a7b-f182-41d5-0897-08dc3e31559c_ENV22866/71692cf3a64002021cd994ec4dfcf9859cfe37a8

Kemp, L. et al. (2022) 'Climate endgame: exploring catastrophic climate change scenarios', *PNAS*, 119 (34), e2108146119

Lawrence, J. et al. (2022) 'Australasia', in IPCC, *Climate Change 2022: impacts, adaptation and vulnerability*, Cambridge: Cambridge University Press

Lenton, T. et al. (2019) 'Climate tipping points: too risky to bet against', *Nature*, 575, pp.592–5

Lenton, T. et al. (2022) 'Operationalising positive tipping points towards global sustainability', *Global Sustainability*, 5, e1, pp.1–16

Lenton, T. et al. (eds) (2023) *Global Tipping Points Report 2023*, https://global-tipping-points.org/resources-gtp/

Milne, J. (2022) 'Mining firm says drilling big gold seam won't harm unique frog', *Newsroom*, 12 July, https://newsroom.co.nz/2022/07/12/mining-firm-says-drilling-big-gold-seam-wont-harm-unique-frog/

Ministry for the Environment (2020) *National Climate Change Risk Assessment for Aotearoa New Zealand: main report – Arotakenga Tūraru mō te Huringa Āhuarangi o Āotearoa: pūrongo whakatōpū*, Wellington: Ministry for the Environment

OECD (2017) OECD *Environment Performance Reviews: New Zealand 2017*, Paris: OECD

OECD (2022) *Climate Tipping Points: insights for effective action*, Paris: OECD

OECD (2024) 'Beyond green tagging: linking budgets better with climate goals', Paris, OECD, GOV/SBO(2024)15

Palmer, G. and R. Clarke (2022) 'A new Environment Act is needed now', *Policy Quarterly*, 18 (2), pp.3–9

Petrie, M. (2021) *Environmental Governance and Greening Fiscal Policy: government accountability for environmental stewardship*, London: Palgrave Macmillan

Petrie, M. (2022) 'Integrating economic and environment policy', *Policy Quarterly*, 18 (2), pp.10–17

PIK (2024) 'Earth exceeds safe limits: first Planetary Health Check issues red alert', 24 September, Potsdam Institute for Climate Impact Research, https://www.pik-potsdam.de/en/news/latest-news/earth-exceed-safe-limits-first-planetary-health-check-issues-red-alert

Randerson, T. et al. (2020) *New Directions for Resource Management in New Zealand*, report of the Resource Management Review Panel, Wellington: Resource Management Review Panel

Rawls, J. (1971) *A Theory of Justice*, Cambridge: Harvard University Press

Ripple, W. et al. (2022) 'World scientists' warning of a climate emergency 2022', *BioScience*, 72 (12), pp.1149–55

Ripple, W. et al. (2023) 'Many risky feedback loops amplify the need for climate action', *One Earth*, 6 (2), pp.86–91

Rockström, J. et al. (2023) 'Safe and just Earth system boundaries', *Nature*, 619, pp.102–11

Royal Society Te Apārangi (2013) 'The sustainable carrying capacity of New Zealand', https://www.royalsociety.org.nz/assets/documents/Sustainable-Carrying-Capacity-v3.0-Final.pdf

Sacks, J. (2020) *Morality: restoring the common good in divided times*, London: Hodder & Stoughton

Southgate, C. (2008) *The Groaning of Creation: God, evolution, and the problem of evil*, Louisville: Westminster John Knox Press

Steffen, W. et al. (2018) 'Trajectories of the Earth system in the Anthropocene', *Proceedings of the National Academics of Science USA*, 115, pp.8252–9

Treasury (2023) *Ngā Kōrero Āhuarangi me te Ōhanga – climate economic and fiscal assessment*, Wellington: The Treasury

Treasury (2024) *Budget Economic and Fiscal Update 2024*, Wellington: The Treasury

Upton, S. (2020) 'RMA reform: coming full circle', RMLA Salmon Lecture 2020, https://pce.parliament.nz/media/hxjhxecy/salmon-lecture-rma-reform-coming-full-circle.pdf

Wunderling, N. et al. (2023) 'Global warming overshoots increase risks of climate tipping cascades in a network model', *Nature Climate Change*, 13, January, pp.75–82

Appendix Major changes to environmental policies since late 2023[5]

	Policy area	Main changes	Main concerns
1	Resource management	• Reforms are being undertaken in phases to implement around 20 commitments in the two coalition agreements, with multiple legislative and regulatory changes over several years.[6] The various phases are designed to unlock development capacity for housing and business growth, enable the delivery of high-quality infrastructure, and facilitate the growth and development of the primary sector, while safeguarding the environment and human health. • Phase 1: the Natural and Built Environment Act 2023 and the Spatial Planning Act 2023 were repealed in late 2023; the former Resource Management Act (RMA) 1991 was reinstated. • Phase 2: involves implementing a one-stop consenting and permitting regime for regionally and nationally significant projects (see Fast-Track Approvals Bill below). • Phase 2B: involves targeted changes to the RMA to change freshwater obligations (including to exclude Te Mana o te Wai from consenting processes), extend marine farm consents, delay the implementation of significant natural areas (SNAs), and establish a consenting pathway for new coal mines near inland wetlands or SNAs, along with measures to make medium-density residential standards optional and facilitate renewable energy projects (see below). • Phase 3: involves legislation, probably in 2025, to replace the RMA. There will be two Acts, one to enable development, the other to manage environmental effects. The new approach will be premised on the 'enjoyment of property rights as its guiding principle' and will avoid placing environmental protection over the ability to use land and resources productively. While eschewing integrated management under a single Act, the new legislative framework will have many policy tools in common with the regime that was repealed at the end of 2023 (e.g., spatial planning, single regional plans, a greater use of national direction, less reliance on consents, better compliance monitoring, quantified environmental limits, etc.) and will be rules-based and effects-based. Against this, it will be narrower in its scope and the effects that it controls. • Among other things the National Policy Statement on Highly Productive Land (NPS-HPL) is likely to be amended to exclude LUC-3 category land, thus enabling such land to be used for development.	Developing and implementing a major, multi-year programme of legislative and regulatory reform will be costly for the various levels of government, as evident during 2017–23. The process is likely to increase long-term policy uncertainty, especially if there is no multi-party consensus on the new framework. Notwithstanding an apparent governmental commitment to safeguarding the environment and public health, the proposed changes will likely weaken environmental protections, put more indigenous species at risk, and worsen overall environmental and health outcomes. Downgrading environmental goals, values and rights also risks undermining the nation's long-term prosperity, given the high dependence on natural capital and healthy ecosystems for much of its export revenue.

	Policy area	Main changes	Main concerns
2	Fast-track legislation for development projects	• The Fast-Track Approvals Bill was introduced in March 2024, and amended in August, to streamline and speed up the process for approving significant infrastructure, housing and development projects. The bill's purpose statement focuses entirely on development goals, with no mention of environmental protection. The bill enables development projects to be undertaken in the absence of normal environmental safeguards and through processes that minimise the opportunity for public participation. Previously rejected projects can be considered. • In early October 2024 the government announced that 149 projects would be listed in the Fast-Track Approvals Bill. The projects cover a wide range of public infrastructure, energy and housing developments, together with, among other things, coal mines, open-pit gold mines, and a seabed mining project. Some of the projects, if approved, will occur on SNAs; some appear to run counter to the government's climate change goals; and some have already been rejected on environmental grounds.	Development goals are being prioritised over environmental goals. There are significant limitations on public participation; obligations under the Treaty of Waitangi have been downgraded.
3	Integrated national direction package	• An integrated package of regulatory reforms is proposed for 2025 involving amendments to many existing regulations (i.e., national policy statements and national environmental standards), along with several new national policy statements (e.g., for infrastructure, natural hazards and papakāinga) and new national environment standards (e.g., for heritage and infrastructure).	The proposed national direction package is wide ranging, but despite being referred to as 'integrated' it appears likely to be more fragmented than the National Planning Framework in Part 4 of the repealed Natural and Built Environment Act 2023. It will likely also have weaker environmental goals and protections.
4	Freshwater policy and water services	• The Water Services Acts Repeal Act 2024 repealed the Water Services Entities Act 2022, the Water Services Legislation Act 2023, and the Water Services Economic Efficiency and Consumer Protection Act 2023. • The Local Government (Water Services Preliminary Arrangements) Act 2024 established the coalition government's Local Water Done Well framework and the preliminary arrangements for the new water services system; local councils are required to develop a Water Services Delivery Plan for their communities within a year. • The Resource Management (Freshwater and Other Matters) Amendment Bill – among other things, this amends the RMA to reduce the regulatory burden, including amendments to: – the National Policy Statement for Freshwater Management 2020;	Labour's three waters legislation mandated a form of co-governance and was regarded by the new coalition as undemocratic and inefficient. It is unclear what impact the Local Water Done Well framework will have on water quality and other environmental standards. The multiple legislative and regulatory changes regarding fresh water will slow current efforts to improve freshwater quality.

	Policy area	Main changes	Main concerns
		– the National Policy Statement for Indigenous Biodiversity 2023; – the Resource Management (National Environmental Standards for Freshwater) Regulations 2020; and – the Resource Management (Stock Exclusion) Regulations 2020. In particular, the bill excludes the hierarchy of obligations within the National Policy Statement for Freshwater Management 2020 (NPS-FM 2020), based on Te Mana o te Wai, from resource consent application and decision-making processes. • The government is committed to replacing the NPS-FM 2020 with a simpler, less complex and less demanding policy framework – in phase 2 of the RMA reform agenda. • The time frame for councils to finalise their freshwater plans was extended from 2024 to the end of 2027.	The proposed new NPS-FM will likely take years to develop and implement; assuming it is less restrictive than the current NPS, freshwater quality will be lower than otherwise in many regions for a lengthy period.
5	Climate change mitigation	• The government remains committed to the country's greenhouse gas emissions-reduction targets and first Nationally Determined Contribution (NDC) but is relying primarily on the emissions trading scheme (ETS) to reduce greenhouse gas emissions. Hence, many complementary policies have been repealed or weakened. A heavy reliance remains on forestry to sequester carbon, with a primary focus on net rather than gross emissions. Additionally, the government is proposing to create a regulatory framework for carbon capture, utilisation and storage that provides a level playing field for this technology. • The introduction of emissions pricing in the agricultural sector has been delayed from 2025 until 2030, and most of the funding for the relevant policy work has been cut. If the current emissions budgets and targets are to be met, non-agricultural emissions will need to be reduced even more (i.e., energy and transport). • The He Waka Eke Noa process, initiated by the previous government, has been disbanded. • Reviews of ETS settings are ongoing; in August 2024 the government announced that the number of emissions units available between 2025 and 2029 would be reduced from 45 million to 21 million. • Implementation of the first Emissions Reduction Plan (ERP), which took effect in 2022, is ongoing; a second ERP, to take effect from 2026, is under development, and is to be published before the end of 2024. As proposed, it involves confirming a direction that will miss New Zealand's emission reduction targets for 2035 and 2050 (e.g., 17 million tonnes over budget during 2031–35).	Most announced and proposed measures (excepting the reduction of ETS unit availability) will slow the pace of emissions reductions and make it harder to meet the country's emissions reductions targets and emissions budgets. This will also increase the costs of meeting the country's first NDC between 2021-30, assuming the country fulfils its international obligations. Most policies are not consistent with the advice and recommendations of He Pou a Rangi – the Climate Change Commission in November 2023 Some of the announced and proposed legislative changes will reduce the incentives for companies to take proper account of climate change risks in their decision-making Overall, the coalition's approach to mitigation involves a greater reliance on technologies that are not yet fully developed or tested

	Policy area	Main changes	Main concerns
		• The government has closed the $4.5 billion Climate Emergency Response Fund (CERF), established in 2021 (drawing partly on proceeds from the ETS); $2.4 billion has been diverted to tax cuts. Programmes cut or reduced include: – the Carbon Neutral Government programme (the government is considering removing the goal of a 20% reduction in public sector emissions by 2025); – Establishing Native Forests at Scale programme; – Hapori Māori programme to improve evidence available to Māori communities about climate change, adaptation and resilience. • A new Climate Strategy was announced in July 2024, containing five pillars but few details. The pillars are: – infrastructure is resilient and communities are well prepared; – credible markets support the climate transition; – clean energy is abundant and affordable; – world-leading climate innovation boosts the economy; and – nature-based solutions address climate change. • A separate review, independent of the Climate Change Commission, is being undertaken of methane science and targets for consistency with no additional warming from agricultural methane emissions. • The Just Transitions Programme in the Ministry of Business, Innovation and Employment has been discontinued. • The Regulatory Systems (Climate Change Response) Amendment Bill makes various changes to forestry-related provisions in the Climate Change Response Act 2002. • The government has announced that it will repeal s131(5) of the Companies Act 1993. Under this section of the Act, company directors are permitted to consider broader factors, including environmental, social and governance matters, when assessing what constitutes the best interests of the company; they are not bound only to pursue profit maximisation. • The government is considering removing the personal liability of company directors under the mandatory climate-related disclosures regime.	
6	Climate change adaptation	• The parliamentary inquiry into adaptation issues was transferred from the Environment Committee to the Finance and Expenditure Committee. The committee released its report on 1 October 2024. • Legislation on climate change adaptation is to be introduced in the first part of 2025, with possible additional legislative steps later in the decade.	Progress on adaptation has been, and remains, slow. While agreeing to support some new and improved defensive structures, the government remains unwilling to provide significant additional funding

	Policy area	Main changes	Main concerns
		• Budget 2024 allocated funding to support the rebuild and recovery of communities affected by Cyclone Gabrielle and the 2023 Auckland Anniversary weekend floods, and to improve emergency preparedness; funding of $20 million has been allocated to enhance Westport's flood protection. Against this, the multi-year National Resilience Plan, which was allocated $6 billion in May 2023 by the Labour government, has been closed with around $3 billion unspent, thus reducing funding for adaptation initiatives by around $400 million per annum. • The government is continuing the Labour government's policy to enable land information memoranda (LIMs) to be updated to include climate-related information in the natural hazard section. • National Direction for Natural Hazards is to be progressed, for implementation by mid-2025.	for planned relocation. Nor is it addressing the growing challenges of insurance affordability and retreat. In the absence of stronger planning controls, there is the potential for significant additional housing construction in flood-prone areas and those exposed to coastal erosion and inundation.
7	Offshore oil and gas exploration	• The 2018 ban on new offshore oil and gas exploration is being reversed, with the goal of stimulating the fossil energy sector, enhancing investor confidence, and securing the country's energy supply; regulatory processes for oil and gas projects will be eased. • The Crown Minerals Act will be amended, allowing for new petroleum permits in areas like Taranaki.	**The new policy is contrary to international efforts to reduce reliance on fossil fuels and decarbonise global and local energy systems.**
8	Housing, urban development, and infrastructure	• Kāinga Ora's (KO) role in building houses and developing communities in a way which has emphasised intensification of housing and providing tenants with public and active travel options to reduce emissions has been heavily cut. Community housing providers, whose government funding has been increased, are generally less mitigation-oriented. • The 'Going for Housing Growth' plan aims to free up land for development and remove 'unnecessary' planning barriers, improve infrastructure funding and financing, and provide incentives for communities and councils to support housing growth. Specific measures include: – requirements for Tier 1 and 2 councils to establish housing growth targets; – fewer restrictions on cities expanding at the urban fringe; – stronger provisions for intensification in the National Policy Statement for Urban Development (e.g., stronger density requirements around transport corridors); – abolition of minimum floor areas and balcony requirements; – making medium-density residential standards optional for councils.	KO's operating principles include protecting and enhancing the environment, and actively mitigating the impacts of climate change. KO's mitigation action plan is likely to be largely nullified. The Housing Growth plan, by requiring councils to 'live zone 30 years of development capacity' risks placing a high infrastructure burden on councils. Provisions for stronger density requirements make sense, but the rules requiring cities to be allowed to expand outwards at the urban fringe are unclear, as is the aspiration for an effective 'right to build' on city fringes, on the condition that the infrastructure costs of new development are covered. Such

	Policy area	Main changes	Main concerns
		• A new National Infrastructure Agency is being established to help facilitate private sector investment in infrastructure, partner with agencies and local government on projects involving private finance, and administer government infrastructure funds; the Infrastructure Commission will continue to provide independent advice on infrastructure matters. • There are proposals to reduce insulation standards for new buildings, thereby rolling back energy efficiency improvements to the Building Code that started in mid-2023	provisions may be difficult to enforce and may foster urban sprawl with higher transport emissions
9	Transport	• The broad policy direction is to: a) remove or reduce regulatory requirements for carbon dioxide emissions reductions; b) prioritise public investment in roads over public transport, rail and active transport modes; and c) invest heavily in a new generation of roads of national significance. • The Clean Car Discount was discontinued from 31 December 2023, with road user charges applied to light battery electric vehicles and hybrid EVs from 1 April 2024. • The Land Transport (Clean Vehicle Standard) Amendment Act 2024 weakened the required carbon dioxide standards for vehicle importers to meet. • The Government Policy Statement on Land Transport 2024–34 (June 2024) contains four priorities: economic growth and productivity; increased maintenance and resilience; safety; and value for money. Decarbonisation is no longer a priority, and climate change is not addressed other than to claim that the ETS is the relevant policy measure. • The National Land Transport Programme (September 2024) involves a major increase in public expenditure on new roads and road maintenance, a halving of funding for walking and cycling, from $910 million (2021–24) to $460 million (2024–27), and a 25% reduction in expenditure on rail. Investment in public transport infrastructure and services is being increased from around $5 billion to $6.4 billion, but will constitute a slightly smaller proportion of total public expenditure on land transport. • The government's Supercharging EV Infrastructure Work Programme aims to create a nationwide network of 10,000 public EV chargers by 2030, albeit subject to robust cost–benefit analysis (note: Norway had 22,000 public EV chargers in 2023; there were around 1,200 in New Zealand in early 2024); in April 2024 the government announced creating 25 new high-speed EV charging hubs on major routes between large urban centres.	Overall, the policy changes are expected to slow the process of decarbonization in the transport sector, worsen human health, and reduce public safety. With the abolition of the Discount, sales of new fully electric vehicles fell from over 30% of the market in late 2023 to well under 10% in 2024. The removal of the Discount will likely generate 1.4 million tonnes more carbon-dioxide' emissions over 2026-2030. The weakening of the standards is likely to add up to two million tonnes of carbon dioxide emissions between now and 2050. With the cancellation of the order for Cook Strait ferries there is a risk of a replacement ferry breaking the continuous rail link between the North and South Islands, leading to greater use of trucking, with higher emissions

	Policy area	Main changes	Main concerns
		• Other policy changes include the reversal of speed limit reductions in many areas, the repeal of the Auckland regional fuel tax on 30 June 2024, the cancellation of the Auckland Light Rail project, the cancellation of several new Cook Strait ferries and the related upgrade of port infrastructure in Wellington and Picton, and support for congestion charging.	
10	Energy	• A key government objective is to double renewable electricity supply by 2050. At the same time, the government has scrapped the proposed pumped hydro scheme at Lake Onslow on the grounds of excessive cost. • Under its Electrify NZ Plan, the government is supporting measures (e.g., via the Fast-Track Approvals Bill) to enable major renewable energy and transmission projects to be consented sooner and more efficiently; planned legislation will reduce consent and re-consenting processing time for most renewable energy consents, and extend the default lapse periods for renewable energy, transmission and local electricity lines consents from 5 years to 10 years. • The National Policy Statement for Renewable Electricity Generation and the National Policy Statement for Electricity Transmission will be amended to strengthen national direction for renewable electricity and transmission; other regulatory changes will set new standards for different types of energy generation and infrastructure. • Several of the programmes run by the Energy Efficiency and Conservation Authority have been cut, including the Government Investment in Decarbonising Industry Fund (GIDI) and the State Sector Decarbonisation Fund. • Legislation is being drafted to enable a new regulatory regime for offshore renewable energy from mid-2025, with the aim of opening a first feasibility permit round in late 2025. • To enhance energy security and affordability, various measures were announced in August 2024 to remove regulatory barriers to the construction of critically needed facilities to import liquefied natural gas (LNG), ease restrictions on electricity lines companies owning generation, ensure access for gentailers to hydro contingency, and improve electricity market regulation. • Budget 2024 reduced funding for, among other things, the Community Renewable Energy Fund and the Support for Energy Education in Communities Programme.	While there is every reason to expand renewables generation, this should be accompanied by reforms to the electricity market so that electricity is not overpriced at the retail level. The development of an LNG facility would be costly and wasteful: other means of meeting short-term electricity shortfalls, including rapid expansion of renewables and battery storage, are more economic and less environmentally damaging. Note that the government rejected proposals by Rewiring Aotearoa for rapid household electrification based primarily on rooftop solar and home battery backup, along with the electrification of heating, including heat pump water heaters.

	Policy area	Main changes	Main concerns
11	Agriculture, forestry and land use	• The main policy aims include 'getting Wellington out of farming and freeing up farmers to do what they do best', along with 'driving down costs' for farmers and foresters by simplifying regulations. • The coalition agreement between National and ACT included commitments to: – reverse the ban on live animal exports; – discontinue the implementation of new SNAs; – make farm environment plans more cost-effective for farmers; – enable farmers and landowners to offset sequestration against their on-farm emissions; – liberalise genetic engineering laws • The Resource Management (Freshwater and Other Matters) Amendment Bill, among other things: a) removes the exclusion of non-intensively grazed beef cattle and deer from waterbodies, and b) repeals the regulations in the National Environmental Standards for Freshwater regarding intensive winter grazing. • The Climate Change Response (Emissions Trading Scheme Agricultural Obligations) Amendment Bill removes agricultural activities from the ETS. • Other policy changes and reviews include: – pausing the roll-out of freshwater farm plans until system improvements are finalised; – discontinuing the proposed expansion of on-farm support services by the Ministry for Primary Industries; – changes to the National Policy Statement – Commercial Forestry regarding slash management standards, especially on low-risk land, with reduced discretion for councils to introduce more stringent or more lenient rules within their districts/regions; – tougher penalties for non-compliance with forest harvesting conditions; - more pragmatic rules for on-farm water storage - reforming rules on biotech - undertaking an independent review of the forestry ETS registry cost recovery scheme - undertaking a regulatory sector review of the approval process for new agricultural and horticultural products	Most of the announced and proposed policy changes affecting land use will reduce the stringency of the regulations which farmers are required to meet, resulting in worse environmental outcomes than would otherwise have been the case. This includes a greater risk of biodiversity losses

	Policy area	Main changes	Main concerns
12	Marine, aquaculture and fishing	• Notable policy changes include: – disbanding the Oceans Secretariat (established in 2021, with three departments involved); – withdrawal of the Kermadec Ocean Sanctuary Bill, which would have created a 620,000km^2 reserve. – A legislative change under the Resource Management (Extended Duration of Coastal Permits for Marine Farms) Amendment Bill extends for 20 years the duration of all coastal permits currently issued by the RMA authorising aquaculture activities. This affects hundreds of marine farms with consents that were due to expire over the next few years, and thus needed renewal. – The Hauraki Gulf/Tīkapa Moana Marine Protection Bill provides for new reserves and seafloor protection areas and acknowledged customary rights within seafloor protection areas and high protection areas.	Most of the announced and proposed policy changes will reduce environmental protection; the Hauraki Gulf/ Tīkapa Moana Marine Protection Bill is an exception.
13	Waste minimization and the circular economy	• The Plastics Innovation Fund has been disestablished and the third tranche of plastics phase-outs delayed. • Budget 2024 signalled that the waste disposal levy will increase by $5 per tonne a year for three years, amounting to a $15 per tonne increase by 2027, but with reduced resourcing for waste minimisation policy and non-levy funded operational work programmes and the termination of the Circular Economy and Bioeconomy Strategy. • The Waste Minimisation (Waste Disposal Levy) Amendment Act broadens the range of activities for which the central government can use its share of levy funding to include: – activities that reduce environmental harm or increase environmental benefits (e.g., restoring freshwater catchments); – remediating contaminated sites; – waste-related emergency spending; – funding to enable the Ministry for the Environment to undertake its functions and duties, and exercise its powers, in relation to waste management and minimisation and hazardous substances. No changes have been made to how local authorities can use their share of levy funding.	Overall, the policy changes reverse policies implemented on the advice from various expert bodies. The amendment to the Waste Minimisation Act removes the strict hypothecation of the national waste disposal levy, which previously could only be spent on waste-related projects. Henceforth, levy funds can be spent not only on core waste policy development work but also on environmental projects unrelated to waste: the cleaning up of contaminated sites that can include former landfills, but also sites that are contaminated for any other reason, e.g., industrial or extractive activities. The changes will reduce funding for critical upgrades and innovation to waste and resource recovery infrastructure.
14	Conservation and biodiversity	• Jobs for Nature funding concluded in June 2024 unless an extension was provided to utilise existing funds over a longer time period.	New Zealand faces a biodiversity crisis, with the ongoing degradation and loss of vital

	Policy area	Main changes	Main concerns
		• Total appropriations for the Department of Conservation are expected to fall from $917 million in 2023–24 to $705 million in 2027–28, with around $120 million of this reduction due to the discontinuation of Jobs for Nature. • Key funding reductions in Budget 2024 included cuts to the Kermadec Ocean Sanctuary programme, the contaminated sites programme, regulatory services and strategic partnerships. • Note that a large proportion of the Department of Conservation's funding is for managing the country's natural heritage and biodiversity, including maintaining, restoring and protecting ecosystems, habitats and species across public conservation lands and waters (over 30% of the nation's area). As it happens, the reduction in the budget for addressing contaminated sites on public land was followed by (but not the cause of) the Ohinemuri River turning orange in August 2024 due to earlier mining operations in the catchment. • The first-principles review of the Wildlife Act 1953 has been scaled back and biodiversity issues deprioritised.	habitats and many native species threatened by mammalian introduced predators. A high proportion of reptile, amphibian, bird, bat and freshwater fish species are either facing extinction or at risk of being threatened with extinction. Prior to the expenditure cuts in 2024, the Department of Conservation was struggling to fulfil its legislative mandate to protect the country's biodiversity. The reduced expenditure will likely increase the risk of further species extinctions.
15	Environmental research, evidence, and information	• Major reductions in operational and capital funding (e.g. exceeding $250 million annually) for research and development over the medium-term, much of it related to environmental research. Examples include: - Discontinuation of the National Science Challenges with no replacement funding - 3D Coastal Mapping scaled back from 85% to 40% of the country's coastline - Funding for Accelerating Development of Agriculture Greenhouse Gas Emissions Mitigation programme reduced by 10% - Reduced funding for the Native Afforestation Programme of research - Separate funding terminated for developing Mātauranga Māori-based approaches to Accelerating Development of Agriculture Greenhouse Gas Emissions Mitigation Programme	The largescale, medium-term reduction in public expenditure on research and development will result in a significant loss of research capacity and capability, probably with enduring impacts on the quality and availability of important environmental data and analysis
16	Other issues	• The Smokefree Environments and Regulated Products Amendment Bill, among other things: - removes requirements for retailers of smoked tobacco products to apply to, and be approved by, the Director-General of Health before selling smoked tobacco products - removes the limit on the number of retailers that can sell	The repeal of the previous landmark smokefree legislation will almost certainly result in a higher rate of consumption of tobacco products than otherwise and thus impair human health

	Policy area	Main changes	Main concerns
		smoked tobacco products in New Zealand - removes the requirement for smoked tobacco products to meet a low nicotine content limit of 0.8 mg/g - retains a minimum sales age of 18 years for smoked tobacco products rather than providing for a smokefree generation under which sales to anyone born on or after 1 January 2009 would have been prohibited - removes provisions relating to te Tiriti o Waitangi associated with the matters above.	and increase health care costs
17	Public expenditure on conservation, environmental protection, and related matters	• Substantial expenditure reductions were announced in Budget 2024 affecting the Department of Conservation, the Ministry for the Environment, the Ministry for Primary Industries, Te Puni Koriri, the Environmental Protection Authority, the Energy Efficiency and Conservation Authority, the Climate Change Commission, and the Climate Change Chief Executives Board.[7]	The key central government departments and agencies responsible for environmental matters will have reduced capacity and capability over the coming years

Sources: This table draws on a wide range of government and on-government sources.

Simon Upton, Geoff Simmons,
Nora Lanari and Matt Paterson

Going with the Grain of the Landscape rethinking our approach to environmental policy

Abstract

There are doubts about whether the current approach to regulating the impacts of land use in rural Aotearoa is making a difference. This article starts by outlining four challenges policymakers face when designing policies to protect the environment while balancing social, cultural and economic interests. We then discuss some of the barriers landowners encounter when contemplating land use change to address environmental degradation. Finally, we sketch out an adaptive approach to rethinking how we do environmental policy, including by devolving some decision making to communities, providing better environmental information, being explicit about the costs and trade-offs, and reforming the New Zealand Emissions Trading Scheme.

Keywords land use change, water quality, biodiversity, catchment groups, agriculture, forestry

Simon Upton is the Parliamentary Commissioner for the Environment Te Kaitiaki Taiao a Te Whare Pāremata. **Geoff Simmons** is chief economist, Parliamentary Commissioner for the Environment Te Kaitiaki Taiao a Te Whare Pāremata. **Nora Lanari** is an advisor, research and analysis, Parliamentary Commissioner for the Environment Te Kaitiaki Taiao a Te Whare Pāremata. **Matt Paterson** is chief advisor, policy and programmes, Parliamentary Commissioner for the Environment Te Kaitiaki Taiao a Te Whare Pāremata.

Concerns about the degraded state of the rural environment have increased over the last 15 years, alongside the growth of an increasingly complex web of regulatory interventions and subsidies by successive governments designed to improve environmental outcomes. The evidence we have about the current state of our waterways, biodiversity and emissions reductions suggests that policy initiatives over the last 30 years have largely failed to shift the dial in the right direction. This conclusion has emerged over six years of research into land use change by the Parliamentary Commissioner for the Environment (PCE), which is, in turn, based on substantial investigations by previous commissioners.

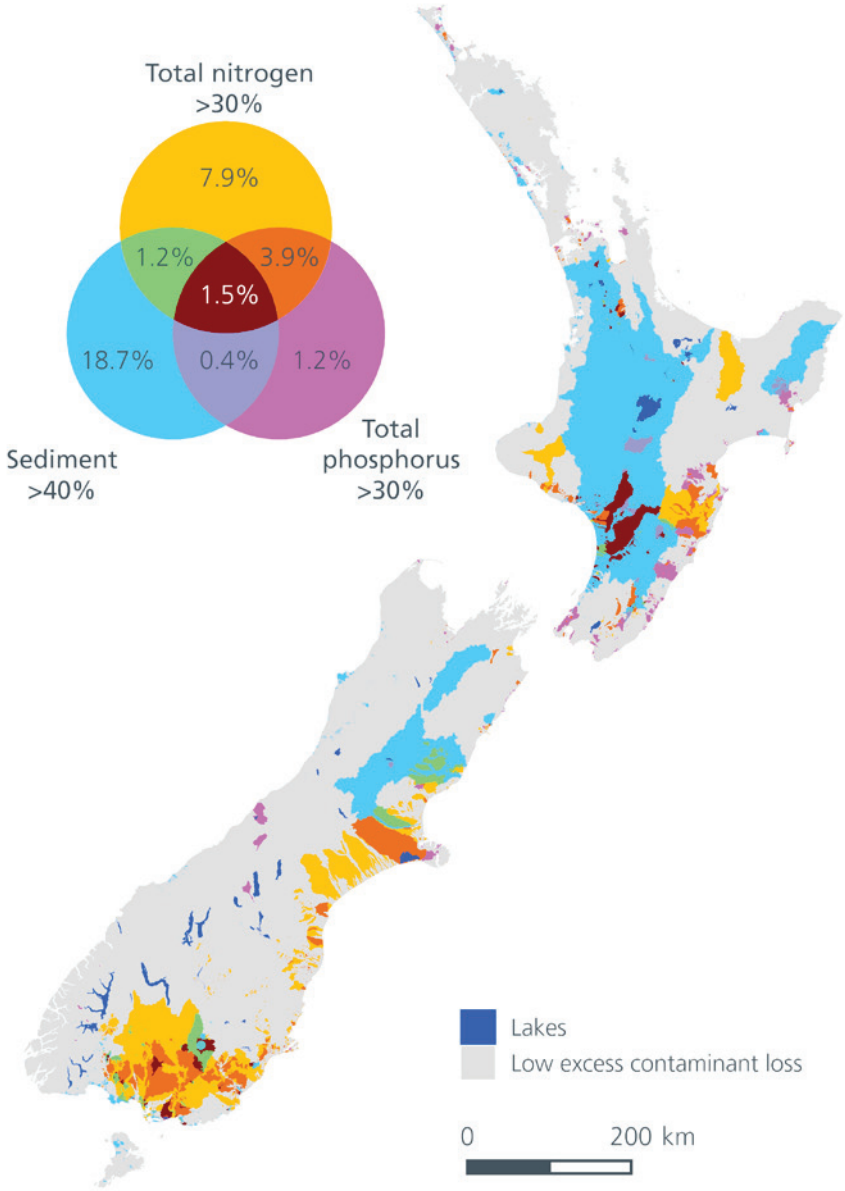
This research culminated in a major report entitled *Going with the Grain: changing land uses to fit a changing landscape* (Parliamentary Commissioner for the Environment, 2024b), which was released earlier this year. Alongside this report, case studies were published which

detailed how current, proposed and alternative approaches to environmental policy could affect land use in two catchments, the Mataura in Murihiku Southland and the Wairoa in Te Tai Tokerau Northland (Parliamentary Commissioner for the Environment, 2024a). This article aims to expand on some of the key findings and recommendations from *Going with the Grain* that may be of particular interest to policymakers. The full report, a summary and the case studies are available on the PCE website.

It is important to emphasise at this point that *Going with the Grain* is not a list of definitive solutions to complex issues. Instead, it suggests that we open ourselves to an experimental approach going forward, one that draws on the knowledge of land users, mana whenua and rural communities, combines high-quality, openly accessible environmental information, and explores alternative tactics in catchments facing the greatest challenges.

The report starts from the premise that policy aims to balance the social, cultural and economic advantages derived from our natural resources, while simultaneously ensuring their protection for future generations. Research indicates that policymakers encounter four primary challenges in pursuing this complex objective.

Figure 1: Catchments with high excess contaminants that will likely require land use change



Source: adapted from McDowell et al., 2021 and Snelder et al., 2023

Four challenges facing policymakers

The magnitude of environmental degradation in some parts of the country means that change in land use – not just change in management practices – is needed

Work from the Our Land and Water National Science Challenge suggests that in roughly one third of catchments, environmental bottom lines for one of three key contaminants in fresh water (nitrogen, phosphorus and sediment) are being exceeded beyond levels that can be mitigated by changes to management practice. In 1.5% of catchments, the exceedances apply to all three contaminants (see Figure 1) (McDowell et al., 2021; Snelder et al., 2023).

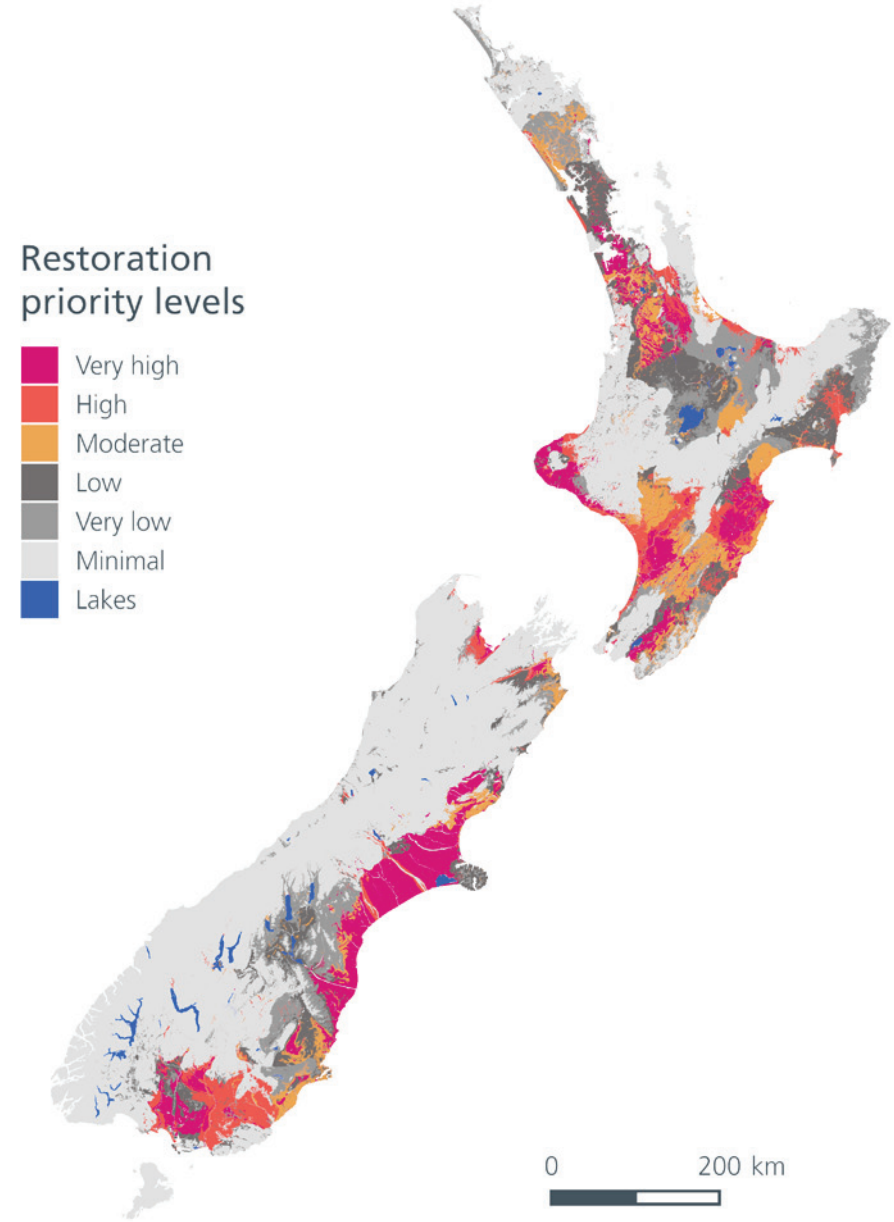
Furthermore, 75% of indigenous species, including birds, freshwater fish, reptiles and bats, are classified as threatened or at risk of being threatened, and just under 1,800 plant species have been introduced and naturalised since human arrival, further threatening endemic ecosystems (Brandt et al., 2021; Statistics New Zealand, 2023). Large areas require biodiversity restoration (see Figure 2). On top of that, urgent greenhouse gas emissions reductions are needed.

This catalogue of ongoing environmental degradation is a direct result of the way we have used the land in the past and the way we continue to use it. Present day pressures are added to the legacy of past land use choices. In short, further changes are needed if we are to halt any further decline. This will mean embracing a spectrum of land use changes, ranging from applying mitigation techniques to existing land uses to wholesale land use change in some places.

The changing climate will increasingly drive land use change as landowners adapt to shifting temperatures and seasonal patterns

While we have some idea of the impact average warming trends will have on land use, one of the big unknowns is the impact of extreme weather events. In terms of average trends, Aotearoa is getting warmer, leading to more frequent droughts and fewer frosts. This temperature shift may facilitate the spread of new and existing pests and diseases. While warming could create new land use opportunities and potentially boost primary productivity by

Figure 2: Areas in New Zealand requiring urgent biodiversity restoration



Source: adapted from Eco-index[1]

up to 10%, it might also encourage more intensive land use (Rutledge et al., 2017; Our Land and Water, 2023).

Extreme weather events are expected to intensify, with more severe droughts, floods and fires, possibly occurring more often. The unpredictability of these events may force landowners to confront new challenges while recovering from previous ones. Additionally, erratic weather patterns could affect production and yield, leading to volatile commodity prices both here and overseas.

In some areas, extreme events may render certain land uses unfeasible, while new possibilities may emerge elsewhere. Land values will likely be affected, sometimes significantly. Currently, it is uncertain who will bear the financial burden of these changes, but without government intervention, it will likely fall on landowners.

The sheer scale and complexity of environmental regulation either in existence or under development

This challenge is worth elaborating, given its relevance to readers of this publication. The regulation of environmental impacts from land and water use is inherently complex, mirroring the intricacy of our diverse landscapes. However, over the past two decades this complexity has been exacerbated by a fragmented regulatory approach. Multiple policy initiatives directly affecting land and water use decisions have converged, seemingly all at once, from the perspective of farmers. This simultaneous influx of policies is a significant source of uncertainty for landowners. There is ambiguity around the scale and timelines of required changes, and lack of clarity around the interplay between various regulations. This uncertainty poses a fundamental question: why would farmers invest in land use changes when the regulatory 'goalposts' are constantly shifting?

One key issue is that we have struggled to find an effective balance between national and local regulation. This situation can be traced back to the early implementation of the Resource Management Act 1991 (RMA), when, to better address the uniqueness of our regions, environmental management was devolved to regional and local government and communities. The RMA allowed for national direction, but policymakers chose to largely avoid this set of tools for over a decade after the passage of the Act.

The principle of environmental 'subsidiarity' was good in theory, but local government was not provided with sufficient practical frameworks, financial mechanisms, or the tools needed to properly implement its new mandates. As a result, we had 16 regional entities working in isolation, struggling to solve the same complex issues from scratch.

Additionally, local decision making has been at risk of being captured by vested interests, be that industry or farming wanting looser environmental standards, or residents using claims of amenity to protect their views and property values.

The resulting decline in rural environmental quality led to increasingly insistent calls for firmer national direction and policy. From the late 2000s through to 2023 both National and Labour-led governments promulgated a plethora of national policy statements and national environmental standards alongside multiple amendments to the RMA. The New Zealand Emissions Trading Scheme (NZ ETS) also entered the frame.

Today, it all adds up to a complicated web of top-down policies. All are well-intentioned. But some are duplicative and some even contradictory, with little thought having been given to how they

interact with one another. A tangle of funding mechanisms (see Figure 3) has also sprung up, designed to help implement the myriad policies but in some cases simply causing further confusion for land users considering land use change.

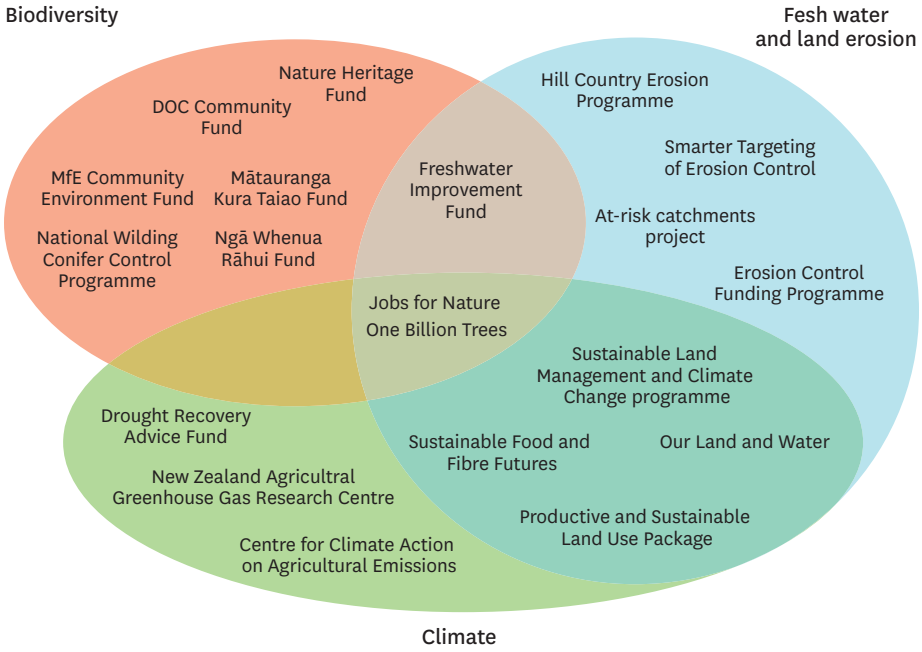
Implementing regulation effectively can take a decade before a system beds down, but the rapidly changing regulatory landscape has meant that some national direction has never been given time to work. A recent example is the National Policy Statement for Freshwater Management, which was introduced in 2011 and then amended in 2014, 2017 and 2020, and is again under review.

Long-term regulatory success requires buy-in from stakeholders and needs to be practical to implement. Key groups, mainly farmers and businesses, responsible for acting to improve environmental outcomes have viewed the increase in national direction and regulation as onerous, complicated and impractical. There is some truth to that view.

Regional councils have struggled to implement national policy statements provided by central government. Ratepayer money that has been spent on plan changes and the associated deluge of reviews and court cases would probably have been better spent on actual solutions. In part, this situation can also be traced back to regional councils' lack of capacity and risk aversion, but policies must be held up to scrutiny. If regional councils are struggling to successfully implement regulation, then the practicality and effectiveness of this regulation needs to be questioned. Upon receiving national guidance, regional councils would be well within their rights to ask central government to provide several things, including:

- consistency across different policy domains (or at least consistent use of definitions);
- funding to help implement the regulations;
- guidance on how to prioritise the actions derived from different national direction across different domains and within the limited resources of regional councils;
- legislation that enables the sorts of regulation and enforcement required to implement national direction;
- guidance on how to resolve iwi rights and interests over fresh water to expedite land use change affordably;
- where it is unaffordable, finance to compensate landowners for land use change (or at least clarity from central government that they are comfortable bankrupting landowners and asking regional councils to do that on their behalf);
- the necessary information, monitoring and modelling base to inform all of the above.

Figure 3: Examples of past and present funding programmes related to climate change, fresh water and land erosion as well as biodiversity



Source: Parliamentary Commissioner for the Environment, 2024a, p.24

In particular, central government has not provided tools or funding sufficient to shift the dial in environmentally constrained catchments. Land use change will be required in these catchments to achieve our environmental goals. Some of this might be done profitably; although even then it is not easy for landowners to make such large and possibly risky shifts. Where land use change cannot be undertaken profitably, central government has not provided regional councils with any tools to facilitate land use change where it is needed, and none are on the horizon.

The focus on farm-level or individual-level responsibility has led to solutions based on property boundaries

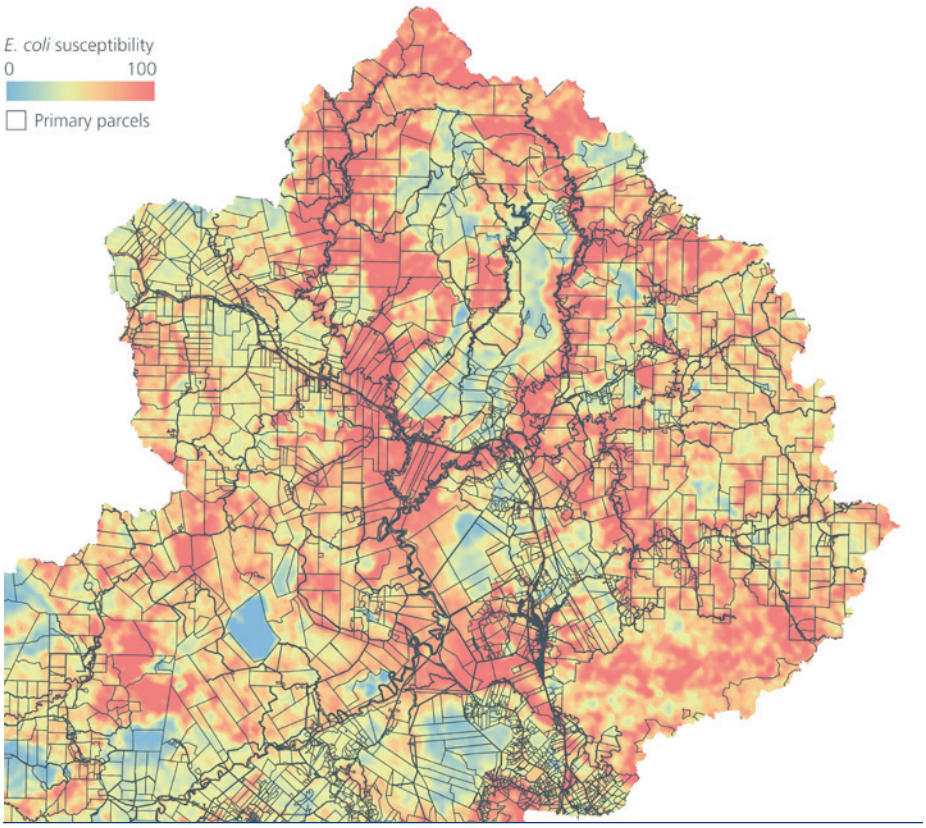
The RMA has further constrained environmental management by placing land use decisions largely in the hands of landowners. This approach ignores the fact that many of the environmental impacts of land use do not respect property boundaries.

For example, fresh water on the surface or underground runs through multiple properties. It can also be difficult to pinpoint the origin of and responsibility for environmental problems within a catchment. A property-based management approach also makes it difficult to incentivise land use change when the benefits from such change rarely map neatly onto cadastral boundaries.

Figure 4 demonstrates the mismatch between property boundaries in a part of the Northern Wairoa catchment in Northland and the land's susceptibility to *E. coli* contamination. This figure shows clearly that without cooperation between neighbours and others sharing the same catchment, individuals can have only a limited impact on improving freshwater quality. The same is true for biodiversity and many other environmental attributes.

This important insight has big implications for how policymakers think about implementing regulation and market-based mechanisms. New Zealand's predominant approach of *ex ante* RMA consents for activities with bespoke conditions does not deal well with either diffuse pollution or cumulative effects.

Figure 4: Susceptibility to *E. coli* pollution in the Northern Wairoa catchment, Northland, shown in red, overlayed with cadastral boundaries



Source: susceptibility map adapted from Rissmann et al., 2022; primary parcels retrieved from LINZ [2]

Top-down national direction was an attempt to standardise approaches and set limits. But those are difficult to apportion and attribute to individual consents and landowners.

Measurability and attribution are essential to conform to the concept of 'innocent until proven guilty'. Enforcement on regulatory grounds relies on detection strategies, abatement mechanisms and prosecutions. For all three, the regulator must be able to objectively measure the impact on the environment and attribute that impact to the actions of a particular landowner. This is why the most effective regulations tend to concern things that are easily observable. Prosecutions of landowners, for example, tend to relate to things like dumping cowshed effluent directly into a stream, not fencing a riverbank, or redirecting a stream without consent. Waikato Regional Council estimates that about 7% of the farms in the region are not doing these basics day-to-day. These 300 farms (out of 3,666) are the focus of the council's resources dedicated to investigations and prosecutions (Piddock, 2024).[3] The resources required mean that only the worst and most obvious offenders are investigated. As such, it only effectively deals with the laggards, rather than 'moving the middle'. Successfully prosecuting large numbers of people for diffuse, non-point sources of contamination is nigh on impossible.

The nature of environmental issues, like freshwater quality, can also make it nearly impossible to attribute causes to individual land parcels. *Going with the Grain* argues that it is only possible to understand most of the environmental impacts of land use at a catchment scale. However, the deficiencies in our monitoring network mean we cannot always know where the issues *are* within a catchment, let alone know if particular actions are making a difference.

Water quality is probably the best example of this. The Overseer model attempts to estimate nitrogen losses with several land uses. But, as set out in a PCE report from 2018, Overseer should never have been used for regulatory purposes (Parliamentary Commissioner for the Environment, 2018). The Overseer model stops at the farm boundary and only models a thin sliver of the land. Yet environmental impacts occur in distant waterbodies. Further, environmental impacts depend just as much on the susceptibility of different land parcels as they do on land use. Hence, the reality is far more complex than a model conceives.

Incidentally, the same issues apply to attempts to create market-based mechanisms (whether taxes or tradable permits) to incentivise landowners to change their behaviour to reduce environmental impacts. Long before we start talking about what is politically palatable, we should be talking about what impacts are measurable and attributable to individual property owners. Too often there have been proposals for market-based mechanisms that do not meet these conditions. Nitrogen trading is a good example: despite nitrogen being a pervasive issue, trading rights has only been successfully implemented in Taupō, and that was with considerable public subsidy.

One way to effectively regulate diffuse, non-point source contaminants using this paradigm is through input regulation (or input controls). This approach is used – to an extent – by the European Union.[4] An example of an input control would be a limit on the number of stock units allowed in a particular catchment. Input controls are very unpopular with farmers and have been studiously avoided by New Zealand regulators. There are good reasons for this. By regulating inputs rather than outcomes, it can make it impossible for farmers to find innovative ways to reduce their environmental impacts.

Going with the Grain recommends that input controls should be retained within the toolkit of regulators as a last resort. They would be very unsatisfactory to all concerned, but they remain one of the few effective tools within the existing paradigm. Having the threat of input controls hanging over people's heads should be enough to focus the mind on the need to find a better way forward. Again, some ideas on a different way forward are set out in *Going with the Grain*. Farmers have to be prepared to work together collaboratively on environmental improvement through organisations like catchment groups.

The second issue is that the current approach to regulation only ever moves the

laggards (see Gunningham, 2012; Gunningham and Sinclair, 2017). The traditional process of enforcing regulation relies on the legal process. This can be slow and expensive, especially if challenged or it goes to court, making it impossible to apply to all farmers. It can only target the most egregious breaches. In this sense, regulation aims to speed up the Darwinian approach to economics by nipping at the heels of the slowest in the herd of landowners.

We think the aim of good environmental policy should be to 'move the middle' – to encourage the slow starters to catch up with the best of landowners (who tend to be both profitable and with a lower environmental footprint) (see Greenhalgh and Morgan, 2021). If we want to meet our environmental goals, we simply cannot afford to move at the pace of the slowest operator.

There are other regulatory approaches that might make more sense here. For some complex occupations (such as in the health sector) we license people to operate. This creates high barriers to entry, and then lets them get on with the job at hand. They are only prosecuted for the most egregious and obvious breaches of good practice. This could be an approach used for farming, though, like input controls, it is unlikely to be welcomed by farmers themselves. Risk-based regulation – such as farm plans – is also promising in theory, but a lot depends on the quality of implementation.

Some barriers to land use change

Before moving on to alternative approaches to land use change, it is worth briefly discussing examples of specific regulations that are acting as barriers to transitions.

Water rights

Securing freshwater resources is crucial for identifying profitable and environmentally friendly land use alternatives. However, water rights are typically bound to specific land parcels and not easily transferable. This arrangement grants advantages to the status quo and perpetuates current, frequently inefficient usage patterns. *Going with the Grain* recommends that the government tackle this – which means in turn addressing the long-parked issue of resolving Māori rights and interests over fresh water – something the Land and Water Forum recommended back in the days of the Key government (Land and Water Forum, 2012).

> To change the current trajectory of rural environmental degradation, first there must be a broad acknowledge-ment by policymakers that our current approach to regulating the environmental impacts of land use is not working.

Zoning regulations

Zoning regulations that create 'permitted uses' or that prohibit alternative activities or subdivision of rural land can be a barrier to land use change and also deny landowners the means to release capital that could be used for environmental improvement. For example, mitigation activities that necessitate earthworks or alteration to a waterbody often require resource consent. While many councils have categorised mitigation techniques as permitted activities, this varies across regions, and landowners also often face a long list of conditions that can be difficult to meet.

Adopting innovative land use practices can be challenging when landowners bear the responsibility of proving reduced environmental impact, especially if the criteria are overly stringent or expensive to meet. Subdivision is one contentious example of a potentially environmentally beneficial land use change that faces significant regulatory obstacles. Local government regulations frequently prevent landowners from subdividing and selling property for lifestyle blocks or other uses deemed non-productive. These rules were initially implemented due to farmers' concerns about lifestyle properties encroaching on agricultural land. More recently, urban planners and developers have embraced these restrictions to discourage low-density development, as exemplified by Waikato Regional Council's Future Proof Strategy (Future Proof Te Tau Tītoki, 2024). However, allowing subdivisions could provide landowners with the financial means to enhance environmental practices or transition to alternative land uses.

New Zealand Emissions Trading Scheme

The greatest current driver of land use change in New Zealand is the NZ ETS, which is both incentivising certain uses (pine forestry) and inhibiting others. Viewed through the lens of reducing net emissions, the NZ ETS has been successful. However, from the perspective of gross emissions reductions, it has been a failure. And from the perspective of land use, it is becoming a massive liability.

Carbon emissions stay in the atmosphere effectively forever, so any forest we plant as an offset must also remain forever. Can we make that promise as a country, given the risks of fire, disease, natural disasters and a changing climate? As emissions continue, we must plant more and more forests. We are altering rural communities and removing choices from future generations about how to use that land to delay the inevitable fact that we need to reduce gross emissions (see also Parliamentary Commissioner for the Environment, 2019). As a nation, are we happy to collectively carry that liability? The time for delay is long past. Technologies now exist that a rising carbon price should be able to incentivise.

Instead, money is pouring into our landscapes from fossil fuel users, changing them forever without consideration of what land uses best suit the landscape in

the long term. As pine sequesters carbon more quickly than other tree types, there is no consideration of the other environmental issues generated by planting a monoculture. We have seen the results of this already in Tairāwhiti and we can expect disasters like this to happen more frequently with climate change.

A way forward?

To change the current trajectory of rural environmental degradation, first there must be a broad acknowledgement by policymakers that our current approach to regulating the environmental impacts of land use is not working. Neither devolution nor centralisation have worked. How then do we find an appropriate middle ground that is practical, and where both communities prosper and the state of the environment improves? A new approach is needed to stop the policy pendulum swinging wildly as it is currently doing.

Going with the Grain advocates that we tackle environmental pressures imposed by rural land uses in a joined-up way – in what is often described as a landscape approach – and focus on catchments or sub-catchments as the practical unit at which land users need to be engaged.

There is limited time, money and expertise to do this well, so regulators should focus on the catchments or sub-catchments where the pressures are the greatest and where the biggest changes are likely to be required. We need to make progress where we are most at risk, rather than advance incrementally everywhere.

To have a chance of making progress in the more challenging catchments we need to do four things.

Bring decision making closer to the people who will have to make significant management changes or even change land uses

Central and regional levels of government have to agree on *what* the desired environmental goals and outcomes are, but *how* those are met should be led and driven by landowners, local communities and mana whenua. We are inspired by Ostrom's (1990) design principles on how to manage common-pool resources at a catchment or sub-catchment level. It makes sense to offer incentives only to those willing to work collectively, and focus regulatory attention on those unwilling to take part in collaborative processes. Tackling our environmental deficit cannot be optional but it does not all have to be driven by a central rule book. The *Going with the Grain* report does not go into detail about the structure and governance of catchment groups. This would require some careful thinking about where regulation ends and where collaboration begins; about power inequalities in small groups, as well as the risk of capture; and how to share costs.

Currently, New Zealand's environmental data, monitored within the environmental reporting framework, is at best fragmented – lacking geographical coverage or consistent time series – or at worst not even accessible.

Everyone – regulators and regulated alike – needs cheap, easy access to high-quality environmental information

This is an investment that needs to be made by the government as a freely available public good; it cannot be made by individuals acting alone. Farmers and regional councils should be able to access the same information free of charge.

Currently, New Zealand's environmental data, monitored within the environmental reporting framework, is at best fragmented – lacking geographical coverage or consistent time series – or at worst not even accessible. This data and information are often only available behind a prohibitive paywall, presented in a complex format that cannot easily be used, or have simply been lost. Indeed, the funding of New Zealand's environmental monitoring system is inexcusably low and has been static for many years. There is also a wealth of non-government environmental data held by landowners and companies that is inaccessible. Without such information, regulators and land users are constrained in their ability to make decisions about land use change.

Water regulation provides a good case in point. For a country that depends on its bioeconomy for its comparative advantage, it is startling that we do not have consistent statistics on water use available at a national level. Nor is our water monitoring network sufficient to confidently detect whether thresholds are reached for key water quality measures, including visual clarity, and phosphorus, nitrogen and *E. coli* concentrations. To do that, a recent Our Land and Water paper estimated that investment in monitoring would have to increase by four to five times current levels (McDowell et al., 2024). Our water quality monitoring network is not up to monitoring the effectiveness of on-farm actions to reduce environmental impacts.

Until now, regulation has often been progressed where, based on the information available, it is impossible to accurately answer any of the following questions:

- Where does land use result in environmental problems?
- What are the sources of those problems?
- Which options might best improve those environmental problems?
- What are the social and economic impacts of those options?
- How can we monitor the impacts of any actions taken?

This lack of information should have been repeatedly raised with ministers at each stage of the development of the many different national policy statements. The ongoing information deficit is symptomatic of a broader problem in the New Zealand public service: a lack of monitoring and

evaluation to inform continuous improvement. Instead, we have a penchant for doing something half-heartedly and when we realise it has not worked, we chuck it out and start afresh.

High-quality, accessible data would allow catchment groups (and individual farmers) to model the impact of different actions and be able to easily identify areas where land use change will yield higher than average benefits. In return, landowners and catchment groups need to be prepared to share the details of their practices and resource use with councils.

Monitoring and auditing have to generate information that can tell us, collectively, if we are making a difference at the catchment level, rather than just become an inventory of farm-level box ticking. Farm plans could be a useful part of the toolkit under the proposed approach. However, as currently conceived, farm plans seem to require voluminous amounts of information that is costly to assemble and certify and may not really make a difference. Farm plans need high-quality information that can be linked up through something like catchment groups.

We must be upfront about the potential cost of making changes and who is going to have to pay

We need a coherent and equitable basis for deciding who will pay to make those changes. If no one will, the environment will continue to carry those costs. What costs should lie with landowners? When should public subsidy be available to facilitate land use change, and how should that public subsidy be funded?

Socialising the costs of land use change is always the easiest route politically, but it can be eye-wateringly expensive. It cost $80 million of public money to purchase a 20% reduction in the flow of nutrients into Lake Taupō. The lake's iconic recreational status provided an urban constituency for such largesse. It is unlikely to be repeated in anonymous reaches of rural Aotearoa devoid of tourist attractions. Other financing solutions need to be explored – *Going with the Grain* provides some that are worthy of further investigation, including integrated grant and loan schemes, demonstration grants for first movers, and market-based mechanisms like an intensity-adjusted land tax.

We must refocus climate policy and harness it for positive land use change

Finally, to repeat the call that the Parliamentary Commissioner for the Environment has made consistently for some years, the government is now exploring limiting the rights of different land types to enter the NZ ETS. This will be an administratively complex and arbitrary way of addressing the issue, instead of dealing with the underlying cause. In the spirit of 'one tool for one outcome', it would work a lot better if the NZ ETS were purely focused on reducing gross emissions. The country could then explore other tools to encourage afforestation in a way that is sensitive and appropriate to the landscape. Options could include grants to plant forests on erosion-prone land, and creating an NZ ETS for biogenic methane that allows for offsets with commercial forestry. An NZ ETS built around biogenic methane would put all land uses on a level playing field with respect to greenhouse gas emissions.

An adaptive approach

It is important to emphasise that environmental problems resulting from land use are an adaptive challenge. They are a set of complex and ambiguous problems that require a fundamental shift in mindset, values and behaviours. They are not siloed problems that can be addressed by technical solutions and expertise alone. They require iterative approaches tailored to the needs of different environments. As policymakers, we currently lack the toolkit to diagnose and deal with such adaptive challenges. The closest we have come in New Zealand is the process of developing the emissions reduction plans (Parliamentary Commssioner for the Environment, 2023, 2024c). Given the difficulties encountered in the first and second iterations of this process, we still have a long way to go in developing the institutional frameworks to deal with adaptive challenges.

Collectively, as policymakers, we also need to admit that we do not have all the answers and open ourselves to an experimental approach. *Going with the Grain* only sketches the contours of what such an approach could look like. Much more in-depth thinking and experimenting needs to go into designing the flexible and responsive governance arrangements that can underpin this way forward.

We do not have to completely reinvent the wheel. There are many lessons we can draw on – yes, from overseas, but also from right here in Aotearoa New Zealand. Te ao Māori and mātauranga offer great insights into holistic environmental management and governance. The process of the Land and Water Forum provides a recent experience and model of how to bring opposing world views and contradictory perspectives together. We have a foundation; now we need to build on it.

1 Data for map sourced from https://eco-index.nz/ and licensed for reuse under CC BY 4.0.

2 Sourced from the LINZ Data Service and licensed for reuse under CC BY 4.0.

3 That said, unusually, dairy farming is a permitted activity in Waikato.

4 Water quality in the European Union is governed by the Water Framework Directive (WFD), which is largely based on principles, procedures and processes, with few 'hard' measures. The exception to this is where the WFD refers to the Nitrate Directive (1991), which regulates nitrate pollution of groundwater and surface waters from agricultural use. The Nitrate Directive limits the timing of and conditions when nitrogen fertiliser (often livestock manure) can be applied in so-called nitrate-vulnerable zones (OECD, 2017). While these thresholds and standards can be understood as input control, research suggests that they are too loose to achieve the ecological ambitions of the WFD (Wiering, Kirschke and Akif, 2023).

References

Brandt, A.J. et al. (2021) 'Naturalised plants transform the composition and function of the New Zealand flora', *Biological Invasions*, 23 (2), pp.351–66, https://doi.org/10.1007/s10530-020-02393-4

Future Proof Te Tau Tītoki (2024) *Future Proof Strategy: future development strategy update 2024–2054*, Hamilton: Future Proof Te Tau Tītoki, https://futureproof.org.nz/the-strategy/#readtheFPS

Greenhalgh, S. and F. Morgan (2021) *Moving the Middle: sustainable society and policy*, Auckland, https://www.landcareresearch.co.nz/discover-our-research/environment/sustainable-society-and-policy/moving-the-middle/

Gunningham, N. (2012) 'Regulatory reform and reflexive regulation: beyond command and control', in E. Brousseau, T. Dedeurwaerdere

and B. Siebenhüner (eds), *Reflexive Governance for Global Public Goods*, Cambridge, Mass: MIT Press

Gunningham, N. and D. Sinclair (2017) *Leaders and Laggards: next-generation environmental regulation*, Routledge, https://doi.org/10.4324/9781351282000

Land and Water Forum (2012) *Third Report of the Land and Water Forum: managing water quality and allocating water*, Wellington: Land and Water Forum

McDowell, R.W. et al. (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), pp.390–410, https://doi.org/10.1080/00288233.2020.1844763

McDowell, R.W., A. Noble, M. Kittridge, O. Ausseil, C. Discher and D.P. Hamilton (2024) 'Monitoring to detect changes in water quality to meet policy objectives', *Scientific Reports*, 14 (1), https://doi.org/10.1038/s41598-024-52512-7

Ostrom, E. (1990) *Governing the Commons: the evolution of institutions for collective action*, Cambridge: Cambridge University Press

OECD (2017) 'Emerging policy instruments for the control of diffuse source water pollution', in *Diffuse Pollution, Degraded Waters: emerging policy solutions*, Paris: OECD

Our Land and Water (2023) *Land Use Opportunities: Whitiwhiti Ora*, Our Land and Water, https://ourlandandwater.nz/project/land-use-opportunities/

Parliamentary Commissioner for the Environment (2018) *Overseer and Regulatory Oversight: models, uncertainty and cleaning up our waterways*, Wellington: Parliamentary Commissioner for the Environment

Parliamentary Commissioner for the Environment (2019) *Farms, Forests and Fossil Fuels: the next great landscape transformation?*, Wellington: Parliamentary Commissioner for the Environment

Parliamentary Commissioner for the Environment (2023) *How Ministers and Officials Developed the First Emissions Reduction Plan – and how to do it better next time*, Wellington: Parliamentary Commissioner for the Environment

Parliamentary Commissioner for the Environment (2024a) *Exploring Land Use Change under Different Policy Settings in Two Case Study Catchments*, Wellington: Parliamentary Commissioner for the Environment

Parliamentary Commissioner for the Environment (2024b) *Going with the Grain: changing land uses to fit a changing landscape*, Wellington: Parliamentary Commissioner for the Environment

Parliamentary Commissioner for the Environment (2024c) 'Submission on the second Emissions Reduction Plan discussion document', Wellington: Parliamentary Commissioner for the Environment

Piddock, G. (2024) '7% of Waikato farms inspected significantly non-compliant', *Farmers Weekly*, 14 August, https://www.farmersweekly.co.nz/news/seven-percent-of-waikato-farms-significantly-non-compliant/

Rissmann, C., L. Pearson, B. Robson and S. Rahimi (2022) *Exploring a High-resolution Landscape Approach for Managing Water Quality and Soil Greenhouse Gases*, Land and Water Science report 2022/03, Invercargill: Land and Water Science Ltd

Rutledge, D.T. et al. (2017) *Identifying Feedbacks, Understanding Cumulative Impacts and Recognising Limits: a national integrated assessment. Synthesis report RA3, Climate Changes, Impacts and Implications for New Zealand to 2100*, MBIE contract C01X122

Snelder, T., H. Smith, D. Plew and C. Fraser (2023) *Nitrogen, Phosphorus, Sediment and Escherichia coli in New Zealand's Aquatic Receiving Environments: comparison of current state to national bottom lines*, Lyttelton: LWP Ltd, https://ourlandandwater.nz/wp-content/uploads/2023/11/CurrentStateComparedToNBL_Final25Nov2023_v2.pdf

Statistics New Zealand (2023) 'Extinction threat to indigenous species', https://www.stats.govt.nz/indicators/extinction-threat-to-indigenous-species/

Wiering, M., S. Kirschke and N.U. Akif (2023) 'Addressing diffuse water pollution from agriculture: do governance structures matter for the nature of measures taken?', *Journal of Environmental Management*, 332, https://doi.org/10.1016/j.jenvman.2023.117329

Ben France-Hudson

Property Rights versus Environment?

A critique of the coalition government's approach to the reform of the Resource Management Act

Abstract

The coalition government in New Zealand intends to repeal the Resource Management Act 1991 and replace it with new legislation 'based on the enjoyment of private property rights, while ensuring good environmental outcomes'. This article considers the real possibility that the government is intending to place a theory of absolute private property rights at the centre of the new system. It argues that any policy that assumes private property rights should confer absolute rights on owners is a mischaracterisation of those rights and the law of private property. Making policy on a myth of absolute property rights is unlikely to result in good environmental outcomes.

Keywords private property rights, environmental management, Resource Management Act, environmental harm, nuisance

Ben France-Hudson is an associate professor in the Faculty of Law at the University of Otago.

The coalition government has stated that it intends to take a staged approach to the reform of the resource management system, ultimately replacing the Resource Management Act 1991 (RMA) with new legislation which will be based on 'the enjoyment of property rights, while ensuring good environmental outcomes' (Cabinet Economic Policy Committee, 2024). To date, limited details have been provided and it is unclear what perceived problems are driving this policy option. I speculate that, given the RMA is already a private property-focused statute, the idea of property rights that will guide the reforms is likely to be based on a theory of 'absolute' rights that allows individuals to use their property in any way they wish, providing only that they do not cause harm to others (ACT New Zealand, 2022). I argue that this approach would be unlikely to ensure good environmental outcomes and does not have any sound theoretical basis in property law. There is already extensive evidence that unconstrained use of private property rights can contribute to environmental problems, so it is unlikely that an absolute private property rights approach, on its own, can provide an appropriate framework. Potential limits

involving the law of nuisance would not be sufficient to deal with the complex collective actions problems that modern land use gives rise to. Moreover, and perhaps most importantly, the idea of absolute property is a myth. The theory underpinning absolute property rights has never existed in the Western legal tradition New Zealand's law is based on. The reality is that private property is a social institution that confers both rights and obligations. Careful reading of ancient texts and modern judgments makes this clear. This is important because it suggests that it is possible to both harness the great benefits private property can incentivise while also regulating that use for desired goals, such as good environmental outcomes. There are risks in legislating to create an idea of absolute property. Rather, we need a considered debate about how to balance the inherent conflicts that accompany resource use and environmental management. Private property rights are a critical part of this discussion, but mythical interpretations of its function have no place in that debate.

There is a tendency to view the RMA through the lens of administrative law and focus on how decisions are made, who decisions are made by and how individuals and the public can be involved.

What is happening?

Cabinet has agreed to develop 'proposals for legislation to replace the RMA that has the enjoyment of property rights as a guiding principle' (Cabinet Economic Policy Committee, 2024). The minister responsible for RMA reform has elaborated slightly on this in public statements, noting that there are two broad objectives to the work programme. The first is to make it easier to get things done by unlocking development capacity for housing and business growth. The second objective comprises a list of goals, including safeguarding the environment and human health, adapting to climate change and upholding Treaty of Waitangi settlements (Bishop, 2024; Bishop and Court, 2024a). This suggests that the two competing objectives that sit at the heart of the RMA's focus on sustainable development (use and development in the public interest while ensuring good environmental outcomes) are likely to remain drivers of policy development. The most recent comments by ministers, providing slightly more detail about the proposed system, tend to support this view, confirming that 'we need a resource management system that protects the environment not by resisting growth but by setting clear rules so growth occurs within limits' (Bishop and Court, 2024b). What is being presented as new, and yet to be clearly articulated, is the focus on absolute private property rights as the guiding principle to resolve this trade-off. Ministers intend to 'allow people to do more on their property more easily, so long as it doesn't harm others' (Bishop and Court, 2024a).

Private property rights are important because the minister responsible for RMA reform considers that the way the RMA purpose statement (RMA, s5) has been interpreted operates to put protection of the environment above development and other land use. He states that this has established a presumption against land use and requires property owners to prove their case for development or to change activities on their properties; this is contrary to the desire of the original framers of the RMA, who wished to return to the common law position that a use of land is allowed unless there is a rule controlling that use (Bishop, 2024). The minister appears to be saying that the current RMA has not achieved this aim, so it is necessary to refocus the legislation using absolute private property rights as a guide.

What is interesting is that the minister's comments are not specific. Presumably, he is referring to recent judicial decisions that have rejected the 'overall broad judgement' approach which allowed decision makers to stand back at the end of the process and consider whether a proposed use of resources represented sustainable management taking into account all relevant considerations (*King Salmon*, 2014; *Port Otago Ltd*, 2023). The courts have recently concluded that this approach did not give full recognition to the fact that protection of the environment is an element of the sustainable management principle at the heart of the RMA (*Port Otago Ltd* at [81]) and that it is legitimate for planning instruments to prioritise protection over other elements in some circumstances. They have also confirmed that there is a hierarchical scheme of planning documents and that the 'overall broad judgement' approach, which could function to soften environmental protections, should not be used to read down otherwise directive policies (*King Salmon*).

However, the minister does not say this. Rather, he seems to be appealing to a general dissatisfaction with the way the RMA operates. We are left to guess at precisely what he means. What is doubly confusing is that the RMA does preserve the common law position that landowners may undertake activities on their land, unless that activity is controlled by a lawful constraint. This policy is reflected in section 9, which states that any use of land that does not contravene the provisions of a national environmental standard, a regional rule or a district rule is allowed. Section 10 also allows for many 'existing uses' of land to continue indefinitely, even if the rules around that piece of land change. Other sections allow for some types of consent to continue indefinitely (see ss123(a) and (b)). It is difficult to seriously contend that the RMA does not contain a presumption of use.

Of course, the minister is making political statements. Presumably, he is uncomfortable saying that the courts were wrong to endorse the use of environmental bottom lines. Few people would be willing to say that environmental protection should never (or for that matter always) be subordinated to use. Rather, the rhetorical move is to claim that the RMA is broken and appeal to private property rights, as if the RMA were not already intimately concerned with property rights.

There is a tendency to view the RMA through the lens of administrative law and focus on how decisions are made, who decisions are made by and how individuals and the public can be involved. However, this obscures the reality that the RMA is fundamentally a piece of property law in much the same way as the Land Act 1948, the Property Law Act 2007 or the Land Transfer Act 2017. Indeed, its purpose is focused entirely on managing the use, development and protection of natural and physical resources. Property rights are often described as a 'bundle' of legal rights or relations, including, at a minimum, the 'liberal triad' of possession, use and disposition:

> An owner of land characteristically has the privilege of using the land, the right that others not come on it or use it without his permission, the power to alienate it completely through gift or sale ... (Waldron, 2012)

The RMA controls the use of land and resources, almost all of which will be owned by someone. Private property rights are an unavoidable aspect of its purpose. However, Waldron's use of the word 'privilege' here is interesting as it immediately suggests there might be some limits to property rights. The privilege to use may come with some corresponding duties. The RMA's starting presumption of use, protections extended to existing uses and purpose of enabling use and development while ensuing preservation and protection of the environment reflect the (contested) idea that people should be able to do what they want with what they own and that the primary purpose of private property is to give individuals the free choice about how to live life (Babie, 2010b), while also reflecting the need to look after the environment. The position adopted by the RMA gives rise to a tension between the fact that, although Parliament has set a starting presumption of use, this must be balanced by legal restrictions, reached through the planning process. This reflects the reality that modern society relies on a complex approach to resource use that must attempt to balance an individual's rights against environmental imperatives, the rights of future generations and of the community (Barton, 2003). This tension is made explicit by the inclusion of section 17, which states that individuals have a duty to avoid, remedy or mitigate any adverse effects on the environment that arise out of activities they undertake. Recent debates about agricultural emissions or freshwater quality appear to have been driven by a perception that the rules have gone, or could go, too far.

It follows that the minister's position that there is a presumption against land use is a matter of opinion, and as far as problem definitions go it is lacking in any robust evidence. It is clearly shared by some (Wilkinson, 2020). Others disagree, making the point that, contrary to the intention at the time the RMA was passed that the Act would usher in an era of sustainability and increased protection of the environment, this goal has not been achieved (Whiteside, 2022). As noted by the Randerson Review:

> While a major improvement on the previous system, the RMA has not sufficiently protected the natural environment. The RMA had the ambitious purpose of sustainable management of natural and physical resources. However, the Act suffered from a lack of clarity about how it should be applied … Lack of clear environmental limits has made management of cumulate environmental effects particularly challenging. (Resource Management Review Panel, 2020, p.16)

'Absolute' private property rights

Clearly, there are differing views as to how and why the RMA is broken (if indeed it is). The government considers that private property rights can guide the way to improvement. This raises the question of what a new regime based on absolute private property rights as a guiding principle might look like.

The National–ACT coalition agreement appears to be the driving force behind the government's goal of replacing the RMA with new laws …

The government has yet to give much indication as to its thinking, so any answer must be speculative. The National–ACT coalition agreement appears to be the driving force behind the government's goal of replacing the RMA with new laws (New Zealand National Party and ACT, 2023). Statements made by ACT, particularly pre-election material published by the party, provide some further insights. Simon Court, ACT party MP and parliamentary under-secretary to the minister for infrastructure and the minister responsible for RMA reform, has recently said that:

> Putting property rights at the centre of resource management means ditching rules that invite every Tom, Dick, and Harry to vexatiously object to peaceful use and development of private property. Rules should only restrict activity with material spillover effects on other people's enjoyment of their own property, or on the property rights of the wider natural environment that sustains us. (Bishop and Court, 2024a)

This reinforces earlier statements he made during the third reading of the now repealed Natural and Built Environments Act 2023 that his party believes it is time for a 'radical reset'. To achieve this, ACT would:

> go back to the principles of common law and private property rights. So the presumption should be not that we have to beg for permission from a planning tribunal or from a judge, but instead we have the right to use our land as long as we don't affect our neighbours or discharge to the commons. (Court, 2023)

... the modern environmental movement owes part of its genesis to the observation that our 'Abrahamic' concept of land ownership, conferring rights but no obligations, is a key source of environmental harm ...

This point is elaborated on in ACT's resource management policy document, 'ACT's solutions for building New Zealand and conserving nature' (ACT New Zealand, 2022). This document contains several criticisms of the RMA and sets out ACT's proposed approach to resource management. It notes the challenges of managing peoples' impacts on each other's property, and the common resources such as the air, rivers, oceans and forests. In relation to private property, it notes that the 'principle of resource management should be to preserve the enjoyment of property, with common property accounted for by representative groups such as local regional councils'. This would shift the presumption about how property is used, as '[a]t present the presumption is that people can do what Councils permit'.

In contrast, a property rights approach is said to allow people to do anything that does not harm others' enjoyment of property. This would 'dramatically reduce the range of people who have an interest in someone else's use of their own property'. Environmental protection is to be governed by a specific Act, which would allow people do to whatever they like on their land, unless the Act prohibits it. To the extent that there may be problems, the solution is seen as lying with the 'tried and tested' common law, with reliance placed on the tort of nuisance, which allows 'neighbours to sue their neighbours where their peaceable enjoyment of the land is put in jeopardy by their neighbours' actions, for land pollution-related claims'. The overall remedy for any environmental problem is seen to be either compensation, or a contribution to various clean-up funds.

Of course, ACT is not the first group to advocate for private property as the primary (or only) tool of environmental management. It is well illustrated in the work of the free market environmentalists (Anderson and Leal, 1991, 2001) and others (Libecap, 2009). Free market environmentalists claim that positive environmental results can be achieved if private property rights in natural resources are well-defined and protected by the normal liability rules (i.e., the law of nuisance). They claim that the objective operation of the market should ensure that all negative environmental externalities are internalised, alleviating the necessity of outside intervention (Rose, 1999; Godden, 2010). It can be seen as part of the broader trend beginning in the 1970s among legal and economic scholars to advocate the use of market mechanisms to deal with any manner of different social problems (Rieser, 1999).

Central to this thinking is the belief that 'strong property rights and private contract are the best means to increase overall welfare, with the sole justification for "political intervention" being to "correct market failures"' (Grewal and Purdy, 2014). Property rights are seen as the best mechanism by which autonomy can be protected, allowing individuals to satisfy their individual preferences and in so doing allowing humans to flourish under conditions of scarcity (Williams, 1998; Epstein, 2011). This leverages the happy story that is told about private property, where humans are lazy and disinclined to work, but private property motivates them to do so by rewarding the careful management, development and conservation of resources. Efficient owners can reap the rewards, while lazy or poor owners suffer the costs. By harnessing self-interest, private property also facilitates trade as individuals seek to profit by selling their surplus and more of what others want (Rose, 1995). In turn, this feeds the idea that if some property is good, more property must be better (Rose, 1998b). Importantly, to have this happy effect, it is said, by some, that private property should be an absolute right, limited only by the rights of others and in the public interest in a very limited sense (normally restricted to the duty not to harm other individuals) (Foster and Bonilla, 2011). Applied to the environment, the theory is that if all resources are privately owned with strong property rights, the socially optimal level of environmental use should be reached through the complete specification of private property rights and privately ordered bargaining (Connor and Dovers, 2002).

The problem of property

If this is what the government is anticipating doing, then it is important to note that this theory has never accurately reflected how private property rights operate in law or society. In addition, many disagree that this theory will allow sufficient protection of resources, instead arguing that private property rights can be a key driver of environmental harms (Burdon, 2010). It follows that any move towards enshrining a theory of absolute property rights in law may do more harm than good.

Indeed, the modern environmental movement owes part of its genesis to the observation that our 'Abrahamic' concept of land ownership, conferring rights but no

obligations, is a key source of environmental harm (Leopold, 1949). This is an idea that has often been repeated by a diverse range of people (Taylor and Grinlinton, 2011). The essential point is that, in the absence of regulation, the self-interest at the heart of this idea of property encourages the use of resources by the owner, who is not required to give much, or any, thought to the needs of others, enabling the sorts of behaviour that can lead to extensive environmental harm (Singer, 2000).

This has several consequences. It can lead to a belief that there is a distinction between the people who live on the land and the land itself, which has no intrinsic worth beyond its ability to be exploited. This allows for use in ways that are not ecologically sound and which do not consider the interconnected whole or interests of future generations. Private property rights act as a shield to any kind of accountability (Freyfogle, 2011).

It also makes it very difficult for ecological interests to be catered for, as private property rights find it difficult to account for values that have long-term implications or that are hard to measure (Butler, 2000). Private property rights' bias tends towards consumptive and private uses rather than uses that would benefit ecosystems and the community more generally. Investment and use tend towards certainty and stability over other considerations and struggle to account for environmental systems, which are in a constant state of flux (ibid.).

It also obscures the fact that cumulative, albeit small, actions can have profound environmental consequences. Climate change is perhaps the best example of this. It is the billions of often very small choices made by individuals every day (for example, to take their car or to walk) that are partly responsible for the build-up of greenhouse gases in the atmosphere (Babie, 2010a). What is often not recognised is that these are fundamentally choices about property. The impact of each individual choice can be hard to accurately identify, but in each case it is the ability to make those choices that is cumulatively extremely harmful.

The focus on short-term exploitation for profit also disregards the ability of resources to keep producing over the long term (Grinlinton, 2011). Overall, private property rights can, unless placed within some limits, drive a general neglect of the rights of others, the environment and the public interest.

There are many practical examples. The widespread use of toxic products by industrial landowners is partly driven by weak regulation leaving landowners free to choose to use those products regardless of the effect on others, or the environment generally (Burdon, 2010). As noted, the cumulative everyday choices of individuals as to how we go about our lives are a root cause of climate change, albeit that choices are confined to the options given to us by corporations (Babie, 2010a). New Zealand already has major environmental problems because of dairy farming. In the absence of regulations such as the agricultural intensification rules (the National Environmental Standards for Freshwater 2020 Regulations), there would be nothing to stop us overindulging in our love of cows, leading to a real-world tragedy of the commons,[1] with resulting impacts on nitrogen leaching, methane gas emission, and over-demand for surface and ground water (Baskaran, Cullen and Colombo, 2009).

The response might be that if only we had stronger property rights and an absolute presumption of use, landowners would be incentivised to only carry as many cows as the land can support. However, this ignores the fact that many of the consequences are not borne by the landowner; rather, they are borne by others and the environment itself. The costs are externalised, leading to price signals being distorted and failing to reflect the true price of environmental use (Palmer, 2015).

Critically, it can be very difficult to manage these 'spillover' effects. Indeed, this is something the RMA tries, with varying levels of success, to do. In addition, it is not always easy, or possible, to stop a certain activity and expect things to return to the way they were before the activity started. There is now a large body of work assessing when various 'tipping points' might be reached, particularly in relation to climate change (Global Tipping Points, n.d.). Tipping points are thresholds along a non-linear pattern of system change that, once crossed, move the system to a new state that can be very difficult, or impossible, to reverse (Ruhl and Kundis Craig, 2021). There are grave concerns that we may be approaching tipping points in relation to many important climate-supporting systems, including 'the Western Antarctic ice sheet, glaciers, tropical coral reefs, the Amazon rain forest and the Arctic boreal forest' (ibid.). What might make it all worse is that once reached, a tipping point may set off a cascade of other changes in other natural systems. This work considers the global climatic system, but the point is of general application and operates at smaller scales. It is an important observation, as it undermines the assumption that any 'spillover' damage to the environment can be simply put right or that monetary compensation will be an adequate alternative.

> [Private Nuisance] does not provide a remedy for personal injury to the landowner... Neither does nuisance provide a direct route to controlling harm to air or water.

Private property on its own will not solve any of these problems; indeed, it exacerbates many of them. It is difficult to see why we would trust it with the solutions (Babie, 2010b).

A practical problem

Of course, the government may consider that the 'tried and true' private law of nuisance will provide sufficient limits in a system where the enjoyment of property

rights is a guiding principle. However, private actions in the law of nuisance are hopelessly inadequate to deal with the level of challenge.

Private nuisance protects against the unreasonable interference with a person's right to the use or enjoyment of an interest in land (Atkin, 2019). In other words, it protects against harm to the land itself or to the use or enjoyment of the land by its owner. It does not provide a remedy for personal injury to the landowner ... Neither does nuisance provide a direct route to controlling harm to air or water. This is because any damage to those resources would also need to affect a particular landowner's enjoyment of their land.

The remedy for nuisance is usually an injunction to stop the behaviour and/or damages to compensate for past damage. There are many practical problems. For example, if a defendant's use of the land is considered to be reasonable, then it will not cause a nuisance (there are some activities people just have to put up with). Plaintiffs would also have to overcome barriers in relation to standing, identifying the right defendant, causation and fault, and a range of defences. Of these, the fact that many activities that may give rise to harm are authorised by statute (for example, an activity that has been granted consent under any form of resource management regulation) may be a major barrier to a successful claim (Emmanouil, Popa and Kallies, 2021). Similar problems arise with claims in 'public nuisance', which is a related tort that can provide a remedy where there has been an injury to the public as a whole caused by an interference with a public right. Attempts to use public nuisance are currently being litigated in New Zealand in an attempt to address some of the harms caused by climate change (Bullock, 2022; *Smith v Fonterra*, 2024).

There are also problems with remedies. Court proceedings (and appeals) can be much more costly than the impact of the nuisance itself and take a very long time. An injunction might stop the offending behaviour as between the two relevant parties, but there would be nothing to stop any other neighbour behaving in the same way, except the threat of litigation (a risk they may be prepared to take given the contested nature of each case). Conversely, the impact on one particular property might be quite small, but over a number of properties might be cumulatively quite large. Addressing this would involve all affected landowners taking action, either separately or in concert.

> ... there has never been a period in the Western legal tradition on which New Zealand's law is based when private property rights have been absolute and individuals have been able to do whatever they want with what they own ...

Compensation for damage also requires the cost to the plaintiff to be quantified, which may be difficult. As damage is assessed as the diminution in the value of the plaintiff's land (Atkin, 2019), if the damage occurs in a rising market for land values it may be that the plaintiff has suffered no loss at all, even if the environmental quality of their land has decreased. A group of neighbours may all be undertaking very similar activities and may be quite happy to continue with the status quo, leading to a situation where there is no one with sufficient standing to bring a claim and therefore nothing to stop the harm to the environment from continuing.

Finally, individuals or companies often become insolvent, or simply walk away, meaning that damages cannot be recovered in any event. Overall, nuisance is unlikely to be of much use in stopping harm, nor in restraining land use to ensure good environmental outcomes.

Absolute private property is a myth anyway

Beyond the reality that in some cases private property can already be a root cause of environmental problems, there are further issues with the government's potential policy position if it relies on an assertion that property rights are, or should be, absolute. In particular, there has never been a period in the Western legal tradition on which New Zealand's law is based when private property rights have been absolute and individuals have been able to do whatever they want with what they own (France-Hudson, 2017; Grinlinton, 2023).

A careful reading of famous texts such as Magna Carta, or Blackstone's 16th-century statement that the right of property is a 'sole and despotic dominion' (Blackstone, 1765), reveal extensive qualifications that go beyond the 'normal liability rules' (Rose, 1998a; Babie, 2016a; Grinlinton, 2023). The rights in Magna Carta are subject to 'the law of the land'. Blackstone immediately casts his opening (metaphorical) statement into doubt by querying various aspects of the modes of owning property operating at that time (Rose, 1998a). Blackstone also places his statement within the context that property rights are subject to the law of the land and form part of the residue from time to time that 'is not required by the law of society to be sacrificed to the public convenience' (Grinlinton, 2023, citing Blackstone, 1765). Magna Carta was accompanied by a now almost forgotten 'indispensable' partner, the Forest Charter, which contained a commitment to community and obligations that balanced Magna Carta's commitment to individual rights (Babie, 2016a). Time and again the key sources repeat the point that the use of property can appropriately be controlled by law and obligations that are inherent in private property for the common good.

Of course, property rights are critically important to our culture and our legal system.

There is no doubt that they do provide many of the incentives outlined above. They are partly responsible for our affluence and quality of life (Grinlinton, 2023). However, what becomes apparent on any reading of either ancient texts or modern judgments is that the Western tradition of property is plural and that private property, while always important, is an inherently social institution serving social purposes and has always been subject to other considerations, not simply the desires of the individuals who own it (France-Hudson, 2017; Grinlinton, 2023). As recently noted by the High Court (albeit in the context of gun control):

> The difficulty from The Kiwi Party's perspective in the present case, is that while it has identified values, it does not assert that those values are 'higher law' values, and it is difficult to see that it could properly do so. First, it asserts a right to private property. The right to private property has never been absolute. (*Kiwi Party v Attorney General*, 2019)

This was supported by the Court of Appeal:

> We briefly repeat that Parliament is able to pass whatever legislation it considers appropriate to control the possession, ownership and use of firearms in New Zealand. There is no 'property right' that overrides the supremacy of Parliament. (*Kiwi Party v Attorney General*, 2020)

Many people hold on tight to the myth of absolute private property rights, simple and seductive as it is. However, in many respects the debate has moved on, and one of the contemporary issues in property law is how to better acknowledge the obligations of property (Grinlinton, 2023). Two options have been floated. The first is to look to the common law and judicial method to make the inherent obligations in property more clearly articulated. In this context, the increased recognition in the courts of tikanga Māori as an important source of law may become very important. The other is to look to external measures, such as legislation and regulation (ibid.). However, these options are not mutually exclusive.

The absolute theory of private property rights is accompanied by a view that any interference with those rights by government is illegitimate. This aspect of the story suggests that private property rights act as the boundary between the private and the public and it is almost always bad for government to interfere by attempting to control property's use (Reich, 1964). However, there is a strong line of thought that considers that regulations do not impose potentially illegitimate restrictions on private property owners; rather, they are simply the modern form in which the restrictions inherent in private property are crystallised. As the modern democratic state has evolved, decision making has moved from the judicial to the legislative sphere. In contrast to the early days of planning law, which included the judicial development of the restrictive covenant and private contract, Parliament has stepped in (as it has in almost all other areas of daily life) to provide much more carefully thought-out policy and regulation. Regulation, then, is the way in which the law now mediates the relationships at the heart of private property rights and should, and does, reflect its underlying social function and the choice of different and conflicting priorities:

> because it operates within a network of social relationships that form a community, every system of private property is inherently limited by moral imperatives, duties, and obligations, imposed and enforced by law, so as not only to allow the holder of private property to choose personal preferences, but also to allow the state to prevent outcomes inimical to the legitimate interests of others. (Babie, 2016b)

It follows that restrictions imposed on how individuals can use what they own are not external and illegitimate; rather, they are simply articulating the limits that are already inherent in the private property rights themselves. These restrictions (and the corresponding rights) will change over time.

This observation is critical beyond the relatively narrow confines of environmental management. Regulation is a fundamental part of how we organise our society. Any attempt to control that based on a mythical idea of property should be of concern. Unsuccessful attempts have already been made to pass a Regulatory Standards Bill that would do exactly this. That attempt suggested that legislation should not 'diminish a person's ... rights to own, use and dispose of property, except as is necessary to provide for … [a] right of another person' (Regulatory Standards Bill 2021, cl 6(a)). Any regulation that impairs private property rights would not be possible without consent unless it is in the public interest and coupled with full compensation (Regulatory Standards Bill 2021, cl 6(c)(i) and (ii)). The coalition agreement between National and ACT includes a commitment to 'Legislate to improve the quality of regulation, by passing the Regulatory Standards Act as soon as practicable' (New Zealand National Party and ACT, 2023). However, the points made in this article regarding the inherent limits within private property rights apply equally in this context.

> Legislating for a scheme based on a guiding principle of absolute private property rights that does not exist is unlikely to achieve any degree of consensus either.

Conclusion

Parliament is sovereign. If the government can command a majority, it can legislate to create an environmental management system with an absolute idea of private

property rights at its heart. However, it should pause before doing so. Property rights are powerful and the choices that we make about them fundamentally shape who can access and use resources, and through that use shape the land and environment itself (Graham and Shoemaker, 2022). There can be a marked distinction between the cultural discourse about property and the legal reality. The myth that private property rights are, or should be, absolute can resonate strongly, particularly with those who feel their property choices are being unduly limited. There are, however, very real risks of legislating to bring that myth into reality. If the desire is to balance use with ensuring good environmental outcomes, an absolute right of private property will be unsuccessful. Without recognition of limits, the free use of private property can and does result in very negative environmental outcomes. Once damaged, environments do not necessary heal, and the cumulative effect of many smaller actions can tip a system into irreversible change. The 'tried and true' common law is hopelessly outmatched when it comes to dealing with the scale of land use undertaken today and the immensity of the environmental challenges we are facing.

One of the reasons that the Natural and Built Environments Act 2023 was repealed so soon after its enactment was a lack of political consensus. Legislating for a scheme based on a guiding principle of absolute private property rights that does not exist is unlikely to achieve any degree of consensus either. Recognition of the fact that private property rights on their own hold no answers and that regulation is a key part of ensuring a balance between rights and obligations inherent in owning private property could short-cut this aspect of the debate and get us closer to the solutions we need.

The apparent consensus is that the RMA is broken beyond mending. If true, the answers do not lie in attempting to bring to life a halcyon myth in aid of popular feeling. Rather, it is time for an unrushed, apolitical discussion that acknowledges that the problems that environmental law must solve are dynamic and contested:

> socio-political conflict, polycentricity, interdisciplinarity and scientific uncertainty are not just interesting features of environmental problems to note in passing but are part of the operational reality of the subject. (Fisher, 2013)

Resolving these problems may require us to look at some of our core constitutional and social values from a different perspective to develop responsive institutions that can 'help foster the rule of law in this unusual legal context' (Warnock, 2020). Private property rights properly have an important part in this discussion, but they should not overwhelm it, nor be held out as holding answers they do not provide.

1 It should be noted that Hardin posed two solutions to the tragedy: private property or 'mutual coercion mutally agreed upon' (i.e., regulation). He was agnositc as to which solution should be adopted (Hardin, 1968).

Acknowledgements: I would like to thank Jonathan Boston and the two reviewers for their very helpful comments.

References

ACT New Zealand (2022) 'ACT's solutions for building New Zealand and conserving nature', https://www.act.org.nz/acts-solutions-for-building-new-zealand-and-conserving-nature

Anderson, T.L. and D.R. Leal (1991) *Free Market Environmentalism*, Boulder: Westview Press

Anderson, T.L. and D.R. Leal (2001) *Free Market Environmentalism: revised edition*, New York: Palgrave

Atkin, B. (2019) 'Nuisance', in S. Todd (ed.), *Todd on Torts*, Wellington: Thomson Reuters

Babie, P. (2010a) 'Idea, sovereignty, eco-colonialism and the future: four reflections on private property and climate change', *Griffith Law Review*, 19 (3) pp.527–66

Babie, P. (2010b) 'Private property: the solution or the source of the problem', *Amsterdam Law Forum*, 2 (2), pp.23–32

Babie, P. (2016a) 'Magna Carta and the Forest Charter: two stories of property', *North Carolina Law Review*, 94, pp.1432–74

Babie, P. (2016b) 'Three tales of property, or one?', *Griffith Law Review*, 25 (4), pp.600–16

Barton, B. (2003) 'The legitimacy of regulation', *New Zealand Universities Law Review*, 20 (3), pp.364–401

Baskaran, R., R. Cullen and S. Colombo (2009) 'Estimating values of environmental impacts of dairy farming in New Zealand', *New Zealand Journal of Agricultural Research*, 52 (4), pp.377–89

Bishop, C. (2024) 'Speech to the New Zealand Planning Institute', 22 March 2024, https://www.beehive.govt.nz/speech/speech-new-zealand-planning-institute

Bishop, C. and S. Court (2024a) 'Replacement for the Resource Management Act takes shape' and factsheet, 'Replacing the Resource Management Act', media release, 20 September, https://www.beehive.govt.nz/release/replacement-resource-management-act-takes-shape

Bishop, C. and S. Court (2024b) 'Speech on replacing the Resource Management Act', speech to the Resource Management Lawyers Association Conference, New Plymouth, 20 September, https://www.beehive.govt.nz/speech/speech-replacing-resource-management-act

Blackstone, W. (1765–1769) *Commentaries on the Laws of England Book I*

Bullock, D. (2022) 'Public nuisance and climate change: the common law's solutions to the plaintiff, defendant and causation problems', *Modern Law Review*, 85 (5), p.1136–67

Burdon, P. (2010) 'What is good land use? From rights to relationship', *Melbourne University Law Review*, 34, pp.708–35

Butler, L.L. (2000) 'The pathology of property norms: living within nature's boundaries', *Southern California Law Review*, 73, pp.927–1015

Cabinet Economic Policy Committee (2024) 'Work programme for reforming the resource management system', 6 March, ECO-24-MIN-0022

Connor, R. and S. Dovers (2002) 'Property rights instruments: transformative policy options', in *Property: rights and*

responsibilities current Australian thinking, Canberra: Land & Water Australia

Court, S. (2023) 'Natural and Built Environment Bill – third reading', 15 August, New Zealand Parliamentary Debates, 770

Emmanouil, N., T. Popa and A. Kallies (2021) 'Climate change litigation in private nuisance: can it address harms sustain by traditional owners in the Torres Strait?', *Monash University Law Review*, 47, pp.142–65

Epstein, E.A. (2011) 'Series introduction', in R.A. Epstein (ed.), *Liberty, property, and the law: constitutional protection of private property and freedom of contract*, New York: Routledge

Fisher, E. (2013) 'Environmental law as "hot" law', *Journal of Environmental Law*, 25 (3), pp.347–58

Foster, S.R. and D. Bonilla (2011) 'The social function of property: a comparative law perspective', *Fordham Law Review*, 80, pp.100–03

France-Hudson, B. (2017) 'Surprisingly social: private property and environmental management', *Journal of Environmental Law*, 29 (1), pp.101–27

Freyfogle, E.T. (2011) 'Taking property seriously', D. Grinlinton and P. Taylor (eds), *Property Rights and Sustainability: the evolution of property rights to meet ecological challenges*, Leiden: Martinus Nijhoff Publishers

Global Tipping Points (n.d.) https://global-tipping-points.org/about-gtp/

Godden, L. (2010) 'Governing common resources: environmental markets and property in water', in A. McHarg et al. (eds), *Property and the Law in Energy and Natural Resources*, Oxford: Oxford University Press

Graham, N. and J.A. Shoemaker (2022) 'Property rights and power across rural landscapes', in N. Graham, M. Davies and L. Godden (eds), *The Routledge Handbook of Property Law and Society*, London: Routledge

Grewal, D. and J. Purdy (2014) 'Introduction: law and neoliberalism', *Law and Contemporary Problems*, 77 (4)

Grinlinton, D. (2011) 'Evolution, adaptation, and invention: property rights in natural resources in a changing world', in D. Grinlinton and P. Taylor (eds), *Property Rights and Sustainability: the evolution of property rights to meet ecological challenges*, Leiden: Martinus Nijhoff Publishers

Grinlinton, D. (2023) 'The intersection of property rights and environmental law', *Environmental Law Review*, 25 (3), pp.202–18

Hardin, G. (1968) 'The tragedy of the commons', *Science*, 162, pp.1243–8

King Salmon (2014) *Environmental Defence Society Inc v The New Zealand King Salmon Co Ltd* [2014] NZSC 38, [2014] 1 NZLR 593

Kiwi Party Inc v Attorney General (2019) *The Kiwi Party Inc v Attorney General* [2019] NZHC 1163

Kiwi Party Inc v Attorney General (2020) *The Kiwi Party Inc v Attorney General* [2020] NZCA 80, [2020] NZLR 224

Leopold, A. (1949) *A Sand County Almanac: and sketches here and there*, Oxford: Oxford University Press

Libecap, G.D. (2009) 'The tragedy of the commons: property rights and markets as solutions to resource and environmental problems', *Australian Journal of Agricultural and Resource Economics*, 53 (1), pp.129–44

New Zealand National Party and ACT (2023) 'Coalition agreement between the National Party and the ACT party'

Palmer, G. (2015) 'Ruminations of the problems with the Resource Management Act', keynote address to the Local Government Environmental Compliance Conference, Auckland

Port Otago Ltd (2023) *Port Otago Ltd v Environmental Defence Society Inc* [2023] NZSC 112, [2024] 1 NZLR 205

Reich, C.A. (1964) 'The new property', *Yale Law Journal*, 73 (5), pp.733–87

Resource Management (National Environmental Standards for Freshwater) Regulations 2020

Resource Management Review Panel (2020) *New Directions for Resource Management in New Zealand*, Wellington: Resource Management Review Panel

Rieser, A. (1999) 'Prescriptions for the commons: environmental scholarship and the fishing quotas debate', *Harvard Environmental Law Review*, 23 (2), pp.393–422

Rose, C.M. (1995) 'Property as the keystone right', *Notre Dame Law Review*, 71 (3), pp.329–69

Rose, C.M. (1998a) 'Canons of property talk, or, Blackstone's Anxiety', *Yale Law Journal*, 108, p.601–32

Rose, C.M. (1998b) 'The several futures of property: of cyberspace and folk tales, emission trades and ecosystems', *Minnesota Law Review*, 83, pp.129–82

Rose, C.M. (1999) 'Expanding the choices for the global commons: comparing newfangled tradable allowance schemes to old-fashioned common property regimes', *Duke Environmental Law & Policy Forum*, 10, pp.45–72

Ruhl, J.B. and Kundis Craig, R. (2021) '4°C', *Minnesota Law Review*, 106, pp.191–282

Singer, J.W. (2000) *The Edges of the Field: lessons on the obligations of ownership*, Boston: Beacon Press

Smith v Fonterra (2024) *Smith v Fonterra Co-Operative Group Ltd* [2024] NZSC 5, [2024] 1 NZLR 134

Taylor, P. and D. Grinlinton (2011) 'Property rights and sustainability: toward a new vision of property', in D. Grinlinton and P. Taylor (eds), *Property Rights and Sustainability: the evolution of property rights to meet ecological challenges*, Leiden: Martinus Nijhoff Publishers

Waldron, J. (2012) *The Rule of Law and the Measure of Property*, Cambridge: Cambridge University Press

Warnock, C. (2020) 'Environment and the law: the normative force of context and constitutional challenges', *Journal of Environmental Law*, 32 (3), pp.365–89

Whiteside, J. (2022) 'Sustainability in New Zealand environmental legislation: shortcomings of the Resource Management Act and opportunities presented by the proposed legislation', *New Zealand Journal of Environmental Law*, 26, p.21–51

Wilkinson, B. (2020) 'The wrong direction for RMA reform', 4 August, https://www.nzinitiative.org.nz/reports-and-media/opinion/the-wrong-direction-for-rma-reform/

Williams, J. (1998) 'The rhetoric of property', *Iowa Law Review*, 83, pp.277–361

Marie Doole, Theo Stephens and Geoff Bertram

Navigating Murky Waters

characterising capture in environmental regulatory systems

Abstract

Regulatory capture is the quest by vested interests to exercise excessive influence on one or more aspects of a regulatory system. While conceptually simple, it is difficult to define and thus hard to diagnose and mitigate. In the environmental arena, sound regulation is at risk from, among other things, amorphous and contested conceptualisations of the 'public interest', politically salient asymmetries and scant institutional recognition of the breadth and depth of capture impacts. This article examines some indicative scenarios to illustrate potential impacts of capture and characterise motivations, conditions and outcomes that enable capture. We propose a wide-boundary definition which frames capture as a risk present throughout a regulatory system and delineates several potential types of capture and their characteristics.

Regulatory capture refers to situations when vested or special interests succeed in exercising excessive influence on institutions and systems that are ostensibly designed to protect the 'public interest'.[1] Our focus is on regulatory capture affecting environmental values and outcomes, which is but one dimension of the public interest. We contend that the outcomes sought from environmental regulatory systems will continue to be undermined unless the harms associated with regulatory capture are recognised and mitigated. Weak or narrow definitions, and scant guidance for policy and regulatory agencies as to how best to diagnose and mitigate capture, enable its perpetuation and the consequential harm to the environment.

Regulatory capture can be mistaken for the democratic power bestowed on our politicians working as it should. Weak controls on democratic institutions such as election funding, political donations and transparency of engagement by elected officials all confound detection of improper conduct in the political realm. Thus, the core challenge in managing regulatory capture lies in recognising where vested and public interests align and where they don't. This demands transparency and rigour often not present in New Zealand.

Some important definitions before we start

Defining regulatory capture relies on a clear understanding of several underlying terms: what is a regulatory system, who or what are 'vested interests', and what is meant by 'the public interest'. We address each in turn. Of the three, the definition of the public interest is the most highly contested, and we cannot pretend to have resolved that here.

Marie Doole is an independent researcher and consultant, specialising in research, strategy and regulation related to the environment. **Theo Stephens** is a retired conservation scientist with interests in freshwater ecology, community restoration and environmental economics. **Geoff Bertram** is an economist, previous associate at the Institute for Governance and Policy Studies, and currently attached to the School of History, Philosophy, Political Science and International Relations at Victoria University of Wellington.

A key driver for proposing a broad definition of capture is to better support its diagnosis and mitigation throughout regulatory systems. We observe a disproportionate focus on managing regulatory capture on the front line of enforcement agencies, without due attention to the potential of vested interests to warp earlier decisions.

We rely on the definition of a regulatory system from the Ministry for Regulation:

> A regulatory system is a set of formal and informal rules, norms and sanctions, given effect through the actions and practices of designated actors, that work together to shape people's behaviour or interactions in pursuit of a broad goal or outcome. (Ministry for Regulation, n.d.b)

Taking a system view of capture better enables effective management and matches the scope of important responsibilities such as regulatory stewardship.

Managing the risk of excessive influence of vested interests on regulatory systems necessitates their definition. Vested interests (sometimes called special interests) can be characterised by having narrow interests that they promote generally at the expense of the public interest. Duncan and Chapple define the term as one which:

> refers to a person, group or firm that wields sufficient economic or political influence to shift decision-making processes in directions that would favour themselves and do injury to the social interest. Here a vested interest is a type of political or economic interest, or related interest group, which has a stake in maintaining or producing a state of affairs that may not coincide with, or may even harm, the public interest, and which enjoys an advantage over others in achieving its objectives. (Duncan and Chapple, 2021, p.5. For further discussion of vested interests, see James and Argyle, 2014.)

A conclusive diagnosis of capture will require a clear notion of what those interests are in the circumstances. Therefore, the final critical underlying definition is that of 'the public interest'.

Members of society generally underestimate their reliance on healthy ecosystems and thus the 'will of the people' commonly diverges from the outcomes that might optimally protect environmental values and associated wellbeing.

The 'public interest' is commonly referenced but rarely precisely defined. It is very much more complex than, in our context, simply private interests versus protection of the environment. Multiple and competing interests, aspirations, values and motivations to organise, advocate and influence must be weighed at every scale. Consequently, different actors with particular values, perspectives and motivations will define the public interest quite differently, often leading vested interests to depict their interest as being the public interest.

Similarly, variation in the purpose and context of different statutes (e.g., the Official Information Act 1982) results in a range of public interest definitions and ways it may be considered in practice (e.g., van der Heijden 2021; Ombudsman, 2019). So, given the chimeric nature of public interest definition, we suggest that clarity about the extent to which the different aspects of the 'public interest' are being served is probably the most feasible basis for analysis of capture.

Appreciating the contested meaning of the public interest, we lean on the analytical definition of the public interest put forward by Brian Barry. Barry defined the public interest as 'those interests which people have in common qua members of the public' (Barry, 2010, p.134). Barry defines 'the public' as any number of representations depending on the context and determined by how they might be affected as consumers (ibid., p.136). Defining 'interest' sees Barry distinguish from the many and mixed possible interests in an outcome that an individual might have, in defining their 'net interest'. The challenge was to identify the best course of action given all the multiple possible and competing interests. Such an undertaking is challenging in the abstract, but we contend more easily able to be determined in relation to a specific set of circumstances.

In terms of the protection of nature, further complexities arise in respect of the public interest in a healthy environment. The pursuit of other interests commonly comes at the expense of the environment. Members of society generally underestimate their reliance on healthy ecosystems and thus the 'will of the people' commonly diverges from the outcomes that might optimally protect environmental values and associated wellbeing. Further, the chronic and slow-moving nature of many environmental issues can mean the cost of pursuit of other interests is muted further in the system, a price to be paid by as yet unborn generations.

Turning to regulatory capture

Regulatory capture became recognised as a phenomenon following George Stigler's discussion of the economic theory of regulation, in which he posited that regulation is shaped not only by the desire to protect the public interest by correcting market failures, but also by the regulated community (Stigler, 1971). Regulatory capture is widely cited as a driver of environmental harm, and other adverse public interest outcomes in regulatory systems (Borges, 2017), though not always supported by a rigorous definition (Carpenter and Moss, 2013). Regulators commonly discuss it, sometimes gingerly,

but acting upon concerns about it may be rare (Pink, 2024). Corruption is well recognised as a key impediment to environmental protection, including climate change (see, for example, UNODC, 2024), and the most common form in liberal democracies is 'trading in influence' (Johnston, 2005).

Carpenter and Moss (2013) and later Lodge (2014) identified regulatory capture as:

> the result or process by which regulation, in law or application, is consistently or repeatedly directed away from the public interest and toward the interest of the regulated industry, by the intent and the action of the industry itself. (Carpenter and Moss quoted in Lodge, 2014, p.539)

The New Zealand Common Capability Compliance Programme defines it as 'when an official inappropriately identifies with the interests of a person or organisation from the regulated sector, rather than the public interest' (Manch et al., 2011, p.94). Newly minted 'quick guides' from the Ministry for Regulation define it thus: 'Regulatory capture happens when a regulator puts the interests of a group above the public interest and the outcomes of the regulatory system. The result is the regulator acting in ways that disproportionately benefit parts of an industry it is regulating' (Ministry for Regulation, n.d.a, p.4).

Various perspectives in the international literature offer alternative definitions (see, for example, Dal Bó, 2006), but the core theme is an intentional drive to warp the activities of a regulator to act in the interests of the regulated, potentially at the expense of the public interest. Capture can have an impact on the full scope of a regulatory system in various ways; however, in New Zealand focus has been largely on the operational front line of regulatory agencies. Such uneven attention means that the impact of capture on earlier stages of the policy cycle (e.g., agenda setting, policy formulation) is only weakly addressed in practice. We suggest that a broader definition of regulatory capture supported by an explanation of underpinning concepts can help enable proactive identification, diagnosis and mitigation and so avert the more egregious forms of regulatory capture. While we focus on regulatory capture linked to environmental harm, we suggest that the definition and characterisation of capture will have application across any regulated domain.

> Robust and consistent definition and diagnosis of capture at both conceptual and practical levels is challenging because of the amorphous nature of underlying definitions, low awareness or understanding of risk of capture, and weak transparency of policy and regulatory decision making.

Regulatory capture is a risk associated with the normal activities of policy and regulatory agencies. The challenge lies in how to perform normal activities while avoiding capture. For instance, policy consultation is both a protection against capture (by requiring agencies to take heed of diverse viewpoints and avoid the blinkered view that often characterises a captured entity) and an opportunity for regulated parties to gain excessive influence. Cooperative alignment between regulators and regulated parties presents one suite of risks, while adversarial relationships present a different suite. We also contend that other relationships between agencies, communities and the private sector may also benefit from a clear characterisation of inappropriate levels of influence (e.g., funding and sponsorship arrangements and commercial partnerships).

But how much is too much? When does consultation and engagement with regulated parties constitute or at least lay the foundations for capture? Its definition must not constrain effective engagement with regulated parties (whose interests will be driven by a combination of public and private benefit), robust evaluation of regulatory instruments or information sharing as these are essential for efficient and effective policy.

Towards a sharper definition

Given the scale, pace and existential consequences of the burgeoning meta-crisis (Merz et al., 2023), and the particular consequences for nature in Aotearoa New Zealand (Macinnes-Ng et al., 2021), there is a rapidly closing opportunity to modify and constrain the behaviour of vested interests. Better definition and characterisation of regulatory capture could contribute to this adjustment. Providing clear definitions and ways of thinking about capture supports efforts by agencies and civil society to weed it out and withstand it in practice. Riches (2023) referred to the risk of 'grooming and capture' as 'ever present within regulatory organisations'. A consistent failure to detect and address capture can also result in regulated parties climbing an 'epistemic ladder' – perpetuating harmful behaviours with increasing brazenness, with spillover effects into other regimes (Saltelli et al., 2022). Thus, we suggest that the most pragmatic approach is to recognise capture as a risk to be mitigated due to its adverse effects and the fact that it will worsen if unchecked.

Society bears the cost of poorly designed environmental laws that cannot achieve their purposes. Further, weak implementation of these laws diminishes the societal benefits of a healthy environment, while a privileged few gain material (usually economic) benefits. Capture is context dependent. It arises from the private economic opportunities

and regulatory design and delivery characteristics that incentivise behaviours at odds with achieving intended public interest outcomes.

Robust and consistent definition and diagnosis of capture at both conceptual and practical levels is challenging because of the amorphous nature of underlying definitions, low awareness or understanding of risk of capture, and weak transparency of policy and regulatory decision making. Regulatory capture behaviours can be easily 'explained away' as they tend to be more subtle, insidious and concealable than more blatant forms of corruption. How capture behaviours develop and where normal practice ends and impropriety begins can be difficult to delineate. This is because impropriety is more easily camouflaged, hidden and denied than proven. On top of that are compelling incentives for policy and regulatory staff to look the other way rather than be the whistle-blower suffering career-limiting consequences. This ambiguity confounds capture's detection and management, allowing it to perpetuate.

A proposed way forward

In this article we:

- propose a wide-boundary definition that takes account of the diverse ways in which capture can manifest in a regulatory system;
- identify a range of illustrative examples that may be evidence of capture;
- propose a broad methodology to establish an evidential basis for capture diagnosis based on the motivations, conditions and consequences of observed actions;
- demonstrate the strategies which can be adopted by vested interests to achieve excessive influence on the regulatory system;
- propose some mitigations for capture in the design and monitoring of regulatory systems.

A proposed definition

We define regulatory capture as: the processes and conventions by which vested interests excessively influence a regulatory system, becoming particularly problematic if the public interest is undermined for the benefit of regulated parties. Capture may range from subtle to blatant and have impacts from individual transactions to constitutional settings. It can occur at all stages of the political and policy cycle and at agency and individual levels. Its impacts are typically cumulative in increasing the likelihood that the public interest outcome(s) of the regulatory system will be compromised.

What capture might look like – some examples

We contend that regulatory capture takes place at all levels of the regulatory system, including the political sphere (noting the interplay with democracy mentioned earlier), in policy and regulatory agencies and in the particular behaviours of individual actors. In Table 1, the authors compile and describe a suite of familiar scenarios that policy and regulatory agencies encounter to illustrate the potential impacts of capture. Then we move on to suggesting a systematic process of diagnosis.

Diagnosing capture

Defining what influence is 'excessive' is contextual and dependent on motivations and outcomes. A robust diagnosis of capture requires analysis based on evidence pertaining to all three dimensions. We contend that for capture to be present the following criteria must be met, often as part of a repetitive pattern of behaviour choices:

- the *motivation* behind the behaviour is to secure personal or sector benefit, which will arise generally at the expense of the public interest;
- the *conditions* in the regulatory system have allowed the capture to occur

Table 1: Indicative scenarios to illustrate potential for capture and the likely impact of that capture in different parts of the regulatory system (compiled by the authors based on experience)

Influence	Issue	Consequences
Controlling priority of regulatory development or review at political and agency levels	Delaying or disincentivising interventions that control extraction/development	Reduced likelihood of effective regulation of full suite of harms, (see for example Urlich & Mawardah, 2024) enabled by a range of factors such as uneven policy analysis (Disproportionate regard for impacts on regulated community, such as RIS that emphasizes costs to sector over costs of inaction/BAU or harm to public goods)
Controlling relative stringency of regulatory control compared with comparative or less potentially harmful uses	Reduced focus on or express leniency towards some activities compared with others (e.g., through carve outs and exemptions)	Absence of an even playing field whereby adverse effects are controlled to the extent the targeted activity or sector wields political power, increasing the risk of harm to the environment.
Abrupt changes in policy direction that diverge from urgent policy responses required	Repeal or replacement of policy instruments, without evidence that change is needed (e.g., the regulatory framework is not fit for purpose)	Undermines public participation and results in wastage of embedded energy in processes
Politicised selection processes decision-making panels and boards	The 'stacking' of panels with industry representatives where a more balanced configuration is more appropriate	Decisions more likely to favour vested interests and discount impacts on the rest of society. May lack sufficiently broad governance skills and topic understanding.
Political power of resource users has a chilling effect on regulatory functions	Weak funding of regulatory functions and limited support for executing the function	Neglected regulatory role lacks visibility, detection and addressing of offending is challenging and decision-making skews outcomes towards leniency. (see Manch 2017 for an analysis of good regulatory decision-making including the importance of apolitical decision-making)

Influence	Issue	Consequences
Revolving doors: Frequent and unchecked exchange of staff between the regulator and the regulated community	Industry sourced staff do not deliberately 'change hats'. They use their knowledge or connections to undermine regulatory regime. This is aggravated by usually weak controls and limited or no 'cooling off' periods between roles.	Improper behaviour that advances interests of regulated parties over the public interest and/or over competing regulated parties.
Targeted consultation that favours vested interests over public interest advocates	Consultation minimum requirements are met without recourse to diverse views and consideration of wider matters including distributional impacts	Policy settings fix in place a weak or ineffectual regime that may have adverse consequences or be highly challenging to implement (e.g., may not address the intended harms effectively, may be inefficient to implement or may lack key elements such as sufficient powers of entry/sanction)
Culture of advancing positions of policy that favour industry interests over the public interest.	Weak or patchy regulatory control of high harm activities including a reliance on ineffective voluntary mechanisms	Failure to maintain an even playing field can cause disharmony with adjacent regulated parties who incur higher compliance costs than sectors with equal or greater impacts.
Lenient regulators against repeated non-compliance by powerful industries	Uneven treatment of regulatory expectations depending on political power of the industry in question compared to others	Weak implementation on the regulatory framework, including an emphasis on non-statutory interventions like 'education' in more scenarios than appropriate and a failure to appropriately escalate compliance actions to address poor behaviour.
Political hostility to oversight reduces rigour and frequency of evaluation	Insufficient stewardship and monitoring of the regulatory system as it is under implemented.	Lack of stewardship removes prospect of structured evaluation and detection of failures before they are crises that cannot be disguised
Culture of reticence to regulate	Individuals and agency not geared towards effective enforcement or good regulatory practice (customer service vs. public interest oriented)	Agencies less likely to recommend or develop stringent policies, to monitor proactively or to take decisive enforcement action (especially re more serious sanctions). This issue can reinforce itself by not having sufficient expertise and oversight to detect the issues with the regime being weakly implemented or see the risk.
Receipt of inappropriate gifts	The receipt of inappropriate and/or undeclared gifts or donations from regulated parties for individual officers in a regulatory system	Officer bias including making findings or recommending options more aligned to regulated party interest than public interest. This limits the regulators effectiveness at safeguarding the public interest.
Conscious or unconscious chilling of advice to appease those holding political power	Failing to clearly articulate the costs and benefits of a policy or otherwise skewing advice to favour vested interests	Officer advice to management or governance tacitly or explicitly chilled by individuals or teams under excessive influence
Individual or team reinterpretation of statutory intent	Staff do not correctly implement legislation, implementing requirements more aligned to the interests of the powerful than the public interest	Erosion of rule of law, and reputational risks for the agency. See further Tadaki 2020 for a discussion of the nuance of the exercise of bureaucratic discretion in a named government agency
Obfuscation of information that demonstrates environmental risk by agencies or regulated parties to delay intervention	Information on environmental quality or threats to it are consciously or unconsciously obscured or downplayed, particularly in public reporting	Lower likelihood of issues being prioritised in the policy or regulatory work programme due to a perception that risks are lower than they are (see Joy and Canning for a discussion of capture as it might relate to environmental information and limit setting)

(noting that capture is rarely expressly unlawful);

- the *consequence* of capture is adverse for the public interest.

Unpacking the three elements helps diagnose capture and mitigate it.

Motivation

In environmental law, the benefits of limited or weak regulation are typically concentrated, and thus accrue to a few (i.e., a small minority of the population), while the costs are widely dispersed, and often over multiple generations. Defensible diagnosis of capture relies on identifying the motivations for exercising excessive influence. The resources available to vested interests, and the incentive to organise effectively, can enable much greater (and potentially excessive) influence to be exerted compared with the diffuse and disorganised interests safeguarding public goods (King and Hayes, 2018). This behaviour is not necessarily confined to regulated parties, either. Some or all of the characteristics of capture are evident, for example, in most instances of 'NIMBYism', improper inter-agency pressure, and some of the activities of narrow public bodies. Being clear about the motivation is important: successful influence from the campaigns of civil society organisations advocating for the public interest is unlikely to meet the definition of capture.

Conditions

It is often difficult to distinguish settings that enable capture (which may be an outcome of previous capture action) from extant capture. Conditions in the

regulatory system can drive capture behaviours without the conscious intention of individual actors in the system. We suggest that both system conditions and individual behaviour are usually relevant and should form part of any specific or general analysis focused on capture. For example, a shared cultural identity of the policy agency and/or the regulator with the regulated parties can lead to regulated parties benefitting at public expense (Alves de Lima and Fonseca, 2021). Shared culture also discourages critical questioning of industry perspectives and promotes the view that regulated parties are 'customers' to be served (Wauchop and Manch, 2017; see further Ministry for Regulation, n.d.b) and their interest is indistinguishable from the public interest.

Agency culture is a powerful condition, and many concerning behaviours can be thought of as 'just the way we do things' and deeply embedded in practice. The New Zealand Productivity Commission's analysis of our regulatory institutions and practices highlighted the importance of agency culture as an underlying driver of or mitigating factor against capture. The report noted that, for example, internal cultures that valued evidence and promoted openness and transparency and standards of independence and impartiality likely made entities more resistant to the influence of capture than where those settings were sparse. Conversely, poor culture can provide implicit and explicit incentives that promote capture (e.g., preferentially advancing those individuals who are more likely to be most sympathetic to industry interests).

Consider, for example, an individual officer working in a policy or frontline implementation role, moonlighting as a regulatory consultant to the regulated community they have oversight of. While an egregious and concerning behaviour choice, it is only possible to do it in the absence of successful detection strategies operationally and with (presumably) a perception of trivial sanction. Behaviour and conditions should be considered together, and efforts to curtail impropriety focused not only on the individual's choice, but on the conditions that provided the fertile ground for that choice. Both require a response.

We do not differentiate a type of capture as 'political' capture because in our view all capture, at its core, is political, because it pertains to public choice.

Consequences

We agree with previous authors that the magnitude of regulatory capture's impact is the extent to which it drags the system outcomes away from the public interest outcome sought (e.g., Carpenter and Moss, 2013). This critical distinction of consequence is what separates influence with pro-social and pro-environmental outcomes from excessive influence driving adverse and anti-social consequences. The influence of civil society groups in protecting public goods is different from the self-interest inherent in vested interests exerting their influence on a regulatory system, as noted earlier. The delineation therefore partly lies in the ultimate outcome (i.e., the consequence for the public interest).

Capture strategies

Regulatory system integrity is compromised with repeated failures to prevent poor decision making. Structural choices, settings and day-to-day behaviours of individuals can become so embedded that they skew agency activities to the extent that they no longer reliably act unambiguously in the public interest. In Table 2 we identify some different capture strategies according to the way in which they are likely to undermine the integrity of the regulatory system.

We do not differentiate a type of capture as 'political' capture because in our view all capture, at its core, is political, because it pertains to public choice. Note that unlike many authors, we purposely exclude 'systemic capture' from the typology. This is because we suggest that 'systemic capture' results from different drivers of excessive influence and is more a measure of severity than a defining feature of capture itself. The list is not exhaustive; further types are likely to exist. The list below is compiled from the literature where noted, in addition to unpublished examples.

Further characteristics of capture

The self-perpetuating nature of capture arises when drivers cascade through the system, starting with compromised problem definition and policy ideation and continuing to include weak regulatory constraints on economic opportunities from flawed policy processes, underfunded agencies with weak mandates, permissive consenting, ineffective offence detection, dilatory enforcement, curtailment to powers of sanction and inadequate performance monitoring. We contend that an integrated definition (supported by an understanding of key characteristics) is necessary to curtail the 'capture cascade'.

Dye behaviour is in some ways analogous to capture. Imagine a river representing a policy process flowing into implementation. Along it are intakes coloured dark purple, denoting excessive influence (capture). On the other side of the river are intakes of clear and clean water, representing checks and balances in a system designed to safeguard the public interest. Effective capture produces deeply discoloured results, while effective mitigations dilute it. If vested interests excessively influence early aspects of the policy process such as agenda setting or regulatory impact analysis, this can 'bake in' (discolour) inadequacies in the policy design, leading to frontline regulators being stuck with manifestly inadequate regulatory instruments, capacity and capability. In short, good design and review of legislation with public interest at the forefront both inoculates against permeation of capture at ideation stage and helps to mitigate it at the operational level.

Table 2: Capture strategies - a description and an explanation of the ways in which these types can manifest. Delineation of types of capture can support actors in a regulatory system to focus attention on areas of greatest risk.

Possible types of capture in a regulatory system	How it might manifest
Financial capture – using monetary contributions to influence or attempt to influence a regulatory system	Resourcing from regulated parties and allies are used to shape policy and implementation delivery. Examples of where these behaviours may arise include · funding of research by industry · funding of political parties and candidates that support particular industries or interests and/or influence election results (see further Rashbrooke & Marriott, 2023).
Sabotage capture – collaboration at any given stage of the policy process designed to constrain regulatory effectiveness	Participation by regulated parties in policy ideation, development and implementation processes that extends into delaying progress, limiting the scope and driving the focus of the regulatory system away from necessary public interest outcomes and/or delaying the process. Impact of sabotage capture may also include that it undermines public confidence in collaborative and codesigned processes and results in wasted effort
Information/knowledge capture – information asymmetry due to expertise and data being held by regulated parties and weak powers or willingness to compel sharing	Inability to access data owned by private entities to support analysis results in inadequate oversight and lower detection of offending. Niche, remote, highly complex and emerging industries can have additional advantage in undermining policy and regulatory functions by holding the bulk of the expertise or otherwise limiting access to operational aspects (see Holley et al, 1998), operating in remote or dangerous contexts where access and unannounced oversight is unlikely or unsafe (e.g. offshore deep-sea activities) or where transboundary impacts particularly in the global south are present.
Culture capture – influencing decision making and conduct of an agency with politicised expectations that detract from independence or incentivise inappropriate behaviours.	Chilling effect on agency conduct is achieved via politicised expectations that they should move from (or not achieve) a balanced and independent discharge of their function, often embracing ideologies such as a 'business friendly' or 'customer service' culture. Outcome is an agency less likely to develop robust policy that safeguards the public interest, or to take actions that promote public good outcomes. This can be facilitated or aggravated by executive leaders in agencies with limited regulatory experience.
Disempowerment and risk aversion capture – sustained criticism of policy and regulatory agencies via informal (media attack) or formal (threat or actualised legal challenge) that erodes their reputation/standing and drives risk averse decision making	Can result in a public loss of confidence in the agencies that might not be reflected by their actual performance, undermining their credibility and diminishing morale. Politicised actions such as the appointment of new leadership or board members to reduce the activity levels of the agency or influence decision making are also relevant here

Regulatory capture also exists on a continuum from weak to strong (see, for example, Carpenter and Moss, 2013). Weak capture is probably always present, because it is necessary and appropriate for agencies to understand vested interest perspectives and this understanding can potentially shape agency actions. Indeed, accommodating vested interests is pro-social to the extent that the public interest is not undermined. At the other end of the continuum, the consequences of extreme regulatory capture are likely to be so averse to the public interest that it might be better if the regulation did not exist at all. Pink (2024) refers to a continuum of agency descriptors spanning collaboration through to conflicted, compromised, captured then corruption. Viewing capture as a continuum supports not only identification, but risk assessment in practice.

The roots of capture and why it matters for New Zealand

A wide variety of factors influence the extent of capture in a democracy like New Zealand. Compared with many Western democracies, New Zealand has many positive features that provide a buffer against capture. These include, but are not limited to, a comparatively high level of transparency, a relatively competent public service and an independent media, in addition to the specific independent oversight roles of the Parliamentary Commissioner for the Environment, the Office of the Controller and Auditor-General and the Office of the Ombudsman.

There is growing evidence, however, that our standards are slipping, and we have been outpaced in the management of risks like capture by other jurisdictions. Recent research by Philippa Yasbek, supported by the Helen Clark Foundation, identified a significant array of concerns, and potential solutions for five key areas of central government policy contributing to corruption challenges in New Zealand. Those factors are political lobbying,[2] the management of political donations and election funding, how official information is managed and shared, foreign bribery, and weak transparency of beneficial ownership (Yasbek, 2024).

Other factors and trends which may lay foundations for capture include the increasingly polarised political context, coalition deals, the political power of the primary industries, and the dominance of neoliberal ideology (i.e., maximising externalisation of social and environmental costs to communities), which arguably set us up for extreme vulnerability in New Zealand. Examples outside the environmental space include the repeal (against official advice) of New Zealand's world-leading smokefree legislation, concerns regarding the role of ministers with lobbying histories now being in core political and decision-making roles related to their respective backgrounds (e.g., tobacco, guns), and a range of analyses that

cast aspersions on the legitimacy of decision making (such as Yasbek, 2024). These examples reflect the settings that had their origins in structural choices made in the 1980s.

We consider that New Zealand's enthusiastic embrace of the neoliberal paradigm has created fertile ground for regulatory capture, including of our environmental legal systems. Neoliberal approaches to environmental protection are characterised by limited regulation (Kelsey, 2010), a limited role of government in high-risk industries (Turner et al., 2016), weak prospects for civil society to challenge regulatory decision making, institutional design that sets up conflicts of interest (Ong, 2020) and a preference for 'flexible standards over preventive rules' (Urlich and Hanifiyani, 2024). A strong link between neoliberalism and regulatory capture has been drawn in other jurisdictions, including Australia (see Toner and Rafferty, 2024 for a variety of examples). For many policy and regulatory staff operating in New Zealand today, their entire lives have occurred within a neoliberal context, meaning that particular dimensions inherent in the model aren't easily perceptible and are seen as fixed aspects of society (Mirowski, 2013).

New Zealand's particular vulnerability to the impact of capture in the environmental sphere lies in the uniqueness of its environment and the globally significant values that are adversely affected by regulatory capture. Over-allocated catchments, rising pollution, falling fish 'stocks', continued attrition in indigenous ecosystems and declines in species even where targeted recovery efforts are in play all demonstrate the short- and long-term impacts of a failure to address drivers of harm such as regulatory capture. The parlous state of our environment means the capacity available to absorb the maladministration of human impacts on natural systems is lower than in some parts of the world and the consequences (such as losing endemic species) particularly significant.

Seeds sown decades ago

New Zealand embraced the 'neoliberal experiment' with an enthusiasm almost unparalleled globally. Central to the New Zealand neoliberal project was a package of statutes largely divorced from the public sector institutions and practices built up in Aotearoa New Zealand over the century to 1984 and designed instead to fit the extreme individualist version of public choice, with its rejection of communitarian thinking. This 'iron cage' (Bertram, 2021a, 2021b) of constraining laws has successfully crippled state activism on many fronts.

What had been envisaged as hard constraints within which business would have to operate turned out instead to be soft and negotiable limits, with contested rather than settled meanings.

Bertram cites, among many examples, the State-Owned Enterprise Act 1986, in which profit seeking explicitly displaced public interest objectives; the Commerce Act 1986, which legalised 'excess profits' and decriminalised anti-competitive conduct; the Fiscal Responsibility Act (now part of the Public Finance Act) that entrenched low public debt and budget-balancing targets; the Local Government Act 1989, which curbed the scope and capacity of local government; and the Public Sector Act 1989, which has led to replacement of professionalism, vocational skills and a public service ethos with managerialism and silos. All of these weakened both the ability of government to act decisively to advance the public interest, and the capability of its regulatory agencies to resist capture.

In respect of environmental legislation, capture was arguably enabled in a variety of instances by a suite of international (oil price shocks) and domestic factors (e.g., the Muldoon administration's 1976–84 'Think Big' programme of industrial and infrastructure investments, with fast-track planning procedures imposed by the National Development Act 1979). The conceptual design of the Resource Management Act 1991 (RMA) was intended to lay down a clear set of explicit environmental constraints within which private business would be free to operate without detailed regulatory oversight.

In practice, things looked different. The languid approach to the production of crucial national direction and the setting of limits created ambiguity at odds with the intent. In this uncertainty and undefined context, vested interests seeking access to environmentally sensitive resources had strong incentives for opportunistic lobbying and legal action to expand the scope of their operations, and to push back against discretionary attempts by regulators to protect environmental values in the absence of clear guidelines from central government. What had been envisaged as hard constraints within which business would have to operate turned out instead to be soft and negotiable limits, with contested rather than settled meanings. To overcome this legacy, New Zealand must proactively diagnose and mitigate regulatory capture and seek to alter the settings that enable it to perpetuate.

Mitigation of capture

Once diagnosed, or where risk of capture is apparent, mitigation strategies can help avert further instances of excessive influence or reduce and even eliminate the impacts of existing examples. In this section, we briefly set out possible mitigations, but will develop these further in a future paper. Mitigating regulatory capture can occur at multiple levels in a regulatory system. The focus of agency-level mitigation tends to be operational frontline strategies (e.g., rotation of auditing staff), but much wider focus is needed to root out capture in all the places it prospers.

We contend that successfully addressing capture relies on deliberate rebalancing of power. Rebalancing refers to granting greater power to civil society and agency leadership within the political sphere, shifting it away from vested interests. Focusing attention on changing the locus of power deliberately avoids the 'solution' to capture lying merely in greater transparency (which may serve only to expose it), relying on other drivers to compel action to address it (which may not exist).

Mitigation of capture requires a combination of approaches, including:

- leadership that establishes a culture of best practice policy development, integrated consideration of regulatory implementation at the outset, stewardship of effective policies and procedures, and robust evaluation and quality control processes in agencies charged with the relevant role;
- developing operational action plans for policy and regulatory staff to proactively identify areas of risk and identify mitigations in advance (note the workshop approach proposed in Pink, 2024);
- proactive monitoring of operational issues such as the revolving door of staff between the regulator and the regulated, and pre-emptive management of the risks that arise, preferably integrated into risk registers and other formal frameworks;
- rigorous regulatory stewardship practices for both the design and the delivery of regulatory systems, supported by clear lines of accountability and required action where problems are identified (a more robust implementation of existing stewardship mandates would be a good start, combined with explicit treatment of capture);
- supporting the role of the independent judiciary and (specifically in respect of the environment) the value of a specialist judiciary for complex matters (e.g., New Zealand's world-leading Environment Court), and independent decision making more generally (e.g., opting for independent commissioners rather than sitting elected representatives as is common practice in RMA planning);
- ensuring appropriate transparency obligations for processes where the public interest is affected, and limiting exceptions to this (e.g., short consultation periods, targeted consultation, use of urgency and override provisions);
- ensuring a robust fourth estate, as the media plays a critical role in highlighting instances of potential capture and reporting on the implications to raise public awareness (e.g., funding of public interest journalism);
- resourcing and supporting civil society initiatives, including participation in planning processes, public interest research, enabling participation in public discourse, and legal challenge to regulatory decisions (such as via mechanisms like the Environmental Legal Assistance Fund, disestablished without replacement by the coalition government).

Conclusion

Regulatory capture is a driver of environmental harm due to the disruptive and disabling impact it has on the operation and effectiveness of regulatory systems. By exerting influence at one or more levels, vested interests ensure that the statutory goals of environmental protection will generally occur only where such protection does not imperil economic objectives. While defining 'regulatory capture' rigorously is challenging, this article offers a structured and systematic approach that could readily be applied in Aotearoa to environmental law.

As highlighted in the preceding analysis, different strategies are required to counter excessive influence in different parts of regulatory systems. A failure to recognise the risk and respond effectively makes it more likely that capture will be successfully 'baked in' as regulatory systems develop and evolve. A proactive and concerted approach, underpinned by clear definitions and implementable safeguards, will enable individuals and agencies to more often successfully contest, avert and mitigate regulatory capture.

1 There are various other aggregative concepts of a normative nature that are similar to 'the public interest' which are also potentially relevant in this context, including 'the national interest', 'the public good', 'the general welfare', 'the common good', etc. But for the sake of simplicity, and because it is a widely employed term, we use 'the public interest'.

2 Notably, the most recent economic review of New Zealand by the OECD highlighted that we are 'not close to the frontier of international best practice in terms of regulating lobbying' (OECD, 2024).

References

Alves de Lima, I. and E. Massard da Fonseca (2021) 'Analytical perspectives in the study of regulatory policies', *Brazilian Journal of Public Administration*, 55 (3), pp.625–43, https://www.scielo.br/j/rap/a/J64hd6s5ngFwdb9vJhyk69S/?format=pdf&lang=en

Barry, B. (2010) *Political Argument*, London: Routledge

Bertram, G. (2021a) 'Breaking out of the "iron cage": removing statutory barriers to transformational change', presentation to University of Otago Medical School symposium 'Post-COVID Reset: transformational opportunities for a healthier, fairer, more sustainable Aotearoa', 3 February, https://geoffbertram.com/wp-content/uploads/2021/12/iron-cage-slides-for-covid-19-reset-2021.pdf

Bertram, G. (2021b) 'Regulatory capture in product markets and the power of business interests', *Policy Quarterly*, 17 (2), pp.35–44

Borges, M.R. (2017) 'Regulation and regulatory capture', https://www.worldacademy.org/files/colloquium_2017/papers/Regulation_regulatory_capture_M.Borges.pdf

Carpenter, D. and D. Moss (eds) (2013) *Preventing Regulatory Capture: special interest influence and how to limit it*, Cambridge, Mass: Cambridge University Press

Dal Bó, E. (2006) 'Regulatory capture: a review', *Oxford Review of Economic Policy*, 22 (2), https://faculty.haas.berkeley.edu/Dalbo/Regulatory_Capture_Published.pdf

Duncan, G. and S. Chapple (2021) 'What is a vested interest?', *Policy Quarterly*, 17 (2), pp.3–8

Holley, C., A. Kennedy, T. Mutongwizo and C. Shearing (2021) 'Public servants and regulator capture in energy and environmental governance', in H. Sullivan, H. Dickinson and H. Henderson (eds), *The Palgrave Handbook of the Public Servant*, Cham: Palgrave Macmillan, https://doi.org/10.1007/978-3-030-29980-4_7

James, C. (with E. Argyle) (2014) 'A way of thinking about vested interests', *Policy Quarterly*, 10 (4), pp.53–8

Johnston, M. (2005) *Syndromes of corruption: wealth, power and democracy*, New York: Cambridge University Press

Joy, M. and A. Canning (2020) 'Shifting baselines and political expediency in New Zealand's freshwater management', *Marine and Freshwater Research*, 72, 10.1071/MF20210

Kelsey, J. (2010) 'Regulatory responsibility: embedded neoliberalism and its contradictions', *Policy Quarterly*, 6 (2) pp.36–41

King, D. and J. Hayes (2018) 'The effects of power relationships: knowledge, practice and a new form of regulatory capture', *Journal of Risk Research*, 21 (9), pp.1104–16

Lodge, M. (2014) 'Regulatory capture recaptured', *PAR*, 74 (4), pp.539–42

Macinnis-Ng, C., A.R. Mcintosh, J.M. Monks, N. Waipara, R.S.A. White, S. Boudjelas, C.D. Clark, M.J. Clearwater, T.J. Curran, K.J.M. Dickinson, N. Nelson, G.L.W. Perry, S.J. Richardson, M.C. Stanley and D.A. Peltzer (2021) 'Climate-change impacts exacerbate conservation threats in island systems: New Zealand as a case study', *Frontiers in Ecology and Environment*, 19 (4), pp.216–24, https://doi.org/10.1002/fee.2285

Manch, K. (2017) 'What does good regulatory decision making look like?', *Policy Quarterly*, 13 (2), pp.72–81

Manch, K., P. Burke, M. Pawson, S. Bailey and J. Kavanagh (2011) *Achieving Compliance: a guide for compliance agencies in New Zealand*, Wellington: Government Regulatory Practice Initiative, https://apo.org.au/node/303500

Merz, J.J., P. Barnard, W.E. Rees et al. (2023) 'World scientists' warning: the behavioural crisis driving ecological overshoot', *Science Progress*, 106 (3), doi:10.1177/00368504231201372

Ministry for Regulation (n.d.a) 'Engaging as a regulator quick guide', Wellington: Ministry for Regulation, https://www.regulation.govt.nz/assets/Ministry-for-Regulation-files/Regulatory-System-Capability/Quick-guides/RPE-Quick-Guide-Engaging-as-a-Regulator.pdf

Ministry for Regulation (n.d.b) 'Regulatory systems and stewardship quick guide', Wellington: Ministry for Regulation, https://www.regulation.govt.nz/assets/Ministry-for-Regulation-files/Regulatory-System-Capability/Quick-guides/RPE-Quick-Guide-Regulatory-Systems-and-Stewardship.pdf

Mirowski, P. (2013) *Never Let a Serious Crisis Go to Waste: how neoliberalism survived the financial meltdown*, London: Verso Books

New Zealand Productivity Commission (2014) 'Regulatory institutions and practices', Wellington NZ

OECD (2024), *OECD Economic Surveys: New Zealand 2024*, Paris: OECD Publishing, https://doi.org/10.1787/603809f2-en

Ombudsman (2019) *Public Interest: a guide to the public interest test in section 9(1) of the OIA and section 7(1) of the LGOIMA*, Wellington: Office of the Ombudsman, https://www.ombudsman.parliament.nz/resources/public-interest-guide-public-interest-test

Ong, R. (2020) 'Whose interests are we really protecting? Regulatory capture in the New Zealand animal welfare regime', Bachelor of Laws (Honours) dissertation, University of Otago, https://www.otago.ac.nz/__data/assets/pdf_file/0020/331940/whose-interests-are-we-really-protecting-regulatory-capture-in-the-new-zealand-animal-welfare-regime-828550.pdf

Pink, G. (2024) 'Regulatory capture: defining it, refining it, and mitigating it', https://anzsog.edu.au/news/regulatory-capture-defining-it-refining-it-and-mitigating-it/

Rashbrooke, M. and L. Marriott (2023) 'A reform architecture for political party funding in Aotearoa New Zealand', *Policy Quarterly*, 19 (1), pp.73–9

Riches, M. (2023) 'The regulator's dilemma: regulating in a sea of influence', https://anzsog.edu.au/news/the-regulators-dilemma/

Saltelli, A., D.J. Dankel, M. Di Fiore, N. Holland and M. Pigeon (2022) 'Science, the endless frontier of regulatory capture', *Futures*, 135, https://doi.org/10.1016/j.futures.2021.102860 https://www.sciencedirect.com/science/article/pii/S0016328721001695

Stigler, G.J. (1971) 'The theory of economic regulation', *Bell Journal of Economics and Management Science*, 2 (1), pp.3–21, https://doi.org/10.2307/3003160

Tadaki, M. (2020) 'Is there space for politics in the environmental bureaucracy? Discretion and constraint in Aotearoa New Zealand's Ministry for the Environment', *Geoforum*, 111 (2020) pp.229–38, https://doi.org/10.1016/j.geoforum.2020.02.021

Toner, P. and M. Rafferty (2024) *Capture: how neoliberalism transformed the Australian state*, Sydney: Sydney University Press

Treasury (2017) 'Government expectations for good regulatory practice', https://www.treasury.govt.nz/sites/default/files/2015-09/good-reg-practice.pdf

Turner, J.A., L. Klerkx, K. Rijswijk, T. Williams and T. Barnard (2016) 'Systemic problems affecting co-innovation in the New Zealand agricultural innovation system: identification of blocking mechanisms and underlying institutional logics', *NJAS: Wagening Journal of Life Sciences*, 76 (1), pp.9–112, https://doi.org/10.1016/j.njas.2015.12.001

UNODC (2024) 'Addressing corruption risks to safeguard the response to climate change: discussion draft II', World Bank Group and the United Nations Office on Drugs and Crime, track.unodc.org/uploads/documents/corruption/Publications/2024/Addressing_Corruption_Risks_to_Safeguard_the_Response_the_Climate_Change_Discussion_Draft_II.pdf

Urlich, S.C. and M.N. Hanifiyani (2024) 'A stringent failure: regulators do not use available tools to protect aquatic ecosystems from clearcut forestry impacts in New Zealand', *Journal of Environmental Management*, 370, https://doi.org/10.1016/j.jenvman.2024.122540

Van der Heijden, J. (2021) 'The politics of regulation: a review of the international academic literature', State of the Art in Regulatory Governance research paper 2021.08, https://www.wgtn.ac.nz/__data/assets/pdf_file/0010/1987309/State-of-the-Art-in-Regulatory-Governance-08-The-politics-of-regulation.pdf

Wauchop, B. and K. Manch (2017) 'Are regulated parties customers?', *Policy Quarterly*, 13 (4), pp.10–12

Yasbek, P. (2024) *Shining a Light: improving transparency in New Zealand's political and governance systems*, Helen Clark Foundation

Sara Belcher, Raine Hananui
and O. Ripeka Mercier

Legislating for Gene Technologies

a Māori view of the Hazardous Substances and New Organisms Act

Abstract

In Aotearoa New Zealand, gene technology is currently governed by the Hazardous Substances and New Organisms Act 1996. Recent Tiriti-led research has resulted in nationwide collaborations with mana whenua towards the culturally inclusive development of gene technology for invasive species management. This article reviews the Hazardous Substances and New Organisms Act's fitness for purpose from a Māori and Tiriti perspective. We make recommendations for future legislative review, including that regulation and policy 'give effect to' te Tiriti/the Treaty, that whakapapa and mauri considerations are accounted for in gene technology regulation, and that cultural impact assessments are based on whakapapa and mauri. Mātauranga-based impact assessments that use Māori concepts in a way that complements scientific understanding of gene technology, and Māori considerations (values and goals) should feature in the decision-making process. This will ensure that appropriate measures are taken by the Crown to 'mitigate adverse environmental, economic, social, cultural or spiritual impacts' (United Nations Declaration on the Rights of Indigenous Peoples) of genetically modified organisms and hazardous substances in Aotearoa New Zealand, and that properly resourced mana whenua can actively engage in decision making.

Keywords genetic modification, legislation, mātauranga Māori, mauri, whakapapa, taonga species

Sara Belcher is a senior lecturer in the School of Science in Society at Te Herenga Waka Victoria University of Wellington. **Raine Hananui** is a Kāi Tahu research assistant in Te Kawa a Māui, Te Herenga Waka Victoria University of Wellington, exploring social perceptions of biotechnological pest control. **O. Ripeka Mercier** is an associate professor in Te Kawa a Māui, Te Herenga Waka Victoria University of Wellington.

The purpose of the Hazardous Substances and New Organisms Act 1996 is to 'protect the environment, and the health and safety of people and communities, by preventing or managing the adverse effects of hazardous substances and new organisms' (s4). In 2024, the Hazardous Substances and New Organisms Act is the primary legislation governing genetic modifications such as gene editing in Aotearoa New Zealand (Everett-Hincks and Henaghan, 2019; Kershen, 2015). Under the Act, genetically modified or edited organisms (GMOs) are considered 'new organisms' even if they are developed within Aotearoa (s2A). No GMOs may be developed, imported, field tested or released in Aotearoa without prior approval from the Environmental Protection Authority (EPA), the national environmental regulator (ss34, 38A, 40, 109).

Gene technologies became prominent in the public consciousness in the 1990s (Smith, 2006), resulting in the Royal Commission on Genetic Modification in 2000. Over two decades later, genetic techniques and attitudes towards them have evolved considerably from those extant at the time the GMO provisions of the Hazardous Substances and New Organisms Act were last significantly updated in 2003 (Brankin, 2021; Clark et al., 2024; Penman and Scott, 2019). The development of more precise gene editing in the past decade in particular has resulted in renewed interest and discussion on the potential of gene technologies to help solve health, environmental and primary industry challenges in Aotearoa (Pantoja, 2021; Penman and Scott, 2019; Science Media Centre, 2024). Gene technologies applied in environmental contexts include techniques not considered by the EPA to be genetic modification, such as eDNA (Bunce and Freeth, 2022) and gene silencing (Palmer et al., 2022). However, issues of control and the lack of Māori rangatiratanga (self-determination) in the gene technologies space remain unresolved (Clark et al., 2024; Cram, 2005; Palmer, Mercier and King-Hunt, 2020).

Māori have taken part in the debate on gene technology since at least the 1990s (Smith, 2006; Tipa, 2016), and have expressed persistent concerns regarding the impact of genetic modification on the integrity of whakapapa (genealogy), mauri (life essence) and rangatiratanga, and subsequent effects on the ability of iwi and hapū to act as kaitiaki (guardians) of their taonga (cultural treasures) (Cram, 2005; Hudson et al., 2019; King-Hunt, 2023; Roberts and Fairweather, 2004). Article two of te Tiriti o Waitangi guarantees to Māori rangatiratanga over their whenua (lands), kāinga (settlements) and taonga (including the tangible and intangible) (Kawharu, 1989; Waitangi Tribunal, 2011). To honour te Tiriti, iwi and hapū must be meaningfully involved in decision making on gene technologies in a way that enables rangatiratanga, particularly when it impacts on Māori relationships with whenua and taonga.

These concerns are echoed by indigenous peoples elsewhere, leading to growing calls for indigenous people to be recognised 'as key stakeholders in decisions about gene-editing', with engagement activities that are 'designed, conducted, and analysed in ways that confront longstanding power imbalances that dismiss Indigenous expertise' (Taitingfong and Ullah, 2021:S74). This supports calls for states to 'mitigate adverse environmental, economic, social, cultural or spiritual impacts' (United Nations, 2007) in collaboration with indigenous peoples.

The Waitangi Tribunal reported in *Ko Aotearoa Tēnei,* its report on the Wai 262 claim, that the 'law and policy with respect to [genetically modified] organisms does not sufficiently protect the interests of mana whenua in mātauranga Māori or in the genetic and biological resources of taonga species' (Waitangi Tribunal, 2011). For most of the lifetime of the Hazardous Substances and New Organisms Act, Māori cultural values have been subordinate to scientific ones in GMO decision making by the EPA and its predecessor, the Environmental Risk Management Authority (disestablished in 2011) (Kurian and Wright, 2012; Oldham, 2018; Waitangi Tribunal, 2011; Wheen and Baillie, 2019). The Environmental Risk Management Authority in particular was criticised for privileging techno-scientific considerations over others (Kurian and Wright, 2012) and de-legitimising spiritual and cultural concerns (Oldham, 2018). The over-emphasis on science is partly due to the 'inherent science bias' in the decision-making process. The Hazardous Substances and New Organisms (Methodology) Order directs the EPA (and the Environmental Risk Management Authority before it) to begin with consideration of the scientific evidence (s25(1)).

Despite legislative shortfalls, the EPA, working with its statutory Māori advisory committee, Ngā Kaihautū Tikanga Taiao, has made considerable efforts since its inception in 2011 to improve its regulatory practice with respect to te Tiriti ...

Despite legislative shortfalls, the EPA, working with its statutory Māori advisory committee, Ngā Kaihautū Tikanga Taiao, has made considerable efforts since its inception in 2011 to improve its regulatory practice with respect to te Tiriti, such as the development of a mātauranga framework to integrate mātauranga Māori into EPA decision-making processes (Jenkins, 2019; Jones et al., 2020). As a nation we have made progress in creating more effective Tiriti partnerships, and in the last decade there has been a notable increase in Tiriti-led research (Collier-Robinson et al., 2019; Duncan and Robson-Williams, 2024), including research on the

potential for genetic technologies, and gene drive and gene silencing, to control invasive species (Black et al., 2022; Palmer et al., 2022).

There have been renewed calls from companies, scientists and political parties to update, 'future-proof' (Royal Society Te Apārangi, 2019) and liberalise gene technology regulation (Biotech New Zealand, 2022; Pantoja, 2021; Parmar, 2024; Science Media Centre, 2024; Science New Zealand, 2023). In its 2023 Harnessing Biotech plan, the New Zealand National Party describes its intent to end what it calls the 'effective ban' on genetic modification and gene editing by introducing dedicated gene technology legislation that 'provides for the use of gene editing and modification', establishes a new biotechnology regulator to take over decision making on genetic technologies from the EPA, and updating the Hazardous Substances and New Organisms Act and related legislation to 'avoid duplication of regulatory activities' (New Zealand National Party, 2023).

There is no argument that the Hazardous Substances and New Organisms Act was in dire need of a review prior to the inception of these proposed changes if it was to be brought into line with the changing sociocultural, technological and ecological landscape. This article presents recommendations from a clause-by-clause review of the Act undertaken by the first author from a Māori and Tiriti perspective. The recommendations range from highly specific suggestions for how the EPA and the Act might be adjusted to be more responsive to iwi, hapū and mana whenua, to more generalisable recommendations applicable to any legislation that governs natural heritage. With gene technology development in flux, any rebuilding of legislative frameworks must also protect and support social, cultural and ecological interests now and into the future.

The Act and te Ao Māori

Like most legislation in Aotearoa, the Hazardous Substances and New Organisms Act includes a Treaty clause to acknowledge the Crown's Tiriti obligations. Section 8 states that 'All persons exercising powers and functions under this Act shall take into account the principles of the Treaty of Waitangi (Te Tiriti o Waitangi).' This section should be amended to 'shall give effect to' to bring the Act into line with the Conservation Act 1987. The new terminology would provide a stronger statutory obligation for decision makers (Beverley, 1998) and is in line with the recommendation of the Royal Commission on Genetic Modification (Eichelbaum et al., 2001).

Iwi should have the opportunity to have members undergo the appropriate training to become warranted officers, and iwi encouraged to develop appropriate compliance measures.

An effective way to honour te Tiriti is to include Māori in decision-making processes. Mātauranga Māori, as a taonga, should inform those decisions for better outcomes overall (Bargh, 2017; Ngā Koiora Tuku Iho, 2023), but only as Māori choose, and with iwi retaining rangatiratanga over their mātauranga (Broughton and McBreen, 2015). Such mātauranga could include iwi-based impact and prioritisation frameworks, management targets based on cultural ecological limits, and the use of rāhui (temporary bans) (Prime, 1993) and tohu (ecological indicators). Cultural ecological limits are targets/limits established by traditional ecological knowledge and are usually more holistic than other management targets. Mātauranga would be used to frame mana whenua expectations and te reo Māori requirements, and define the effect on the cultural landscape.

Treaty rights, building partnerships and shared decision making

Consultation is an important part of this process of building effective co-governance partnerships. Consultation should be more than just a tick box exercise and to achieve this iwi need to be actively engaged and effectively resourced. Consultation processes should be designed to ensure that tangata whenua can engage at a depth and level appropriate for them and mana whenua have space to effectively inform decisions.

For effective consultation in the current EPA decision-making processes, mana whenua need to be identified and notified. Mana whenua are those iwi and/or hapū that have whakapapa links to the whenua on which the application states genetically modified or edited organisms will be developed, contained or released or a hazardous substance will be applied. Mana whenua are currently not specifically invited to submit an impact assessment, outline their reporting requirements, or state any conditions they may have for the development, containment, release or use of a new organism or hazardous substance, and should be enabled to do so. Providing this information should not come at cost to the mana whenua and should form part of the cost of the application.

Enforcement agencies, usually Crown entities, employ warranted officers who are trained and authorised to enforce EPA conditions and determine the existence and extent of breaches. Iwi should be entitled to some of the non-compliance charges, particularly if the damage extends to iwi lands. Iwi should have the opportunity to have members undergo the appropriate training to become warranted officers, and iwi encouraged to develop appropriate compliance measures. Costs incurred by iwi as enforcement agents should be covered by the Crown, as should the cost of warranting iwi members. Iwi should be treated similarly to other enforcement agents and specialist consultants (ministries, local government, Crown research institutes and universities) that have access to public funding and resources.

Mātauranga in the Act

Mātauranga Māori is a knowledge system that encompasses Māori ways of generating, organising and transmitting knowledge (Hikuroa, 2017; Mead, 2016) and is integral to rangatiratanga (Broughton and McBreen, 2015). Including mātauranga in decisions relating to gene technologies and new organisms would help ensure that Māori perspectives and knowledge are part of the decision-making process, thus supporting Māori rangatiratanga and kaitiakitanga rights and responsibilities. Key mātauranga concepts should inform decision making. Concepts of whakapapa, mauri, kaitiakitanga and rangatiratanga are extremely relevant to Māori in relation to gene technologies in both environmental and societal applications (Baker, 2012). These concepts are not mentioned in the Hazardous Substances and New Organisms Act. Application of these concepts may need to be informed by mana whenua at consultation, as iwi may have different definitions and meanings according to their mātauranga ā-iwi; each iwi is also likely to want to determine how they individually engage with legislation and the partnerships. These concepts will also determine how impact assessments are conducted, control requirements are set, and enforcement outcomes are framed and applied.

Impact assessments

To inform decisions, the EPA requires applications under the Act to include various ecological, social and economic assessments. These assessments include impact assessments; risk analysis; the setting of limits, standards, targets and controls; ongoing monitoring; damage and mitigation analysis; decisions about release dates, and the timing and instigation of reviews, reassessments and the granting of variations, suspensions and extensions; and, finally, the establishment of codes of practice. Mātauranga should inform all of these.

Section 36 of the Act sets minimum standards that new organisms, including GMOs, must meet. If they cannot meet the minimum standards, the EPA is required to decline the application. These standards include that the new organism cannot cause significant displacement of endemic species, deterioration of natural habitat or impact on human health, have an adverse effect on Aotearoa's genetic diversity, or be disease causing (unless it is intended for biocontrol purposes). Reframing these standards in the context of whakapapa, mauri and tangata whenua and changing 'significant' to 'any' impact would bring impact evaluation back in line with kaitiakitanga and mātauranga. The current wording of 'significant impact' introduces subjectivity, is rather arbitrary and introduces bias. Who decides what is a significant impact and how, who is omitted from this decision, and who benefits? No decisions will have to be made about what is a significant impact and what that means.

The social and cultural impacts of an application under the Act are a particularly important consideration for Māori and should feature prominently in impact assessments and risk analysis. In te ao Māori, social outcomes are just as relevant as environmental ones. Assessment of the impact on the cultural landscape should be led by tangata whenua and informed by mātauranga and should include the outcomes and impacts on rangatiratanga and the mana of the community. The inclusion of mātauranga will require an increased use of te reo Māori. Te reo Māori terms should be defined by mana whenua and te reo Māori should be used preferentially when describing Māori concepts.

Whakapapa

Whakapapa is a foundational concept in te ao Māori which deals with genealogical connections, particularly the tracing of descent from the atua (gods) to the present (Benton et al., 2013). All things, animate and inanimate, have whakapapa. It is the key to land rights and determines kinship responsibilities (ibid.). Mātauranga Māori tohu should be employed to define the impact of an application on whakapapa (Hudson et al., 2007).

Whakapapa would feature in impact and prioritisation frameworks to describe changing biodiversity and impacts on endemic species. Genetically modified/edited and new organisms have a direct impact on whakapapa, either from having whakapapa (genetic heritage) directly altered or by changing the interactions of organisms that whakapapa to the whenua with those that do not. Whakapapa at its most basic interpretation defines the genealogy of organisms; therefore, it may be considered the equivalent of the taxonomic description of an organism. Whakapapa can define an organism's cladistic, ecological (niche or trophic-level occupancy) or physical (phenological, temporal, successional, structural and processional) relationships (Roberts et al., 2004). Whakapapa is generally seen by Māori as something that should not be interfered with (Black et al., 2022). The degree and way that each proposed GMO or new organism will impact on whakapapa, and its acceptability, is something that mana whenua will have to determine on a case-by-case basis. For example, transgenic modification involving the transference of DNA from one species to another is likely to be viewed as having more impact on whakapapa than switching on or off an existing gene within a species.

> Mauri may be characterised by the diversity and abundance of the organisms in the environment, and this includes non-native and pest organisms.

Mauri

Mauri is the essential quality or life force of a being and is an expression of the mana of the atua (power and prestige of the gods). Mauri is present in both animate and inanimate objects, so awa (waterways) and maunga (mountains) can be considered entities with their own life force (Benton et al., 2013; Pomare et al.,

2023, p. 60). Mauri may be characterised by the diversity and abundance of the organisms in the environment, and this includes non-native and pest organisms. A healthy mauri imbues hauora (health) in the people and is essential for our wellbeing. Mauri is adversely affected by the presence of diseases, the loss of key taonga species, pollution, and habitat degradation. Preserving and improving degraded mauri is therefore a vital kaitiaki activity and the success of kaitiaki is linked to the mana of the iwi.

Because mauri is a significant way to assess mana whenua outcomes, it is often a key tohu Māori use to assess the health of their environment. It should therefore be a key component of impact assessments and monitoring frameworks. The impact on mauri should be used as the overarching focus of ecological outcomes. All ecological, social and economic tohu or indicators should be geared to assess and report on mauri. The impact on mauri should be the primary consideration that all approvals, approval conditions and enforcement criteria are measured against. Preserving and restoring mauri should be the primary objective of all resource and environmental management decisions made in Aotearoa New Zealand. Assessment of mauri can be done in quantitative ways, such as using the mauri-o-meter (Morgan, 2010), or by qualitative assessment by knowledgeable people such as tohunga.

Review outcomes

In summary, the key desired review outcomes are a rewording of section 8 so that it reads 'give effect to' te Tiriti, and to engage with Māori terms such as whakapapa, mauri, kaitiaki etc. This would give Māori pivotal roles in defining the intent, powers and functions of the Act and how iwi engage with it. Properly resourcing mana whenua would provide them the capacity to engage to the extent and level they wish and the ability to effectively inform assessment frameworks (including risk assessments and impact monitoring), control requirements, release dates and time frames, the setting of group standards and codes of practice, granting of variations, suspensions and extensions, and reviewing frameworks. Mātauranga could support the enforcement and compliance frameworks, informing penalties, the appeal process and emergency response.

Actively engaging with a fully resourced and recompensed mana whenua at all stages of the application process informed by mātauranga Māori is arguably the best way to protect the integrity of our natural and cultural heritage and the wellbeing of people and communities, and build a cohesive and just society.

Conclusion

Currently, the Hazardous Substances and New Organisms Act does a poor job of engaging with mātauranga Māori and meeting the Crown's Tiriti obligations. The Act does not mention whakapapa or mauri, and these are vital concepts for understanding the impact of genetically modified organisms on ecosystem health. Mauri should drive any environmental management policy or legislative framework and the impact on whakapapa should be implicit in legislation governing genetic technology. The Act mentions the Treaty of Waitangi once and uses weak wording, implying that meeting Treaty obligations is a suggestion rather than a requirement. While an application requests that consultation with Māori is undertaken, there are no guidelines or confirmation that the consultation is adequate or appropriate from the mana whenua perspective.

The Hazardous Substances and New Organisms Act legislates a very important and rapidly evolving field. The distinction between what is a genetically modified organism and what is not is becoming very blurred. Transgenic organisms can easily be categorised as genetically modified organisms. Categorising an organism that has had the expression of existing genes altered is not so easy. The impact on mauri and whakapapa may be the only way to define outcomes in a way that we can interpret meaningfully. The technical attributes of the genetic modification are less relevant than the cultural or environmental outcomes for whakapapa.

The purpose of the Hazardous Substances and New Organisms Act is to 'protect the environment, and the health and safety of people and communities, by preventing or managing the adverse effects of hazardous substances and new organisms' (s4). Actively engaging with a fully resourced and recompensed mana whenua at all stages of the application process informed by mātauranga Māori is arguably the best way to protect the integrity of our natural and cultural heritage and the wellbeing of people and communities, and build a cohesive and just society. Mātauranga can provide the context that the science requires to assess ecological health and help ensure that kaitiakitanga is restored. This means that while science can provide the understanding of how, for example, introducing genetically modified rats (modified for single-sex selection) will affect populations of rats, and ecosystem functions such as food web interactions, mātauranga will inform our understanding of the impact these rats will have on the mauri and whakapapa, enabling us to see the holistic impact on ecological, cultural and economic health and on all the biodiversity of Aotearoa.

References

Baker, M. (2012) 'The Korowai Framework: addressing GE through tribal values', *New Genetics and Society*, 31 (1), pp.87–9

Bargh, M. (2017) 'Council–Māori engagement: new models on the horizon', *LG: NZ Local Government Magazine*, 54, May, pp.14–17

Benton, R., A. Frame and P. Meredith (2013) *Te Mātāpunenga: a compendium of references to the concepts and institutions of Māori customary law*, Wellington: Victoria University Press

Beverley, P. (1998) 'The mechanisms for the protection of Māori interests under part II of the Resource Management Act 1991', *New Zealand Journal of Environmental Law*, 2, pp.121–51, https://search.informit.org/doi/10.3316/informit.377255490087806

Biotech New Zealand (2022) 'NZ needs genetic modification in the world of climate change', 26 April, https://biotechnz.org.nz/2022/04/26/nz-needs-genetic-modification-in-the-world-of-climate-change/

Black, A., G. Garner, M. Mark-Shadbolt, J. Balanovic, E. MacDonald, O. Mercier and J. Wright (2022) 'Indigenous peoples' attitudes and social acceptability of invasive species control in New Zealand', *Pacific Conservation Biology*, 28 (6), pp.481–90, https://doi.org/10.1071/PC21049

Brankin, A. (2021) 'GMO: a matter of rangatiratanga', *Te Karaka*, 88, 29 June, pp.54–5, https://ngaitahu.iwi.nz/opportunities-and-resources/publications/te-karaka/gmo-a-matter-of-rangatiratanga/

Broughton, D. and K. McBreen (2015) 'Mātauranga Māori, tino rangatiratanga and the future of New Zealand science', *Journal of the Royal Society of New Zealand*, 45 (2), pp.83–8, https://doi.org/10.1080/03036758.2015.1011171

Bunce, M. and A. Freeth (2022) 'Looking further and deeper into environmental protection, regulation and policy using environmental DNA (eDNA)', *Policy Quarterly*, 18 (4), pp.33–9

Clark, A., P. Wilcox, S. Morrison, D. Munshi, P. Kurian, J. Mika, D. Chagne, A. Allan and M. Hudson (2024) 'Identifying Māori perspectives on gene editing in Aotearoa New Zealand', *Communications Biology*, 7 (1), 221, https://doi.org/10.1038/s42003-024-05896-1

Collier-Robinson, L., A. Rayne, M. Rupene, C. Thoms and T. Steeves (2019) 'Embedding indigenous principles in genomic research of culturally significant species: a conservation genomics case study', *New Zealand Journal of Ecology*, 43 (3), pp.1–9, https://www.jstor.org/stable/26841832

Cram, F. (2005) 'Backgrounding Māori views on genetic engineering', in J. Barker (ed.), *Sovereignty Matters: locations of contestation and possibility in indigenous struggles for self-determination*, Lincoln: University of Nebraska Press

Duncan, R. and M. Robson-Williams (2024) 'Co-designing a research programme for impact: lessons learned from practice by Aotearoa New Zealand's Biological Heritage National Science Challenge Ngā Koiora Tuku Iho', *Kotuitui: New Zealand Journal of Social Sciences Online*, 19 (2), pp.164–89

Eichelbaum, T., J. Fleming, J. Allan and R. Randerson (2001) *Report of the Royal Commission on Genetic Modification*, https://environment.govt.nz/publications/report-of-the-royal-commission-on-genetic-modification/

Everett-Hincks, J.H. and M. Henaghan (2019) 'Gene editing in Aotearoa: legal considerations for policy makers', *Victoria University of Wellington Law Review*, 50 (3), pp.515–50

Hikuroa, D. (2017) 'Mātauranga Māori: the ūkaipō of knowledge in New Zealand', *Journal of the Royal Society of New Zealand*, 47 (1), pp.5–10, https://doi.org/10.1080/03036758.2016.1252407

Hudson, M., A.L.M. Ahuriri-Driscoll, M.G. Lea and R.A. Lea (2007) 'Whakapapa: a foundation for genetic research?', *Journal of Bioethical Inquiry*, 4 (1), pp.43–9, https://doi.org/10.1007/s11673-007-9033-x

Hudson, M., A.T.P. Mead, D. Chagné, N. Roskruge, S. Morrison, P.L. Wilcox and A.C. Allan (2019) 'Indigenous perspectives and gene editing in Aotearoa New Zealand', *Frontiers in Bioengineering and Biotechnology*, 7, https://doi.org/10.3389/fbioe.2019.00070

Jenkins, K. (2019) 'Remember the flicking tail of the lizard: how mātauranga Māori is being woven into place-based regulatory decisions in Aotearoa', *Policy Quarterly*, 15 (2), pp.55–61

Jones, D., D. Hikuroa, E. Gregory, H. Ihaka-McLeod and T.T. Moko-Mead (2020) 'Weaving mātauranga into environmental decision-making', *New Zealand Science Review*, 76 (1–2), pp.49–54, https://doi.org/10.26686/nzsr.v76i1-2.7833

Kawharu, I.H. (1989) *Waitangi: Māori and Pākehā perspectives of the Treaty of Waitangi*, Auckland: Oxford University Press

Kershen, D.L. (2015) 'Sustainability Council of New Zealand Trust v. the Environmental Protection Authority: gene editing technologies and the law', *GM Crops and Food*, 6 (4), pp.216–22, https://doi.org/10.1080/21645698.2015.1122859

King-Hunt, A. (2023) 'Novel biotechnological controls for social wasp eradication: exploring religious and spiritual Māori perceptions using a Q-method and kaupapa Māori methodology', MA thesis, Te Herenga Waka Victoria University of Wellington, https://openaccess.wgtn.ac.nz/articles/thesis/Novel_biotechnological_controls_for_social_wasp_eradication_Exploring_religious_and_spiritual_M_ori_perceptions_using_a_Q-Method_and_kaupapa_M_ori_methodology/22186756

Kurian, P. and J. Wright (2012) 'Science, governance, and public participation: an analysis of decision making on genetic modification in Aotearoa/New Zealand', *Public Understanding of Science*, 21 (4), pp.447–64, https://doi.org/10.1177/0963662510382362

Mead, H.M. (2016) *Tikanga Māori: living by Māori values* (2nd edn), Huia Publishers

Morgan, T.K.K.B. (2010) 'The mauri model decision-making framework: robust decision-making for community cultural mosaics', in J.S Te Rito and S.M. Healy (eds), *Kei Muri i te Awe Kāpara he Tangata Kē: recognising, engaging, understanding difference*, proceedings of the 4th International Traditional Knowledge Conference, Auckland: Ngā Pae o te Māramatanga

New Zealand National Party (2023) 'Harnessing biotech', https://assets.nationbuilder.com/nationalparty/pages/17968/attachments/original/1686385900/Biotech_Policy.pdf?1686385900

Ngā Koiora Tuku Iho (2023) *Me Tū ā-Uru: an action plan for a flourishing and abundant environment*, Ngā Koiora Tuku Iho, New Zealand's Biolical Heritage National Science Challenge

Oldham, O.M. (2018) 'A critical analysis of the incorporation of tikanga Māori in decisions on genetic modification', *New Zealand Journal of Environmental Law*, 22, pp.87–112, https://heinonline.org/HOL/LandingPage?handle=hein.journals/nzjel22anddiv=8andid=andpage=

Palmer, S., P.K. Dearden, O.R. Mercier, A. King-Hunt and P.J. Lester (2022) 'Gene drive and RNAi technologies: a bio-cultural review of next-generation tools for pest wasp management in New Zealand', *Journal of the Royal Society of New Zealand*, 52 (5), pp.508–25, https://doi.org/10.1080/03036758.2021.1985531

Palmer, S., O.R. Mercier and A. King-Hunt (2020) 'Towards rangatiratanga in pest management? Māori perspectives and frameworks on novel biotechnologies in conservation', *Pacific Conservation Biology*, 27 (4), pp.391–401, https://doi.org/10.1071/PC20014

Pantoja, Y. (2021) 'Vested interests and business diplomacy: biotechnology companies and gene editing in New Zealand', *Policy Quarterly*, 17 (2), pp.56–61

Parmar, P. (2024) 'Liberal GE laws bring opportunities for NZ', 9 January, https://www.act.org.nz/liberal_ge_laws_bring_opportunities_for_nz

Penman, D. and B. Scott (2019) 'Gene editing: reflections from the panel co-chairs', Royal Society Te Apārangi, https://www.royalsociety.org.nz/assets/Uploads/Gene-editing-reflections-from-panel-co-chairs.pdf

Pomare, P., N. Tassell-Matamua, N. Lindsay, B. Masters-Awatere, K. Dell, B. Erueti and M. Te Rangi (2023) 'Te mauri o te kauri me te ngahere: indigenous knowledge, te taiao (the environment) and wellbeing', *Knowledge Cultures*, 11 (1), pp.55–83, https://doi.org/10.22381/kc11120234

Prime, K. (1993) 'Pest problems: the view of Nga Whenua Rahui', *New Zealand Journal of Zoology*, 20 (4), pp.247–50, https://doi.org/10.1080/03014223.1993.10420338

Roberts, M. and J.R. Fairweather (2004) *South Island Māori Perceptions of Biotechnology*, research report 268, Christchurch: Lincoln University, https://researcharchive.lincoln.ac.nz/handle/10182/745

Roberts, M., B. Haami, R.A. Benton, T. Satterfield, M.L. Finucane and M. Henare (2004) 'Whakapapa as a Māori mental construct: some implications for the debate over genetic modification of organisms', *The Contemporary Pacific*, 16 (1), pp.1–28

Royal Society Te Apārangi (2019) 'Calls for overhaul of gene-technology regulations and wide public discussion', 12 August, https://www.royalsociety.org.nz/news/calls-for-overhaul-of-gene-technology-regulations-and-wide-public-discussion/

Science Media Centre (2024) 'Regulating genetic technologies in Aotearoa: expert Q&A', 15 February, https://www.sciencemediacentre.co.nz/2024/02/15/regulating-genetic-technologies-in-aotearoa-expert-qa/

Science New Zealand (2023) 'Science New Zealand on gene technologies', February, https://sciencenewzealand.org/assets/Uploads/Files/SNZ-GE-Positioning-Paper-Feb-2023.pdf

Smith, C. (2006) 'Na takoto ana a papatūānuku: the state of biotechnologies and Māori', in M. Mulholland (ed.), *State of the Māori Nation: twenty-first-century issues in Aotearoa*, Reed Publishing

Taitingfong, R. and A. Ullah (2021) 'Empowering indigenous knowledge in deliberations on gene editing in the wild', *Hastings Center Report: Gene Editing in the Wild*, 51 (S2), pp.S74–S84, https://doi.org/https://doi.org/10.1002/hast.1323

Tipa, R. (2016) 'Environmental watchdogs', *Te Karaka*, 69, 3 April, pp.12–13, https://ngaitahu.iwi.nz/opportunities-and-resources/publications/te-karaka/environmental-watchdogs/

United Nations (2007) 'United Nations Declaration on the Rights of Indigenous Peoples', A/RES/61/295, https://www.refworld.org/legal/resolution/unga/2007/en/49353

Waitangi Tribunal (2011) *Ko Aotearoa Tēnei: a report into claims concerning New Zealand law and policy affecting Māori culture and identity: te taumata tuarua*, vol.1, Wellington: Waitangi Tribunal

Wheen, N. and H. Baillie (2019) 'GMOs, pests and participatory and representative democracy in decision-making about GM activities in New Zealand', *Asia Pacific Journal of Environmental Law*, 22 (2), pp.257–76, https://doi.org/10.4337/apjel.2019.02.04

Heather Peacocke, Linda Major
and Taciano L. Milfont

Drawing upon Covid-19 lessons

to equip Aotearoa New Zealand to take bolder climate action

Abstract

This article highlights challenges in public discourse on climate change in Aotearoa New Zealand and explores why framing and narratives matter. Drawing on the country's Covid-19 experience, it shows how narratives can help unlock climate action (both mitigation and adaptation). It proposes improving climate communications by providing structures to support sense-making and decision making, with more specificity around societal and individual actions. This will give people, businesses and communities more agency to respond to climate change. By fostering narratives that are hopeful, practical and people-centred, and that relate to people's needs and aspirations, it is possible to build more momentum around climate action.

Keywords climate change communication, Covid-19, public discourse, framing strategies, climate narratives, climate action

Heather Peacocke is the strategic lead, stewardship, data and governance at the Ministry for the Environment, and the former Covid-19 group head of public engagement and communications in the Department of the Prime Minister and Cabinet. Corresponding author: heather.peacocke@mfe.govt.nz. **Linda Major** is a behavioural change specialist, former insights and narrative lead at the Ministry for the Environment, and former director of social marketing at Clemenger BBDO. **Taciano L. Milfont** is a professor of environmental psychology at the University of Waikato, Tauranga, and had a two-year secondment at the Ministry for the Environment as their behavioural insights lead.

> When we centre our narratives on the better lives we can build together as we take bold action to respond to climate disruption, we can deepen understanding of what community and civic action is and increase people's willingness to engage. (Berentson-Shaw and Fairfield, 2024, p.6)

How we frame climate change, and the narratives we use, influence how people think and reason about the issue, the policies they support and the decisions they make. For the purposes of this article, framing is understood as the way information, issues or choices are presented to shape how people interpret and respond to them. It has also been described as 'the process of defining the context or issues surrounding a question, problem, or event in a way that serves to influence

how the context or issues are perceived and evaluated' (American Psychological Association, n.d.). It is not just about 'what' is being communicated, but 'how' it is communicated and by 'whom'. Tversky and Kahneman (1981) demonstrated that how you frame a situation – whether focusing on positive or negative outcomes – affects the decisions people make.

It is also important to explain what we mean by 'climate change' in this article. Climate experts, policymakers and climate scientists tend to separate strategies to address climate change into two main components, 'mitigation' (reducing greenhouse gas emissions) and 'adaptation' (adjusting to its effects). However, studies have shown that people do not make this mitigation–adaptation distinction and generally view climate change as a single issue.

This article relates to framing and narratives for climate action generally – both mitigation and adaptation – and discusses how this can influence individual action, community action and action by organisations (e.g., businesses and governments). Narratives – the stories we tell ourselves and others and how they shape our collective and personal experiences – can help breathe life into goals and strategies by relating them to matters that people care about, inspiring them as critical partners in the path to change.

How framing and narratives help shape public beliefs

Many people find climate change hard to comprehend and relate to. It involves a web of scientific, environmental, economic and social factors, and the science behind it spans numerous disciplines, such as atmospheric chemistry, oceanography and ecology, making it hard to distil into simple, digestible pieces of information for the lay audience (McClure et al., 2022).

Besides its inherent scientific complexities, climate change is also perceived as distant, or irrelevant to people's immediate concerns, making it harder for them to feel personally connected to the issue. Climate change may be experienced across one or more dimensions of psychological distance: the complexity and uncertainty of the science can make it feel abstract and less urgent to address (hypothetical dimension), and people can perceive climate change as a tomorrow problem (temporal dimension), affecting others instead of oneself (social dimension), and that it will affect faraway places (spatial dimension).

The experience of Aotearoa through Covid-19, despite the distinctions from climate change, demonstrated how people can come together around a shared purpose, in this instance to 'save lives' and minimise the impacts of the virus.

Spatial considerations of climate change are further challenged by the fact that although it affects all parts of Aotearoa New Zealand, climate impacts vary by location, as seen with recent extreme weather events in this country. As people in different regions experience climate change differently, it is hard to develop a uniform sense of urgency. Added to the inherent psychological distance of climate change is the cognitive dissonance people experience as they try to reconcile the scale of the problem with their daily choices, along with rising misinformation and polarisation of the issue globally.

Therefore, it is natural for people to feel helpless, confused or resigned (Aitken, Chapman and McClure, 2011; Landry et al., 2018), and to downplay the need for action. More productive narratives are needed to help the public engage cognitively and emotionally with climate challenges: by reducing psychological distance (Evans, Milfont and Lawrence, 2014; Vlasceanu et al., 2024), building agency, instilling hope (Figueres, 2024), and shining a light on the path forward.

New Zealand's response to Covid-19 offers a case study of how framing and narratives can shape people's responses, including their engagement with policies and strategy, drawing upon the authors' joint expertise in public engagement, communications, social science and psychology.

We recognise that public engagement and communications (including framing and narratives) is one of several levers governments and organisations have at their disposal to address climate challenges, along with regulation, data and evidence, incentives, infrastructure and innovation. However, we believe it is a lever which can be used in a more strategic and coordinated way to build public trust and buy-in. We begin by highlighting aspects of the pandemic response which were successful in building public support for the health measures required, then demonstrate how these can be drawn upon to encourage bolder climate action at both an individual and societal level.

Covid-19 case study

We acknowledge that there are fundamental differences between Covid-19 and climate change. Covid-19 was a sudden, acute, global health crisis with urgent short-term interventions, including border closures, lockdowns and, later, vaccines. Although Covid-19 affected every part of society, and intersected with many aspects of people's lives, climate change is a more complex, multidimensional challenge which affects whole ecosystems, weather patterns, food production, water and energy security and human societies, and requires sustained long-term system and policy changes across multiple generations.

The experience of Aotearoa through Covid-19, despite the distinctions from climate change, demonstrated how people can come together around a shared purpose, in this instance to 'save lives' and minimise the impacts of the virus. Those

leading the communications[1] have described an extraordinary operating environment for communicating a message, with a lack of competing outputs and Covid-19 occupying public consciousness for extended periods during 2020–22 and beyond. Thousands of lives were saved[2] and the communications approaches are widely acknowledged as an important factor in the country's success (Beattie and Priestley, 2021; Greive, 2020). For these reasons and given the significant public investment[3] in this aspect of the response, and expertise involved, Covid-19 provides useful insights for navigating through unprecedented times.

The government's vision for the Covid-19 response was to protect public health while maintaining social cohesion and minimising the impact of the pandemic on the economy and the wellbeing of people. At the core, after the initial phase,[4] was an 'elimination' approach aimed at keeping Covid-19 out of the country and reducing its spread. This was actively led by politicians, officials and community leaders and left no one in any doubt about the country's focus in the first 18 months. As the pandemic wore on, and public fatigue and apathy emerged, the vision evolved to encompass living with Covid-19 and included mass vaccination programmes and reopening of borders.

Naomi Klein's advice for responding to moments of collective trauma is pertinent: 'gather together, find your footing and your story' (Klein, 2023, p.8). The narratives threaded through the response centred on people, in particular on being receptive to their emotional and practical needs. This was not your usual government information campaign, and it set out to create a 'human response to a health crisis'. All activity was designed with this in mind and centred around people rather than the virus. The purpose was to 'save lives', navigating people through the pandemic and enabling them to act in a way which minimised impacts and supported social cohesion during a period of upheaval. This approach aimed to anticipate and address the human needs that emerge in times of extreme uncertainty and fear. The public needed to be concerned enough to act with urgency, but without slipping into panic or hopelessness.[5] Simple questions provided guard rails for the response efforts, including: 'what' is the most important action to take?; 'how' do we enable people to do what is required?; and 'why' do we need people to act in a certain way? Māori narratives added another dimension, drawing on what could be learned from the past. This was significant, given the collective memories of the flu epidemic in 1919 which had a disproportionate impact on the indigenous population.

Instead of focusing on the health threats as a way in to get people to make significant adjustments to their lives, there was a need to tap into a collective attitude that would unify people and build a team of five million active fighters against the virus.

With this in mind, there are four key aspects of the Covid-19 communications response worth emphasising.

Beating Covid-19 was a collective goal

Instead of focusing on the health threats as a way in to get people to make significant adjustments to their lives, there was a need to tap into a collective attitude that would unify people and build a team of five million active fighters against the virus. Framed as 'Unite Against Covid-19', this became a call to participate, a challenge to take on, rather than a crisis to endure with top-down directives. People were treated like teammates, both in the tone of the communications and in the commitment to be transparent, helping people make sense of a changing game plan and motivating them to stay in it. There was a need to recognise the underlying cultural codes that may be invisible but made sense to people living in Aotearoa to understand how people might receive messages and accept interventions. It was necessary to look at people's relationship with rules and authority, and willingness to act as a collective. The country is more individualistic and lower in power distance than many other comparable countries.[6] New Zealanders are thus comparatively independent, and more likely to dislike rules and being told what to do by people in authority. The following comment by Brandon Wilcox illustrates this: 'We (the public) don't want to be told what to do or be deprived of being able to do something we want to do, but we willingly adopted the concept of standing together against a common enemy. Those behind the campaign judged the mood of the nation perfectly and crafted a message that resonated' (Anthony, 2020). This became more challenging as the response progressed, and there was a need for the communications to continually adapt to address feedback and changing public sentiment, and to maintain relevance.

Making action tangible and accessible

A cornerstone of the Covid-19 communications was its aim to be useful. People needed an easy way to manage the wave of information and uncertainty. To address this, the communications were designed around two pillars: structure and empathy.

- *Structure* – this provided a way to help people organise themselves and the infodemic that emerges in times of crisis, tied to specific, concrete actions ('wash hands, sanitise, scan, bluetooth on'). Routine formats, rhythms and channels were put in place so people would access information when they needed it in the form that suited. Messaging aimed to be clear and consistent, showing where Aotearoa

was at, how decisions were being made and what the decisions meant, to help people relate to the information in their own way. An all-of-government Covid-19 website, focused on addressing public needs and separate from the constraints of individual government agencies, aimed to help reduce the mental load for people. It acted as a hub, a 'source of truth' and 'signpost', attracting millions of eyeballs per day during key moments of the pandemic.

- *Empathy* – this involved listening to people's concerns in real time (through analysis of social media commentary, research, and large online community and sector hui) and providing guidance in response to those concerns, to help them along. The core threats for people were not just the virus, but the 'problems of living', the implications of government policies on day-to-day activities.

  The communications effort sought to recognise the whole needs of people, whether they were financial, employment, mental health or travel-related. Activity was targeted to meet those citizen needs as they evolved. This led to a dynamic and agile work programme which flexed with the response.

Empower communities

The importance of local voices and local initiatives, such as community-based health responses, was demonstrated time and again through the pandemic, whether this involved dispensing food parcels to families during lockdown or delivering vaccination programmes. Local leaders and influencers needed resources, autonomy and trust to meet the needs of their communities. One example is Māori roadblocks to reduce public movement through at-risk, isolated communities. These roadblocks were often controversial, but supported by police. While there was an overarching 'Unite Against Covid-19' narrative, which provided framing and guidance, the way this was reflected in some regions required nuance and was more targeted. For instance, over time the campaign became more regionalised and less official-looking, so it was better placed to connect with people experiencing the pandemic in different ways or those who had less trust in public institutions. The level of success with this varied from place to place, depending on the relationships between community, Treaty partners, council, health providers, and local and central government. Likewise, the pandemic highlighted the need to protect groups at risk of poor physical, psychological or social health. From our experience, public health measures were most effectively communicated when inclusive narratives were drawn upon and designed to protect those most at risk.

The core threats for people were not just the virus, but the 'problems of living', and the implications of government policies on day-to-day activities.

Use compelling storytelling, connect with your audience

'He tā kākaho e kitea, he tā ngākau e kore e kitea'; a bend in a reed can be seen, but not a bend in the heart. This Māori whakataukī articulates the importance of recognising and respecting the unseen struggles that others may be facing. Finding and maintaining relevance was a priority for teams working in communities and those leading the 'Unite Against Covid-19' digital channels. People needed to know their concerns were being heard, and that others understood the challenges they were facing, rather than being told what to do. Level 4 lockdown required people to stay home and avoid activities like hunting and fishing. For some communities these weren't recreational, they were about providing kai (food) and supporting whānau. The communications needed to evolve to acknowledge and respond to people's lived experiences. During the 2020 and 2021 outbreaks in South Auckland, teams supported trusted messengers in affected communities with targeted guidance and resources (e.g., church leaders, mothers, key sports people) to enable them to frame actions in ways which resonated. The active two-way dialogue between government and citizens was made possible thanks to the network of community connections on the ground and the active digital community of more than 470,000 people (as at February 2022) following the Covid-19 channels, who provided live commentary and reaction as the pandemic unfolded. For instance, social media posts during August 2021 generated more than 63,000 comments as the public sought information about changing alert levels. Though imperfect and ever evolving, this dialogue provided opportunities to tweak government decisions in real time if policies or approaches proved unworkable.

In brief, the Covid-19 response in Aotearoa avoided many of the narratives employed to delay climate action. Take the climate delay narratives identified by Lamb et al. (2020), for example. Discourses for delaying climate action often focus on redirecting responsibility (others should act first), encouraging non-transformative solutions (disruptive change is not necessary), emphasising the downsides (change will be disruptive), and surrender (climate change cannot be stopped). These delay narratives were broadly absent from the country's approach to the Covid-19 response, and this illustrates the possibility of applying a similar approach for climate change.

Shifting climate narratives

Before articulating how lessons from the Covid-19 response can help mobilise climate action, it is important to understand past, current and emerging climate narratives. Historically, climate discourse has been dominated by science and policy perspectives, and the language is generally technical, ambiguous and

abstract (Bruine de Bruin et al., 2021). This has led to a disconnection of climate change discourse from people and the realities of their day-to-day lives. This complexity inhibits public participation, and this slows progress towards addressing the climate challenges Aotearoa and other nations face.

We don't need to persuade people that climate change is real or that it will adversely affect them. There is high recognition of and concern about the impact of climate change,[7] and public support for climate action (with conditions attached). This has been climbing steadily over the past decade, but quickly drops down the priority list when more acute, psychologically closer issues dominate (e.g., Covid-19 lockdowns, the cost of living, job cuts). (It is worth noting, though, that this salience bias also works the other way – for example, when levels of climate concern increase due to personal experiences of severe weather events (see, e.g., Bergquist, Nilsson and Schultz, 2019).)

Climate concerns compete with other live pressures and there is a disconnect between climate beliefs and action. The 'intention–behaviour gap' describes how people often express intentions to act in a certain way, whether to support the environment, improve their health or make ethical purchasing decisions, but real-world constraints, such as cost, convenience, time pressure and habit frequently prevent them from following through (for reviews across distinct domains, see Auger and Devinney, 2007; Carrington, Neville and Whitwell, 2010; Conner and Norman, 2022; Kollmuss and Agyeman, 2002; Sheeran, 2002).

The cost of climate change action and inaction

Existing framing and narratives around climate challenges are problematic because they tend to focus on cost, sacrifice and immediate needs. They are often positioned as hostile to progress, getting in the way of where the country needs to get to. Use of terms like 'trade-offs' and 'tough decisions' lead people to think about personal loss rather than the collective gains that can be made (Berentson-Shaw and Fairfield, 2024). We acknowledge that the cost of effective mitigation and adaptation in relation to climate change will be extraordinary. And Deloitte's (2023) analysis shows that the costs of not acting fast and at scale are even greater (see also Kotz et al., 2024). However, narratives about costs and sacrifice are unhelpful for engaging busy, already-pressured people. Most people do not like to make sacrifices. Covid-19 taught us that people are willing to make sacrifices in a crisis, for a short period of time, but they won't stay committed if the focus is on the cost alone. This is likely to lead to a sense of being overwhelmed or despondency, and to people 'switching off' from the issue. Instead, the issue needs to be framed in a way that is both realistic about the scale and severity of the problem and provides meaningful, achievable actions (Chapman, Lickel and Markowitz, 2017). Notwithstanding the inherent complexity of the problem, narratives can help simplify the message and make it relevant to the context and action.

… the media tend to pay more attention to 'today' issues, and indeed the public context is informed by what is happening now – the economic and social conditions, realities at a regional, community and individual level – rather than potential future impacts of climate disruption.

In addition, the media tend to pay more attention to 'today' issues, and indeed the public context is informed by what is happening now – the economic and social conditions, realities at a regional, community and individual level – rather than potential future impacts of climate disruption. Most New Zealanders are worried about the 'here and now', whereas climate change is viewed as a 'tomorrow problem', even if there is recent lived experience of climate-related harm. Although the case for climate action seems obvious, and there is a need to reduce cost (human, social, economic) now and into the future given the likelihood of ongoing climate-induced disruption, progress is faltering. Evidence shows climate change is a threat to civilisation as we know it. It will have an impact on economic activities, damage infrastructure and communities, and lead to loss of culturally significant places, spread of pests, increasing food shortages, etc. However, this alone is not enough. There is a need to decrease psychological distance in order to get progress towards the needed climate transition (Vlasceanu et al., 2024).

Other narratives reinforce the supposed off-ramps or easy opt-outs: Aotearoa contributes just 0.15%[8] of global greenhouse gas emissions, driving the perception that it is not a problem for the country to solve, the country is too small to make a difference; or that it is too late to limit the average global temperature increase to 2°C. This 'whataboutism' narrative (i.e., 'What about [add country]? Our climate contribution is trivial compared to that country's') is known to be strategically used to delay action (Lamb et al., 2020; Painter et al., 2023). Also, for many, the issue simply feels too hard to tackle: the alternatives are not there, nor are they easy; it is too expensive, and other priorities fill the gap.

Complicating matters further, the persistent suggestion touted through a range of channels is that climate action is detrimental to progress. This creates a tension between the need to address the climate challenges and desire for societal

improvement or the opportunities for a better life. This unresolved tension, coupled with commentary focusing on costs, sacrifices and negative outlooks, contributes to inertia and inaction. For instance, New Zealand businesses connect climate action with increased costs, and this has been increasing over the past four years (EECA and TRA, 2023).

Paired with this, there is confusion on many aspects of climate change in Aotearoa, including how to act, what advice to follow, which approach is more important, and what we are building and working towards. In addition, information about climate-related issues is spread across numerous platforms, government agencies, sectors and regions and is challenging to navigate (see Figure 1). This confusion is prevalent and, combined with the competing narratives, contributes to public paralysis and apathy.

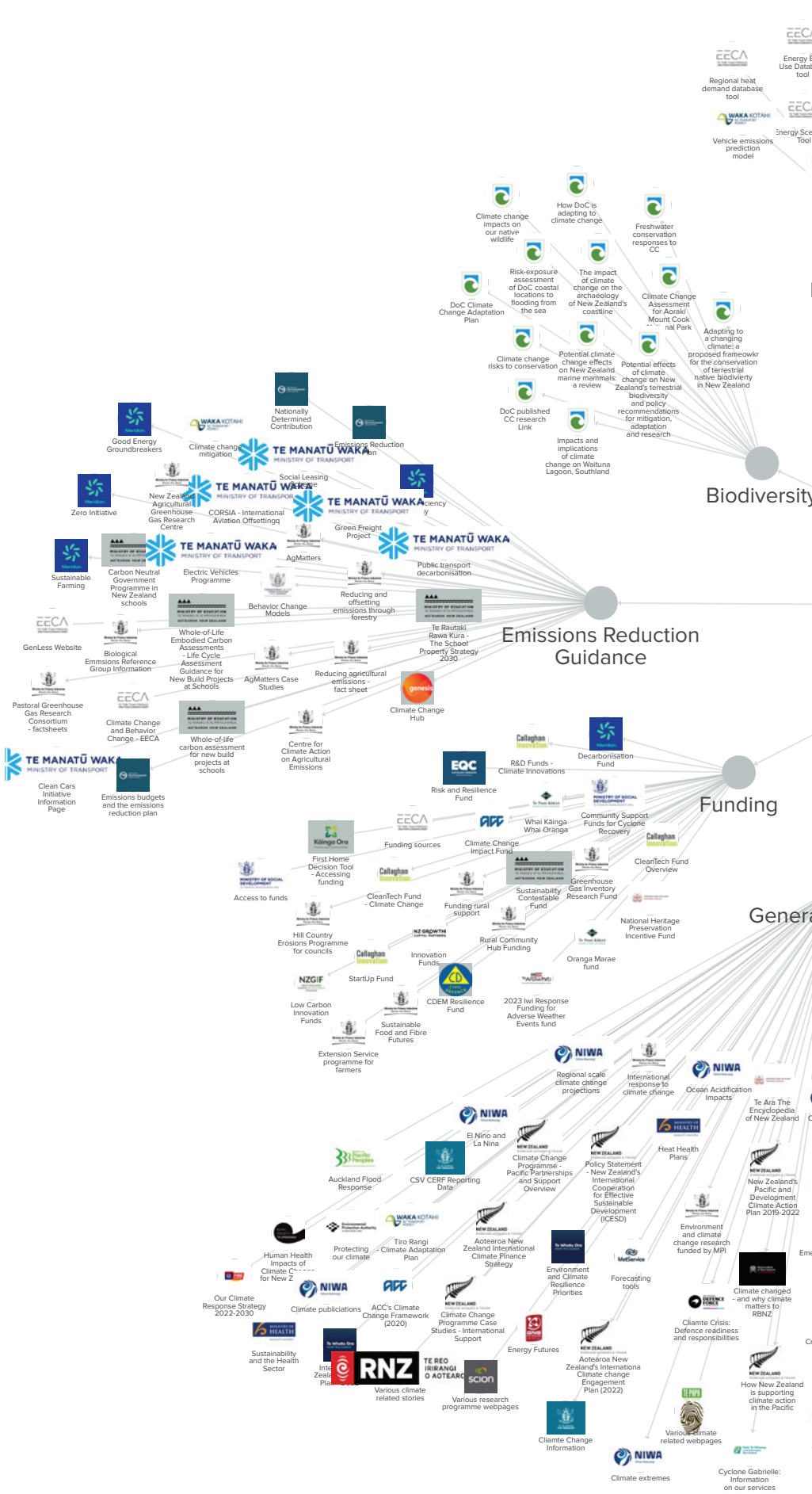
If people are asked how they 'feel' about climate change, the range of emotions that come forward tends to be negative: whether fearful or despondent, angry or over-it, confused or overwhelmed. This is compounded by doom-and-gloom language and fear-based framing. When people become overwhelmed, they are more prone to fall back on old habits, disengage and deny (Kirwan, 2021). Public morale is a key ingredient in driving climate action and motivating individuals and communities to support efforts. Individuals need to feel that their efforts, combined with the efforts of others, can lead to meaningful outcomes. Therefore, how climate action is framed significantly affects public morale.

In summary, climate narratives tend to lack relevance, focus on fear-based language, as well as cost and loss, and are overshadowed by everyday issues. These dynamics are set in a confusing information landscape, with uncoordinated data and context, and lack of practical support, making it challenging for people to navigate a way forward.

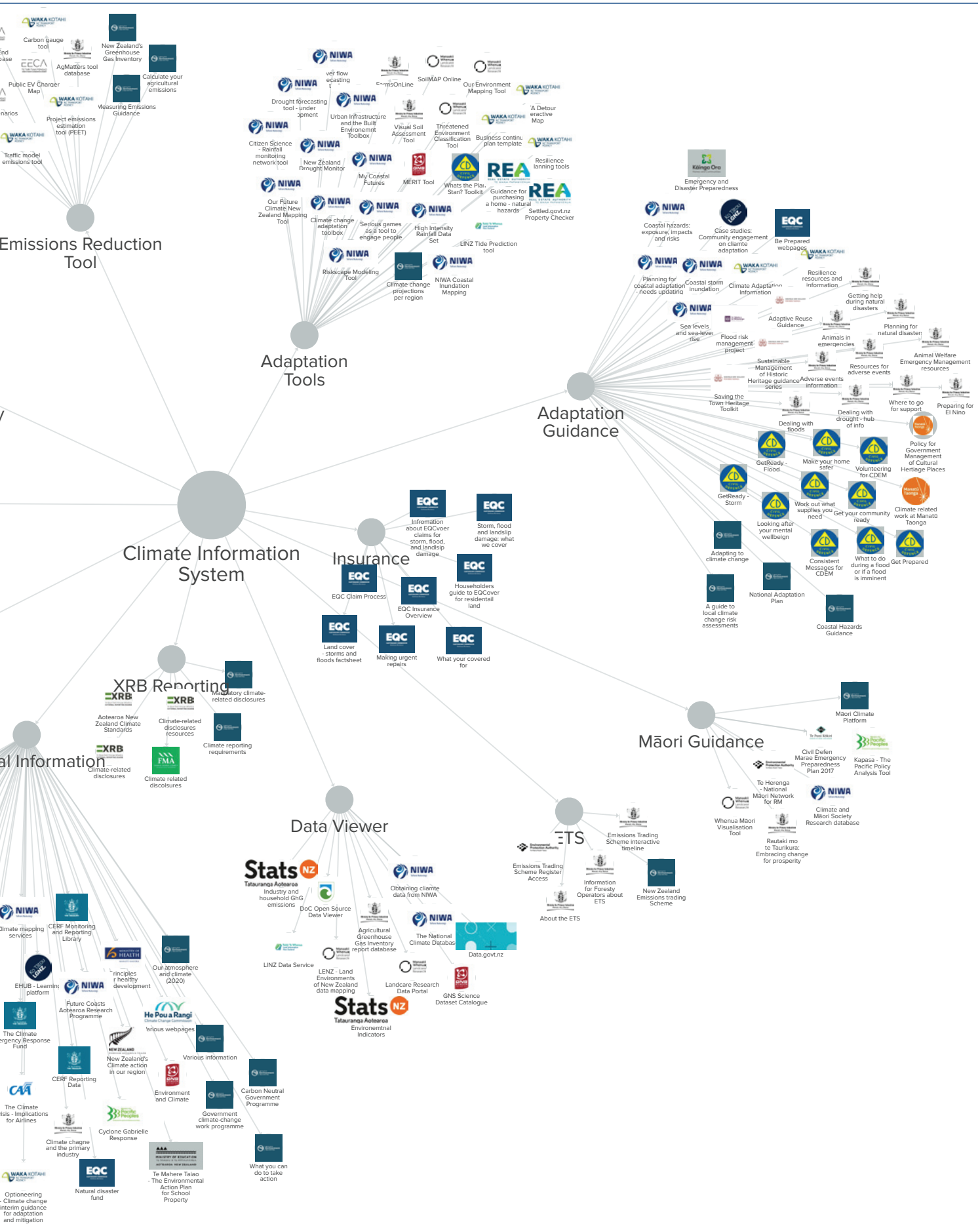
Build public morale and create a shared vision: clarifying the 'why'

Our review clearly indicates that climate discourse in Aotearoa would benefit from the articulation and execution of a shared long-term vision by our leaders, government, public and private

Figure 1: Non-exhaustive mapping of the public sector climate information system in Aotearoa New



Zealand (2022)



Source: Ministry for the Environment

sector organisations, Treaty partners, communities and innovators. This vision needs to sit beyond the language of goals ('what': e.g., Net Zero 2050) and strategies ('how': e.g., steps to meeting said goals), and articulate the 'why'. This means painting a vivid picture of the place/community/country people want to live in, tapping into deeper emotional and psychological motivations that inspire care and action. This is often referred to as the 'hearts and minds' task, encouraging people to align their personal values with the larger cause.

To succeed, such a vision needs to be reflected in a range of supporting narratives to help people make sense of it within their context and lived experience. As Noam Chomsky said, 'social action must be animated by a vision of a future society, and by explicit judgements of value concerning the character of this future society' (Chomsky, 1970, p.403). Given that climate challenges are so huge and overwhelming, people need to feel they are part of something bigger than themselves, otherwise their own efforts may feel meaningless (even if they are self-beneficial – e.g., saving money). Framing solutions through a positive future vision can inspire action (Bain et al., 2016), and imagining a desirable future helps people see the benefits of change rather than focusing only on the sacrifices, making them more open to accepting risk when needed.

The nation's Covid-19 response demonstrated that it is possible to rally people around a clear 'why': in that instance, the commitment to saving lives and protecting those most at risk to ensure the wellbeing of the entire population. This appealed to people's sense of responsibility and community and was central to securing public support for the stringent health measures in the early phases of the pandemic. Along with the 'why', supporting people to understand the 'what' and 'how' was also key when it came to enabling people to practically understand and address the impacts of the pandemic.

So how do we walk people through a new way of thinking and talking about climate action, drawing on what was learned during Covid-19? We share some relevant research and considerations below.

> A success of the Covid-19 communications was their ability to distil complex health information into a series of simple actions, repeated often, making it easy for people to understand how they could play their part, and how individual actions would benefit the collective.

Frame climate action as 'collective responsibility for a shared problem'

As with Covid-19, there is a need to develop framing and narratives that emphasise collective efficacy to help people believe that together they can make a difference. Literature in environmental psychology indicates that when climate change is framed as a societal challenge that requires collective action, people are more likely to engage in pro-environmental behaviours as it shifts the responsibility from individual actions to a collective challenge that necessitates cooperation (e.g., see Barth et al., 2021). Collective framing also taps into social norms and the sense of responsibility towards others, which is effective in mobilising individuals to act. Berentson-Shaw and Fairfield's (2024) research showed that one of the challenges in how people talk and think about climate change is that '[i]ndividual behaviour change messages make people feel like they are being asked to do the work of addressing climate disruption when the responsibility and resources sit with large organisations which are not being asked the same' (Berentson-Shaw and Fairfield, 2024, p.8). They advocate for an increased emphasis on collective and civic action in New Zealand, although there is work to do to help people understand what community and civic action looks like and the problems to be solved.

Building on this, localised framing of issues as a community or part of a national effort can enhance public support for key policies. For instance, framing climate issues as local challenges with local benefits, such as job creation and health improvements, can reduce dimensions of psychological distance (i.e., hypothetical, temporal, social and spatial), and makes the issues more relevant, tangible and immediate. Likewise, messaging that appeals to common values such as stewardship, fairness and responsibility has been shown to resonate with broader audiences. Framing climate issues as a moral responsibility to protect others might also transcend political divides (Billet et al., in press). Such collective framing led by government and organisations might be particularly relevant for the country's context given the historical and contemporary relevance of the natural environment for our national identity (Bell, 1996; Durie, 2004; Milfont et al., 2020); although, some people might view the government's role in developing and promoting such collective framing as overstepping personal agency.

Make climate action more tangible and accessible

Studies on nudge theory show that making small actions easier and more accessible leads to greater engagement (Thaler and Sunstein, 2008). People are more likely to engage in behaviour which benefits the climate when it feels manageable. As a starting point, this means framing action as a series of simple steps that people can incorporate into their daily lives: for instance, washing laundry in cold water, improving home insulation, clearing drains ahead of rain, or cycling to work. In

addition, building visibility of community actions, like waterway planting, car-free days or renewable energy projects, helps others see the benefits of climate action and normalise these behaviours. Together, this 'constellation of actions' can help build momentum around the steps required at a community level and creates demand for further change from decision makers. We acknowledge that individual actions make only a modest difference to reducing greenhouse gas emissions and preparing for climate disruption. As Chater and Loewenstein (2023) noted, impactful change comes when businesses and governments introduce smart policies, interventions and innovations which create system-level change. This is more likely when a society's culture supports those changes, and narratives and framing help 'switch on' helpful shared mindsets which support those cultural shifts.

A success of the Covid-19 communications was their ability to distil complex health information into a series of simple actions, repeated often, making it easy for people to understand how they could play their part, and how individual actions would benefit the collective. When it comes to climate change, many New Zealanders believe they need to act, and there is support for climate action. However, as noted, there is a lack of clarity and specificity around the individual and collective mitigation and adaptation actions people can take and confusion about where to get information from. In addition, although there are many community projects being led by both public and private organisations, iwi/hapū, NGOs and businesses, these often operate in isolation from one another, making it more challenging to build momentum around changes required which in turn will encourage people to become more open to solutions.

Empower communities and their trusted messengers

The need for nuanced, localised approaches was highlighted by Covid-19, and this need is amplified when it comes to addressing climate change. People are more likely to trust and act upon information from credible and relatable community figures. These messengers have more legitimacy and are generally more effective in shifting opinions and motivating change. In addition, narratives are more effective when they include culturally relevant frames and voices from diverse communities. This helps broaden engagement and make the message more inclusive. Acknowledging that climate change is experienced as a removed threat across dimensions, equal focus needs to be given to locally grounded initiatives. Partnering with local communities to co-design climate solutions ensures these are tailored to specific environmental, social and economic contexts (Harmsworth, Awatere and Robb, 2015). Such localised approaches allow communities to apply indigenous knowledge and local values to the challenge, fostering stronger community ownership and participation. Māori scientists have also emphasised the importance of integrating mātauranga Māori (Māori knowledge) into scientific and policy processes (Rauika Māngai, 2020). Inclusive processes that involve diverse voices, especially indigenous perspectives, enhance the legitimacy of climate actions and also counter the disproportionate impacts climate change has on at-risk groups, including Māori (Gray, Athy and Milfont, 2022).

> … the Covid-19 experience shows that there are benefits to making climate framing and narratives more human-centred, and for information to be organised in ways that are more comprehensible and relatable, rather than presented as two workstreams, emissions reductions and adaptation.

Use compelling storytelling

As recently noted by Nadine Hura, 'people might not always remember facts and details, but they will never forget critical information wrapped up inside a good yarn' (Hura, 2024). Hura's observation is supported by research on the neuroscience of storytelling which shows that stories activate brain areas associated with emotion and memory. Paul Zak (2014) highlights how narratives significantly boost retention and engagement compared with data and statistics. He found people are more likely to remember and be motivated by stories, as they engage empathy and 'narrative transportation'. This means people become deeply absorbed or 'transported' into a story, experiencing vivid imagery, emotional engagement and a sense of connection. As a result, their attitudes, beliefs or intentions can be influenced. The success of the Aotearoa Predator Free 2050 movement is a great example, with stories of birdsong returning to inner city suburbs, thanks to collective community trapping efforts, inspiring efforts in other suburbs and towns. When it comes to climate change, emotionally engaging narratives have been found to more effective in spurring behavioural intentions than data-driven approaches (Moser, 2016). Moving away from the abstract and complexity and presenting information through the lens of the lives people want to lead and what matters to them is critical to building connection and creating impact. Importantly, climate narratives need to lead with people's interests and what they care about, not what others want them to know.

Making climate action easier

Nothing about climate change is easy. However, the Covid-19 experience shows that there are benefits to making climate framing and narratives more human-centred, and for information to be organised in ways that are more comprehensible and relatable, rather than presented as two workstreams, emissions reductions and adaptation. Alongside this, we need to help people understand 'why' action is required and greater empathy is required towards people's approaches to climate action, without judgement. This is exemplified in the statement in Peter Senge's book *The Fifth Discipline*: 'People don't resist change. They resist being changed' (Senge, 1994, p.140). People need to be able to maintain their own identity and ideology, while still taking action. It is important to honour the challenges that others face, whatever these look like.

From a narratives and framing perspective, there are also three practical components to 'making climate action easier' which government and organisations could consider: (1) the provision of integrated climate science, data and evidence; (2) provision of wrap-around context, information and guidance to make data and science useful to people and help them to understand the 'what'; and (3) mechanisms to enable civic and community engagement with supporting education and behaviour change campaigns. Individually, these components will not deliver the scale of change needed – data and evidence will not help people make the right choices, addressing the information deficit will not motivate change, and isolated behaviour change campaigns will not have enduring impacts. However, when these components are packaged together in support of a clear vision and strategy, and climate action is framed in ways that make intuitive sense, it is possible to engender engagement and build more momentum around change.

Building on the success of the Covid-19 response, consideration could be given to the creation of an independent national platform, free of any single government agency or organisation, with supporting digital and face-to-face channels. This will ensure that the components outlined above are presented in ways that are accessible and tailored to suit users (from central government policymakers to local government planners, iwi, businesses, communities and individuals). Such consolidated efforts will help people understand 'what' needs to be done, 'why' and 'how', in their language and stories.

Climate change should not be viewed in isolation but as a lens on every activity. It is not going away and applying the metaphorical ostrich solution to hide one's head to avoid the issue, which was dramatically depicted in the 2021 movie *Don't Look Up*, will not work.

We need to aim for simplicity and clarity, providing transparency and assurance about the impending challenges, and providing opportunities for solutions to be co-designed with iwi, communities, businesses and government, drawing upon existing knowledge and expertise. Building alliances across sectors and political spectrums can help build buy-in for those priority actions that will deliver the most benefit at both an individual and societal level, as well as driving more innovative and durable mitigation and adaptation solutions. These collaborations also signal that climate action is important.

Climate change should not be viewed in isolation but as a lens on every activity. It is not going away and applying the metaphorical ostrich solution to hide one's head to avoid the issue, which was dramatically depicted in the 2021 movie *Don't Look Up*, will not work. Aligning climate actions together under a shared vision, with supporting narratives to motivate, inspire engagement and contextualise, help people connect with the issue. Supporting people to stay hopeful but realistic about progress is also critical. Again, this is not about downplaying the truth, or the grave reality of the situation Aotearoa finds itself in. As noted by Solnit (2016), hope 'is not the belief that everything was, is or will be fine', but there are 'specific possibilities ... that invite or demand that we act'. This is *grunty* hope, not idealistic hope – accepting the truth and understanding that there will be ups and downs, but that as a nation we can and should take on the challenge. Dealing with climate change is hard and it will be important to maintain public energy and commitment, so that there is endurance for the marathon ahead. It also helps to hold some tension with inaction. It's not in the nature of New Zealanders to shy away from a challenge; instead, we must tap into the Kiwi 'can do' attitude.

To conclude, reframing the public discourse on climate change is an important factor for building public morale around climate action. It also helps build the culture for systemic change, and, in a democratic system, greater opportunity for cross-party government strategy to tackle this long-term, complex and existential threat. To quote Christiana Figueres, the former executive secretary of the United Nations Framework Convention on Climate Change:

> Faced with today's facts, we can be indifferent, do nothing and hope the problem goes away. We can despair and plunge into paralysis. Or we can become stubborn optimists with a fierce conviction that no matter how difficult, we must, and we can rise to the challenge. (Figueres, 2020)

1 The Covid-19 Public Engagement and Communications team was based in the National Crisis and Management Centre from March to May 2020, then moved to the Department of the Prime Minister and Cabinet from June 2020 to late 2022. The wider team also included people from other government agencies and their partners, and from the private sector, such as social science experts, researchers, and creative and media-buying agencies.

2 To 31 December 2021, Aotearoa New Zealand experienced 10 confirmed Covid deaths per million of population. This compares with 91 for Australia, 769 for Canada, 1,932 for France, 2,379 for the US and 2,584 for the UK ('Coronavirus (COVID-19) deaths' (derived from WHO data from 22 March 2020 onwards; rounded to the nearest whole number), https://ourworldindata.org/covid-deaths.)

3 $116,603,499 spent on Unite Against Covid-19 advertising (https://www.dpmc.govt.nz/sites/default/files/2023-01/dpmc-roia-oia-2022-23-0126-gvt-spending-radio-tv-campaigns-and-covid-19%20campaign.pdf).

4 Initially the policy aim was to 'flatten the curve'; however, this was so successful that it became feasible to change the aim to elimination.

5 This compares with an Oregon public awareness campaign in the US, 'It's up to you how many people live or die' (https://www.oregonlive.com/coronavirus/2020/03/oregon-launches-stark-new-public-appeal-stay-home-dont-accidentally-kill-someone.html).

6 The Hofstede model of national culture: https://geerthofstede.com/culture-geert-hofstede-gert-jan-hofstede/6d-model-of-national-culture/.

7 80% of New Zealanders are worried about the impacts of climate change already seen in New Zealand and around the world (Ipsos, 2023), 70% of property owners think we are already seeing the impact of climate change (TRA and Ministry for the Environment, 2023), and belief in the reality of climate change and its human cause has markedly increased between 2009 and 2018 (Milfont et al., 2021).

8 0.15% means New Zealand has three times the global average emissions per capita. NZ is 19th in the world for greenhouse gas emissions (Gen Less, 2023).

Acknowledgements

The views expressed in the article are those of the authors based on their individual experience and do not necessarily reflect the views of the organisations they work for. Ideas discussed in this article were developed while all authors were employed by Manatū Mō Te Taiao Ministry for the Environment. The authors thank colleagues who offered valuable input and suggestions during review.

References

Aitken, C., R. Chapman and J. McClure (2011) 'Climate change, powerlessness and the commons dilemma: assessing New Zealanders' preparedness to act', *Global Environmental Change*, 21, pp.752–60, https://doi.org/10.1016/j.gloenvcha.2011.01.002

American Psychological Association (n.d.) 'Framing', in *APA Dictionary of Psychology*, https://dictionary.apa.org/framing

Anthony, J. (2020) 'Government spends $20 million on Covid-19 advertising campaign delivered at "breakneck pace"', *Stuff*, 28 October, https://www.stuff.co.nz/business/industries/123212411/government-spends-20-million-on-covid19-advertising-campaign-delivered-at-breakneck-pace

Auger, P. and T.M. Devinney (2007) 'Do what consumers say matter? The misalignment of preferences with unconstrained ethical intentions', *Journal of Business Ethics*, 76, pp.361–83, https://doi.org/10.1007/s10551-006-9287-y

Awatere, S., D. King, J. Reid, L. Williams, B. Masters Awatere, P. Harris, N. Tassell-Matamua, R. Jones, K. Eastwood, J. Pirker and A. Jackson (2021) *He Huringa Āhuarangi, he Huringa Ao: a changing climate, a changing world*, Manaaki Whenua Landcare Research, https://www.maramatanga.ac.nz/media/6944/download?inline

Bain, P. et al. (2016) 'Co-benefits of addressing climate change can motivate action around the world', *Nature Climate Change*, 6, pp.154–7, https://doi.org/10.1038/nclimate2814

Barth, M., Masson, T., Fritsche, I., Fielding, K., & Smith, J. R. (2021). Collective responses to global challenges: The social psychology of pro-environmental action. *Journal of Environmental Psychology*, 74, 101562. https://doi.org/10.1016/j.jenvp.2021.101562

Beattie, A. and R. Priestley (2021) 'Fighting COVID-19 with the team of 5 million: Aotearoa New Zealand government communication during the 2020 lockdown', *Social Sciences and Humanities Open*, 4 (1), 100209, https://doi.org/10.1016/j.ssaho.2021.100209

Bell, C. (1996) *Inventing New Zealand: everyday myths of pakeha identity*, Auckland: Penguin

Berentson-Shaw, J. and J. Fairfield (2024) *How to Talk about Community Planning for Climate Disruption*, Wellington: The Workshop, https://www.theworkshop.org.nz/s/How-to-talk-about-Community-Planning-for-Climate-Disruption-ar4x.pdf

Bergquist, M., A. Nilsson and P.W. Schultz (2019) 'Experiencing a severe weather event increases concern about climate change', *Frontiers in Psychology*, 10, https://doi.org/10.3389/fpsyg.2019.00220

Billet, M.I., A. Baimel, T.L. Milfont and A. Norenzayan (in press) 'Political common ground on preserving nature: environmental motives across the political spectrum', Environment and Behavior. Pre-print: https://doi.org/10.31234/osf.io/de5qx

Bruine de Bruin, W., L. Rabinovich, K. Weber, M. Babboni, M. Dean and L. Ignon (2021) 'Public understanding of climate change terms: key findings', University of Southern California Dornsife College Public Exchange with the United Nations Foundation, https://publicexchange.usc.edu/wp-content/uploads/2021/03/Public-Understanding-of-Climate-Change-Report-.pdf

Carrington, M.J., B.A. Neville and G.J. Whitwell (2010) 'Why ethical consumers don't walk their talk: towards a framework for understanding the gap between the ethical purchase intentions and actual buying behaviour of ethically minded consumers', *Journal of Business Ethics*, 97, pp.139–58, https://doi.org/10.1007/s10551-010-0501

Chapman, D.A., B. Lickel and E.M. Markowitz (2017) 'Reassessing emotion in climate change communication', *Nature Climate Change*, 7, pp.850–52, https://doi.org/10.1038/s41558-017-0021-9

Chater, N. and G. Loewenstein (2023) 'The i-frame and the s-frame: how focusing on individual-level solutions has led behavioral public policy astray', *Behavioral and Brain Sciences*, 46, e147, https://doi.org/10.1017/s0140525x22002023

Chomsky, N. (1970) *For Reasons of State*, New York: Penguin

Conner, M. and P. Norman (2022) 'Understanding the intention-behavior gap: the role of intention strength, *Frontiers in Psychology*, 13, https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2022.923464/full

Deloitte (2023) *Aotearoa New Zealand's Turning Point*, https://www.deloitte.com/content/dam/assets-zone1/nz/en/docs/about/2023/nz-turning-point-report.pdf

Durie, M. (2004) 'An indigenous model of health promotion', *Health Promotion Journal of Australia*, 15, pp.181–5, https://doi.org/10.1071/he04181

EECA and TRA (2023) 'A deep dive into how New Zealand businesses approach energy use and climate change', Energy Efficiency and Conservation Authority and the Research Agency, https://www.eeca.govt.nz/assets/EECA-Resources/Research-papers-guides/TRA_EECA-Business-monitor-webinar-presentation-slides.pdf

Evans, L., T.L. Milfont and J. Lawrence (2014) 'Considering local adaptation increases willingness to mitigate' *Global Environmental Change*, 25, pp.69–75, https://doi.org/10.1016/j.gloenvcha.2013.12.013

Figueres, C. (2020) 'The case for stubborn optimism on climate', TED video, https://www.ted.com/talks/christiana_figueres_the_case_for_stubborn_optimism_on_climate?utm_campaign=tedspreadandutm_medium=referralandutm_source=tedcomshare

Figueres, C. (2024) 'Why a mind-set of stubborn optimism about the climate crisis is needed, now more than ever', *Bulletin of the Atomic Scientists*, 80, pp.38–40, https://doi.org/10.1080/00963402.2023.2293576

Gen Less (2023) 'New Zealand isn't too small to make a difference', 13 November, https://genless.govt.nz/stories/new-zealand-isnt-too-small-to-make-a-difference/#:~:text=New%20Zealand%20contributes%20about%200.15,proportion%20of%20the%20global%20population

Gray, N.H., A.E. Athy and T.L. Milfont (2022) 'Climate crisis as a catalyst to advance indigenous rights', *MAI Journal*, 11 (2), pp.103–16, https://doi.org/10.20507/MAIJournal.2022.11.2.2

Greive, D. (2020) 'The epic story of NZ's communications-led fight against Covid-19', *Spinoff*, 11 May, https://thespinoff.co.nz/politics/11-05-2020/a-masterclass-in-mass-communication-and-control

Harmsworth, G., S. Awatere and M. Robb (2015) 'Māori values and perspectives to inform collaborative processes and planning for freshwater management', policy brief 14, Manaaki Whenua Landcare Research, https://www.landcareresearch.co.nz/assets/Publications/Policy-Briefing-Guidance-Papers/Policy-Brief-14-Maori_Values_Perspectives.pdf

Hura, N. (2024) 'A single light on the mahua: on the parallel worlds of climate change storytelling', *Spinoff*, 30 January, https://thespinoff.co.nz/atea/30-01-2024/a-single-light-on-the-mahau-on- the-parallel-worlds-of-climate-change-storytelling

Ipsos (2023) *Climate Change 2023: public opinion on climate change*, https://www.ipsos.com/sites/default/files/ct/news/documents/2023-08/Ipsos%20New%20Zealand%20Global%20Advisor%20-%20Climate%20Change%202023%20v2%2008.08.23.pdf

Kirwan, D. (2021) 'We need to change the way we talk about climate change', *Behavioral Scientist*, 11 October, https://behavioralscientist.org/we-need-to-change-the-way-we-talk-about-climate-change/

Klein, N. (2023) *Doppelganger*, Penguin

Kollmuss, A. and J. Agyeman (2002) 'Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behavior?', *Environmental Education Research*, 8, pp.239–60, https://doi.org/10.1080/13504620220145401

Kotz, M., A. Levermann, and L. Wenz (2024). 'The economic commitment of climate change,' *Nature*, 628, 551-557. https://doi.org/10.1038/s41586-024-07219-0

Lamb, W.F., G. Mattioli, S. Levi, J.T. Roberts, S. Capstick, F. Creutzig, J.C. Minx, F. Müller-Hansen, T. Culhane and J.K. Steinberger (2020) 'Discourses of climate delay', *Global Sustainability*, 3, e17, https://doi.org/10.1017/sus.2020.13

Landry, N., R. Gifford, T.L. Milfont, A. Weeks and S. Arnocky (2018) 'Learned helplessness moderates the relationship between environmental concern and behavior', *Journal of Environmental Psychology*, 55, pp.18–22, https://doi.org/10.1016/j.jenvp.2017.12.003

McClure, J., I. Noy, Y. Kashima and T.L. Milfont (2022) 'Attributions for extreme weather events: science and the people', *Climatic Change*, 174, 22, https://doi.org/10.1007/s10584-022-03443-7

Milfont, T.L., D. Osborne, K. Yogeeswaran and S.G. Sibley (2020) 'The role of national identity in collective pro-environmental action', *Journal of Environmental Psychology*, 72, 101522, https://doi.org/10.1016/j.jenvp.2020.101522

Milfont, T.L., E. Zubielevitch, P. Milojev and C.G. Sibley (2021) 'Ten-year panel data confirm generation gap, but climate beliefs increase at similar rates across ages', *Nature Communications*, 12, 4038, https://doi.org/10.1038/s41467-021-24245-y

Moser, S.C. (2016) 'Reflections on climate change communication research and practice in the second decade of the 21st century: what more is there to say, *WIREs Climate Change*, 7, pp.345–69, https://doi.org/10.1002/wcc.403

Painter, J., J. Ettinger, D. Holmes, L. Loy, J. Pinto, L. Richardson, L. Thomas-Walters, K. Vowles and R. Wetts (2023) 'Climate delay discourses present in global mainstream television coverage of the IPCC's 2021 report', *Nature Communications Earth and Environment*, 4, 118, https://doi.org/10.1038/s43247-023-00760-2

Rauika Māngai (2020) *A Guide to Vision Mātauranga: lessons from Māori voices in the science sector*, https://www.sftichallenge.govt.nz/assets/Uploads/About-us/Rauika-Mangai_A-Guide-to-Vision-Matauranga_FINAL.pdf

Senge, P.M. (1994) *The Fifth Discipline: the art and practice of the learning organization*, Random House

Sheeran, P. (2002) 'Intention–behavior relations: a conceptual and empirical review, *European Review of Social Psychology*, 12 (1), http://dx.doi.org/10.1080/14792772143000003

Solnit, R. (2016) '"Hope is the embrace of the unknown": Rebecca Solnit on living in dark times', *Guardian*, 15 July, https://www.theguardian.com/books/2016/jul/15/rebecca-solnit-hope-in-the-dark-new-essay-embrace-unknown

Thaler, R.H. and C.R. Sunstein (2008) *Nudge: improving decisions about health, wealth, and happiness*, Yale University Press

TRA and Ministry for the Environment (2023) 'Property owner climate resilience', https://environment.govt.nz/assets/publications/climate-change/Property-owner-climate-resilience.pdf

Tversky, A. and D. Kahneman (1981) 'The framing of decisions and the psychology of choice', *Science*, 211, pp.453–8, https://www.jstor.org/stable/1685855

Vlasceanu, M. et al. (2024) 'Addressing climate change with behavioral science: a global intervention tournament in 63 countries', *Science Advances*, 10 (6), https://doi.org/10.1126/sciadv.adj5778

Zak, P.J. (2014) 'Why your brain loves good storytelling', *Harvard Business Review*, 29 October, https://hbr.org/2014/10/why-your-brain-loves-good-storytelling

David Hall

In the Mix: managing policy complexity in climate change mitigation

Abstract

The policy mix is an analytical framework for understanding the elements, processes, dimensions and characteristics of complex policy systems. This article applies this framework to Aotearoa New Zealand's policy mix for climate mitigation, both to understand why we have the policies we have, and also to stimulate ideas about how to improve outcomes. Instead of a comprehensive analysis, the article focuses on the mix of policy instruments, the evaluative principles that guide policy appraisal, the challenge of harmonising multiple principles, and the influence of economic principles on the scope and intent of policy mixes.

Keywords policy mix, policy appraisal, policy design, climate mitigation, climate change

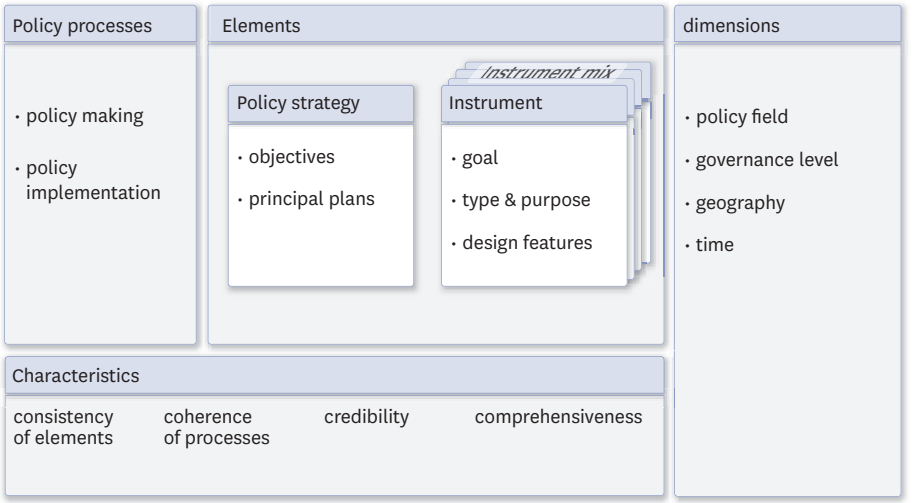
> It goes without saying that complicated systems of economic policy (for example) will almost invariably be a mixture of instruments.
>
> —Jan Tinbergen, 1952, p.71

David Hall is the policy director of the Toha Network and an adjunct lecturer in climate action at Auckland University of Technology (AUT).

Have you heard the joke about the lost tourist in the Irish countryside who asks a local for the way to Dublin? After considering the matter for a moment, the local answers: 'Well, if I were you, I wouldn't start from here.' This also feels like the right way to think about New Zealand's climate mitigation policy. If we are to take a step back, to honestly take stock of present circumstances – for instance, recent developments in clean technologies, new insights into policy evaluation, the evolution of actual (as opposed to theoretical) carbon markets, international ambition on target setting, the emboldened social licence for climate action – we might well wonder whether we would start with the policy framework we have. It is a product of circumstances that are many years, even decades, old – going back to a time when carbon budgets were not nearly depleted, when clean technology seemed out of reach, when climate change was distant to most people's thoughts and fears. Does it make sense to carry on, given what we now know? Or should we take a step back and ask ourselves, honestly, is our policy pathway consistent with our aims?

Policymakers are rarely afforded – nor afford themselves – this opportunity to reflect. There are, of course, many causes for this: path dependencies, personal legacies, the fallacy of sunk costs, and the frenetic pace and reactive style of contemporary

Figure 1: Policy processes, elements and dimensions



Source: adapted from Rogge and Reichardt, 2016

policymaking. But it is also a consequence of the tragedy in the joke: we are where we are, which is not always where we ought to be. Starting from somewhere else is, if not impossible, then often inadvisable, because retracing our steps is wasted time and energy. We must press on from wherever we happen to be – and yet it would be foolish to do so without understanding how we went astray. If we do not, we may reproduce our mistakes, misbeliefs and misjudgements. Once again, we might find ourselves lost in the countryside, asking for help from strangers and tricksters.

We need new maps, new ways of thinking about complex challenges, where we are and where we want to go. This article introduces the framework of the policy mix as a structured way of evaluating climate mitigation policy in Aotearoa New Zealand. As the term 'policy mix' implies, there is an inherent assumption – like Tinbergen's in the epigraph above – that there will be multiple policies. However, just because multiple policies are justifiable, this does not mean that any particular policy is justified. The aim, rather, is a judiciously selected portfolio of policies that delivers more than the sum of its parts, but refrains from an expensive accumulation of policies that conflict and contradict one another. To achieve this, we need new capabilities in policy appraisal to distinguish good mixes from bad, which is the focus of the latter part of this article.

The policy mix framework

In circumstances of complexity and uncertainty, we need new analytical tools. One such tool is the extended concept of the policy mix (Rogge and Reichardt, 2016; Rogge, 2018; Rogge and Song, 2023), which offers a framework for describing and evaluating the assemblage of elements, processes, dimensions and characteristics that – intentionally or otherwise – make up the policy response to a particular challenge (see Figure 1).

The *elements* of a policy mix are strategies and instruments. *Strategies* refers to policy objectives (such as emissions reduction targets) and also principal plans which set out plausible pathways for achieving these objectives (such as emissions reduction plans and national adaptation plans). *Instruments* refers to the actual policy tools that governments implement to achieve objectives. These might include economic instruments (emissions trading schemes, taxes, subsidies, grants, loans), regulatory instruments (standards, consents, laws, performance targets) and informational instruments (public campaigns, labelling, foresight exercises, roadmaps).

Policy processes refers to policy as a verb, as something people do, rather than policy as an output or instrument. In other words, it is the 'political problem-solving processes among constrained social actors in the search for solutions to societal problems' (Rogge, 2018). As such, it relates to institutional structures and cultures, to the ways that policymakers work to develop, implement and modify policy. But it also relates to the exercise of power and agency, which includes electoral politics and the challenge of holding and retaining office, as well as competition and collaboration within and among policy agencies.

Dimensions refers to the broader context within which the policy mix is operating. These dimensions include the wider policy system, local and global governance, geographic factors, and time. All these impose certain constraints on the policy mix, limits on what is possible; yet may also create policy opportunities that are not available elsewhere.

Finally, *characteristics* refers to the evaluative dimensions of the policy mix, the values by which to make assessments of its performance. Four vital characteristics are consistency, coherence, credibility and comprehensiveness:

- *Consistency* refers to whether the policy elements are synergistic (or mutually detrimental) with each other. Does the strategy align with objectives? Do instruments positively reinforce each other, or do they stand in conflict?
- *Coherence* refers to whether policy processes are aligned (or misaligned) to policy objectives. Is policymaking integrated and holistic, or operating across silos? Is policymaking coordinated by aligning the tasks and efforts of different organisations?
- *Credibility* refers to whether the policies and commitments are believable and reliable (or not). Do the right agents have sufficient commitments? Is greater accountability and transparency needed? Are independent agencies or greater decentralisation required?
- *Comprehensiveness* refers to whether the policy mix is extensive in its coverage of relevant issues and stakeholder engagement. Are all market and institutional failures addressed? Are all barriers and bottlenecks addressed? Has engagement been undertaken for all affected parties?

The literature on policy mixes – also described as policy packages or portfolios – in general is growing (e.g., Bouma et al., 2019; van den Bergh et al., 2021; Dimanchev and Knittel, 2023; Blanchard et al., 2023), as well as that on sector-specific mixes in transport (Bhardwaj et al., 2020; Edmondson et al., 2024), agriculture (Kalfagianni and Kuik, 2017; Rodríguez-Barillas et al., 2024) and forestry (Scullion et al. 2016). The remainder of this article draws on these themes, not to provide a comprehensive analysis of New Zealand's

policy mix, but rather to make a few broad brushstroke observations to illuminate the usefulness of this framework.

Many tools in the toolbox

The idea of an instrument mix is, of course, plural rather than singular. It assumes more than one policy instrument is needed to pursue the target of – in this instance – emissions reductions.

The case for instrument mixes in climate mitigation is well-established. In the IPCC's sixth assessment report, the working group on climate mitigation concluded that: 'Both theoretical and empirical analysis reinforce the argument that single policy instruments are not sufficient (*robust evidence, high agreement*)' (IPCC, 2022, p.461). It acknowledges that the final composition of the policy mix will vary from country to country, depending on contextual factors and local circumstances (the dimensions of Figure 1). However, it recommends an open-minded approach that considers:

> a combination of: (i) standards, nudges and information to encourage low-carbon technology adoption and behavioural change; (ii) economic incentives to reward low-carbon investments; (iii) supply-side policy instruments including for fossil fuel production (to complement demand-side climate policies) and (iv) innovation support and strategic investment to encourage systemic change. (ibid.)

I have written before about the insufficiency of emissions pricing alone to achieve the mitigation pathways that we have (Hall and McLachlan, 2022). I will not rehearse this argument again, except to note that the empirical research cited throughout this article reinforces its thesis. In the context of policy mixes, however, it is important to highlight that this is not a unique deficiency of emissions pricing: the lesson of the instrument mix is that any single instrument will be insufficient. A sole dependence on, say, a subsidy, or supply-side regulation, would also allocate too much responsibility to a single instrument. To drive sufficient emissions reductions, the instrument would need to be so stringently imposed that it would attract political resistance, such as electoral pressure and industry lobbying, just like high emissions pricing does.

This realisation goes back at least as far as Jan Tinbergen's pioneering studies of policy appraisal. The so-called Tinbergen rule is often glossed as if the ideal ratio of instrument (*n*) to policy target (*n*') is 1:1.[1] However, Tinbergen clearly argued for a ratio of $n \geq n'$. He was not unaware of the dangers of 'too many instruments', yet he understood that multiple instruments were needed to manage what he called 'the distribution of pressure' – that is, the tension that policy creates through its effects (Tinbergen, 1952, pp.38, 41). In particular, he singled out 'fairness' and 'efficiency' as reasons to favour additional instruments: first, to manage the uneven impacts of policy and, second, to relieve any single instrument of the full burden of delivering its outcome.

On this latter point, a recent cross-country analysis of energy-related emissions is illustrative. Its policy simulations show that 'given current technologies and substitution possibilities, even significant carbon price hikes will not suffice to meet net-zero emission targets' (D'Arcangelo et al., 2022). Indeed, only steep and persistent increases in emissions pricing to over €1,000 per t/CO_2 by the late 2030s would deliver the necessary emissions reductions. The politics of this, given the pro-inflationary effects on energy and food prices, would be extremely challenging. Yet the same outcome can be achieved by a far more moderate price increase – an annual increase of 10% to reach €220 by 2040 – if price responsiveness (or demand elasticity) is increased five-fold over the same period. In the policy simulations, this was achieved by clean technology support, regulations and standards. This redistributes the pressure and, therefore, reduces the likelihood of backlash.

Are we all mixologists now?

These pragmatic realities go some way to explaining New Zealand's actual policy mix for climate mitigation. Despite the rhetorical prevalence of a 'first-best' approach to climate mitigation which centres on the promise of emissions pricing, our actual experience is suboptimal pricing, political compromise and an insufficient mix of multiple instruments.

Since its implementation in 2008, the New Zealand Emissions Trading Scheme (NZ ETS) was typically framed as 'the principal policy tool underpinning New Zealand's domestic emissions reduction action' ...

Since its implementation in 2008, the New Zealand Emissions Trading Scheme (NZ ETS) was typically framed as 'the principal policy tool underpinning New Zealand's domestic emissions reduction action' (Ministry for the Environment, 2017). In reality, however, the NZ ETS was never the *only* instrument. Notably, the Energy Efficiency and Conservation Authority was established in 1992 and has managed a variety of regulatory, economic and informational instruments ever since, justified in part by emissions reductions.[2] Other policies were also introduced and maintained alongside the NZ ETS, including various support schemes for forestry and agriculture, public investment in climate-related research, and low-emissions transport policy, including public transport – typically to pursue other policy goals in addition to climate mitigation. Nevertheless, this instrument mix amounted to a policy underreaction

(Dyer, 2023), failing to induce the structural shifts that would deliver gross emissions reductions. Arguably, the primacy of emissions pricing in the policy process – from the initial commitment to a carbon tax in 1997, to a decade-long navigation of serious political resistance, to the eventual implementation of the NZ ETS 11 years later – served to crowd out other policy options. This continued into the first phase of the NZ ETS when its effectiveness was being moderated (Hall, 2020).

As a critical part of the policy process, policy appraisal involves 'providing information or advice to policymakers concerning the relative advantages and disadvantages of alternative policy choices' ...

With the release of the first Emissions Reduction Plan in 2022, there was a notable shift in official framing:

> While emissions pricing plays a central role in reducing our gross and net emissions, *emissions pricing alone cannot support our transition in an equitable way* … Instead, a mix of regulation and policies, such as innovation, equitable transition measures, behaviour change and finance, are needed alongside emissions pricing. (Ministry for the Environment, 2022, p.99, emphasis added)

This signalled a more overt and expansive view of the instrument mix, justified primarily in regard to effectiveness and distributional impacts. However, this process was also characterised by a lack of coherence and systems-wide strategy, and insufficient analysis of the consistency and comprehensiveness of the instruments that proliferated out of sectoral adding-up exercises (Parliamentary Commissioner for the Environment, 2023).

Since then, the pendulum appears to be swinging back, at least partially. The 2024 discussion paper for the second Emissions Reduction Plan consultation asserts that the NZ ETS 'will continue to be the main tool to determine where and how to reduce net emissions'. But it also acknowledges that 'there is a clear role for policies that allow the NZ ETS to work better and support the early adoption of emerging technologies', which requires 'correctly understanding the relationship between complementary policies and the NZ ETS' (Ministry for the Environment, 2024, p.25). The 'correct relationship' is articulated strictly in terms of market failure – that is, complementary policies are only warranted if they target a well-defined market imperfection. I return to this subject in the final section.

The actual disagreement in New Zealand, then, is not so much about single versus multiple instruments; it is about narrow versus wide policy mixes. At the narrow end, the NZ ETS is the primary instrument, adjoined by a small set of complementary policies. At the other end of the spectrum, the NZ ETS is but one of multiple instruments, none of which have *a priori* primacy; indeed, in certain circumstances, the NZ ETS might be complementary to other policies that do the heavy lifting. It is well known, for instance, that direct support for research, development and deployment (RD&D) is critical for innovation and adoption of new technologies (Jaffe, Newell and Stavins, 2005; Grubb et al., 2021). Once such technologies are scaling up, however, the NZ ETS might play a complementary role by creating a price signal that boosts the competitiveness of clean technologies in a market economy, as well as the threat of a regulatory backstop through declining unit supply.

The disagreement over the breadth of instrument mixes is not only technical, it is also political. It will not have escaped the attention of many readers that the back-and-forth over policy design is synchronised with changes in coalition governments. This is to be expected to a point: different political parties bring different values and priorities to the process of policy appraisal. The focus on distributive impacts versus market failures not only implies wider and narrower policy mixes respectively, but also aligns with different political orientations, including different visions of government and its proper role. In a representative democracy, there must be space for reasonable disagreement on policy design.[3]

However, there is also a science to policymaking, a body of empirical evidence which ought to moderate the whims of decision makers. Both narrow and wide instrument mixes might be rationally defensible depending on the consistency and coherency of their elements, the credibility of their implementation, and the real-world circumstances and constraints that they must deal with. However, each can also produce distinct pathologies. On the one hand, a policy mix can be so narrow that it cannot fulfil its target(s) and therefore results in policy underreaction (Maor, 2021). On the other hand, a wide policy mix, if incoherent and internally inconsistent, can evolve into a policy mess (Sorrell et al., 2003; Bouma et al., 2019). The current volatility in policy design, as well as the deficient analyses of policy mixes in policy processes, leaves the door open to the influence of ideology, political whim and reactive policymaking.

Appraising policy

This brings us to the challenge of policy appraisal. As a critical part of the policy process, policy appraisal involves 'providing information or advice to policymakers concerning the relative advantages and disadvantages of alternative policy choices' (Howlett et al., 2015). This is critical for the development of policy, but also the neglected phases of evaluation and ongoing improvement. In the discussion so far, I have already invoked various principles that weigh for or against certain policies: effectiveness, efficiency, feasibility, distributional impacts and so

on. These principles, as well as several others, are summarised in Table 1 (adapted from Peñasco, Anadón and Verdolini, 2021). Aligning the policy mix to a well-articulated set of such principles is critical to its coherence.

Economic efficiency has long played the predominant role in policy processes. Nearly twenty-five years ago, Parr (2000) noted that: 'The overriding objective of New Zealand's climate change policy is that any actions taken to abate climate change must be done at least cost. Yet, for a complex and dynamic challenge like climate mitigation, it would be surprising if not all the principles in Table 1 (and potentially others too) had some role in policy appraisal. Unfortunately, this does not lend itself to a neat and tidy algorithm. On the contrary, trade-offs among principles are unavoidable; their application requires a sensitivity to their mutual interdependencies and relation to facts on the ground; and the prioritisation of these principles is subject to practical and political disagreement. Good policy appraisal, therefore, involves not only evaluative principles and due regard to evidence, but also the exercise of political judgement, which I define here as an aptitude for 'the art of the possible'. How might we improve this quality of judgement?

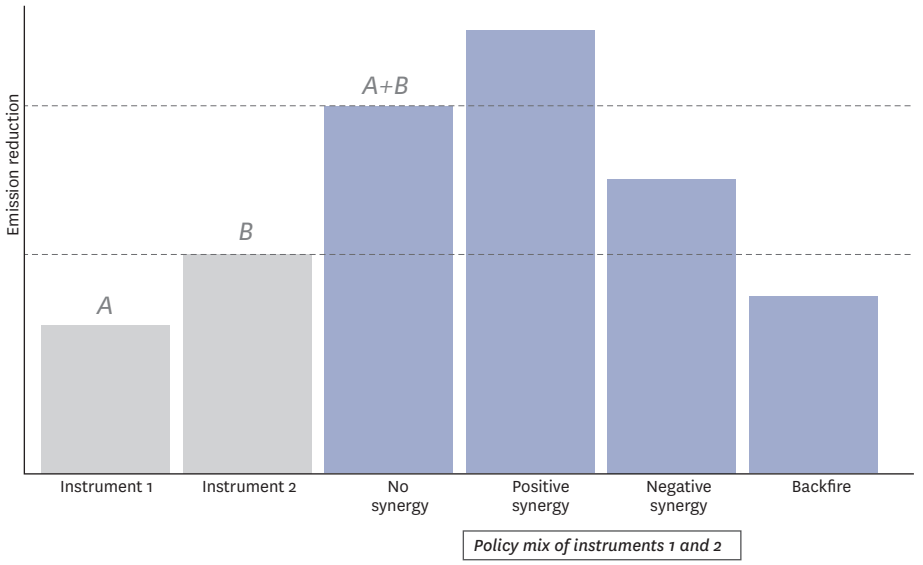
Table 1: Selected principles for policy appraisal

Principle for policy appraisal	Description
Effectiveness	Extent to which policy meets its proposed objective or realises a positive outcome.
Efficiency	Extent to which policy achieves the highest amount of output by using the least amount of inputs – whether as financial cost, time, energy or materials.
Social acceptability	Extent to which policy is regarded as legitimate by relevant publics and gains broad-based acceptance.
Political feasibility	Extent to which policy is likely to be adopted, implemented and maintained over time, given existing political conditions and constraints.
Ease of implementation	Extent to which policy is technically able to be implemented, with relatively manageable transaction costs.
Distributional impacts	Extent to which policy has unequal or inequitable impacts, and the perceived (un)fairness of the policy instrument in its distribution of costs and benefits.
Spillovers	Extent to which policy has positive or negative effects on policy goals which are not the primary goal of the policy (e.g. co-benefits of decarbonisation for public health by reduced air pollution)
Macroeconomic effects	Extent to which policy produces macroeconomic effects, such as competitiveness, change to GDP, employment, exports and imports, industry creation, and other changes in the costs and benefits to parties.
Adaptability	Extent to which policy can be modified or adjusted over time in response to changing circumstances.
Policy harmonisation	Extent to which policy interacts positively, negatively or neutrally with other policies, both within a policy portfolio, but also in relation to wider policy settings (e.g. taxation, urban development).
Tipping points	Extent to which policy is likely to trigger social tipping points – such as technology diffusion or behaviour change – that causes irreversible and self-reinforcing change.

First, it must be recognised that each of these evaluative principles can be interpreted in diverse ways. Distributional impacts, for instance, summons up longstanding debates in ethics over the meaning of equality, equity and fairness. But even apparently technical principles, such as efficiency, have a variety of meanings which need to be carefully delineated. For instance, economic efficiency is often conceived statically as the relative cost of inputs and outputs at a single point in time. Marginal abatement cost curves (MACCs) are often interpreted by decision makers in this way, which encourages the view that only least-cost options should be considered first, with more expensive options left until a later date. However, 'as it is well known, a static notion of cost efficiency can lead to inefficient policies whenever dynamic effects are in place' (Fabra and Reguant, 2024). For instance, if investing in an expensive option reduces its costs – which is precisely what has occurred with clean technologies like solar PV, wind turbines, batteries, EVs (Bond, Butler-Sloss and Walter, 2024) – then this will realise cost savings over the long run that outweigh the initial costs (Vogt-Schilb, Meunier and Hallegatte, 2018; Grubb et al., 2021). To accept this point is not to reject the importance of efficiency, it is rather to shift from one conception of efficiency to another, from *static* to *dynamic* efficiency, the latter of which is appropriate to the circumstances of transition and transformation (Huerta de Soto, 2008). This further highlights the importance of time as a dimension in the policy mix, in particular the opportunities for policy sequencing, knowing when to begin and end a policy, and how to stage policies so that one might amplify another (Pahle et al., 2018).

Second, each evaluative principle, while oriented towards an ideal, must be applied with due regard to the non-ideal circumstances in which the policy will actually be implemented. The notion that emissions pricing alone is justified on the basis of economic efficiency, for example, rests upon several heroic assumptions that do not pertain in the real world, such as perfectly operating markets, full compliance by market participants, the quantifiability of future climate impacts, and the absence of near-term targets. Nevertheless, some prominent commentators and even some decision makers appeal to this 'first-best' ideal by arguing that, because emissions pricing delivers the most efficient response to climate change, complementary policies can only but contribute to inefficiency. In the real world, however, the superior efficiency of emissions pricing relative to other policies is far from obvious. As Borenstein and Kellogg (2023) have shown, in the circumstances of imperfect energy markets and near-term gross emissions targets, the difference in the economic

Figure 2: Potential outcomes of policy instrument interactions



Source: adapted from Drews, Exadaktylos and van den Bergh, 2020

efficiency of subsidies or emissions pricing is negligible. In short: 'It is a fundamental mistake to begin the analysis of climate change under the premise that, but for the mispricing of emissions, the economy is efficient' (Stern and Stiglitz, 2021).

Third, it is important to consider these evaluative principles in relation to one another, not in isolation. For example, the most efficient option *in principle* might not *in fact* be politically feasible – and, as such, its claim to efficiency is unrealisable. The same goes for effectiveness: a supply-side policy which directly restricts emissions-intensive consumption, such as a ban on fossil fuel imports, will not be effective at all if it induces a backlash so severe that it cannot be implemented or sustained. The virtues of efficiency and effectiveness must be reconciled with the principle of political feasibility. If reconciliation is not possible, then it is churlish to continue to insist upon the ideal option, not least because it crowds out feasible alternatives. A least-cost policy that cannot be implemented is not a triumph for fiscal prudence; it is a failure. However, a policy with a higher abatement cost might be worth the investment if it avoids resistance and ensures durability.

The lesson here is not that one or other principle is superior; rather that judicious policy design will involve a synergistic combination of principles. By way of example, a major cross-country survey by OECD economists found that public support for climate policy is dependent on three key factors: the perceived effectiveness of the policies in reducing emissions, their perceived distributional impacts on lower-income households, and their own household's gains and losses (Dechezleprêtre et al., 2022). In other words, social acceptability – which is a contributing factor to political feasibility – is underpinned by the effectiveness, efficiency, distributional impacts and macroeconomic effects of the policy mix. In turn, this social acceptability enhances the capacity of policymakers to tighten the stringency of those attributes.

Policy harmonisation

The assumption of an instrument mix should not be taken as a *carte blanche*, as an excuse to implement any and every policy idea as if each were necessarily additive. Rather, the challenge is to develop a strategic portfolio of instruments which is defensible as an interrelated package.

As Figure 2 shows, there are a range of possible interactions among overlapping policies. If there is no synergy, the policies are additive – that is, the combined impact is simply the sum of its parts. If there is a positive synergy, the combined impact is greater than the sum of its parts. If there is a negative synergy, it is less than the sum of its parts and, in extreme cases, results in backfire where the combined impact is less than the impact of the best-performing instrument. Policymakers are well advised to anticipate and avoid backfires, to tread carefully with negative synergies, and to pursue policy combinations with no or positive synergies (van den Bergh et al., 2021).

The deliberate pursuit of positive synergies is a plausible goal, as demonstrated by an innovative 2024 study which applies machine learning to a global, systematic ex-post evaluation of 1,500 climate policies in 41 countries between 1998 and 2022 (Stechemesser et al., 2024). It finds 63 instances of emissions breaks, where a country's historical emissions diverge significantly from the counterfactual. By assessing policy interventions associated with each emissions break, the research found that 'effect sizes are larger if a policy instrument is part of a mix rather than implemented alone', which suggests that many policy instruments are complementary or even reinforcing in policy mixes. Emissions pricing is especially important as a complement to other policies.

One way that positive synergies occur is where two (or more) policies trigger self-reinforcing feedbacks which create irreversible momentum for a new behaviour or technology. A combination of adoption subsidies and emissions pricing, for instance, can accelerate the deployment of clean technologies and therefore build economies of scale and cost efficiencies, which in turn improves its cost-competitiveness and its deployment in market economies. These so-called 'learning curves' or 'experience curves' are behind the dramatic diffusion of mass-manufactured technologies – including solar panels, batteries and electric vehicles – which abruptly shift from niche to mainstream over relatively short periods of time (Grubb et al., 2021; Sharpe, 2023; Bond, Butler-Sloss and Walter, 2024).

An example of a negative synergy is the waterbed effect in a cap-and-trade scheme. In theory, any additional policy will only free up allowances that other polluters will use, thus negating any emissions reductions that the additional policy delivered. If the cap-and-trade scheme is watertight, the negative synergy will, in theory, be on the boundary of backfire. Yet we need to differentiate between ideal and non-ideal circumstances. The NZ ETS is not watertight. It has, at best, a leaky cap that permits a substantial flow of forestry removals. Furthermore, New Zealand companies have diverse motives to reduce emissions, above and beyond

compliance (Nikula, 2022), which means that they may not avail themselves of all opportunities to pollute. These motives include company-level targets, brand alignment, employee retention, competitive advantage, market access, and the spectre of carbon border adjustment taxes. This results in an accumulation of surplus units in the stockpile, which might be released to permit emissions in future that complicate the meeting of targets by permitting an excess of future emissions..

Even worse, an ETS can produce perverse incentives that discourage ambition. For example, technology breakthroughs can create emissions reductions at unexpected volumes that run ahead of the cap, contributing to oversupply and depressing the price. For this reason, some experts argue for carbon taxes instead (Sharpe, 2023). However, the waterbed effect can be mitigated by policy: for example, the EU ETS has temporarily achieved this with its Market Stability Reserve (Perino, Ritz and van Benthem, 2022). Tightening the cap to lock in ambitious emissions reductions can deliver an outcome closer to no synergy, although accurately quantifying the real emissions reductions is not without its challenges (Pahle and Edenhofer, 2021).

This is where credibility is key. If governments lack the fortitude to manage the NZ ETS with due stringency, then this is potentially a reason to complement it, or even replace it, with other policy tools. Recent analysis has shown that, in the EU ETS, policy credibility has a substantial effect on price, beyond basic dynamics of supply and demand. It forces market participants to be far-sighted, to take long-term targets seriously, whereas policy decisions that betray a lack of credibility encourage market participants to be more myopic, to prioritise short-term gain and management of risks (Sitarz et al., 2024). Many readers will also recognise that dynamic in the NZ ETS, in its sensitivity to political announcements. In sum, it is not merely about the tool, but about the willingness to use it well, the commitment of a government to apply it with stringency and to address inconsistencies when they arise.

Two economic paradigms

Another dimension of the policy mix is the paradigms that policymakers draw upon to interpret problems and solutions. A paradigm is a set of overarching and interconnected assumptions about the nature of reality (Kuhn, 1962). The concept of market failure is an expression of a distinctive economic paradigm. It is defined as a situation where, due to a market imperfection, the market alone cannot achieve an optimal allocation of economic resources. This justifies interventions that restore optimal allocation, but cautions against further interventions, lest they produce a distortion. It reflects a view of the economy as an equilibrium which needs to be restored or fixed by judicious interventions.

> … our economy is presently optimised for fossil fuels, which is an equilibrium we cannot afford to keep returning to.

The logic of market fixing might appear to favour a narrow policy mix. However, given how pervasive market imperfections really are, this is far from obviously the case. Market failure can actually be used to justify a wide range of interventions – from direct support for innovation and technology, to internalising externalities, to infrastructure investment, to addressing information deficits and bounded rationality (Climate Change Commission, 2021, p.213). Furthermore, when emissions are being priced suboptimally, then the scope for complementary policy is potentially rather wide. As the energy economist Jesse Jenkins (2014) notes, suboptimal pricing creates an 'opportunity space' for other policies to deliver the response that optimal pricing would have done. In this context, determining what is a genuine market failure – and what is not – is unlikely to be free from subjective opinion, or political preference.

Market failure is also, more importantly, ill-suited to the task at hand. As the name suggests, it takes as its starting point the assumption that markets would be optimal if not for discrete, identifiable market imperfections. However, our economy is presently optimised for fossil fuels, which is an equilibrium we cannot afford to keep returning to. The objective of climate mitigation policy for the energy system is to destabilise this equilibrium, to supplant the current system with another that relies on renewable energy generation and the electrification of end use. Transformative change is also needed in other sectors, including our response to the impacts of climate change itself.

The UK Treasury's *Green Book* for policy appraisal defines transformative change as 'a radical permanent qualitative change in the subject being transformed, so that the subject when transformed has very different properties and behaves or operates in a different way' (HM Treasury, 2022). This pertains to situations where:

- policy is being developed for an operational environment that is undergoing transformative change (e.g., climate adaptation);
- transformative change is the objective of policy (e.g., electrification of the energy system);
- transformative change is a consequence or side-effect of policy that is pursuing another primary objective (e.g., major land use change as a consequence of meeting net-zero targets).

In such circumstances, the *Green Book* warns that marginalist analysis alone, such as standard forms of cost–benefit analysis, is not sufficient for policy appraisal. Cost–benefit analysis has a well-known status quo bias, which becomes increasingly problematic over long time frames and greater uncertainty: 'simple extrapolation from past experience will fail to foresee the way that a system may behave after it has been transformed or once the process of change has started' (ibid.). In such circumstances, we need to consider the wider set of analytical tools available,

which might include real options analysis, portfolio analysis, robust decision making, scenario analysis and risk-opportunity analysis (Pells, 2023).

More than that, we need to shift paradigms. As noted earlier, direct support for RD&D is conceived as fixing a market failure, insofar as it compensates businesses for technology spillovers that they cannot entirely capture (Jaffe Newell and Stavins, 2005). But RD&D can also be conceived as *market shaping*, as corralling the forces of innovation and investment towards specific goals, such as the strategic pursuit of green economic opportunities. This involves a different mental model of the economy, not as an equilibrium, but arguably as an ecosystem that evolves and changes over time. This is also associated with a shift in economic disciplines – from orthodox neoclassical economics to evolutionary economics, complexity economics, systems thinking and transitions theory.

Climate policy expert Simon Sharpe (2023) notes that, once we take this view, 'we see that just like an ecosystem, [the economy] has many possible dynamic states. It can grow, crash, oscillate, bounce, and lurch. It is rarely, if ever, in a perfect state of balance of equilibrium' (Sharpe, 2023, p.110). These are the dynamic conditions which policymakers must operate in, not only to anticipate and navigate economic disruptions, but also to purposefully mobilise the disruptive power of innovation and markets to achieve the goals of public policy.

In Table 1 I included tipping points as a criterion for designing policy mixes. Rather than aim for changes at the margin of existing systems, this involves the strategic pursuit of non-marginal, non-linear change, such as the scaling up of new products or business models, or major transitions in industry or land use. This paradigm, in turn, influences the strategic design of the policy mix. The goal is a well-sequenced combination of instruments that intentionally push new technologies and behaviours to a point where reinforcing feedbacks take hold, precipitating a larger, irreversible change.

The extraordinary rise of solar PV is a good example. In 2010, electricity from solar PV was 710% more expensive than the cheapest fossil electricity, but by 2022 it was 29% less expensive against the same benchmark (IRENA, 2023). As a fact of history, this did not occur spontaneously, but rather as a consequence of intentional policy mixes and international coordination. In Germany in the 1990s, feed-in tariffs for renewable energy were introduced, later augmented by renewables targets and the industrial strategy known as *Energiewende*. By supporting solar technologies when they were uneconomic, innovation processes could be sustained, driving down technology costs and improving efficiency. This further enabled the development of Chinese manufacturing, initially to meet offshore demand from Germany especially, and subsequently to meet China's own renewable energy ambitions (Grubb et al., 2021). As a consequence, the cost of electricity from solar generation declined dramatically. It is an extraordinary demonstration of dynamic efficiency, where investments at a high abatement cost in the past sowed the seeds for low abatement costs in the present, along with energy cost savings and other co-benefits (e.g., avoided air pollution) that accrue to all future generations. Globally, the substitution of fossil energy with cheaper renewable energy will deliver net savings of many trillions of dollars – even without accounting for climate damages or co-benefits of climate policy (Way et al., 2022).

In 2010, electricity from solar PV was 710% more expensive than the cheapest fossil electricity, but by 2022 it was 29% less expensive against the same benchmark ...

At the country level, Rewiring Aotearoa has estimated that, by electrifying households and private vehicles with technologies that are already commercially available, New Zealand could avoid fossil fuel expenditure of over $10 billion per year by the late 2030s (Griffith et al., 2024). The costs of upfront policy support – whether delivered by subsidies or regulations – need to be assessed in this context.

This pragmatic logic – of policy interactions, of policy sequencing – is not absent from New Zealand's policy domain. It is evident in the current government's approach to agricultural emissions: 'Tools first, then price: Reducing agricultural emissions depends on farmers having access to the right technologies and tools which allows a price response' (New Zealand National Party, 2023). Setting aside the needlessly long delay on pricing until 2030 – plus the injury this does to the credibility of the policy mix – this is at least a defensible intervention logic which might be applied to other sectors as well as agriculture.

Success, however, depends on making choices about technologies and tools, at least at the portfolio level. Again, one paradigm is more amenable to directing innovation than the other:

> Equilibrium economics tells us that we should aim to be technology-neutral. We should set policies that determine the required outcome, and then leave the market to decide the technologies to which resources should be allocated … however, in the ecosystem economy, no action is neutral. Any intervention will affect its evolution, advantaging some of its incumbents and disadvantaging others. (Sharpe, 2023, p.135)

To put the point more sharply, the myth of technology neutrality often functions as *de facto* support for business-as-usual, a refusal to address the market barriers, infrastructure shortfalls, well-formed habits and other arbitrary disadvantages that prevent niche technologies from scaling up. It is sometimes suggested that New Zealand, as a small, technology-taking country, lacks the scale and capacity to drive innovation. Yet we can see how concerted public–private coordination has created an unlikely space industry in New

Zealand. Another small island country, Singapore, uses living laboratories and multi-stakeholder partnerships to purposefully foster climate innovation as part of its mitigation strategy, to steer markets towards addressing challenges.

The critical shift is one of outlook. As Sharpe describes the policymaker's role: 'We are not mechanics, fixing the machine when it fails. We are something more like gardeners, tending and shaping the ecosystem so that it grows in ways that we find beneficial' (ibid., p.111).

Conclusion

New Zealand's policy mix for climate mitigation is now more than three decades in the making. It has brought us to where we are: a levelling-off of gross emissions and a relative decoupling from GDP growth. But this is still a long way from the structural declines in gross emissions that will credibly fulfil our international commitments and support our businesses to align with hardening market expectations for emissions reductions throughout global supply chains. We can try to fix our policy mix, but if we restrict ourselves to the same paradigm that got us lost, we might find ourselves off course again. Too often, our policy processes are taking a narrow approach to policy appraisal, evaluating instruments in isolation instead of interaction, and delivering idealised solutions for non-ideal circumstances.

This is advice that will keep us lost: 'Please, sir, how do I get to Dublin from here?' 'Well, as the crow flies, you'd go directly in a straight line from here to Dublin.' 'But, sir, the roads are crooked and the obstacles are many. People are telling me that the River Liffey is in flood …'. 'Well, I'd still insist upon the way of the crow. Anything else would be inefficient.' We need to do better, to use analytical tools that are well suited to what we are trying to achieve. The framework of the policy mix helps us to understand not only what we are doing, but also how we might do better.

1 For example, 'governments must have policy instruments equal in number to the objectives' (Reinert et al., 2009).

2 For example, the fourth National government introduced minimum energy performance standards in 1996 by quantifying the avoided emissions and observing that the policy would 'help New Zealand in terms of our international commitments on climate change' (Kidd, 1996).

3 I would like to thank the anonymous reviewer for many useful suggestions, including a prompt to sharpen this point.

References

Bhardwaj, C., J. Axsen, F. Kern and D. McCollum (2020) 'Why have multiple climate policies for light-duty vehicles? Policy mix rationales, interactions and research gaps', *Transportation Research Part A: Policy and Practice*, 135, pp.309–26

Blanchard, O., C. Gollier and J. Tirole (2023) 'The portfolio of economic policies needed to fight climate change', *Annual Review of Economics*, 15 (1), pp.689–722

Bond, K., S. Butler-Sloss and D. Walter (2024) *The Cleantech Revolution: it's exponential, disruptive, and now*, Rocky Mountain Institute

Borenstein, S. and R. Kellogg (2023) 'Carbon pricing, clean electricity standards, and clean electricity subsidies on the path to zero emissions', *Environmental and Energy Policy and the Economy*, 4 (1), pp.125–76

Bouma, J.A., M. Verbraak, F. Dietz and R. Brouwer (2019) 'Policy mix: mess or merit?', *Journal of Environmental Economics and Policy*, 8 (1), pp.32–47

Climate Change Commission (2021) *Ināia Tonu Nei: a low emissions future for Aotearoa*, Wellington: He Pou a Rangi Climate Change Commission

D'Arcangelo, F.M., M. Pisu, A. Raj and K. van Dender (2022) *Estimating the CO2 Emission and Revenue Effects of Carbon Pricing: new evidence from a large cross-country dataset*, OECD Economics Department working paper 1732, Paris: OECD Publishing, https://dx.doi.org/10.1787/39aa16d4-en

Dechezleprêtre, A. et al. (2022) *Fighting Climate Change: international attitudes toward climate policies*, OECD Economics Department working paper 1714, Paris: OECD Publishing, https://doi.org/10.1787/3406f29a-en

Dimanchev, E. and C.R. Knittel (2023) 'Designing climate policy mixes: analytical and energy system modeling approaches', *Energy Economics*, 122, 106697

Drews, S., F. Exadaktylos and J.C. van den Bergh (2020) 'Assessing synergy of incentives and nudges in the energy policy mix', *Energy Policy*, 144, 111605

Dyer, C. (2023) 'New Zealand's climate change response: how the (re) allocation of risks, rights, and responsibilities contributes to sustained policy underreactions', PhD thesis, University of Auckland

Edmondson, D., C. Flachsland, N. aus dem Moore, N. Koch, F. Koller, H. Gruhl and J. Brehm (2024) 'Anticipatory climate policy mix pathways: a framework for ex-ante construction and assessment applied to the road transport sector', *Climate Policy*

Fabra, N. and M. Reguant (2024) 'The energy transition: a balancing act', *Resource and Energy Economics*, 76, 101408

Griffith, S., J. Ellison, M. Pawson and P. Conway (2024) *Investing in Tomorrow: the electrification opportunity*, Rewiring Aotearoa

Grubb, M., P. Drummond, J.F. Mercure, D. Popp, S. Samadi and C. Peñasco (2021) *The New Economics of Innovation and Transition: Evaluating Opportunities and Risks*, Exeter: Economics of Energy Innovation and System Transition

Hall, D. (2020) 'Rhetoric and reality in New Zealand's climate leadership: "my generation's nuclear-free moment"', in R.K.W. Wurzel, M.S. Andersen and P. Tobin (eds), *Climate Governance Across the Globe*, Routledge

Hall, D. and D. McLachlan (2022) 'Why emissions pricing can't do it alone', *Policy Quarterly*, 18 (1), pp.3–13

HM Treasury (2022) *The Green Book*, https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-governent/the-green-book-2020

Howlett, M., S.L. Tan, A. Migone, A. Wellstead and B. Evans (2015) 'Policy formulation, policy advice and policy appraisal: the distribution of analytical tools', in A.J. Jordan and J.R. Turnpenny (eds), *The Tools of Policy Formulation*, Edward Elgar Publishing

Huerta de Soto, J. (2008) The Theory of Dynamic Efficiency, Routledge

IPCC (2022) *Climate Change 2022: mitigation of climate change*, Working Group III contribution to the sixth assessment report of the Intergovernmental Panel on Climate Change

IRENA (2023) *Renewable Power Generation Costs in 2022*, International Renewable Energy Agency, https://www.irena.org/Publications/2023/Aug/Renewable-Power-Generation-Costs-in-2022

Jaffe, A.B., R.G. Newell and R.N. Stavins (2005) 'A tale of two market failures: technology and environmental policy', *Ecological Economics*, 54 (2–3), pp.164–74

Jenkins, J.D. (2014) 'Political economy constraints on carbon pricing policies: what are the implications for economic efficiency, environmental efficacy, and climate policy design?', *Energy Policy*, 69, pp.467–77

Kalfagianni, A. and O. Kuik (2017) 'Seeking optimality in climate change agri-food policies: stakeholder perspectives from Western Europe', *Climate Policy*, 17 (suppl.1), pp.S72–S92

Kidd, D. (1996) 'Government to support improved energy efficiency', media release, 11 July, https://www.beehive.govt.nz/release/government-support-improved-energy-efficiency

Kuhn, T.S. (1962) *The Structure of Scientific Revolutions*, Chicago: University of Chicago Press

Maor, M. (2021) 'Policy over- and underreaction as policy styles', in M. Howlett and J. Tosun (eds), *Routledge Handbook of Policy Styles*, Routledge

Ministry for the Environment (2017) *New Zealand's Seventh National Communication: fulfilling reporting requirements under the United Nations Framework Convention on Climate Change and the Kyoto Protocol*, Wellington: Ministry for the Environment

Ministry for the Environment (2022) *Te Hau Mārohi ki Anamata: Towards a productive, sustainable and inclusive economy: New Zealand's First Emissions Reduction Plan*, Wellington: Ministry for the Environment

Ministry for the Environment (2024) *New Zealand's Second Emissions Reduction Plan (2026–30)*: discussion document, Wellington: Ministry for the Environment

New Zealand National Party (2023) 'Reducing agricultural emissions', https://www.national.org.nz/reducingagriculturalemissions

Nikula, P.-T. (2022) 'Beyond compliance: voluntary climate mitigation by New Zealand firms', *Corporate Social Responsibility and Environmental Management*, 29 (5), pp.1456–64, https://doi.org/10.1002/csr.2283

Pahle, M., D. Burtraw, C. Flachsland, N. Kelsey, E. Biber, J. Meckling, O. Edenhofer and J. Zysman (2018) 'Sequencing to ratchet up climate policy stringency', *Nature Climate Change*, 8 (10), pp.861–7

Pahle M. and O. Edenhofer (2021) 'Discretionary intervention destabilizes the EU emissions trading system: evidence and recommendations for a rule-based cap adjustment', *CESifo Forum*, 22 (3), pp.41–6

Parliamentary Commissioner for the Environment (2023) *How Ministers and Officials Developed the First Emissions Reduction Plan – and how to do it better next time*, Wellington: Parliamentary Commissioner for the Environment

Parr, R. (2000) 'Equity and the New Zealand government's climate change domestic policy options statement', *New Zealand Journal of Environmental Law*, 4, pp.49–79

Pells, S. (2023) *Which Analytical Tools are Suited to Transformative Change?*, CEU working paper 23/01, Wellington: Ministry of Business, Innovation and Employment, https://www.mbie.govt.nz/assets/Analytical-tools-suited-to-transformative-change-report.pdf

Peñasco, C., L.D. Anadón and E. Verdolini (2021) 'Systematic review of the outcomes and trade-offs of ten types of decarbonization policy instruments', *Nature Climate Change*, 11 (3), pp.257–65

Perino, G., R.A. Ritz and A. van Benthem (2022) *Overlapping Climate Policies*, NBER working paper 25643, Cambridge, Mass: National Bureau of Economic Research

Reinert, K.A., R.S. Rajan, A.J. Glass and L.S. Davis (eds) (2009) *The Princeton Encyclopedia of the World Economy*, Princeton: Princeton University Press

Rodríguez-Barillas, L. Klerkx and P.M. Poortvliet (2024) 'Transformative policy mix or policy pandemonium? Insights from the Climate Smart Agriculture policy mix in Costa Rica', *Environmental Innovation and Societal Transitions*, 50, 100791

Rogge, K.S. (2018) 'Designing complex policy mixes: elements, processes and characteristics', in M. Howlett and I. Mukherjee (eds), *Routledge Handbook of Policy Design*, Routledge

Rogge, K.S. and K. Reichardt (2016) 'Policy mixes for sustainability transitions: an extended concept and framework for analysis', *Research policy*, 45 (8), pp.1620–35

Rogge, K.S. and Q. Song (2023) 'Policy mixes for addressing environmental challenges: conceptual foundations, empirical operationalisation, and policy implications', in H. Jörgens, C. Knill and Y. Steinebach (eds), *Routledge Handbook of Environmental Policy*, Routledge

Scullion, J.J., K.A. Vogt, S. Winkler-Schor, A. Sienkiewicz, C. Pena and F. Hajek (2016) 'Designing conservation-development policies for the forest frontier', *Sustainability Science*, 11, pp.295–306

Sharpe, S. (2023) *Five Times Faster*, Cambridge: Cambridge University Press

Sitarz, J., M. Pahle, S. Osorio, G. Luderer and R. Pietzcker (2024) 'EU carbon prices signal high policy credibility and farsighted actors', *Nature Energy*, 6, pp.691–702

Sorrell, S., A. Smith, R. Betz, R. Walz, C. Boemare, P. Quirion, J. Sijm, D. Mavrakis, P. Konidari, S. Vassos, D. Haralampopoulos and C. Pilinis (2003) *Interaction in EU Climate Policy*, Science Policy Research Unit, University of Sussex

Stechemesser, A., N. Koch, E. Mark, E. Dilger, P. Klösel, L. Menicacci, D. Nachtigall, F. Petris, N. Richter, M. Schwarz, H. Vossen and A. Wenzel (2024) 'Climate policies that achieved major emission reductions: global evidence from two decades', *Science*, 385 (6711), pp.884–92

Stern, N. and J.E. Stiglitz (2021) *The Social Cost of Carbon, Risk, Distribution, Market Failures: an alternative approach*, Cambridge, Mass: National Bureau of Economic Research

Tinbergen, J. (1952) *On the Theory of Economic Policy*, Amsterdam: North-Holland Publishing Company

Van den Bergh, J. Castro, J., S. Drews, F. Exadaktylos, J. Foramitti, F. Klein, T. Konc and I. Savin (2021) 'Designing an effective climate-policy mix: accounting for instrument synergy', *Climate Policy*, 21 (6), pp.745–64

Vogt-Schilb, A., G. Meunier and S. Hallegatte (2018) 'When starting with the most expensive option makes sense: optimal timing, cost and sectoral allocation of abatement investment', *Journal of Environmental Economics and Management*, 88, pp.210–33

Way, R., M.C. Ives, P. Mealy and J.D. Farmer (2022) 'Empirically grounded technology forecasts and the energy transition', *Joule*, 6 (9), pp.2057–82

Tim Naish, Judy Lawrence, Richard Levy, Rob Bell, Vincent van Uitregt, Bronwyn Hayward, Rebecca Priestley, James Renwick and Jonathan Boston

A Sea Change is Needed

For Adapting to Sea-Level Rise in Aotearoa New Zealand

Abstract

Sea-level rise is accelerating globally and will continue for centuries under all shared socio-economic pathways. Although sea-level rise is a global issue, its impacts manifest heterogeneously at the local scale, with some coastal communities and infrastructure considerably more vulnerable than others. Aotearoa New Zealand is poorly prepared to deal with sea-level rise impacts, and some places are already approaching the limits of adaptation, short of relocation. Maladaptive choices threaten Aotearoa's ongoing ability to adapt going forward. Development of climate-resilient pathways requires an immediate adoption of non-partisan, long-term, system-scale approaches to governance and decision making (from local to national), that integrate effective adaptation and emissions mitigation. This also requires proactive and collective action underpinned by indigenous and actionable knowledge (e.g., NZ SeaRise projections) designed for our unique circumstances. There is still time to put in place sustainable, equitable and effective solutions, but funding and governance models need urgent attention.

Keywords sea-level rise, impacts, risks, just and effective adaptation, te ao Māori, indigenous knowledge, community values, actionable knowledge, uncertainty, decision making, governance, adaptive pathways, climate-resilient pathways

Tim Naish NZAM, FRSNZ is Professor in Earth Sciences at the Antarctic Research Centre, Te Herenga Waka Victoria University of Wellington. He is co-leader of the MBIE Endeavour research programmes Te Ao Hurihuri: Te Ao Hou – Our Changing Coast and Te Tai Pari o Aotearoa – NZ SeaRise, has been an IPCC lead author and is on the joint scientific committee of the World Climate Research Programme. **Judy Lawrence** is an adjunct professor at the New Zealand Climate Change Research Institute and at the Antarctic Research Centre at Te Herenga Waka Victoria University of Wellington. She is co-author of the Coastal Hazards and Climate Change Guidance, coordinating lead author and lead author for the IPCC sixth assessment report, co-convenor of the ministerial Climate Change Adaptation Technical Working Group, and is a New Zealand climate change commissioner. **Richard Levy** is chief science advisor at GNS Science and Professor in Geoscience at the Antarctic Research Centre. He is co-leader of the MBIE Endeavour research programmes Te Ao Hurihuri: Te Ao Hou – Our Changing Coast and Te Tai Pari o Aotearoa – NZ SeaRise. **Rob Bell** is a coastal engineer/planner managing his consultancy Bell Adapt Ltd and is a teaching fellow in the environmental planning programme, School of Social Sciences, University of Waikato Te Whare Wananga o Waikato. He is an IPCC author and lead author of the 2024 Ministry for the Environment *Coastal Hazards and Climate Change Guidance*. **Vincent (Billy) van Uitregt** (Ngā Rauru, Te Ātihaunui-a-Pāpārangi, Tūhoe) is a senior lecturer in environmental studies in the School of Geography, Environment and Earth Sciences at Te Herenga Waka Victoria University of Wellington. Billy works with his and other hapū and iwi and with indigenous communities around the world to support their leadership in environmental and conservation initiatives. **Bronwyn Hayward**, MNZM, FRSNZ is a professor of political science and international relations at the University of Canterbury and was a lead author and coordinating lead author for several chapters of the IPCC assessment round 6. **Rebecca Priestley**, CRSNZ is a Professor of Science in Society at Te Herenga Waka Victoria University of Wellington. She researches history of science and science communication, and writes creative nonfiction, with a focus on climate change and sea level rise in Aotearoa and Antarctica. She is an investigator with the Te Ao Hurihuri: Te Ao Hou, Our Changing Coast research programme. **James Renwick**, CRSNZ is a professor and climate researcher in the School of Geography, Environment and Earth Sciences at Te Herenga Waka Victoria University of Wellington. He was a lead author on the IPCC 4th and 5th assessment reports and a coordinating lead author on the 6th assessment report. He is currently a New Zealand climate change commissioner. **Jonathan Boston**, ONZM is Emeritus Professor of Public Policy at the Wellington School of Business and Government, Te Herenga Waka Victoria University of Wellington. He has published widely on a range of matters, including public management, social policy, climate change policy, tertiary education policy and comparative government.

The increased occurrence of deadly, damaging and costly climate-related natural disasters around the motu has our public and decision makers on notice (see NIWA, n.d.). For our coastal communities, concerns were further heightened when the NZ SeaRise programme projected the impacts of sea-level rise arriving earlier than previously thought (Levy et al., 2024; Naish et al., 2024). While lowering greenhouse gas emissions will help reduce the warming driving these events, it will not eliminate the impacts. A recent assessment of progress towards the National Adaptation Plan (Ministry for the Environment, 2022) by the Climate Change Commission shows that effective adaptation to current and future impacts is not happening on the scale, or at the pace, that is needed (Climate Change Commission, 2024). Following a parliamentary inquiry into adaptation in 2024, the government's Finance and Expenditure Committee has made a range of recommendations to strengthen climate adaptation in Aotearoa (Finance and Expenditure Committee, 2024). These focus on objectives, principles and system change for climate change adaptation and will inform the development of an adaptation framework and supporting legislation.

Here, we review some of the challenges of adapting to climate change in Aotearoa that are relevant to the impacts and risks from sea-level rise and the design and implementation of a national adaptation

BOX 1 Key policy relevant messages

Latest adaptation science and implications

- Sea-level rise is accelerating globally including around Aotearoa New Zealand and will continue for centuries under all emission scenarios. However, decisions made today can impact the timing and the scale of impacts arising from SLR, with significant consequences for centuries to come.
- SLR increases the frequency of flooding on existing communities and infrastructure manifesting in multiple hazards, including storm surges, coastal flooding and erosion which compound with rising groundwater, and saltwater intrusion into soils, aquifers and lowland rivers.
- Deep reduction in greenhouse gas emissions, in line with the Paris Agreement target of 1.5°C, is critical to avoid crossing tipping points that would yield rapid and irreversible SLR with multi-generational consequences.
- While it now seems inevitable warming will exceed 1.5°C, effective adaptation still requires sustained commitment to stabilisation of warming as close to the Paris target as possible.
- Even meeting the Paris Agreement target, 0.4-0.5m of average global SLR by the end of the century is unavoidable due to the heat already baked into the land ice and oceans. It is estimated that this amount of SLR will impact 1 billion people globally by the end of the 21st century.
- Impacts of SLR will further entrench environmental and climate injustice at all levels of global society. In Aotearoa, Māori experiences of SLR intersect with the ongoing settler colonial imposition and understanding the breadth of these impacts requires analysis through conceptual frameworks like environmental and climate justice.
- Compounding and cascading climate change impacts are increasingly being felt globally and in Aotearoa, and these are destined to intensify.

Local context matters for assessing coastal risk

- Although SLR is a global issue, it impacts differently on different communities, with some considerably more vulnerable than others. Responses to SLR need to be integrative and context-specific; there are no one-size fits-all solutions or panaceas.
- Anticipating the impacts of SLR for tectonically active regions such as Aotearoa requires knowledge of vertical land movement (VLM). Forty percent of our coastline is subsiding (sinking) at rates greater than 2 mm/year, which makes a significant contribution to localised SLR projections, bringing forward adaptation decision thresholds by decades.
- With just 0.3-0.4m of relative SLR above the 2005 baseline, the historic 1 in 100-year extreme coastal flood will occur annually, on average, around Aotearoa's coastline. Nuisance flooding will fast become chronic flooding. This important decision-making threshold (eg., with respect to planned relocation) may be reached as early as 2040 in some parts of Aotearoa where the coast is subsiding rapidly (eg., Wellington/Lower Hutt).
- The national *Coastal Hazards and Climate Change Guidance* (MfE, 2024) presents updated sea-level projections that incorporate the latest Intergovernmental Panel on Climate Change sea-level scenarios (IPCC, 2021), together with localised rates of VLM around the coast to provide local relative SLR estimates every 2 km (https://www.searise.nz/maps-2). This information is critical for planning and implementing hazard and risk assessments, as well as adaptation approaches locally along our complex and dynamic coastal environments.

Dealing with uncertainty in coastal risk assessment

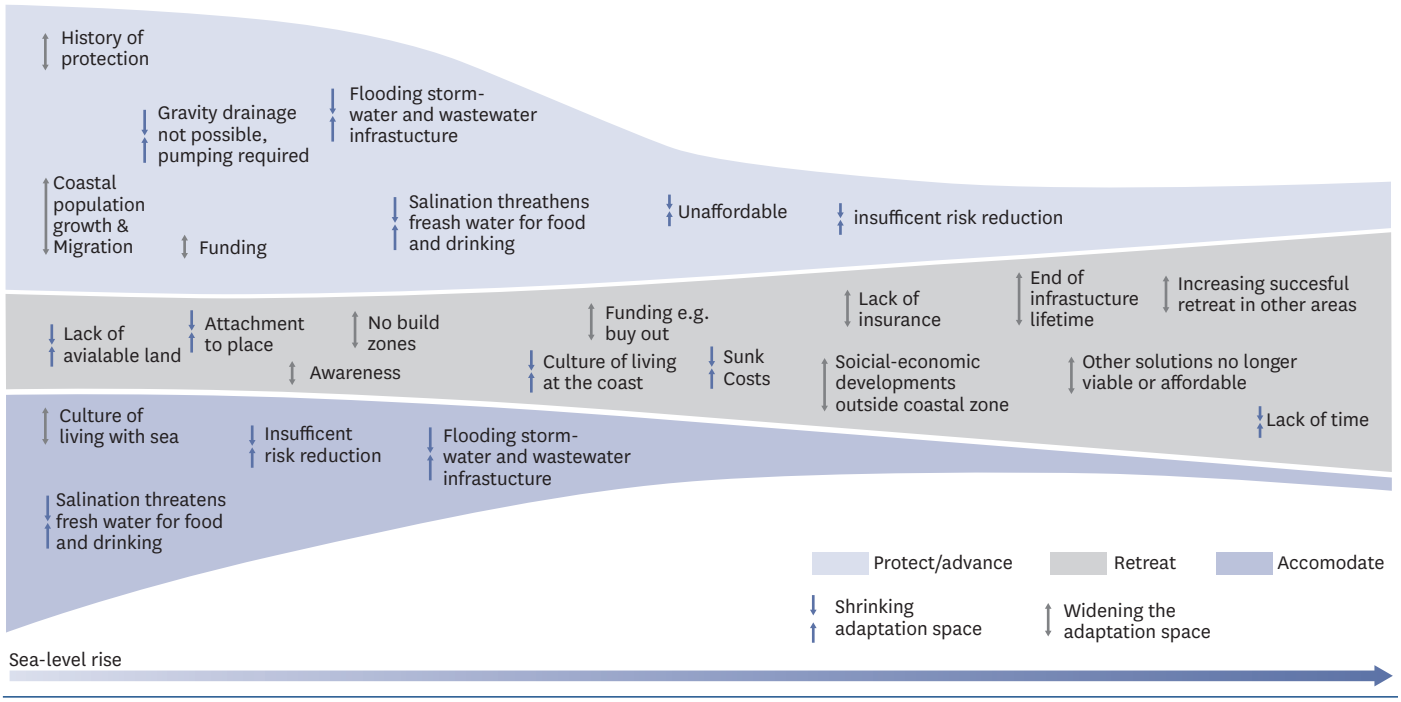
- Due to the potential of non-linear (rapid ice melting) processes, tipping point behaviour and irreversible loss of ice sheets and glaciers, coastal risk assessments and management plans should include a high-end sea-level projection (2m by 2150) that allows for stress-testing the impacts and implications from High Impact Low Likelihood (HILL) events.
- Further, due to uncertain future emissions pathways beyond 2060, and the inherent uncertainties, a dynamic adaptive pathways planning (DAPP) approach should be used. This combined with enhanced local monitoring of signals and triggers will enable adjustments to adaptation strategies as new information emerges, and in time for decisions to be made that avoid maladaptation.

Actionable knowledge for a climate resilient future

- Achieving climate resilient pathways for coastal infrastructure and communities in Aotearoa requires long-term, system-scale approaches to governance and decision making (from local to national), that integrate effective adaptation and GHG emissions mitigation to advance sustainable development. Inclusive approaches to decision-making should be prioritised. This will require additional support for most vulnerable regions, sectors and communities.
- Some parts of the coast around Aotearoa are approaching the limits of adaptation, short of relocation. Actionable knowledge, such as the NZ Sea Rise projections, along with cultural knowledge, and community values in assessments of risk, can inform proactive, collective systems-scale action. There is still time to put in place sustainable, equitable and effective solutions, if there is the political will and foresight to do so.
- Aotearoa New Zealand's, interdisciplinary and transdisciplinary research communities stand ready to provide actionable knowledge that is aligned with te ao Māori and te Tiriti o Waitangi and is crucial to successful decision- and policy-making on mitigation, adaptation, finance, and resilience related to relative SLR.
- There is a critical need for a National Climate Adaptation Research Platform to be funded. A well-supported platform would facilitate system-wide dialogue between policymakers, social scientists and physical scientists, and Indigenous and local communities, on evidence-based policy options, and community aspirations in ways that can anticipate and manage future risks.
- A well-designed Climate Adaptation Act or equivalent legislation is urgently needed, one that mandates the required governance arrangements, policy tools, planning mechanisms, public institutions, and funding instruments.

Figure 1: An illustrative example of adaptation options in an evolving and shrinking adaptation space

Different drivers and hard and soft limits shape this space. The figure highlights: 1) a narrowing of the adaptation space as a whole, and 2) a change in the ratio between the three adaptation strategies, with retreat becoming dominant. This will apply differently for different coastal types due to local contexts.



Source: adapted from Haasnoot et al., 2021 and Lawrence and Bell, 2022

framework. We assess the current state of relevant science, summarise the challenges and barriers to effective adaptation, and outline how to formulate and implement equitable, climate-resilient pathways based on inclusive and context-specific actionable knowledge.[1] We make a series of key policy-relevant statements and recommendations that are summarised in Box 1.

The coastal adaptation challenge

Coasts pose a special case for adaptation due to the progressive and changing risks from sea-level rise, which impact on our communities and ecosystems both through permanent inundation of the lowest-lying areas and by increasing the frequency of flooding affecting the wider coastal environment. Risks will emerge earlier where local rates of relative sea-level rise are higher (due to land subsidence) and will be larger if 'high impact low likelihood' (HILL) processes associated with collapsing polar ice sheets occur (Sherwood et al., 2024). There is already committed sea-level rise that will eventuate due to the heat stored in the oceans, polar ice sheets and glaciers from past anthropogenic greenhouse gas emissions. Coastal hazards and their impacts are occurring in Aotearoa, and their near-term risks are projected to escalate well before 2050 (Stephens, Bell and Lawrence, 2018; Naish et al., 2024). Our ability to anticipate and adapt to sea-level rise and curtail its acceleration beyond 2050 will determine how we cope with increasing coastal risks. But this ability depends on access to context-specific risk information and strategies tailored to Aotearoa's unique environmental, cultural and social setting, together with near-term and ongoing commitment to emissions mitigation so as to avoid maladaptive decisions that lock Aotearoa into unsustainable pathways.

A survey about understanding of sea-level rise showed that publics in Aotearoa 'are aware of, and concerned about, 21st century sea-level rise' and recommended that public engagement efforts are 'more focused and nuanced than raising awareness of the issue' (Priestley, Heine and Milfont, 2021). The publication of relative sea-level rise projections for every 2km of the Aotearoa coastline (Levy et al., 2024; Naish et al., 2024) allows for location-specific communication about necessary adaptation and the available adaptation options. Choice of messages and communication channels, though, needs to take into account the rise of mis- and disinformation about climate change (Clark and Stoakes, 2023) and recent research that shows high levels of consistent news avoidance in Aotearoa (Beattie, Kerr and Arnold, 2024). Ensuring that local communities are aware of local impacts, and engaging them in decision making, is vital to the success of effective and equitable adaptation and needs to be appropriately resourced and prioritised.

There are hard limits to adaptation in the face of progressive sea-level rise, because sea-level rise may become irreversible this century and will become an existential threat for many communities and ecosystems. Inundation threatens habitability and sovereignty for some small island developing states, and some communities, such as Tuvalu and Fiji, are already implementing relocation or managed retreat from the coast or exploring new visions of a digital community (Rothe et al., 2024). Many parts of the low-lying coastal margins around Aotearoa will require the staging of managed retreat in the coming decades. Planning for this will need to occur before the limits to adaptation are surpassed even for low to moderate levels of relative sea-level rise. Adaptations such as nature-based solutions, those that accommodate the risk (e.g., raising floor levels or filling land), and engineering protection against higher levels will become ineffective or unaffordable. Forearmed with actionable risk information, planned

relocation/managed retreat can mitigate the inevitable and rising risk of flooding in low-lying areas (Lawrence and Bell, 2022). Figure 1 illustrates this as an expanding, shrinking and evolving adaptation space for different types of options or actions as sea level continues to rise (Haasnoot, Lawrence and Magnan, 2021).

Investment in adaptations that have limited life, and 'lock-in' of permanent buildings and infrastructure, increases the future risk by making the transition harder and more costly as sea-level rise continues. That said, temporary adaptation options, such as nature-based solutions restoring mangrove and coastal wetland buffer zones and accommodating limited sea-level rise, can buy time to implement longer-term sustainable options such as the phased transition to managed retreat. On the other hand, expensive options such as seawalls, reclaiming land and raising floor levels entrench unsustainable development, and can provide a false sense of security, that when breached or overwhelmed ultimately makes the transition to managed retreat more costly for current and future generations.

Without considering a phased long-term adaptation approach, including for at least the next 100 years (as required by the New Zealand Coastal Policy Statement), communities are increasingly confronted with a shrinking adaptation space (see Figure 1), and adverse consequences will be disproportionately borne by indigenous and marginalised communities.

Implications for Māori

Māori experiences of climate change intersect with ongoing experiences arising from settler colonialism (Johnson et al., 2022). Two centuries of dispossession from lands and waters, oppression of cultural norms and traditions, marginalisation within hegemonic political and economic systems, and forced participation in ill-suited retributive processes have left Māori particularly vulnerable. Estimates suggest that 30–50% of marae across the motu are likely to be significantly affected by climate change and 41 marae across Aotearoa are currently at potential risk of a 100-year flooding event based on estimated sea-level rise by 2200 (Bailey-Winiata et al., 2024). Te Puni Kōkiri (2023) estimates that 14% of Māori households are in areas highly susceptible to coastal inundation due to projected sea-level rise. Climate change also affects Māori in unique ways, including loss of taonga species and the practice of mahinga kai, and the disproportionate area of their whenua (land) that is in vulnerable locations.

Despite being disproportionately affected by and vulnerable to climate change, Māori resilience is built upon whakapapa and Māori already demonstrate leadership in climate adaptation and response.

Environmental Justice is an instructive conceptual framework through which we can more fully appreciate the intersectionality of climate change and settler colonialism for Māori. Grear and Dehm (2020), for example, frame environmental justice to include: distributive patterns and structural unevenness; procedural justice and relational recognition; identifiable wrongs and corrective and retributive reparations; interrogating the sociopolitical; and ontological justice and the politics of meaning. Such frameworks can help to make explicit the injustice that remains unaddressed when hapū and iwi are simply 'consulted' or 'engaged' in climate initiatives and adaptation planning. Just (as in justice) and effective climate adaptation planning approaches must engage with historical injustices experienced by Māori. Local and culturally appropriate environmental justice applications exist (e.g., Parsons et al., 2021; Bargh and Tapsell, 2021) to support progress towards just (or tika) climate adaptation approaches.

Mātauranga Māori (the Māori knowledge tradition) has a rich history of adaptation in close association with the lands and waters of Aotearoa throughout many geological, ecological, cultural and climatic shifts. That means that Māori whānau, hapū and iwi hold deep repositories of information within their oral and visual traditions that may illustrate those changes through time, and also illuminate effective adaptation strategies for such shifts. These repositories of information are complemented by knowledge processes (such as waiata, whakairo and much more) inherent to mātauranga Māori that mobilise knowledge. Such knowledge processes provide an alternative that may overcome the personal and political inertia that appears common in response to climate change research and knowledge mobilisation approaches. Supporting Māori hapū- and iwi-led climate adaptation initiatives makes good practical sense for effective adaptation for all of Aotearoa.

Despite being disproportionately affected by and vulnerable to climate change, Māori resilience is built upon whakapapa and Māori already demonstrate leadership in climate adaptation and response. The severe weather events of 2023 along the east coast of the North Island saw marae become coordinated response centres after national response efforts were hampered by damaged infrastructure. Whakapapa networks were activated all across the motu to support hapū and iwi communities to rebuild. The Covid-19 pandemic elicited similar leadership from Māori across the country as checkpoints were established to manage movement and ensure our most vulnerable were cared for during the lockdowns (Bargh M. & L. Fitzmaurice, 2021). This resilience is also reflected in the development of climate strategies and plans and on-the-ground action by Māori communities at hapū and iwi scales (Stephenson et al., 2024).

The New Zealand government is being held to account for their inaction in a claim before the Waitangi Tribunal, on behalf of all Māori, that the government is in breach

of the Treaty of Waitangi by failing to implement adequate policies to address the threats posed by global climate change (Wai 3325) (Ministry for the Environment, n.d.). Again, partnership with and leadership of Māori hapū and iwi at place, all across Aotearoa, is critical for effective climate adaptation, as emphasised by the National Adaptation Plan (Ministry for the Environment, 2022) and by the Expert Working Group on Managed Retreat (2023).

The current policy challenges

A political environment driven by short-term thinking, vested interests, unclear mandates, conventional static approaches such as blunt insurance levers, fixed land-use zones and funding limitations continues to delay effective adaptation to sea-level rise in Aotearoa. Compounding such influences are very strong incentives to house people affordably, often on flood-prone land and low-lying coastal land (where population has historically been and continues to be located), and maintain traditional infrastructure to service them, and a human desire for living by the coast (Lawrence, Allan and Clarke, 2021; Boston, 2024).

Governance structures and institutional arrangements are required that can operate at large scales, for the long term, are non-partisan, and can work as integrated systems. This involves central and local government agencies in partnership with iwi/Māori and with communities, infrastructure providers, and finance and risk management sectors to take into account social and cultural inequities for climate-resilient development of coastal communities in Aotearoa. Effective decision making under uncertain conditions involves judgements based on the aspirations of communities, informed by actionable knowledge, and appraisal of a range of futures and opportunity costs.

The role of actionable knowledge

Enabling a just transition, and effective climate-resilient development, requires inclusive decision-making processes informed by accessible, actionable climate risk data and information. Such knowledge should include mātauranga, and downscaled global and regional drivers, and take into account local factors that may exacerbate the risks. Moreover, there are ongoing deep uncertainties in some of the processes driving sea-level rise (e.g., polar ice sheet melting), and uncertain divergent future emissions pathways beyond 2050. A dynamic adaptive pathways planning approach can provide a means of testing adaptation options against a range of plausible futures for their sensitivity to different failure conditions (thresholds), so as to reduce lock-in of unsustainable adaptation (Haasnoot et al., 2024; Craddock-Henry et al., 2023). This approach may also be driven by community values and indigenous knowledge so that decision makers can make judgements on robust adaptation strategies that reduce the worst of the risks while retaining flexibility to adjust as the conditions change (Lawrence et al., 2021; Haasnoot, Lawrence and Magnan, 2021).

Future global mean sea level rise will be controlled primarily by the thermal expansion of ocean water and mass wasting of land ice from glaciers, ice caps and ice sheets. The latter is now dominating global sea level rise at an accelerating rate ...

Future global mean sea-level rise will be controlled primarily by the thermal expansion of ocean water and mass wasting of land ice from glaciers, ice caps and ice sheets. The latter is now dominating global sea-level rise at an accelerating rate (Fox-Kemper et al., 2021; Hamlington et al., 2020). Aotearoa is one of many countries with extensive coastlines that sit astride an active tectonic plate boundary (others include Japan, Italy, Indonesia, and the western United States). Here, ongoing changes in land surface elevation at the coast can dramatically reduce or increase the rate of sea-level rise. These local changes matter. The magnitude and direction of vertical land movement can change across short distances, resulting in highly variable rates of relative sea-level rise, with different impacts across short sections of coastline. Accurately determining the ongoing rate and pattern of VLM along coastlines significantly improves location-specific (relative sea-level rise) estimates needed for adaptation planning and risk management.

As an example of actionable knowledge, the NZ SeaRise programme has produced relative sea-level rise projections every 2km for the more than 15,000 km of Aotearoa's coastline (Levy et al., 2024; Naish et al., 2024). These projections incorporate the latest regional sea level information from the IPCC (Fox-Kemper et al., 2021; Kopp et al., 2023), but also include highly variable rates of VLM identified from satellite-based observation systems (Hamling et al., 2022). As the public face of NZ SeaRise, a web-based GIS tool with enough versatility to engage public and stakeholder users (www.searise.nz/maps-2) was developed by Auckland-based data management and analytics platform Takiwā. These new projections improve upon the one-size-fits-all approach to sea level projections previously available and have been recommended to local and regional authorities through the national *Coastal Hazards and Climate Change Guidance* (Ministry for the Environment, 2024). The guidance outlines how practitioners should use the relative sea-level rise projections and recommends their use in planning and decision making where coastal subsidence or uplift is greater than 0.5mm/year, as timing of threshold exceedance for coastal flooding can be brought forward (or delayed with uplift) by decades. With just 0.3–0.4m of sea-level rise above the 2005 baseline, the sea levels historically associated with the one-in-100-year extreme coastal flood will occur annually around the coastline of Aotearoa (Paulik et al., 2023). This important decision-making threshold may be reached as early as 2040 in some parts of Aotearoa where

Figure 2a: An example of how vertical land movement (VLM) is illustrated on the NZ SeaRise website tool via data points every 2km around Aotearoa's coastline, from dark red, representing 9mm/year uplift, with a gradient through pink, white and light blue to dark blue, representing 9mm/year subsidence

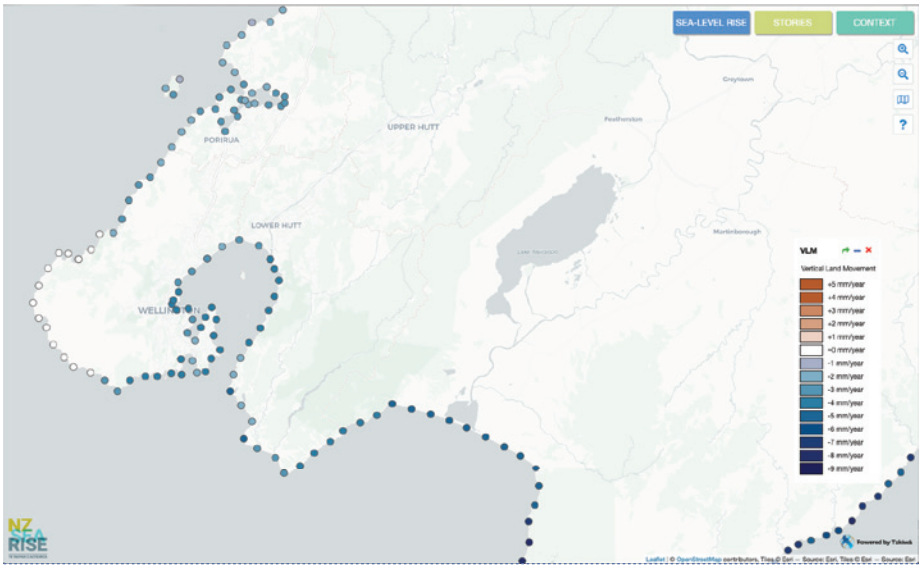


Figure 2b: Sea-level rise projections for a location on the Petone foreshore, Wellington Harbour (site 22494), where the VLM rate is −3.7 ± 0.3mm/year

Occurrences of extreme coastal flooding levels will increase from what used to be a rare 1% AEP (historical one-in-100-year) event of the recent past to become more regularly exceeded. Flooding thresholds (when local flooding occurs annually and monthly) are shown in relation to sea-level rise projections for SSP2-4.5, both with VLM included and without. Inclusion of local subsidence rates brings flood frequency thresholds forward by 20 years.

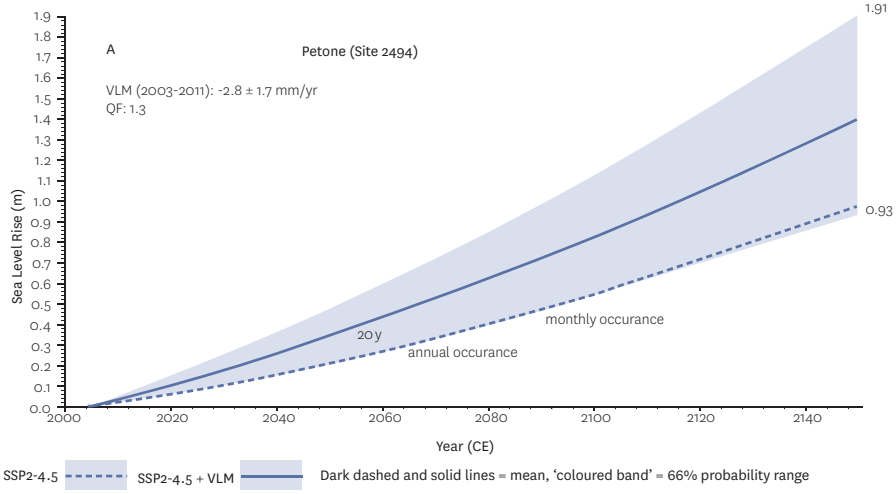
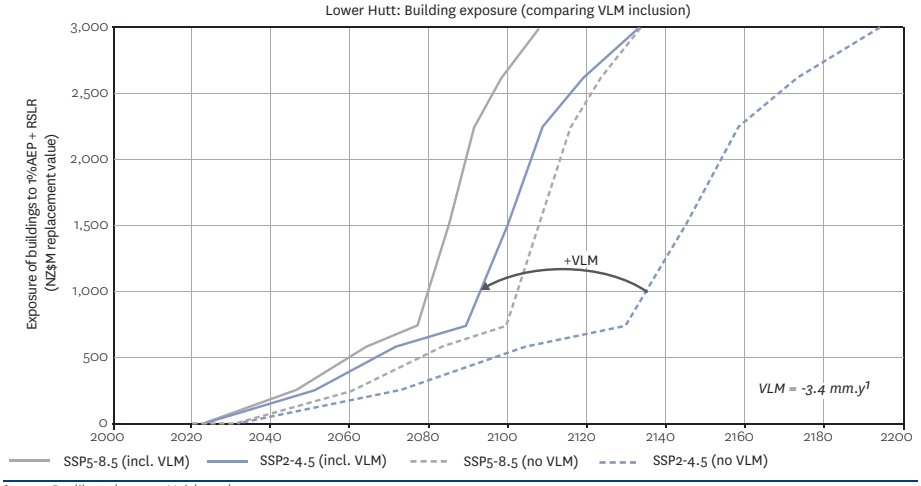


Figure 2c: Building replacement value (2021 NZ$m) exposed to 1% AEP coastal flooding and median sea-level rise projections for SSP2-4.5 and SSP5-8.5, with the solid lines incorporating average VLM rates of −3.4mm/year for Lower Hutt city (north of Petone foreshore)



Source: Paulik et al., 2023; Naish et al., 2024

the coast is subsiding rapidly (e.g., Wellington/Lower Hutt: see Figure 2). Land subsidence also increases the flood-risk exposure of built environments. As shown in Figure 2c, Lower Hutt's high subsidence rate means the SSP2-4.5 projection with VLM overtakes building exposure for the higher-emissions SSP5-8.5 projection without VLM. Here, just 30cm of sea-level rise in low-lying areas is enough to trigger a systems change in storm water services (Kool et al., 2021). This highlights the critical role relative sea-level rise plays in informing adaptation planning locally, compared with only using regional or national downscaled global projections.

Living with uncertainty

Like Aotearoa's dynamic coastline, knowledge is never static, and uncertainties regarding future sea-level rise and its impact will always remain. Not acting in the face of deepening uncertainty involves considerable risk. Instead, uncertainty needs to be accounted for by considering a wide range of plausible future conditions in developing an adaptive planning strategy (Ministry for the Environment, 2024).

Notwithstanding this, there are some certainties in coastal risk assessment. While the pace of change in sea-level rise is uncertain, sea level will continue rising for at least several centuries (Fox-Kemper et al., 2021). This will lock in ongoing sea-level rise on top of an increasing frequency of extreme events that manifests in a variety of hazards, including storm surges, coastal floods and coastal erosion, at the same time as rising groundwater and salt water intrusion into soils, aquifers and lowland rivers and streams. We do know 0.4–0.5m of average global sea-level rise by the end of the century is unavoidable due to the heat already baked into the Earth system combined with the long lag in the response of the ocean and ice sheets to increased heating. It is estimated that this level of sea-level rise will affect 1 billion people globally by the end of the 21st century (IPCC, 2023). We do know that on subsiding coasts sea-level rise will be faster and decision-relevant thresholds will be reached sooner.

Key uncertainties

Climatic surprises

This is especially an issue for the marine margins of the Antarctic ice sheet, where non-linear (rapid melting) processes may drive disintegration of ice shelves and the abrupt, widespread onset of irreversible ice sheet collapse, with a tipping point near +1.5°C of global warming (Armstrong-McKay et al., 2022). The latest IPCC report assessed that these processes were understood with low confidence but included them in a high impact low likelihood (HILL) storyline (projection) in sea-level rise estimates,[2] stating 'that 2 m of SLR by 2100 could not be ruled out', manifesting as 10m by 2300 (Fox-Kemper et al., 2021). The IPCC synthesis report reinforces that ambitious mitigation in line with the Paris Agreement target of 1.5°C is critical to avoid crossing thresholds that would yield rapid and irreversible sea-level rise with multigenerational consequences, and to enable more successful and considered coastal adaptation (IPCC, 2023).

Economists have long noted, for example, that risk is dominated by the upper tail on the probability distribution of climate sensitivity, rather than the central value, due to the highly non-linear increase of damages with warming (Ackerman and Stanton, 2012; Nordhaus, 2011). Consequently, 'stress-testing' to anticipate the potential impact of surprises and unknowns (HILLs) is central to a risk-based adaptation strategy – which the dynamic adaptive pathways planning approach is designed to help deliver. This is especially the case for coastal risk assessments and management plans: as explained above, the response to the climate drivers may be non-linear and deeply uncertain. For this reason, the national *Coastal Hazards and Climate Change Guidance* (Ministry for the Environment, 2024) includes a high-end sea-level rise projection that allows HILL events to be stress-tested using the 83rd percentile of the uncertainty range known as SSP5-8.5 H+.

Unclear future emissions pathways

The IPCC's global sea-level rise projections (Fox-Kemper et al., 2021) are based on new scenarios called shared socio-economic pathways (SSPs: Meinshausen et al., 2020), which include socio-economic assumptions and changes that influence future emissions trajectories. The scenarios span a wide range of plausible societal and climatic futures, from a 1.5°C 'best case' low-emissions scenario (SSP1-1.9) to a more than 4°C warming scenario (SSP5-8.5) by 2100. The lack of action to date on global emissions reductions, and decisions made in the next decade, will largely determine our long-term future emissions pathway, a trajectory that will begin to emerge in the second half of this century. All projections for sea-level rise begin to diverge after 2050, by which time 0.2–0.3m global mean sea-level rise (and similarly for Aotearoa) will have mostly occurred due to heat from past emissions. Beyond this the future is uncertain, with global median sea-level rise projections ranging from 0.44m (SSP1-2.6) to 0.77m (SSP5-8.5) by the end of century, with equivalent median projections of 0.44m and 0.80m for Aotearoa.[3] Adding in deep uncertainty due to Antarctic ice sheet processes (described above) for the high-emissions scenario leads to even higher levels of future sea-level rise and uncertainty. It is not possible to assign likelihoods (probabilities) to a particular sea-level rise projection, which precludes picking a best estimate at this stage (Horton et al., 2018; van de Wal et al., 2022). Therefore, using projections across a range of scenarios to stress-test options using a dynamic adaptive pathways approach avoids a pre-selected estimate of sea level change (and associated impacts) being locked in, and possibly later invalidated.

… the measured inter-seismic (between earthquake) rate that drives local VLM on decadal time scales will be the significant contributor to future relative sea level change around Aotearoa, and should be accounted for in sea level projections and risk assessments.

Vertical land movements may not be linear

We have outlined above that on decision-relevant timeframes (<100 years), and for coastal locations that are subsiding at >0.5mm/y, the government's coastal hazard guidance recommends using relative projections of sea-level rise that include estimates of vertical land movement. However, just like the climatic drivers of sea-level rise, projections of VLM also include uncertainties and require caveats with their use. The NZ SeaRise projections assume linear rates of VLM estimated from relatively short observational time series (global navigation satellite systems (GNSS) and satellite-based synthetic aperture radar interferometry (InSAR)), and do not specifically account for processes that cause non-linear or episodic motion that may occur due to: (a) earthquakes; (b) landslide events; (c) differential subsidence, erosion or sediment deposition and accretion in low-elevation coastal zones such as deltas, wetlands and estuaries; (d) changing rates of sediment compaction where coastal reclamation has occurred; or (e) variations in subsidence rate due to changes in groundwater extraction. The chance of a large-magnitude earthquake causing significant vertical displacement at any given point along the coastline over the next 50–100 years is relatively low due to long recurrence intervals of most of the faults (Gerstenberger et al., 2023; Litchfield et al., 2014; Stirling et al., 2012). Therefore, the measured inter-seismic (between earthquake) rate that drives local VLM on decadal time scales will be the significant contributor to future relative sea level change around Aotearoa, and should be accounted for in sea level projections and

risk assessments.

For 40% of the coastline (southern Hawke's Bay, Wairarapa, Wellington, Nelson, Marlborough and parts of Auckland), VLM makes a significant contribution to the sea-level rise projection (generally those sites where tectonic VLM is >2mm/y), and the mean trend is significant compared to the uncertainty. Here it is assumed that extrapolation of the VLM rate out to 100 years is valid (in the absence of an earthquake) and the VLM uncertainty is incorporated as part of the full range of uncertainty in the relative sea level projections. These projected uncertainties in local VLM add to those associated with 'climatic' drivers of sea-level rise (in the reported uncertainty ranges) and provide another reason for coastal planners and practitioners to adopt a flexible approach to adaptation (Haasnoot et al., 2013; Hamlington et al., 2020). This approach allows the option to monitor VLM alongside other factors that may trigger the need for a shift in adaptation response. If a significant earthquake eventuates, a pre-existing dynamic adaptive pathways planning strategy for a coastal locality can always be updated, the implementation either delayed if uplift occurs or rapidly actioned for significant co-seismic subsidence.

Compounding and cascading hazards

Sea-level rise compounds with other hazards (e.g., river flooding, landsliding, rising groundwater) and the impacts cascade across communities, local and nationally, and intensify the effects on those groups most vulnerable already. These effects are in part uncertain and may be exacerbated by external climate change effects and other impacts occurring globally, including in the Pacific islands. Further research is needed to unpick which coastal areas and communities are most at risk across Aotearoa from compounding and cascading hazards from sea-level rise, and the measures that can best avoid the worst impacts and manage the movement of people out of harm's way.

Outlook and future prospects

The research community is up to the challenge of assessing this uncertain future, and with adaptation science and dynamic assessment tools can help prepare communities and decision makers in the changing environment at all levels. These challenges include addressing:

- What potential high-impact climate hazards, surprises or irreversible changes should society be genuinely worried about and how can the associated risks be assessed robustly and communicated well?
- How can the priorities, values and aspirations of communities be reconciled with 'safe' pathways to a future climate that are consistent with the global Sustainable Development Goals?
- How can the science community, alongside all communities of interest and iwi Māori, assess risk and inform the calibration of responses in a way that is geographically, socially and culturally aware, and that can be incorporated into a flexible management strategy, and address the risk of compounding and cascading threats?

> Sea-level rise offers one clear opportunity to apply an approach that identifies precursors in the physical environment.

These questions are interrelated. Answering them will require the climate research community to be funded to work across disciplines to identify risks arising within the entire earth/human system, and to connect with all aspects of society. Engagement with relevant expertise, especially early in project design, can increase the long-term effectiveness of adaptation action. Scenarios will remain the cornerstone of sea-level rise projections. Nevertheless, the climate risk information community is already moving away from traditional approaches that only consider the means and likely ranges of uncertainty (e.g., IPCC reports). This trend is in favour of transdisciplinary risk-oriented frameworks that focus on HILLs, extreme events, progressive and ongoing changes like sea-level rise, and exceedance of planetary boundaries and absolute adaptation thresholds (Rockström et al., 2023; Sherwood et al., 2024).

Various stakeholders, academics and iwi Māori have turned to a variety of methods that embody futures thinking. Examples include serious 'games' to simulate hypothetical yet plausible future scenarios (Bontoux et al., 2020; Blackett et al., 2021; Lawrence and Haasnoot, 2017). Gaming exercises alongside scenario planning in simple stakeholder workshops can illuminate the feedbacks and conditions that lead to unexpected outcomes, and help identify trigger points that lead to decisions that can avoid adverse impacts. Other approaches, such as digital futuring in indigenous cultures (Rothe et al., 2024) and community engagement approaches such as used for the South Dunedin Future programme (Climate Change Commission, 2024) and the Thames Coromandel Shoreline Management Pathways project (Thames Coromandel District Council, 2022), have been used in low-lying coastal areas. Such approaches involving community and sectoral experts throw light on the issues and timing for different adaptation actions in the decision-making process. A successful approach must include scientific experts, stakeholders, industry partners, indigenous and community groups and policymakers to include input on geopolitical, societal, cultural, technological, economic and sustainable advances in knowledge. The results of these exercises can inform new and nimble scenarios for climate modelling efforts, for assessments using dynamic adaptive pathways planning, development of international and local policies, and communication of climate risks.

Sherwood et al. (2024) propose that such an approach requires the identification of signposts, or sentinels of change (Hermans et al., 2017; Haasnoot, van 't Klooster and van Alphen, 2018), that would foreshadow the need to alter a regional planning pathway, particularly when exceedance of a relevant threshold in some global process essentially rules out lower projections. By anchoring

adaptation plans to such signposts of change, we can simultaneously guide adaptations to better manage the greatest risks, while also making adaptation more predictable so that it can be incorporated into projected future global pathways.

Signposts, triggers and tipping points are not restricted to physical processes and can manifest in a range of transitional risk factors associated with communities and their values, cultural and social thresholds, financial markets, insurance frameworks, ecosystems and conflict levels. Sea-level rise offers one clear opportunity to apply an approach that identifies precursors in the physical environment. Sea-level rise is highly heterogeneous globally: increased rates of ice sheet melting contribute unequally to sea level acceleration across the globe (Kopp et al., 2015), and, as discussed, VLM will change the local expression of sea-level rise. The HILL risk of rapid sea-level rise in a region, over a multi-decadal planning horizon, is, however, strongly influenced by tipping point indicators associated with Antarctic ice sheets. These will not be noticeable in time for adaptive action by only monitoring local sea level itself (Houston, 2021; Wenzel and Schroter, 2010). A regionally targeted 'signposts' approach could escalate local responses based on specific changes in remote climate impact drivers. Moreover, a signpost-like approach can mitigate modelling limitations by identifying observable indicators of risk. One example is that Antarctic sea ice losses (Purich and Doddridge, 2023), Antarctic surface warming (Casado et al., 2023), ice shelf hydrofracture (Lai et al., 2020), and/or warm water incursions into ice shelf cavities (Lauber et al., 2023) would be precursors to accelerated ice sheet loss and global sea-level rise.

Conclusion

In summary, for various reasons policy decisions on mitigation and adaptation are never likely to address the full risks posed by climate change. There will always be a level of residual risk depending on HILL events, ongoing and progressive sea-level rise, and the need to account for compounding and cascading events due to uncertainties about how they will propagate. Furthermore, the capacity of decision makers to address the changes, their projected acceleration, and community acceptance of appropriate measures and their cost and loss of place will lead to additional residual risk.

Here, we propose a strategy that pivots climate science towards addressing two pressing needs, both of which require sustained funding and effort – for example, by way of a dedicated adaptation research platform. The first concerns identifying the key decision-relevant global and regional climate-related risks and working in partnership with community aspirations to understand how best to communicate and manage them. The second concerns identifying the range of possible pathways (good or bad) that lie before Aotearoa, and how to communicate them and implement climate-resilient adaptation solutions. Combined with the use of dynamic adaptive pathways planning, this strategy will involve a stronger focus on worst-case outcomes and the various limits to adaptation that must be avoided. It will also aim to identify and hence avoid maladaptive policy outcomes. To achieve this, climate science must become more integrative and explore transdisciplinary approaches. This requires considering a richer and more flexible family of future pathways using exploratory techniques like gaming, community futures thinking or expert elicitation, with diverse interests and values. Next, adaptive frameworks need to be employed that include signposts and triggers to mark socially significant thresholds of change and help continually update assessments of where affected communities stand and what can still be achieved.

However, none of this will matter unless there is timely, fit-for-purpose, nationally accessible, actionable climate risk information, and well-integrated governance structures and institutions empowered and funded to take a long-term strategic approach to climate adaptation. Accordingly, a well-designed Climate Adaptation Act (or equivalent legislation) is urgently needed, one that mandates the required governance arrangements, policy tools, planning mechanisms, public institutions and funding instruments.

The finance and expenditure committee inquiry on adaptation addresses some but not all of the essential enablers for effective adaptation in coastal settings affected by sea-level rise. In particular, the funding of adaptation measures, including managed retreat, and the funding of sustained decision-relevant science and practice are yet to be addressed. Without these, sea-level rise poses existential risks for many communities.

Finally, there is a critical need for a national climate adaptation research platform to be funded. A well-supported platform would facilitate system-wide dialogue between policymakers, social and physical scientists, and indigenous and local communities on evidence-based policy options and community aspirations in ways that can anticipate and manage future risks.

1 Actionable knowledge focuses on providing usable information that addresses policy and socially relevant problems and advances knowledge.

2 Note that this HILL scenario becomes increasingly more likely as temperatures rise, and will be close to a certainty should global warming reach 2°C (an important point from Sherwood et al., 2024).

3 These projections do not take into account local vertical land motion.

Acknowledgements

Tim Naish, Judy Lawrence, Richard Levy, Rob Bell and Vincent van Uitregt were supported by the NZ SeaRise and Our Changing Coast programmes funded by New Zealand Ministry of Business, Innovation and Employment contract to the Research Trust at Victoria University of Wellington, contracts RTVU1705 and RTVU2206.

References

Ackerman, F. and E.A. Stanton (2012) 'Climate risks and carbon prices: revising the social cost of carbon', *Economics E-Journal*, 6, 2012–10, doi:10.2139/ssrn.1973864

Armstrong McKay, D., A. Staal, J.F. Abrams, R. Winkelmann, B. Sakschewski, S. Loriani et al. (2022) 'Exceeding 1.5°C global warming could trigger multiple climate tipping points', *Science*, 377 (6611), doi.org/10.1126/science.abn7950

Bailey-Winiata, A.P., S.L. Gallop, I. White et al. (2024) 'Looking backwards to move forwards: insights for climate change adaptation from historical Māori relocation due to natural hazards in Aotearoa New Zealand', *Regional Environmental Change*, 24, doi.org/10.1007/s10113-024-02240-5

Bargh, M. and E. Tapsell (2021) 'For a tika transition: strengthen rangatiratanga', *Policy Quarterly*, 17 (3), pp.13–21

Beattie, A., J. Kerr and R. Arnold (2024) 'Selective and consistent news avoidance in Aotearoa New Zealand: motivations and demographic influences', *Kotuitui: New Zealand Journal of Social Sciences Online*, https://www.tandfonline.com/doi/full/10.1080/117708 3X.2024.2409663

Blackett, P., S. FitzHerbert, J. Luttrell, T. Hopmans, H. Lawrence and J. Colliar (2021) 'Marae-opoly: supporting localised Māori climate adaptation decisions with serious games in Aotearoa New Zealand', *Sustainable Science*, https://doi.org/10.1007/s11625-021-00998-9

Bontoux, L., J.A. Sweeney, A.B. Rosa, A. Bauer, D. Bengtsson, A.-K. Bock et al. (2020) 'A game for all seasons: lessons and learnings from the JRC's scenario exploration system', *World Futures Review*, 12 (1), pp.81–103, https://doi.org/10.1177/1946756719890524

Boston J. (2024) *A Radically Different World: preparing for climate change*, Wellington: Bridget Williams Books

Casado, M., R. Hubert, D. Faranda and A. Landais (2023) 'The quandary of detecting the signature of climate change in Antarctica', *Nature Climate Change*, 13 (10), pp.1082–8, https://doi.org/10.1038/ s41558-023-01791-5

Clark, B. and E. Stoakes (2023) 'Intersections of influence: radical conspiracist "alt-media" narratives and the climate crisis in Aotearoa', *Pacific Journalism Review*, 29 (1/2), pp.12–26

Climate Change Commission (2024) *Progress Report: National Adaptation Plan: assessing progress on the implementation and effectiveness of the government's first national adaptation plan*, Wellington: Climate Change Commission, https://www.climatecommission.govt.nz/ our-work/adaptation/nappa/nappa-2024/

Cradock-Henry, N.A., N. Kirk, S. Ricart, G. Diprose and R. Kannemeyer (2023) 'Decisions, options, and actions in the face of uncertainty: a systematic bibliometric and thematic review of climate adaptation pathways', *Environmental Research Letters*, 18 (7), 073002

Expert Working Group on Managed Retreat (2023) *Report of the Expert Working Group on Managed Retreat: a proposed system for te hekenga rauora/planned relocation*, Wellington: Expert Working Group on Managed Retreat, https://environment.govt.nz/publications/ report-of-the-expert-working-group-on-managed-retreat-a-proposed-system-for-te-hekenga-rauora/

Finance and Expenditure Committee (2024) 'Inquiry into climate adaptation', New Zealand House of Representatives, https:// selectcommittees.parliament.nz/v/6/821f67ff-6f67-43d2-cd3a-08dce18146d7

Fitzmaurice, L. & Bargh, M. (2021) Stepping Up: COVID-19 Checkpoints and Rangatiratanga. Huia, 100p

Fox-Kemper, B., H.T. Hewitt, C. Xiao, G. Aðalgeirsdóttir, S.S. Drijfhout, T.L. Edwards et al. (2021) 'Ocean, cryosphere and sea level change', in V. Masson-Delmotte, P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger et al. (eds), *Climate Change 2021: the physical science basis. contribution of Working Group I to the sixth assessment report of the Intergovernmental Panel on Climate Change*, Cambridge: Cambridge University Press

Gerstenberger, M.C., D.A. Rhoades, N. Litchfield, E. Abbott, T. Goded, A. Christophersen et al. (2023) 'A time-dependent seismic hazard model following the Kaikōura M7.8 earthquake', *New Zealand Journal of Geology and Geophysics*, 66 (2), pp.192–216, https://doi.org/10.1080/ 00288306.2022.2158881

Grear, A. (2020) Environmnetal Justice. Elgaronline. https://doi. org/10.4337/9781788970242

Haasnoot, M., J.H. Kwakkel, W.E. Walker and J. ter Maat (2013) 'Dynamic adaptive policy pathways: a method for crafting robust decisions for a deeply uncertain world', *Global Environmental Change*, 23 (2), pp.485–98, https://doi.org/10.1016/j.gloenvcha.2012.12.006

Haasnoot, M., S. van 't Klooster and J. van Alphen (2018) 'Designing a monitoring system to detect signals to adapt to uncertain climate change', *Global Environmental Change*, 52, pp.273–85, doi. org/10.1016/j.gloenvcha.2018.08.003

Haasnoot. M., J. Lawrence and A. Magnan (2021) 'Pathways to coastal retreat', *Science*, 372, pp.128–90, doi:10.1126/science.abi6594

Haasnoot, M., V. Di Fant, J. Kwakkel and J. Lawrence (2024) 'Lessons from a decade of adaptive pathways studies for climate adaptation', *Global Environmental Change*, 88, 102907

Hamling, I.J., T.J. Wright, S. Hreinsdóttir and L.M.Wallace (2022) 'A snapshot of New Zealand's dynamic deformation field from Envisat InSAR and GNSS observations between 2003 and 2011', *Geophysical Research Letters*, 49 (2), e2021GL096465, doi.org/10.1029/ 2021GL096465

Hamlington, B.D., T. Frederikse, R.S. Nerem, J.T. Fasullo and S. Adhikari (2020) 'Investigating the acceleration of regional sea level rise during the satellite altimeter era', *Geophysical Research Letters*, 47 (5), e2019GL086528, doi.org/10.1029/2019gl086528

Hermans, L.M., M. Haasnoot, J. ter Maat and J. Kwakkel (2017) 'Designing monitoring arrangements for collaborative learning about adaptation pathways', *Environmental Science and Policy*, 69, pp.29–38, doi. org/10.1016/j.envsci.2016.12.005

Horton, B.P., R.E. Kopp, A.J. Garner, C.C. Hay, N.S. Khan, K. Roy and T.A. Shaw (2018) 'Mapping sea-level change in time, space, and probability', *Annual Review of Environment and Resources*, 43, pp.481–521, doi.org/10.1146/annurev-environ-102017-025826

Houston, J.R. (2021) 'Sea-level acceleration: analysis of the world's high-quality tide gauges', *Journal of Coastal Research*, 37 (2), pp.272–9

IPCC (2023) *Climate Change 2023: synthesis report: contribution of Working Groups I, II and III to the sixth assessment report of the Intergovernmental Panel on Climate Change*, Geneva: IPCC, doi: 10.59327/IPCC/AR6-9789291691647

Johnson, D.E., M. Parsons and K. Fisher (2022) 'Indigenous climate change adaptation: new directions for emerging scholarship', *Environment and Planning E: Nature and Space*, 5 (3), pp.1541–78, doi. org/10.1177/25148486211022450

Kool, R., J. Lawrence, M.A.D. Larsen, A. Osborne and M. Drews (2024) 'Spatiotemporal aspects in coastal multi-risk climate change decision-making: wait, protect, or retreat?', *Ocean and Coastal Management*, 258, 107385, https://doi.org/10.1016/j. ocecoaman.2024.107385

Kopp, R.E., C.C. Hay, C.M. Little and J.X. Mitrovica (2015) 'Geographic variability of sea-level change', *Current Climate Change Reports*, 1 (3), pp.192–204

Kopp, R.E., G.G. Garner, T.H.J. Hermans, S. Jha, P. Kumar, A. Reedy et al. (2023) 'The framework for assessing changes to sea-level (FACTS) v1.0: a platform for characterizing parametric and structural uncertainty in future global, relative, and extreme sea-level change', *Geoscientific Model Development*, 16 (24), pp.7461–89, doi.org/10.5194/gmd-16-7461-2023

Lai, C.Y., J. Kingslake, M.G. Wearing, P.C. Chen, P. Gentine, H. Li et al. (2020) 'Vulnerability of Antarctica's ice shelves to melt water driven fracture', *Nature*, 584 (7822), pp.574–8, doi.org/10.1038/s41586-020-2627-8

Lauber, J., T. Hattermann, L. de Steur, E. Darelius, M. Auger, A. Nost et al. (2023) 'Warming beneath an East Antarctic ice shelf due to increased

subpolar westerlies and reduced sea ice', *Nature Geoscience*, 16 (10), pp.877–85, https://doi.org/10.1038/s41561-023-01273-5

Lawrence, J., S. Allan and L. Clarke (2021) 'Inadequacy revealed and the transition to adaptation as risk management in New Zealand', *Frontiers in Climate*, 3, 734726 doi:10.3389/fclim.2021.734726

Lawrence, J. and R. Bell (2022) 'The foundations of the sea-level rise challenge: coasts are a special case for adaptation', in *Coastal Adaptation: adapting to coastal change and hazard risk in Aotearoa New Zealand*, special publication 5, New Zealand Coastal Society

Lawrence, J. and M. Haasnoot (2017) 'What it took to catalyse a transition towards adaptive pathways planning to address climate change uncertainty', *Environmental Science and Policy*, http://dx.doi.org/10.1016/

Lawrence, J. and B. Mackey et al. (2022) 'Australasia', in: *Climate Change 2022: impacts, adaptation and vulnerability: contribution of Working Group II to the sixth assessment report of the Intergovernmental Panel on Climate Change*, Cambridge; New York: Cambridge University Press, doi:10.1017/9781009325844.013

Lawrence, J., S. Stephens, P. Blackett, R.G. Bell and R. Priestley (2021) 'Climate services transformed: decision making practice for the coast in a changing climate', *Frontiers in Marine Science*, 8, doi.org/10.3389/fmars.2021.703902

Levy, R., T. Naish, D. Lowry, R. Priestley, R. Winefield, A. Alevropolous-Borrill et al. (2024) 'Melting ice and rising seas: connecting projected change in Antarctica's ice sheets to communities in Aotearoa New Zealand', *Journal of the Royal Society of New Zealand*, 54 (4), pp.1–24

Litchfield, N.J., R. van Dissen, S. Sutherland, P. Barnes, S. Cox, R. Norris et al. (2014) 'A model of active faulting in New Zealand', *New Zealand Journal of Geology and Geophysics*, 57 (1), pp.32–56, doi.org/10.1080/00288306.2013.854256

Meinshausen, M., Z.R.J. Nicholls, J. Lewis, M.J. Gidden, E. Vogel, M. Freund et al. (2020) 'The shared socio-economic pathway (SSP) greenhouse gas concentrations and their extensions to 2500', *Geoscientific Model Development*, 13 (8), pp.3571–605, doi.org/10.5194/gmd-13-3571-2020

Ministry for the Environment (2022) *Aotearoa 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 (2024) *Coastal Hazards and Climate Change Guidance*, Wellington: Ministry for the Environment, https://environment.govt.nz/publications/coastal-hazards-and-climate-change-guidance/

Ministry for the Environment (n.d.) 'Te Uiuinga Rawa ā-Motu Wai Māori me te Ngāwhā (Wai 2358) |The National Freshwater and Geothermal Resources Inquiry (Wai 2358)', https://environment.govt.nz/te-ao-maori/the-treaty-and-the-ministry/wai-2358/

Naish, T., R. Levy, I. Hamling, S. Hreinsdóttir, P. Kumar, G.G. Garner, R.E. Kopp, N. Golledge, R. Bell, R. Paulik, J. Lawrence, P. Denys, T. Gillies, S. Bengtson, A. Howell, K. Clark, D. King, N. Litchfield and R. Newnham (2024) 'The significance of interseismic vertical land movement at convergent plate boundaries in probabilistic sea-level projections for AR6 scenarios: the New Zealand case', *Earth's Future*, 12 (6), e2023EF004165, doi:10.1029/2023EF004165

NIWA (n.d.) 'The New Zealand Historic Weather Events Catalogue', https://hwe.niwa.co.nz/

Nordhaus, W.D. (2011) 'The economics of tail events with an application to climate change', *Review of Environmental Economics and Policy*, 5 (2), pp.240–57, https://doi.org/10.1093/reep/rer004

Parsons, M., K. Fisher and R. Crease. (2021) *Decolonising Blue Spaces in the Anthropocene: freshwater management in Aotearoa New Zealand* (1st edn), Springer Nature, doi.org/10.1007/978-3-030-61071-5

Paulik, R., A. Wild, S. Stephens, R. Welsh and S. Wadhwa (2023) 'National assessment of extreme sea-level driven inundation under rising sea levels', *Frontiers in Environmental Science*, 10, 2633, https://doi.org/10.3389/fenvs.2022.1045743

Priestley, R.K., Z. Heine and T.L. Milfont (2021) 'Public understanding of climate change-related sea-level rise', *PLoS ONE*, 16 (7), e0254348, doi.org/10.1371/journal.pone.0254348

Purich, A. and E.W. Doddridge (2023) 'Record low Antarctic sea ice coverage indicates a new sea ice state', *Communications Earth and Environment*, 4, 314, https://www.nature.com/articles/s43247-023-00961-9

Rockström, J., J. Gupta, D. Qin et al. (2023) 'Safe and just Earth system boundaries', *Nature*, 619, pp.102–11, doi.org/10.1038/s41586-023-06083-8

Rothe, D., I. Boas, C. Farbotko and T. Kitara (2024) 'Digital Tuvalu: state sovereignty in a world of climate loss', *International Affairs*, 100 (4), pp.1491–509, doi.org/10.1093/ia/iiae060

Shaw, B.E., B. Fry, A. Nicol, A. Howell and M. Gerstenberger (2022) 'An earthquake simulator for New Zealand', *Bulletin of the Seismological Society of America*, 112 (2), pp.763–78, doi.org/10.1785/0120210087

Sherwood, S.C., G. Hegerl, P. Braconnot, P. Friedlingstein, H. Goelzer, N.R.P. Harris, E. Holland, H. Kim, M. Mitchell, T. Naish, P. Nobre, B.L. Otto-Bliesner, K.A. Reed, J. Renwick and N.P.M. van der Wel (2024) 'Uncertain pathways to a future safe climate', *Earth's Future*, 12 (6), e2023EF004297, doi:10.1029/2023EF004297

Stephens, S., R. Bell and J. Lawrence (2018) 'Developing signals to trigger adaptation to sea-level rise', *Environmental Research Letters*, 13, 104004, doi:10.1088/1748-9326/aadf96

Stephenson, J., K. Merata, S. Bond, G. Diprose, Te Rereatukāhia Marae Komiti, Maketu Iwi Collective, Te Kaahui o Rauru, Kati Huirapa ki Puketeraki and Aukaha (2024) *Kete Whakaaro: a basket of ideas from mana whenua who are leading their own climate change adaptation*, a report from the Innovations for Climate Adaptation research project, Deep South National Science Challenge, Dunedin: Centre for Sustainability, University of Otago

Stirling, M., G. McVerry, M. Gerstenberger, N. Litchfield, R. van Dissen, K. Berryman et al. (2012) 'National seismic hazard model for New Zealand: 2010 update', *Bulletin of the Seismological Society of America*, 102 (4), pp.1514–2, https://doi.org/10.1785/0120110170

Te Puni Kōkiri (2023) *Understanding Climate Hazards for Hapori Māori*, Wellington: Te Puni Kōkiri, https://www.tpk.govt.nz/en/o-matou-mohiotanga/climate/understanding-climate-hazards-for-hapori-maori-ins

Thames Coromandel District Council (2022) 'Shoreline Management Pathways project', https://www.tcdc.govt.nz/Our-Community/Council-Projects/Current-Projects/Coastal-Management/Shoreline-Management-Pathways-Project

van de Wal, R.S.W., R.J. Nicholls, D. Behar, K. McInnes, D. Stammer, J.A. Lowe, J.A. Church, R. DeConto, X. Fettweis, H. Goelzer, M. Haasnoot et al. (2022) 'A high-end estimate of sea level rise for practitioners', *Earth's Future*, 10, e2022EF002751, doi.org/10.1029/2022EF002751

Wenzel, M. and J. Schroter (2010) 'Reconstruction of regional mean sea level anomalies from 595 tide gauges using neural networks', *Journal of Geophysical Research*, 115 (C8), C08013

Gradon Diprose, Sophie Bond, Janet Stephenson and Merata Kawharu

Supporting Justice in Local Government

Climate Response in Aotearoa New Zealand

Abstract

While climate justice concerns are increasingly incorporated into policy at international scales, there is less research on climate justice and policy at local scales. Recognising how structural inequalities intersect with climate change influences how rights, responsibilities, distribution of resources and procedures for adaptation are understood and implemented. We describe how some local governments in Aotearoa New Zealand are using recognition practices to improve their understanding of the impacts of climate change, and re-allocating resourcing so mana whenua and communities are better able to participate in climate adaptation procedures. We suggest national policy and legislative changes that could support local governments' climate justice recognition practices.

Keywords climate justice, climate change adaptation, local government, decision making, te Tiriti o Waitangi

Gradon Diprose is a senior researcher in environmental social science at Manaaki Whenua Landcare Research. **Sophie Bond** is an associate professor in Te Kura o Iho Whenua/School of Geography at Ōtākou Whakaihu Waka University of Otago. **Janet Stephenson** is a research professor at the Centre for Sustainability, Ōtākou Whakaihu Waka University of Otago. **Merata Kawharu** (Ngāti Whatua, Ngāpuhi) is a professor and deputy vice-chancellor, Māori, at Te Whare Wānaka O Aoraki Lincoln University

Calls for greater emphasis on justice in climate change response have gained traction in recent years. Given the significant and uneven impacts of climate change, indigenous peoples, activists, researchers and others have raised concerns about the differences in communities' exposure to climate change, how costs and benefits will be distributed, who will pay and be compensated, and how those most affected will participate in policy and decision making (Bargh and Tapsell, 2021; Bray, Stephenson and Bond, 2023; Ellis, 2019; Pollex, 2024; Bulkeley, Edwards and Fuller, 2014; Tombs and France-Hudson, 2018). As a result, there is established literature applying theories of justice to adaptation, especially the rights and responsibilities of nation states and communities. Climate justice concerns are increasingly recognised in international policy such as the Paris Agreement (Pollex, 2024; United Nations, 2016). However, there is less research on how climate justice is incorporated into local adaptation policy and practice (Brousseau et al., 2024;

Bulkeley, Edwards and Fuller, 2014; Pollex, 2024; Swanson, 2023). This gap is important to address because local climate change responses may end up perpetuating existing inequalities and negative outcomes, including community opposition (Brousseau, 2024; Bulkeley, Edwards and Fuller, 2014; Klinsky et al., 2017).

To reduce these risks, Bulkeley, Edwards and Fuller (2014) suggest exploring local practices of recognition that make visible how climate change intersects with existing structural inequalities. They argue that recognition practices highlighting structural inequalities provide a useful entry point for understanding how rights, responsibilities, distributions and procedures are framed. In this article we explore selected practices of recognition that some local governments (regional, district and city councils) in Aotearoa New Zealand are using as they work with communities (including Māori) to adapt to climate change. These practices are beginning to reflect understandings of responsibility and good process in proactive climate adaptation.[1] Focusing on councils' recognition practices in relation to climate adaptation is important for two reasons. First, responding to climate change poses unprecedented challenges for councils' decision making and governance in Aotearoa New Zealand (Iorns, 2022; Lawrence, Wreford and Allan, 2022; Stephenson et al., 2020). Second, councils play a vital role in climate adaptation due to their responsibilities for environmental planning and regulation, infrastructure and natural hazards management, and emergency response (which is becoming increasingly frequent and costly).[2]

We draw from our research with territorial local authorities, regional councils and mana whenua organisations in three regions over 2022–24.[3] We tracked organisational changes and practices relating to proactive climate adaptation. This article draws primarily from three rounds of interviews with council staff over two years with participants from Bay of Plenty Regional Council, Western Bay of Plenty District Council, South Taranaki District Council, New Plymouth District Council, Taranaki Regional Council, Dunedin City Council and Otago Regional Council. We also carried out interviews at Waikato Regional Council and Whanganui District Council. In addition, we draw from interviews with members of mana whenua organisations in the three regions.

Climate justice

The concept of climate justice emerged from environmental justice discourses which drew attention to how poor and minority communities tend to experience greater pollution, poorer environmental conditions, and associated adverse social and health impacts. Schlosberg and Collins (2014) describe how climate justice research increased following Hurricane Katrina, particularly in the United States, where scholars and activists noted that the uneven impacts of climate change resembled other long documented environmental injustices. Bulkeley, Edwards and Fuller (2014) and Pollex (2024) suggest that most climate justice research has focused on four considerations, often from a normative or idealist position in relation to nation states: the rights and the responsibilities of different actors, whether resources are distributed fairly, and whether procedures (decision-making processes) are fair and transparent, reflecting key dimensions of justice theory. In more pragmatic terms, community activists and grassroots organisations have argued that climate justice must focus on the local level: how impacts are experienced unevenly depending on existing inequities, and the importance of local voice and autonomy in response (Schlosberg and Collins, 2014). To address these local concerns, Bulkeley, Edwards and Fuller suggest climate justice also needs to include '*recognition*, which views socio-economic (i.e. distributive) injustices as fundamentally linked to "cultural or symbolic injustices" which fail to give adequate recognition to certain groups (such as women, the working class, or particular racial or ethnic groups)' (Bulkeley, Edwards and Fuller, 2014, p.33). Practicing such recognition means exploring who bears the burdens of climate change impacts, who benefits from adaptation actions, whether adaptation perpetuates inequalities or fosters more equitable outcomes, and whether adaptation processes include those most affected (especially if they have been historically marginalised). Recognition is therefore an important first step in understanding the 'types of rights, responsibilities, distributions and procedures required to respond justly to climate change' (ibid., p.31).

> Recognising structural injustice means acknowledging that historical legacies affect people's capacity to respond to climate impacts and recover from disruption.

Drawing on Awatere et al. (2021), Bulkeley, Edwards and Fuller (2014), Bargh and Tapsell (2021), Schlosberg (2012) and Juhola et al. (2022), we understand just climate adaptation recognition practices as those that:

- make visible existing inequalities that may be exacerbated by climate change or adaptation responses, for a deep engagement with the way impacts are distributed;
- include people and communities' knowledge relevant to climate change adaptation that may have been historically marginalised in local (council) decision-making processes. In the context of settler colonial states, this requires finding processes that recognise indigenous sovereignty and knowledge systems;
- attempt to resource and include those people and communities who will be affected most by climate change, but have historically been marginalised in local (council) decision-making

processes. This enables procedural justice, through recognising structural processes that perpetuate inequalities and affect communities' ability to engage.

Recognising structural injustice means acknowledging that historical legacies affect people's capacity to respond to climate impacts and recover from disruption. In Aotearoa New Zealand this includes recognising that colonisation and urbanisation resulted in severe resource losses for mana whenua, with ongoing adverse intergenerational impacts on Māori wellbeing and on the health of their lands, forests and waterways (Kawharu, Tapsell and Tane, 2023; Moewaka Barnes and McCreanor, 2019). Māori economic wealth is also heavily tied up in the primary sector (fishing, forestry and farming). Consequently, Māori, their assets and livelihoods are at great risk from climate change (Awatere et al., 2021; Haimona-Riki, 2024). In Aotearoa New Zealand recognition also involves ensuring that climate response decisions reflect obligations and responsibilities under te Tiriti o Waitangi, the Māori text of the Treaty of Waitangi, in particular. While the Local Government Act 2002 refers to the Treaty of Waitangi in directing councils to provide 'opportunities for Māori to contribute to its decision-making processes', this does not go as far as specifying partnership. What 'opportunities' means in relation to climate adaptation and addressing historical inequalities for Māori remains ambiguous and an omission. There is a risk that councils' climate responses may exacerbate existing inequalities, particularly for those people least able to respond to climate change, and in the process cause new Treaty breaches if specific duties are not clarified.

Climate adaptation and councils in Aotearoa New Zealand

While there is some national guidance and legislation to support councils' climate adaptation[4] in Aotearoa New Zealand, researchers, expert panels and others have argued that existing legislation and institutional arrangements limit councils' mandate and ability to respond to climate change proactively and equitably (Boston and Lawrence, 2017, 2018; Ellis, 2019; Expert Working Group on Managed Retreat, 2023; Grace, France-Hudson and Kilvington, 2019; Iorns and Watts, 2019; James at al., 2019; Lawrence, Wreford and Allan, 2022; Peart, 2024; Productivity Commission, 2019; Resource Management Review Panel, 2020; Review into the Future for Local Government, 2023; Climate Change Adaptation Technical Working Group, 2018; Tombs and France-Hudson, 2018). Drawing on much of this literature, Iorns (2022) identifies seven particular problems with the existing system for climate adaptation:

- a lack of national guidance from central government;
- uncertainties relating to science and hazard planning that have led to local government experiencing litigation and being paralysed by fears of it;
- a lack of clarity about roles and responsibilities between regional councils and territorial authorities;
- inability to reduce risks due to protection of existing uses under the Resource Management Act 1991;
- the need to better protect Māori interests and partner with Māori;
- poor integration across the resource management system and institutions; and
- inadequate funding for councils to implement adaptation responses.

Despite these delays and challenges, many councils in Aotearoa New Zealand, including those we interviewed, have started proactive climate change adaptation ...

To address these problems, practitioners, researchers and others have called for changes to the resource management system and a new climate change adaptation act to provide procedural tools and consistency across Aotearoa New Zealand that address the complex matters of managed relocation, in particular (e.g., funding, land acquisition, compensation, liability and insurance) (Resource Management Review Panel, 2020; Peart, 2024). While these calls do not explicitly refer to climate justice, it is reflected through arguments for clarity on how rights, responsibilities, procedures and distribution of costs and benefits will be addressed.

Compounding these problems, the recent political seesaw of resource management reform efforts have led to further delays and uncertainties for councils. These include the repeal of the recently developed Natural and Built Environment Act 2023 and Spatial Planning Act 2023 in late 2023 by the new National-led government (thereby returning to the previous Resource Management Act 1991 as the primary environmental and land use planning statute), the introduction of the 'fast-track' consenting bill in early 2024, and indications of further reform. These reforms and repeals have increased workloads for councils and mana whenua, caused delays, and increased uncertainty exactly when the opposite is needed.

Despite these delays and challenges, many councils in Aotearoa New Zealand, including those we interviewed, have started proactive climate change adaptation (Bond and Barth, 2020; Bond et al., 2024; Diprose et al., 2024; Hanna, White and Glavovic, 2017). We recognise that climate justice recognition practices are challenging and difficult to operationalise in the messy and often conflictual resource-constrained spaces of councils and their spheres of responsibility. Consequently, in what follows we highlight the everyday recognition practices that help to introduce justice concerns (even if imperfectly) into the complex processes councils operate within.

Council practices of recognition

The councils that we interviewed face diverse climate change impacts, are at

various stages of climate response, and have varying relationships with mana whenua. Despite these differences, all council participants described significant internal organisational shifts to support climate response. Across these shifts we identified recognition practices that help to highlight structural inequalities related to two main themes: improving understanding of the uneven impacts of climate change, and improving collaboration and partnership with mana whenua and communities. In what follows we describe first these recognition practices in their context, then the perceived benefits these have for more just climate response, and, finally, what is needed to further support these practices.

Recognition practices for understanding uneven impacts of climate change

All councils in our case studies were seeking robust data to inform their climate response decision making, initially through regional climate change risk assessments. This typically involved the regional council commissioning a high-level risk assessment using down-scaled climate projections to inform understandings of changes in, for example, sea level rise and inundation, climatic change and associated hydrology, and increased risks of erosion, floods and wildfires.[5] From these, the impacts for territorial local authorities (e.g., infrastructure, land use) could then be explored. The risk assessment process partially prompted creation of regional climate change working groups in each region that include staff from the regional council and relevant territorial authorities. Participants observed that these risk assessments showed how climate change impacts cut across existing council 'silos', work programmes and jurisdictions. This recognition had helped to redistribute understanding of, and responsibility for, climate response within and between councils, rather than relying on one staff member or a small team.[6]

The completed regional risk assessments for Bay of Plenty and Otago explicitly recognise that climate change is likely to exacerbate existing socio-economic inequalities. The reports include some vulnerability and exposure mapping using socio-economic deprivation indexes, population age and ethnic composition to highlight how the anticipated impacts of climate change will unevenly affect different groups – particularly those most vulnerable, with least resources to adapt. Participants noted that the risk assessment processes aimed to include social science, local knowledge and mātauranga as well as biophysical science data to help inform understanding of uneven climate change impacts. However, this was not always achieved in every case. For example, a very localised risk assessment was undertaken in one region but the process did not allow enough time to include mana whenua perspectives. The absence of a mana whenua perspective was explicitly acknowledged in the final report, and to some extent was addressed later, but the example reflects three issues: first, a lack of resourcing for mana whenua to engage with council processes and time frames; second, that risk assessments that prioritise Western methodologies do not always align with te ao Māori perspectives on risk, what is at risk and how to identify risk (Awatere et al., 2021; Pirini and Morar, 2021); and third, how Tiriti partnership is not always understood or implemented.

In some regions the biophysical science data from the risk assessments was beginning to inform district and regional plan changes: for example, new rules about land use, building and development to reduce exposure to hazards, and new rules related to fresh water and land use to take account of predicted climatic changes. However, participants were concerned that changes to regional and district/city plans may have significant impacts on communities (e.g., insurance retreat, increase in risk-based insurance pricing and associated flow-on effects for the community such as mortgage defaults and devaluation of assets) and prompt costly litigation and community backlash. Participants suggested that where standardised risk assessment processes are used, national legislation and compensation frameworks are needed to reduce community backlash and litigation when councils try to reduce risk through such plan changes, and not exacerbate existing inequalities for vulnerable groups.

Finally, while participants saw value in risk assessments, they cautioned that much of the work to date has only focused on gathering information to understand impacts, rather than prioritising and funding actual adaptation. Many noted that the hard work such as re-negotiating existing use rights under the Resource Management Act, and identifying which adaptation projects should be undertaken and how they will be prioritised and funded, had not begun. They were concerned about uncertainties such as who will pay for future adaptation investments that exceed council budgets, and what national framework and procedures will support decision making for contentious issues like managed relocation. As one participant noted:

> [O]ne of the huge elephants in the room at the moment is who funds adaptation work … The National Adaptation Plan … says we need to share the funding between local and central government and others. But there's no detail about how that's

Many noted that the hard work such as re-negotiating existing use rights under the Resource Management Act, and identifying which adaptation projects should be undertaken and how they will be prioritised and funded, had not begun.

> actually financed, or funded. And so local government is funded by rates pretty much … We are never going to have enough money to keep the lights on and do huge multigenerational scale work that needs to be done on climate change adaptation. (District council participant)

Participants cautioned that until these questions relating to rights, responsibilities (including in relation to te Tiriti o Waitangi), distribution of costs and procedures were clarified nationally, councils' ability to progress just adaptation is limited.

The examples and practices described reflect increasing recognition of the colonial history and associated impacts in Aotearoa New Zealand by supporting capacity for both council staff and mana whenua to better engage with each other.

Recognition practices for greater collaboration and partnership

Council participants described examples of how they are developing collaborations and partnerships with mana whenua and communities that are exposed to climate risks. These included improving relationships with mana whenua, developing and sharing relevant information, and distributing resources differently to enable mana whenua and communities to participate in adaptation processes.

Working with mana whenua

Mana whenua we interviewed rarely spoke solely about climate adaptation. In their own actions, and in seeking to partner with councils, their approaches were holistic and underpinned by rangatiratanga (Stephenson et al., 2024). In practice, achieving this is not straightforward. As one mana whenua participant said, working with a council can be 'fraught' because 'a partnership approach is quite easy to say and hard to do in practice'. For many Māori this continues to be an ongoing frustration and was evident in our case studies. However, we also observed some shifts within councils that demonstrate recognition of the need for better relationships with mana whenua, if not yet achieving partnership. These included: increasing the cultural acumen of all council staff through courses in te reo and tikanga; employing dedicated Māori staff at senior strategic levels to improve institutional and operational relationships with mana whenua; and resourcing or partially supporting the work that mana whenua do in statutory planning processes and everyday operations (rather than assuming mana whenua will engage in mahi aroha as volunteers).

For example, in Otago, Aukaha is a Ngāi Tahu consultancy, originally established as Kai Tahu ki Otago in 1995 to represent the five papatipu rūnaka in the statutory consultation requirements of the Resource Management Act. This work has expanded over the years and, following rebranding in 2017, Aukaha's role is 'to strengthen the relationships between mana whenua on one hand and local government and businesses on the other' (Aukaha, n.d.). Changes to the National Policy Statement for Freshwater Management in 2020, which included the requirement to give effect to te mana o te wai, coincided with the renewal of Otago Regional Council's land and water regional plan. Recognising the significant resource needed by Aukaha to support a more co-developed planning process, Aukaha and Otago Regional Council agreed that the council would fund full-time equivalent positions for Aukaha staff to work on the plan. This approach has had significant benefits for both Māori and the council in terms of improved relationships and better outcomes and could be applied to climate adaptation.

A second example lies in recognition of senior leaders in councils and mana whenua working together. Aukaha has a variety of formalised relationships and resourcing requirements with local government in Otago and Southland. They have suggested that this works best where there is a formalised 'mana to mana' relationship, with senior leaders of both rūnaka and council who meet regularly, and effective operational-level working relationships on specific projects for staff. While this terminology might not work for other contexts, the principle of maintaining relationships at both levels is crucial to ensuring transparency, trust, understanding and mutual respect. There can be no one-size-fits-all when it comes to relationships between mana whenua and councils, and there is some way to go in most instances to achieve Tiriti-based partnership. Nevertheless, in some councils we worked with, there was a clear improvement in their relationships with mana whenua, which provides good foundations for future climate adaptation and for implementing Tiriti rights and responsibilities.

The examples and practices described reflect increasing recognition of the colonial history and associated impacts in Aotearoa New Zealand by supporting capacity for both council staff and mana whenua to better engage with each other. These recognition practices within councils mean they are better able to understand how historical and existing inequalities affect mana whenua, and develop procedures that enable mana whenua to more easily participate. In this sense, recognition practices are reframing responsibility and partially (if still imperfectly) redistributing resources to help address some historical inequalities.

While participants (both council staff and mana whenua) described positive outcomes from these practices, they also noted that further clarification of councils'

responsibility and distribution of resourcing is required. For example, are councils required to partner with mana whenua? If not, then recognition practices like those described can only be achieved where elected members and senior council staff prioritise and resource them, leading to inconsistency across Aotearoa New Zealand. If councils are required to partner with mana whenua, further justice-related questions then arise about how to resource mana whenua groups to participate in councils' climate adaptation procedures.

Working with communities

In Aotearoa New Zealand, researchers have identified the need for ongoing relationships between communities and councils in climate adaptation (Barth, Bond and Stephenson, 2023; Bond and Barth, 2020; Stephenson et al., 2020). While it is commonly understood that procedural justice can be enabled through inclusive participation of those affected by decisions, Barth, Bond and Vincent (2019) found that many councils were reluctant to engage with communities until they had adaption proposals ready to present for feedback. Our participants echoed these concerns, describing how lack of clarity in councils' mandated role in adaptation creates challenges for proactive engagement with communities. Participants also described balancing the need to manage expectations (e.g., what might be legally, economically and socially realistic) and the need for openness (e.g., not going to communities with a set of predetermined actions).

To manage these challenges, some participants emphasised the role of community adaptation grants that support community-led action. For example, Whanganui District Council and the Bay of Plenty Regional Council are using contestable community grants of up to $20,000 per project, funded through long-term plans, to support community and mana whenua groups to start adaptation planning, fund mitigation projects and/or initiate projects that build climate resilience. One participant summarised the benefits of these approaches as follows:

> I'm most excited about the community led stuff in terms of once communities are actually given some tools and support and seeing how they respond, and then how we [council] can support that. Because they're great integrators because they don't care about jurisdictional boundaries ... So they kind of integrate it in the place and what's coming to this place and what they need to do in this place, and it kind of brings everything together. That's really useful. (Regional council participant)

Over several years, a combination of active community members and committed staff at the Dunedin City Council have undertaken innovative actions to improve the council–community relationship.

While some may criticise these approaches as councils 'opting out' of leading adaptation, the funds are framed as complementary to councils' wider regional/district adaptation work. Participants emphasised that these funds provided a pragmatic starting point for building relationships with affected communities who were ready to take action and supporting them through (albeit limited) resourcing. Participants described how recognition practices helped to shape the design of funding criteria. For example, Bay of Plenty Regional Council designed their fund eligibility criteria to support 'existing place-based community organisations, iwi, hapū or marae in the Bay of Plenty region', in recognition that such groups are 'deeply connected to place and changes in that place' (Bay of Plenty Regional Council, n.d.). These criteria also recognise that place-based community groups (such as mana whenua and marae in particular) are most likely to be affected by climate change, but often have limited resources to adapt (Kawharu, Tapsell and Tane, 2023).

An example where relationships with a larger community have been prioritised through recognition practices is the South Dunedin Future programme, jointly run through the Dunedin City Council and Otago Regional Council (Dunedin City Council, n.d.). South Dunedin is a large urban area on low-lying, reclaimed land, with a diverse population of 13,000 people, a high proportion of poor-quality housing, and lower socio-economic demographics. There are also extensive assets in the area that are key resources for the whole city, including schools, beaches, sports fields, stadiums and retail. As reported by Bond and Barth (2020), a different approach to the relationship between the councils and the community followed significant floods in South Dunedin in 2015, which became a catalyst for action. The floods highlighted the historically poor relationship between councils and the community, as well as the exposure to climate impacts in the area. Over several years, a combination of active community members and committed staff at the Dunedin City Council have undertaken innovative actions to improve the council–community relationship. These initiatives have been based on a community development approach and have enabled extensive and ongoing community engagement (Bond and Barth, 2020; Stephenson et al., 2020). Within the community, two initiatives were significant – the establishment of the South Dunedin Stakeholders group and the South Dunedin Community Network. The latter run regular community hui (twice a year) which provide a forum for community members to meet, share food, discuss issues facing the area (including, but not exclusively, climate-related), and hear and engage with relevant experts in a space purposefully created to ensure local people are prioritised. The South Dunedin

Community Network has become an important point of contact for the South Dunedin Future team and people from both organisations are in regular contact.

In addition, the Dunedin City Council has embarked on a community engagement model premised on meeting community members where they are at. They have employed dedicated engagement staff and provided resourcing for staff to go to community groups across South Dunedin to reach as many community members as possible, rather than relying only on those able or willing to come to a public meeting, or submit on proposals. This has involved staff attending meetings at over 200 sports clubs, religious organisations and community groups over two years. The South Dunedin Future team also provide updates in *The Lowdown*, a community newsletter started in 2017 after the floods, which is published eight times a year. This approach generated important information and enabled community members to learn more about the likely implications of climate change for their place, and how they could become involved in its future and build a relationship with staff at the councils. More recent community engagement has involved an expo and public meetings. While these might reflect more conventional forms of community engagement, they still build on past activities. The approach is founded on an understanding that community engagement is not a one-off event to garner feedback on a particular adaptation project, but is ongoing, builds from past activities, and requires good relationships of trust and shared information, diverse opportunities and good resourcing. The South Dunedin Future project is recognised as an exemplar of positive community adaptation engagement (Climate Change Commission, 2024).

The South Dunedin Future programme illustrates a number of recognition practices: first, in recognising that South Dunedin is one of the areas in the city that already is, and will be, most affected by climate change; second, recognition that the area has poorer-quality housing and lower socio-economic demographics and that climate change could exacerbate existing inequalities; and third, given the socio-economic characteristics of the community, recognising that they are less likely to engage in conventional council procedures. In recognising these factors, the South Dunedin Future programme has sought to distribute resources differently to help more community members engage in council-led adaptation processes. The example highlights how recognition practices can shape the distribution of resources and procedural practices for decision making.

> … councils can only go so far and are waiting on central government to establish a procedure for managed relocation, including how this will be funded and whether and how landowners will be compensated.

While this is a promising example of effective community engagement, as participants noted, councils can only go so far and are waiting on central government to establish a procedure for managed relocation, including how this will be funded and whether and how landowners will be compensated. Dunedin City Council has pitched for central government funding to help its plan for managed relocation in South Dunedin, as it cannot afford to entirely fund this, nor the expensive litigation that may ensue if it tries to implement it without national clarity.

Conclusion

We have described how some councils are using recognition practices to inform proactive climate adaptation despite national legislative uncertainties and delays. These recognition practices are helping councils to better understand the impacts of climate change by including diverse knowledges in their risk assessments, and building capacity to better engage with mana whenua and affected communities. The recognition practices are also shifting responsibility for climate response from single staff or small teams within a council to across and between councils, and shifting the distribution of resources to support mana whenua and community groups who will be significantly affected by climate change, but have been historically marginalised or are less likely to participate in council procedures. While imperfect and limited, these recognition practices provide practical examples that can be built on to further embed climate justice in local adaptation.

However, echoing our participants' and others' concerns, a national legislative framework is urgently needed to clarify rights, responsibilities and distribution of costs and ensure just procedures for climate adaptation. Drawing from our research participants' concerns, we suggest three key areas that need national clarity to support councils' recognition practices and enable more just climate response.

- Amend the Local Government Act 2002 so that it acknowledges 'the significance and importance of local governments' te Tiriti obligations that accompany roles and responsibilities that have been devolved to them from central government'[7] (Bargh and Tapsell, 2021, p.16; see also Review into the Future for Local Government, 2023). This change could build on existing recognition practices and include the provision of resourcing for iwi, hapū and mana whenua to partner in shared decision-making procedures.
- Introduce legislation that specifies that where robust climate risk assessments that include mana whenua input from the outset, per recognition of Tiriti rights and obligations of partners, inform district and regional plan changes, they cannot be litigated. Without addressing the paralysing risks of litigation that currently occur whenever risk assessments are

translated into plan changes, local government will be unable to effectively reduce risk, making costly maladaptation more likely (Iorns, 2022).

- Introduce legislation that addresses the complex issues of funding adaptation, and revenue and funding models underpinned by just principles. As our participants (and others) caution, actual adaptation has barely begun and the costs of this will far exceed what councils can currently afford (Resource Management Review Panel, 2020). There is existing work that could be drawn on to inform just funding mechanisms to provide greater clarity on the inevitable changes coming and to help reduce the chances that adaptation will worsen existing inequalities (see Bargh and Tapsell, 2021; Boston and Lawrence, 2018; Boston, 2019; 2023; Peart et al., 2023).

1 We follow the IPCC understanding of adaptation as the 'process of adjustment to actual or expected climate and its effects' (IPCC, 2019, p.118). We understand proactive adaptation as actions that take place before the impacts of climate change are fully experienced.

2 Extreme weather events in 2023 set records for the costliest events in Aotearoa New Zealand history (Libatique, 2024) and extreme weather events are predicted to become worse (Ministry for the Environment and Statistics New Zealand, 2023).

3 The research project, Innovations for Climate Adaptation, was funded by the Deep South National Science Challenge.

4 For example, the Ministry for the Environment's *Preparing for Coastal Change guidance* (2017), *A Guide to Local Climate Change Risk Assessments* (2021), *Coastal Hazards and Climate Change Guidance* (2024), *National Adaptation Plan and Emissions Reduction Plan: Resource Management Act 1991 guidance note, Aotearoa New Zealand's First National Adaptation Plan* (2022) and the *National Climate Change Risk Assessment for New Zealand (2020)*.

5 The process has differed depending on region. For example, in Otago, localised assessments had already been completed for priority at-risk assets (e.g., in South Dunedin). For the next Otago regional risk assessment, the intention is to support the development of district-level assessments to underpin the regional assessment, thus providing more granular information and avoiding duplication.

6 Examples included new requirements that maintenance plans and infrastructure requests in long-term and annual plan processes consider climate change impacts, and collaborative investment across councils and industry in waste infrastructure to reduce emissions.

7 As Bargh and Tapsell (2021) note, this change could be done while working towards deeper constitutional transformation (Charters et al., 2019; Jones, 2016; Matike Mai Aotearoa, 2016).

Acknowledgements

Ngā mihi to all our research partners, particularly mana whenua participants and council staff, who gave their time and shared their experience and expertise. We also thank the Deep South National Science Challenge for funding this project.

References

Aukaha (n.d.) 'Ā mātou hītori, our history', https://aukaha.co.nz/our-history/

Awatere, S., J. Reid, B. Masters-Awatere, N. Tassell-Matamua, K. Eastwood, A-M. Jackson, D.N. King, L. Williams, P. Harris, R. Jones and J. Pirker (2021) *He Huringa Āhuarangi, a Huringa Ao: a changing climate, a changing world*, contract report LC3948, Manaaki Whenua Landcare Research for Ngā Pae o Te Māramatanga

Bargh, M. and E. Tapsell (2021) 'For a tika transition strengthen rangatiratanga', *Policy Quarterly*, 17 (3), pp.13–22

Barth, J., S. Bond and J. Stephenson (2023) *Community Engagement for Climate Change Adaptation*, Dunedin: Centre for Sustainability, https://hdl.handle.net/10523/15157

Barth, J., S. Bond and N. Vincent (2019) *Local Authorities and Community Engagement on Climate Change Adaptation*, Dunedin: Centre for Sustainability, https://hdl.handle.net/10523/9378

Bay of Plenty Regional Council (n.d.) 'Community-led adaptation funding initiative', https://www.boprc.govt.nz/environment/climate-change/community-led-adaptation-funding-initiative/

Bond, S. and J. Barth (2020) 'Care-full and just: making a difference through climate change adaptation', Cities, 102, 102734

Bond, S., G. Diprose, J. Stephenson and M. Kawharu (2024) 'Innovations for climate response: a kete for local government to help inform robust and just decision making: a report from the Innovations for Climate Adaptation research project', Deep South National Science Challenge, Dunedin: Centre for Sustainability, University of Otago

Boston, J. (2019) *Funding Climate Change Adaptation: the case for public compensation in the context of pre-emptive managed retreat*, Wellington: Ministry for the Environment

Boston, J. (2023) F*unding Managed retreat: designing a public compensation scheme for private property losses: policy issues and options*, Environmental Defence Society

Boston, J. and J. Lawrence (2017) *The Case for New Climate Change Adaptation Funding Instruments*, Wellington: Institute for Governance and Policy Studies and New Zealand Climate Change Research Institute

Boston, J. and J. Lawrence (2018) 'Funding climate change adaptation: the case for a new policy framework', *Policy Quarterly*, 14 (2), pp.40–9

Bray, A., J. Stephenson and S. Bond (2023) *Just Adaptation: what does justice mean, and how can it guide adaptation planning and decision-making? Summary report*, Dunedin: Centre for Sustainability, University of Otago

Brousseau, J., M. Stern, M. Pownall and L. Hansen (2024) 'Understanding how justice is considered in climate adaptation approaches: a qualitative review of climate adaptation plans', *Local Environment*, pp.1–20

Bulkeley, H., G. Edwards and S. Fuller (2014) 'Contesting climate justice in the city: examining politics and practice in urban climate change experiments', *Global Environmental Change*, 25, pp.31–40

Charters, C., K. Kingdom-Bebb, T. Olsen, W. Ormsby, E. Owen, J. Pryor, J. Ruru, N. Solomon and G. Williams (2019) *He Puapua: report of the working group on a plan to realise the UN Declaration on the Rights of Indigenous Peoples in Aotearoa/New Zealand*, Wellington: Te Puni Kōkiri

Climate Change Adaptation Technical Working Group (2018) *Adapting to Climate Change in New Zealand: recommendations from the Climate Change Adaptation Technical Working Group*, Wellington: Climate Change Adaptation Technical Working Group

Climate Change Commission (2024) *Progress Report: National Adaptation Plan August 2024*, Wellington: Climate Change Commission

Diprose, G., S. Bond, J. Stephenson and M. Kawharu (2024) *Innovations for Climate Adaptation: interim report: summary of adaptation initiatives by local government research partners*, interim findings report from the Deep South National Science Challenge project Innovations for Climate Adaptation, Dunedin: Centre for Sustainability, University of Otago

Dunedin City Council (n.d.) 'South Dunedin Future', https://www.dunedin.govt.nz/council/council-projects/south-dunedin-future

Ellis, E. (2019) *How Should the Risks of Sea-Level Rise be Shared?*, Dunedin: Deep South National Science Challenge

Expert Working Group on Managed Retreat (2023) *Report of the Expert Working Group on Managed Retreat: a proposed system for te hekenga rauora/planned relocation*, Wellington: Expert Working Group on Managed Retreat

Grace, E., B.T. France-Hudson and M.J. Kilvington (2019) *Reducing Risk through the Management of Existing Uses: tensions under the RMA*, GNS science report 2019/55, Wellington: GNS Science

Haimona-Riki, M. (2024) 'PhD student uncovers marae vulnerability to natural hazards', *Te Ao Māori News*, 5 March, https://www.teaonews.co.nz/2024/03/05/phd-student-aims-to-make-marae-safer-in-natural-disasters/

Hanna, C., I. White and B. Glavovic (2017) *Managed Retreat in New Zealand: revealing the terminology, approaches and direction of local planning instruments*, report for the National Science Challenge Resilience to Natures Challenges, Hamilton: University of Waikato

Iorns, C. (2022) 'Climate adaptation law reform: a lot of argument still to come', *Policy Quarterly*, 18 (1), pp.14–21

Iorns, C. and J. Watts (2019) *Adaptation to Sea-Level Rise: local government liability issues*, Wellington: Deep South National Science Challenge

IPCC (2019) *Sixth Assessment Report: annexes*, https://www.ipcc.ch/site/assets/uploads/2019/01/SYRAR5-Glossary_en.pdf)

James, V., C. Iorns and J. Watts (2019) *The Extent of EQC's Liability for Damage Associated with Sea-Level Rise*, Wellington: Deep South National Science Challenge

Jones, C. (2016) *New Treaty, New Tradition*, Wellington: Victoria University Press

Juhola, S., M. Heikkinen, T. Petila, F. Groundstroem and J. Kayhko (2022) 'Connecting climate justice and adaptation planning: an adaptation justice index', *Environmental Science and Policy*, 136, pp.609–19

Kawharu, M., P. Tapsell and P. Tane (2023) 'Applying whakapapa research methodology in Māori kin communities in Aotearoa New Zealand', *Kōtuitui: New Zealand Journal of Social Sciences Online*, 19 (1), pp.56–85

Klinsky, S., T. Roberts, S. Huq, C. Okereke, P. Newell, P. Dauvergne, K. O'Brien, H. Schroeder, P. Tschakert, J. Clapp, M. Keck, F. Biermann, D. Liverman, J. Gupta, A. Rahman, D. Messner, D. Pellow and S. Bauer (2017) 'Why equity is fundamental in climate change policy research', *Global Environmental Change*, 44, pp.170–3

Lawrence, J., A. Wreford and S. Allan (2022) 'Adapting to avoidable and unavoidable climate change: what must Aotearoa New Zealand do?', *Policy Quarterly*, 18 (2), pp.51–60

Libatique, R. (2024) 'Extreme weather catastrophes set new financial loss records in New Zealand – Aon', https://www.insurancebusinessmag.com/nz/news/catastrophe/extreme-weather-catastrophes-set-new-financial-loss-records-in-new-zealand--aon-481293.aspx

Matike Mai Aotearoa (2016) *He Whakaaro Here Whakaumu mō Aotearoa: report of Matike Mai Aotearoa – the Independent Working Group on Constitutional Transformation*, https://nwo.org.nz/wp-content/uploads/2018/06/MatikeMaiAotearoa25Jan16.pdf

Ministry for the Environment and Statistics New Zealand (2023) Our Atmosphere and Climate 2023, Wellington: Ministry for the Environment and Statistics New Zealand, https://environment.govt.nz/assets/publications/Environmental-Reporting/Our-atmosphere-and-climate-2023.pdf

Moewaka Barnes, H. and T. McCreanor (2019) 'Colonisation, hauora and whenua in Aotearoa', *Journal of the Royal Society of New Zealand*, 49 (suppl.1), pp.19–33

Peart, R. (2024) Design Recommendations for a Climate Adaptation Act: final report, Auckland: Environmental Defence Society

Peart, R., J. Boston, S. Maher and T. Konlechner (2023) *Principles and Funding for Managed Retreat*, working paper 1, Auckland: Environmental Defence Society

Pirini, M. and R. Morar (2021) 'Climate change and the claiming of tino rangatiratanga', *New Zealand Women's Law Journal*, 5, pp.86–148

Pollex, J. (2024) 'Climate justice and policy analysis: still a reserved relationship', *NPJ Climate Action*, 3 (65), pp.1–6

Productivity Commission (2019) L*ocal Government Funding and Financing: final report*, Wellington: New Zealand Productivity Commission

Resource Management Review Panel (2020) *New Directions for Resource Management in New Zealand: report of the Resource Management Review Panel*, Wellington: Ministry for the Environment

Review into the Future for Local Government (2023) *He Piki Tūranga, he Piki Kōtuku: the future for local government*, Wellington, Review into the Future for Local Government

Schlosberg, D. (2012) 'Climate justice and capabilities: a framework for adaptation policy', *Ethics and International Affairs*, 26, pp.445–61

Schlosberg, D. and L. Collins (2014) 'From environmental to climate justice: climate change and the discourse of environmental justice', *WIREs Climate Change*, 5, pp. 359–74

Stephenson, J., J. Barth, S. Bond, G. Diprose, C. Orchiston, K. Simon and A. Thomas (2020) 'Engaging with communities for climate change adaptation: introducing community development for adaptation', *Policy Quarterly*, 16 (2), pp.35–40

Stephenson, J., K. Merata, S. Bond, G. Diprose, Te Rereatukāhia Marae Komiti, Maketu Iwi Collective, Te Kaahui o Rauru, Kati Huirapa ki Puketeraki and Aukaha (2024) *Kete Whakaaro: a basket of ideas from mana whenua who are leading their own climate change adaptation*, a report from the Innovations for Climate Adaptation research project, Deep South National Science Challenge, Dunedin: Centre for Sustainability, University of Otago

Swanson, K. (2023) 'Equity and justice in climate action planning: the challenge of evaluation', *Canadian Planning and Policy / Aménagement et politique au Canada*, 2023, pp.23–37

Tombs, B.D. and B. France-Hudson (2018) 'Climate change compensation: an unavoidable discussion', *Policy Quarterly*, 14 (4), pp.40–9

United Nations (2016) 'The Paris Agreement', https://unfccc.int/process-and-meetings/the-paris-agreement

Sara Walton, Sebastian Gehricke and Tess Hazelhurst

Enhancing Climate Decision Making

insights from early adopters of climate risk disclosure

Abstract

This article investigates the early implementation of the Aotearoa New Zealand Climate Standards, the world's first mandatory climate-related disclosure regime, and its influence on New Zealand business practices. Through interviews with 20 organisations, the study explores challenges and opportunities associated with the new disclosure requirements. Findings range from viewing disclosures as compliance to recognising the strategic value. Key needs include enhanced policy support, data access and capacity building to ensure disclosures contribute meaningfully to New Zealand's climate goals. The insights provide a foundation for refining the Aotearoa New Zealand Climate Standards and offer broader lessons for the global adoption of climate risk disclosure standards.

Keywords climate change, climate risk, disclosures, data, qualitative

Sara Walton is a professor of sustainable business in the Department of Management at the University of Otago. **Sebastian Gehricke** is a senior lecturer in the Department of Accounting and Finance at the University of Otago specialising in climate energy finance. **Tess Hazelhurst** is a PhD student at Ulster University, Belfast, researching climate risk disclosures.

Changing decision making for capital allocation is needed in high greenhouse gas-emitting activities, and increased investment in those activities which involve clean, renewable energy and less greenhouse gas-emitting processes (Ministry for the Environment and Ministry of Business, Innovation and Employment, 2019). Business has a considerable role to play in supporting decarbonisation efforts. Demand from stakeholders and investors for transparent and consistent climate-related and ESG (environmental, social and governance) data has also led to organisations voluntarily disclosing such information (Ding, Liu and Chang, 2023; Griffin and Jaffe, 2022). To integrate climate risk and resilience into financial and business decision making, disclosures need to be comprehensive, risk management strategies need to evolve, and capital allocation should align accordingly.

New Zealand was one of the first countries to 'require the financial sector to report on climate risks' (Shaw, 2020) with the introduction of a mandatory climate-related reporting framework. This is part of a national and global effort to transition towards a low-emissions, climate-resilient

economy, as other countries are also making climate-related financial disclosures mandatory (e.g., the UK, EU, Singapore, Switzerland and Australia have just released their standards).

The Aotearoa New Zealand Climate Standards were developed using insights from the international voluntary disclosure regimes, such as the Task Force on Climate-related Financial Disclosures (TCFD), the Global Reporting Initiative and the International Sustainability Standards Board (ISSB). The Aotearoa New Zealand Climate Standards aim to enhance decision making, capital allocation and transparency regarding entities' climate change risks and opportunities. Our wider research programme on the disclosure framework seeks to evaluate whether, and to what extent, these objectives are being achieved. Specifically, this article will explore the early reporters' experiences of preparing their disclosures to understand some of the key issues involved and what changes might be made by policymakers to help all disclosing entities, in New Zealand and globally. The findings are intended to inform both practitioners and policymakers, enabling them to adopt strategies that promote transparency, accountability and continuous improvement in disclosure processes. The article begins with some background on the standards and then outlines the method of research, before moving on to the thematic findings and recommendations.

Goals of mandatory climate risk disclosures

Mandatory climate-related disclosures are increasingly seen as essential for addressing climate change and facilitating the transition to a net zero economy (Armour, Enriques and Wetzer, 2021b; Carattini et al., 2022). The aim of mandatory climate-related disclosures is to ensure that the impacts of climate change are consistently taken into account in business, investment, lending and insurance underwriting decisions. These disclosures aim to help climate-reporting entities show responsibility and foresight in addressing climate issues, leading to a more efficient allocation of capital and facilitating the transition to a more sustainable, low-emissions economy. This involves not only understanding the impact of organisations on reducing emissions, but also striving to mitigate financial market risks associated with physical impacts, such as flood inundation, increased extreme weather, extreme temperature, etc., and transition risks, such as new, more competitive technologies, policy changes, legal liabilities and stranded assets.

Multiple studies have demonstrated that mandated emissions reporting leads to reductions in subsequent emissions among reporting companies in the UK ...

The primary goal of these disclosures is to provide investors with the necessary information to accurately price climate risks and allocate capital efficiently. Current voluntary frameworks have proven insufficient, leading to mispricing and capital misallocation that hinders the net zero transition (Armour, Enriques and Wetzer, 2021b). A key issue associated with a voluntary disclosure is that they allow companies to pick and choose which aspects to disclosure (Armour, Enriques and Wetzer, 2021a). Mandatory, and thus more prescribed, disclosures aim to accelerate carbon emission reductions and help manage carbon transition risks for both public and private companies (Bolton and Kacperczyk, 2021) through more accurate evaluation and pricing of climate risks, enhancing investor decision making to foster a more resilient financial system.

Climate risk disclosures are evolving from voluntary to mandatory standards, influenced by global requirements and organisations such as the TCFD and ISSB (Dey et al., 2024). Effective implementation requires simple, straightforward disclosures and proper enforcement to support informed decision making by stakeholders and to combat greenwashing (Bolton and Kacperczyk, 2021; Dey et al., 2024). However, concerns around greenwashing and quality, credibility and comparability remain central issues (e.g., Sullivan and Gouldson, 2012; Tauringana and Chithambo, 2015; Depoers, Jeanjean and Jerome, 2016). Relatedly, there are issues around data, in terms of both the data needed to develop a risk assessment and disclosure, and the data being produced that investors, creditors and other stakeholders rely on to make financial decisions. Challenges include having the availability of granular data to assess climate risk, and the standardisation and integration of that data, particularly in relation to forward-looking data when developing scenarios (Vinelli, Kidd and Gellasch, 2024; Fiedler et al., 2021; Talbot and Boiral, 2018; Miola and Simonet, 2014).

The effects of mandating sustainability disclosures are emerging as promisingly positive. Multiple studies have demonstrated that mandated emissions reporting leads to reductions in subsequent emissions among reporting companies in the UK (Tang and Demeritt, 2018; Downar et al., 2019; Jouvenot and Krueger, 2020). Research by Miller, Stockbridge and Williams (2023) found that US insurance companies reduced their investments in fossil fuels by 20% relative to non-disclosers after a law required such disclosures; notably, this effect persisted even after the policy was rescinded. The European Union has also passed several directives mandating increased sustainability disclosures. Research by Fiechter, Hitz and Lehmann (2022) indicates a rise in sustainability-related activities in anticipation of the EU Non-Financial Reporting Directive, which, according to Brié, Stouthuysen and Verdonck (2022), has improved the quality and comparability of disclosures across Europe. However, others, such as Tang and Demeritt (2018), note that there is limited evidence (and research) on the relationships between disclosing and reducing emissions.

There is also little research examining the relationship between corporate target setting and emissions reductions (Bolay et al., 2024; Dahlmann, Branicki and Brammer, 2019). However, clear patterns do emerge from these two studies (e.g., absolute and long-term emission targets have a positive relationship with emissions reductions). In Aotearoa New Zealand, we have the opportunity to observe these relationships unfold over the coming years with the mandated framework.

The Aotearoa New Zealand Climate Standards framework involves disclosing in four areas, which align with the TCFD framework for international inter-operability (External Reporting Board, n.d.). The framework provides detailed guidance on the specific information that entities must disclose to ensure comprehensive and transparent climate-related reporting. First, entities must disclose governance practices, including the roles and responsibilities of boards and management in overseeing climate-related risks and opportunities. Second, entities are required to disclose how they incorporate climate considerations into their strategic planning, including the potential impacts of climate change on their business models, operations and long-term objectives. Third, entities are to outline their risk management processes, detailing how climate risks are identified, assessed and managed across the organisation. The fourth part mandates the reporting of specific metrics and targets that organisations use to measure and manage their climate-related performance, such as greenhouse gas emissions, energy use, and progress towards emissions reduction goals. These disclosures aim to provide stakeholders with a clear understanding of how entities are addressing climate-related challenges and contributing to the transition to a sustainable, low-carbon economy.

Who has to disclose?

Approximately 170 financial market participants in New Zealand will be required to produce climate-related disclosures. These include:

- all registered banks, credit unions and building societies with total assets exceeding $1 billion;
- all managers of registered investment schemes (excluding restricted schemes) with more than $1 billion in total assets under management;
- all licensed insurers with total assets greater than $1 billion or annual gross premium revenue exceeding $250 million;
- large listed issuers of quoted equity securities or quoted debt securities. An equity issuer is considered large if the market price of all its equity securities exceeds $60 million, and a debt issuer is considered large if the face value of its quoted debt surpasses $60 million. (Issuers listed on growth markets are excluded from the climate-reporting entity definition.)

Managers of registered investment schemes are required to make disclosures on a fund-by-fund basis, ensuring that investors receive the necessary information to understand the impact climate change may have on the future performance of their investments. This differs from the EU scheme, in which the standards for corporates and financial institutions are separate. Additionally, overseas-incorporated organisations will be required to make disclosures if their New Zealand business exceeds the thresholds outlined above.

Oversight and monitoring of the climate-related disclosures

The Financial Markets Authority (FMA) in Aotearoa New Zealand is responsible for the independent monitoring, supervision and enforcement of the climate-related disclosures regime. The FMA has committed to taking a constructive and educative role in the early stages of implementation (Financial Markets Authority, n.d.). It states that in the first year it will focus on setting initial compliance expectations, in the second year support development of best practice, and in the third year will aim to provide a steady state of guidance, monitoring and enforcement.

This study seeks to feed into the process of supporting best practice and learnings from the initial disclosing practices, drawing on insights by analysing and synthesising the experiences and outcomes of selected disclosing firms. By examining these initial efforts, the study aims to provide a foundation for refining and enhancing future practices, ensuring they are aligned with emerging standards and stakeholder expectations.

Research methods

Interviews were conducted with 20 organisations that were in various stages of their climate-related reporting, ranging from early adopters to those just starting the process, and from various sectors of the New Zealand economy. The organisations were selected based on whether they had already produced climate or broader sustainability reports before mandatory reporting, and to capture a range of potential companies that would be in the process of disclosing as mandated climate-reporting entities. Table 1 outlines the participants involved.

Table 1: Summary of interview respondents (participants)

Type of entity	Total entities
Corporate issuer	13
Registered bank or building society	1
Investment scheme manager	2
Crown financial institution	3
Insurer	1
Total	20

Before any interviews were conducted, and prior to contacting potential participants via email, ethical approval was obtained, and consultation was undertaken with Ngāi Tahu through the Māori Development Office at Ōtakou Whakaihu Waka University of Otago. A database of potential participants was then created and invitations were emailed, accompanied by an information sheet and a consent form. The authors conducted the interviews via

video calls, with each session averaging around 60 minutes. These interviews were digitally recorded with the participants' permission and transcribed using Otter AI software. The transcripts were carefully reviewed against the recordings to ensure accuracy and any errors corrected.

A semi-structured interview approach was employed, designed to capture the participants' perspectives on and insights into the process of disclosing climate risks, as well as the impacts and outcomes of this process. The interviews began with an open-ended question, inviting participants to share their experiences and describe their process of preparing climate risk disclosures. This narrative approach allowed participants to tell their stories in as much detail as they were comfortable with, offering flexibility to highlight aspects that were meaningful to them. The interviewer could then probe further, ensuring a detailed understanding from the participant's viewpoint, expressed in their own words.

The interviews were analysed thematically using NVivo software. This analysis involved systematically identifying, analysing and developing patterns (themes) within the data. NVivo is a specialised tool which helps researchers organise and code large volumes of text, such as interview transcripts, to facilitate the thematic analysis process. We began by reading through transcripts multiple times to gain a deep understanding. A high-level analysis was prepared at this stage. Then NVivo was used to code the data, which involved organising segments of text that relate to specific topics or ideas. These codes are organised into broader themes that capture the key patterns and insights emerging from the data. This article focuses on one of the themes that emerged from the analysis – the challenges associated with data.

Data is the focus of this article because it was a prominent theme across this qualitative data set. It was also the key concern raised in a survey of disclosing entities that was done as part of the larger project (External Reporting Board, 2024). As such, we thought that a deeper delve into and discussion around data and the role of policymakers to facilitate and support the generation of more accurate data for the disclosures was important.

While some participants questioned the necessity of leading in this area, citing the additional costs, others saw value in New Zealand's pioneering role, provided it did not compromise the economic well-being of its citizens.

Findings

This section gives a high-level overview of the participants' thoughts on the Aotearoa New Zealand Climate Standards and the ways in which they have been understood and incorporated into their organisations. We then focus on one of the emerging themes, with a number of issues being raised around the data involved in the reporting process. These are discussed in relation to a series of actions that could be undertaken by policymakers and government departments to faciliate data to enable the mandated climate-related disclosure process.

Overall, the findings from the interviews reveal a complex and varied response to the climate standards process. Most of the participants (75%) indicated uncertainty regarding the impact of the mandatory climate-related disclosures on their decision making or capital allocation, primarily due to the early stage of their involvement in the process. Comments included 'not yet, too early' (participant 1), 'still early days' (participant 18), and the observation that the market didn't understand climate risk yet. While a small number of corporate issuers were starting to see some impacts in decision making, the vast majority of participants saw that it 'would impact future decision making' (participant 2). Even so, a subset of interviewees expressed that they view the climate-reporting requirements as a compliance exercise. This perspective was often tied to immediate competing priorities, such as maintaining global supply chains or recovering from external disruptions, both of which overshadowed the perceived value of climate disclosures. And for some the reporting process was seen as cumbersome, adding to the perceived regulatory burden, particularly for smaller, listed companies.

However, some organisations (approximately 10%) discussed the potential of aspects of the climate-related disclosure process to drive meaningful change. For these entities, the disclosures were not just about ticking regulatory boxes, but were seen as valuable tools for guiding corporate strategy and fostering long-term, holistic thinking about climate-related risks. These organisations viewed the process as an opportunity to embed climate considerations within their decision-making frameworks, which they believe will eventually influence their capital allocation and broader business strategies.

The discussions also highlight a tension between the perceived regulatory burden and the desire for New Zealand to be a global leader in climate action. While some participants questioned the necessity of leading in this area, citing the additional costs, others saw value in New Zealand's pioneering role, provided it did not compromise the economic well-being of its citizens.

Overall, this data points to the climate-related disclosure regime being at a crossroads: while it is seen by some as a compliance task, others view it as an opportunity for integrating climate considerations into organisational strategy. This dichotomy underscores the need for a more nuanced approach to climate reporting, one that not only fulfils regulatory requirements but also adds tangible value to business decision making and supports the transition to a low-carbon economy. The next few years will be an interesting test.

Policymakers are already taking several steps to address the dichotomy between viewing climate-related disclosures as mere compliance exercises and recognising their potential to drive meaningful change in decision making and capital allocation. For example, the External Reporting Board provides extensive guidance on how to integrate climate-related disclosures into strategic decision-making processes, facilitate training programmes aimed at building the internal capacity of companies, and create platforms for dialogue between businesses, investors and other stakeholders to share experiences and learn from each other. Now that organisations are using the New Zealand standards, more support can be provided in terms of best practices, case studies, and tools that demonstrate how disclosures can inform business strategy and capital allocation, plus workshops, webinars, and/or partnerships with academic institutions. In addition, leadership and innovation can be promoted: for example, encouraging and highlighting examples of companies that are using climate-related disclosures to drive innovation and long-term sustainability. By showcasing leaders in the field, it can inspire others to follow.

Other strategies that could be considered to drive change in disclosure practices could include introducing incentives for companies to go beyond the basic compliance requirements to encourage more meaningful engagement with climate-related disclosures. These incentives could be in the form of public recognition, or certain aspects of best practice reporting being a requirement for government contracts.

Data, decision making and the collective betterment

The sharing of data for greater collective understanding and subsequent decision making was identified by a group of participants as crucial in addressing the complex challenges involved in disclosing and understanding risks from climate change. It was suggested that fostering collaborative efforts in data was needed to develop more comprehensive and nuanced understanding of climate dynamics, which in turn informs better practices, actions and reporting.

> The concern is that without clear guidelines and realistic expectations, the system may become overwhelmed by the sheer volume of data, leading to inefficiencies and potentially inaccurate reporting.

This section outlines the challenges identified by participants, followed by a discussion on possible solutions.

Obtaining data

One challenge companies face in developing their climate-related disclosures is obtaining reliable data on what other companies are doing. As one participant (an investor) pointed out, data collection from publicly listed assets has traditionally been handled by third-party providers, such as MSCI or SandP, who have historically focused on financial information but are now expanding to include ESG (including climate) data:

> And for those up until recently, there hasn't been a lot of data collection or data supply. So from external parties, we've had to go and collect that data ourselves. Then there's third parties who will collect this data for you so MSCI and SandP are index and information providers. They have collected a bunch of financial information historically and have started to add a bunch of environmental social and governance data.

Also: 'we don't always actually get as much data as we would like, in fact, we often don't get enough data to do something that we feel is really, really robust (participant 4).

However, for privately held companies, the process is less straightforward. Many organisations find themselves needing to collect data independently or purchase it from external sources to understand the climate practices of companies in their supply chain, customers or those in their investment portfolios. This can be a significant undertaking, especially for companies with limited resources, as they strive to align with industry standards and regulatory requirements. Furthermore, New Zealand has a large number of small and medium-sized enterprises (SMEs), which are often owner-run businesses and largely lack resources (time) and capacity for extra reporting (Lewis, Massey and Harris, 2007), which in turn may be required by larger mandated reporting companies in their disclosures.

Reliability of data: Scope 3 emissions

A recurring theme in discussions about climate data is the reliability of Scope 3 emissions data. Scope 3 emissions, which encompass indirect emissions from a company's value chain, are notoriously difficult to quantify accurately. One participant described the challenges of dealing with Scope 3 data, emphasising the risk of double counting and the general unreliability of the data. To mitigate these issues, some companies focus on high-priority sectors, such as coal, oil and gas, where production data tends to be more reliable. Another participant expressed frustration with the current scramble to report Scope 3 emissions, calling for a more rational, coordinated approach to data collection and reporting:

> I think this is a ridiculous scramble around scope three data at the moment. You have to focus on what you can influence. And I think probably there needs to be a rationalisation and kind of a connected grown up conversation around actually, what data should be reporting, what should we be requesting with scope three data? And what is the reporting system and reporting kind of

> scope, that will mean we spend a reasonable amount of time reporting but we're reporting on things that we can influence and then drive change? (participant 16)

The concern is that without clear guidelines and realistic expectations, the system may become overwhelmed by the sheer volume of data, leading to inefficiencies and potentially inaccurate reporting. This highlights the need for companies, particularly those working with SMEs, to develop effective, collaborative strategies for gathering and managing Scope 3 data.

Integration of data

Several participants emphasised the importance of obtaining data that is not only accurate but also useful for organisational decision making. In New Zealand, where infrastructure and industries are highly interconnected, scenario planning should be done at the country level rather than focusing solely on individual sectors, some participants argued. This is particularly relevant in a small country where sectors such as rail, telecommunications and energy are closely linked. Participants suggested that a cross-sectoral approach would be more effective in building the resilience necessary to address future risks. The current sector-focused model may overlook critical interdependencies, which could undermine the effectiveness of scenario planning and risk management. One participant mentioned this as they felt that:

> the only challenge I have is the fact that our climate data for New Zealand are old. So the most recent data I have from industrial environmental 2018 … I do think that we, at some point, will stop building our own climate scenarios. There will simply be a couple that will emerge and they will become the de facto standards. And I'm expecting ours could be one of them because we are one of the few organisations that have got a nationwide presence. (participant 17)

There are currently very few attempts at trying to develop higher-level scenarios at a systems level. The think tank, McGuiness Institute, advocates for scenarios at the national level (McGuiness Institute, 2023). However, these types of scenarios can be very difficult to develop as they require time and resources and a high level of stakeholder and partner participation. However, they may be worth developing to enable useful discussions on and disclosures of climate-related risk and opportunities.

> While Scope 3 emissions reporting is in the process of becoming more standardised, the challenge is obtaining accurate data for both the upstream and downstream emissions.

Types of data: qualitative data versus quantitative models for scenario planning

The discussions also highlighted the tension between qualitative and quantitative approaches in scenario planning. Many participants noted that the data currently available tends to be backward-looking, making it challenging to develop forward-looking scenarios that accurately reflect potential future risks and opportunities. While quantitative models are essential for providing measurable insights, qualitative data offers valuable context and can help to interpret the implications of various scenarios. However, most of the participants found the use of qualitative data in scenarios challenging as it was harder to understand and factor in than numbers. For example:

> I think getting to the point where we're all comfortable with getting datasets to be used for exploratory analysis, that can then be used for further analysis on the impacts your business. It's not getting the data sets and saying this is what's going to happen in the future and, therefore, this is what's going to happen to our business. The balance between these two types of data is crucial for effective scenario planning and strategic decision making, as it enables companies to anticipate and respond to a range of possible futures. (participant 13)

This illustrates the difference between reading data to understand what is going to happen, often in a quantitative way, and being able to qualitatively explore data to understand the possibilities for the future. Many participants mentioned the challenges in this process in their companies.

Presentation of the data: reading and understanding the data presented in disclosures

Finally, the readability and presentation of data in climate-related disclosures emerged as a significant concern. For example, one participant discussed at length the importance of making data more accessible and engaging for stakeholders, particularly investors who need to understand potential future scenarios. They stated:

> How can we be smart about making this available? Because that is what investors want, rather than producing tables and charts, create [scenarios] like a map. So for instance, we've got the geospatial team so we can produce maps of the country where we simply can click the button. And you can say, well, if I combine that field with the climate view, I can actually start producing maps for short, medium or long term. One and a half, two and a half, three now. Three scenarios. And if you can make it interactive, that's a lot sexier than if you have like a silly table. (participant 17)

Table 2: Summary of findings

Topic	Findings	Implications for policymakers
Organisational impact	Varied organisational responses, from compliance-focused to strategic decision making	Provide guidance to encourage integration of climate risks into core strategies rather than as a mere compliance exercise.
Compliance burden	Smaller entities struggle with the perceived regulatory burden and resource limitations.	Introduce capacity-building initiatives, particularly for SMEs, to help manage and interpret climate-related data.
Strategic opportunities	Some entities leverage disclosures for long-term planning, viewing it as a tool for innovation, resilience and growth.	Highlight and share best practices, showcasing how disclosures can drive strategic benefits beyond compliance.
Recognition and incentives	Incentives for going beyond compliance could drive meaningful engagement.	Establish recognition programmes and explore government contract incentives for entities that demonstrate exemplary disclosure practices.
Interconnected and holistic scenario planning	Sector-focused scenario planning overlooks interdependencies, enhancing overall resilience.	Encourage cross-sectoral scenario planning to address interdependencies and enhance national resilience to climate-related risks.
Data challenges	Issues with Scope 3 emissions data reliability, data integration and accessibility	Support development of centralised data repositories and standards for consistent, reliable data collection and reporting.
Data presentation	Need for interactive, engaging and accessible data presentation to support stakeholder and partner understanding	Promote innovative visualisation tools (e.g., geospatial mapping) to enhance stakeholder partner engagement and understanding of disclosures.

Instead of relying solely on tables and charts, this participant suggested using more interactive and visual tools, to present data in a meaningful way. It was suggested that, by combining climate projections with geographical information, companies can create dynamic visualisations that make it easier for stakeholders to grasp complex information. This approach would not only enhance understanding but also help to bring the data to life, making it more compelling and actionable for stakeholders, partners and decision makers.

Solutions for the data issues

Across all of the themes raised around data, the underlying question might be: how do we best collaboratively develop data on climate to build better understandings, practice and action?

Enhancing the quality, reliability and utility of the data used for climate and broader sustainability decision making includes practices that are already underway, including the development of the Aotearoa New Zealand Climate Standards themselves to bring about a standardisation in data generation and disclosing.

While Scope 3 emissions reporting is in the process of becoming more standardised, the challenge is obtaining accurate data for both the upstream and downstream emissions. The Global Reporting Initiative in conjunction with the Carbon Trust and World Resources Institute regularly releases guidance updates to the Corporate Value Chain (Scope 3) Standard and there are now 15 internationally recognised categories for what is expected to be reported (Greenhouse Gas Protocol, n.d.). Despite this, ambiguities and inconsistencies with data remain.

The Ministry for the Environment has created repositories where companies can access high-quality, verified data on industry practices, emissions and other relevant metrics. However, this repository is not well known and not easily searchable, and keeping it up-to-date is also essential. This data being readily available and understandable can help level the playing field, allowing companies to focus their resources on analysing and using the data rather paying consultants to make sense of it for them.

In addition to the static resources provided, there could be more capacity-building initiatives that equip companies, particularly SMEs, with the tools and expertise needed to manage and interpret climate-related information effectively. This could include funding for training programmes and workshops, and the development of user-friendly data management tools that help companies gather, analyse and report data in line with regulatory requirements. By enhancing companies' internal capacities, policymakers can ensure that the data they produce is both accurate and useful for decision making.

Innovative data presentation tools that make climate-related data more accessible and engaging could be encouraged. Advanced data visualisation technologies could be encouraged, such as geospatial mapping, that help stakeholders better understand complex data and scenarios. By supporting innovation in this area, policymakers can help companies communicate their climate strategies more effectively, fostering greater transparency and stakeholder engagement.

Participants discussed the need for more interconnected data, especially for developing scenarios, given the interconnected nature of industries, particularly in a small country like New Zealand. While there has been sector- and industry-level scenario planning, it seemed from the comments that they would value this process being even wider. The 2023 cyclone across the North Island was a galvanising point for this – participants discussed their role in enabling resilience to climate-related disasters in the future. The interconnected data could be derived from facilitating industry-wide or national-level working groups that bring together representatives from different sectors to share data, insights and best practices. Such collaboration would help address the issue of fragmented data collection and ensure that scenario planning reflects the full range of interdependencies and risks.

Finally, the External Reporting Board has recently announced a public review of

the standards and will call for submissions (External Reporting Board, 2024). This provides the opportunity to give a voice to firms struggling with data to clearly identify and state the data needed to create better quality disclosures.

Conclusion

This research underscores the multifaceted challenges companies face, not just in Aotearoa New Zealand but globally, in processes of collecting, analysing and presenting climate-related data. The series of interviews with climate-risk disclosing organisations in Aotearoa New Zealand raised issues with data in climate-risk disclosure. Indeed, this was one of the key issues identified by participants in this study and in the associated survey (Gehricke, Walton and Zhang, 2024b). Participants have noted that there is a clear need for more coordinated efforts, both within companies and across sectors, to ensure that the data collected is reliable, useful and effectively communicated. Meaningful data is needed to aid decision making to be able to allocate capital efficiently and thus meet the goals of the mandated Aotearoa New Zealand Climate Standards. Table 2 provides a summary of these findings.

One of the key mechanisms to bring about change for climate in the business sector is through finance. For the financial sector to shift, there is a need to accurately price climate risks and allocate capital efficiently (Armour, Enriques and Watson, 2021b). The climate risk disclosures are a key mechanism to provide the data to the market for this change. Without consistent and reliable data, the disclosures could fail to have the impact needed. Thus, we need to take heed of these calls for consistent data and adapt processes and regulations to enable the data for the market to respond.

References

Arian, A. and J.S. Sands (2024) 'Corporate climate risk disclosure: assessing materiality and stakeholder expectations for sustainable value creation', Sustainability Accounting, *Management and Policy Journal*, 15 (2), pp.457–81

Armour, J., L. Enriques and T. Wetzer (2021a) 'Corporate carbon reduction pledges: beyond greenwashing', Oxford Business Law blog, 2 July

Armour, J., L. Enriques and T. Wetzer (2021b) 'Mandatory corporate climate disclosures: now, but how?', *Columbia Business Law Review*, (3)

Bolay, A.-F., A. Bjørn, L. Patouillard, O. Weber and M. Margni (2024) 'What drives companies' progress on their emission reduction targets?', *Journal of Cleaner Production*, 468, 143124

Bolton, P. and M. Kacperczyk (2021) 'Do investors care about carbon risk?', *Journal of Financial Economics*, 142 (2), pp.517–49, https://doi.org/10.1016/j.jfineco.2021.05.008

Brié, B., K. Stouthuysen and T. Verdonck (2022) 'Mandatory CSR reporting in Europe: a textual analysis of firms' climate disclosure practices', https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4231567

Carattini, S., E. Hertwich, G. Melkadze and J. Shrader (2022) 'Mandatory disclosure is key to address climate risks', *Science*, 378, pp.352–4

Dahlmann, F., L. Branicki and S. Brammer (2019) 'Managing carbon aspirations: the influence of corporate çlimate change targets on environmental performance', *Journal of Business Ethics*, 158 (1), pp.1–24

Depoers, F., T. Jeanjean and T. Jerome (2016) 'Voluntary disclosure of greenhouse gas emissions: contrasting the Carbon Disclosure Project and corporate reports', *Journal of Business Ethics*, 134, pp.445–61

Dey, D., L. Richards, A. Arora, E. Boyle, R. Bryson, S. Jackman, V. Patel and C. Shirazi (2024) 'Overview of climate disclosures', *British Actuarial Journal*, 28, e13

Ding, D., B. Liu and M. Chang (2023) 'Carbon emissions and TCFD aligned climate-related information disclosures', *Journal of Business Ethics*, 182 (4), pp.967–1001, https://doi.org/10.1007/s10551-022-05292-x

Downar, B., J. Ernstberger, H. Rettenbacher, S. Schwenen and A. Zaklan (2019) 'Fighting climate change with disclosure? The real effects of mandatory greenhouse gas emission disclosure', discussion paper, Berlin: DIW Berlin

External Reporting Board (2024) 'XRB issues consultation on proposed 2024 amendments to Climate and Assurance Standards', media release, 8 October, https://www.xrb.govt.nz/news/latest-news/

External Reporting Board (n.d.) 'Aotearoa New Zealand Climate Standards', https://www.xrb.govt.nz/standards/climate-related-disclosures/aotearoa-new-zealand-climate-standards/

Fiechter, P., J.M. Hitz and N. Lehmann (2022) 'Real effects of a widespread CSR reporting mandate: evidence from the European Union's CSR directive', *Journal of Accounting Research*, 60 (4), p.1499–549, https://doi.org/10.1111/1475-679X.12424

Fiedler, T., A.J. Pitman, K. Mackenzie, N. Wood, C. Jakob and S.E. Perkins-Kirkpatrick (2021) 'Business risk and the emergence of climate analytics', *Nature Climate Change*, 11 (2), pp.87–94

Financial Markets Authority (n.d.) 'Climate Reporting Entities (CREs)', https://www.fma.govt.nz/business/services/climate-reporting-entities/

Gehricke S., S. Walton and R. Zhang (2024a) 'Effectiveness evaluation of the Aotearoa New Zealand climate-related disclosure framework: evaluation methodology design and baseline assessment: a research brief', Dunedin

Gehricke S., S. Walton and R. Zhang (2024b) 'Effectiveness evaluation of the Aotearoa New Zealand climate-related disclosure framework: evaluation methodology design and baseline assessment: interim report', Dunedin: Climate and Energy Finance Group, Business School, University of Otago, https://www.xrb.govt.nz/news/insights/aotearoa-new-zealand-climate-related-disclosure-framework-evaluation-interim-report-published/

Greenhouse Gas Protocol (n.d.) Corporate Value Chain (Scope 3) *Accounting and Reporting Standard*, https://ghgprotocol.org/corporate-value-chain-scope-3-standard

Griffin, P. and A.M. Jaffe (2022) 'Challenges for a climate risk disclosure mandate', *Nature Energy*, 7 (1), pp.2–4

Jouvenot, V. and P. Krueger (2020) 'Mandatory corporate carbon disclosure: evidence from a natural experiment', working paper, https://ssrn.com/abstract=3434490

Lewis, K., C. Massey and C. Harris (2007) 'Learning by doing: six dimensions of complexity in researching SMEs', *Qualitative Research in Accounting and Management*, 4 (2), pp.151–63

McGuiness Institute (2023) 'Establishing national climate-related reference scenarios', discussion paper 2023/02, https://www.mcguinnessinstitute.org/research-projects/climate-change-nz/climate-related-scenarios/

Miller, G.S., D.R. Stockbridge Jr and C.D. Williams (2023) *Mandatory Disclosure of Institutional Investors' Fossil Fuel Investments*, University of Michigan working paper, https://www.herbert.miami.edu/faculty-research/business-conferences/winter-warmup/miller_disclosure_fossil_fuels_miami.pdf

Ministry for the Environment & Ministry of Business, Innovation & Employment. (2019). Climate-related financial disclosures – understanding your business risks and opportunities related to climate change: Discussion Document. Wellington: Ministry for the Environment.

Miola, A. and C. Simonet (2014) *Concepts and Metrics for Climate Change Risk and Development: towards an index for climate resilient development*, Joint Research Centre, Institute for Health and Consumer Protection, European Commission, https://data.europa.eu/doi/10.2788/44142

Shaw, J. (2020) 'New Zealand in the world to require climate risk reporting', media release, 15 September, https://www.beehive.govt.nz/release/new-zealand-first-world-require-climate-risk-reporting

Sullivan, R. and A. Gouldson (2012) 'Does voluntary carbon reporting meet investors' needs?', *Journal of Cleaner Production*, 36, pp.60–7

Talbot, D. and O. Boiral (2018) 'GHG reporting and impression management: an assessment of sustainability reports from the energy sector', Journal of Business Ethics, 147, pp.367–83

Tang, S. and D. Demeritt (2018) 'Climate change and mandatory carbon reporting: impacts on business process and performance: climate change and carbon reporting: impacts on business', *Business Strategy and the Environment*, 27 (4), pp.437–55

Tauringana, V. and L. Chithambo (2015) 'The effect of DEFRA guidance on greenhouse gas disclosure', *British Accounting Review*, 47, pp.425–44

Vinelli, A., D. Kidd and T. Gellasch (2024) *Climate Data in the Investment Process: challenges, resources, and considerations*, CFA Institute Research and Policy Center, https://rpc.cfainstitute.org/-/media/documents/article/industry-research/climate-data-in-investment-process.pdf

Milena Bojovic

A Just Transition for Aotearoa New Zealand's Dairy Sector

Abstract

Aotearoa New Zealand has a strong history, culture and political economy of dairy agriculture, all of which are deeply interconnected in the global production and trade of dairy. However, changes in the environment, markets and regulations, and the development of alternative proteins, are disrupting traditional pastoral practices, leading to uncertain food futures. This article draws on insights gleaned over a three-year doctoral project investigating just and sustainable transitions for the nation's dairy sector. The article puts forward three key considerations to shape future policy design principles and guidelines for more just and sustainable dairy futures: navigating intensification pressures; supporting the development of alternative proteins; and supporting farmer agency in the transition process.

Keywords dairy, agriculture, sustainability, just transitions, precision fermentation

Milena Bojovic recently completed her PhD in geography and planning at Macquarie University, Sydney. Her research investigated just and sustainable transitions for Aotearoa New Zealand's dairy sector.

Aotearoa New Zealand's dairy sector remains a competitive producer and leader in global dairy exports (OECD and FAO, 2023). The industry, however, faces increasing pressure from an array of market forces and government regulations, as well as environmental concerns, especially in terms of reducing greenhouse gas emissions such as methane (gas produced through the belching and manure from cattle). In addition to environmental concerns, the social, economic and welfare impacts of intensive dairying across Aotearoa have been well documented (for examples, see Jay, 2008; Foote, Joy and Death, 2015; Julian et al., 2017; Ledgard et al., 2020). These concerns and impacts are situated within the broader challenges facing the global dairy sector, which include scrutiny to meet climate, environmental and welfare goals to ensure sustainable trajectories for future food production (see Bojovic and McGregor, 2022).

Already, major customers of brand Aotearoa's dairy are reorienting supply chains to meet global sustainability agendas. For example, Nestlé has announced exclusive support for farmers engaged in 'planting trees or transitioning to silvopasture systems, introducing multispecies pastures, rotational or mob grazing, collecting and storing manure, and adopting more renewable sources of energy' (Nestlé, 2023). Achieving sustainability is a global challenge, particularly as it pertains to the production of food at scale. This was highlighted at the most recent Conference of the Parties meeting (COP28) in 2023, where the final communiqué stated: 'any path to fully achieving the long-term goals of the Paris Agreement must include agriculture and food systems' (COP28, 2023). Moving towards more sustainable modes of production that address global climate change agendas requires change across multiple scales, both culturally and materially in terms of adopting new dietary patterns and transforming established land, labour and trade configurations to accommodate new food production regimes. Such regimes include recent investment in and development of alternative proteins. Most notably, these include plant-based alternatives such as growing oats for oat milk (see Otis Oat Milk, 2024), and more recent investments in the research and development of precision fermentation. Precision fermentation in the dairy sector, colloquially referred to as 'synthetic milk' or 'lab-grown milk' (Bojovic, 2022) is where the natural process of fermentation is advanced through biotechnology to 'teach the microorganisms to produce dairy proteins' (Vivici, 2024).

This article provides insights and guidance towards just and sustainable transitions for the future of Aotearoa's dairy sector. A just transitions framework is commonly understood in the context of transitions towards low-carbon economies that are more economically, socially and environmentally sustainable as societies move away from fossil fuel energy (Heffron and McCauley, 2018; UNEP, 2007). To provide guidance, this article synthesises key findings from a three-year doctoral study investigating the future of Aotearoa's dairy sector. First, it explains challenges facing the industry from environmental and market pressures. The next section provides context for a just transition aligning with the *Guide to Just Transitions* recently developed by the Ministry of Business, Innovation and Employment and independent researchers and practitioners (Just Transitions Aotearoa Group, 2023) and the emerging scholarship on just food transitions. Following this, key findings from the three-year study are summarised, and three high-level considerations for future policy development in this area are put forward – redressing intensification, support for alternative protein development and support for farmer agency. The conclusion sets out more concrete recommendations for specific government agencies to create openings for further engagement across rural communities, with the vision that such communities could lead transitions planning and processes to support the development of fair policies for the future of dairy in Aotearoa.

Challenges facing the dairy industry

Environmental pressures

Emissions and fresh water are critical topics to discuss within the sustainability discourses of the nation's dairy sector, especially in the context of policy and legislative efforts to meet a net zero target by 2050[1] (Ministry for Environment, 2024a). In Aotearoa, there are inherent tensions between the economic interests of government, industry and farming communities, and ensuring long-term environmental sustainability. Public and political pressure is growing for the dairy industry to improve its environmental footprint. Attempts to address these concerns have manifested in different regulatory approaches that continue to evolve as each successive political administration faces pushback from opposition politicians, industry, and advocates for dairy farming communities.

According to a recent survey by Crown research institute Manaaki Whenua Land care Research, fresh water was considered the most important issue facing Aotearoa from 2010 to 2019, and from 2022 more respondents considered climate change to be the most important issue facing the nation (Booth et al., 2022). A variety of stakeholders within and outside the dairy sector are affected by changes to dairy production regimes. These include (but are not limited to) the private sector (primary producers, landholders), rural communities, iwi and policymakers (Norton et al., 2020). Agriculture in Aotearoa contributes over half of the nation's greenhouse gas emissions, mainly through biogenic methane (from livestock) and nitrous oxide (from fertiliser run-off) (Ministry for the Environment, 2024b). Due to this, Aotearoa has a unique emissions profile compared to other OECD nations, with more than half of gross emissions coming from agriculture (OECD, 2022). These high emissions can be attributed to high dairy productivity, as Aotearoa exports 95% of its dairy to 130 countries around the world, with only 5% used for domestic consumption (Dairy Companies Association of New Zealand, 2023).

In addition to the issue of emissions, fresh water remains a contentious social,

In addition to the issue of emissions, fresh water remains a contentious social, environmental and political challenge, particularly because of widespread irrigation infrastructure needed for pasture growth.

environmental and political challenge, due to factors such as widespread irrigation infrastructure for maintaining consistent pasture growth. This increase in groundwater use for irrigation in addition to fertilisers for growth has reduced flows in streams and rivers, as well as increasing nutrient discharges and eutrophication of wetlands (Norton et al., 2020). Government reports have found that between 2002 and 2019, there was a significant – 200% – increase in irrigated land areas, predominantly on dairy farms and particularly in the Canterbury region of the South Island (Statistics New Zealand, 2021).

Market disruptions

Future growth of the nation's dairy sector is expected to be driven by a shift towards higher-value dairy products, which includes new product development, improved efficiency of processing and increased sustainability in milk production (Treasury, 2023). This is because the growth in milk production has slowed since 2015, due to a gradual decline in cattle numbers and tighter environmental regulations (ibid.). Regulations and incentives are coming from industry too, with Fonterra, the nation's largest dairy cooperative and processor of raw milk, recently announcing support for farmers to achieve a 30% intensity reduction in on-farm emissions by 2030 (Fonterra, 2023a). These initiatives reflect global trends from major customers of Aotearoa dairy such as Nestlé, who will pay farmers more to produce low-emissions milk (Fonterra, 2023b).

Alternative proteins provide novel ways to produce protein that requires much less land and fewer animals, emissions, farmers or farms. New areas of research, investment, and production are developing to increase the viability and cost parity of novel protein innovations. They aim to address the sustainability issues associated with traditional dairy farming while ensuring that the food system and human diet continue to have nutritionally equivalent dairy proteins. This has attracted the attention of governments, private investment and entrepreneur innovation (Day et al., 2022). A recent white paper by the Crown research institute AgResearch claimed that, 'radical new processes are needed to meet consumer expectations for less waste, reduced pollution and cleaner, healthier environments', citing the development of animal-free proteins as a opportunities to address this (ibid., p.7).

The production of precision fermentation dairy proteins navigates the challenges of monoculture crops for plant milks while also avoiding the bodily burdens placed on farmed animals. In Aotearoa, there is significant potential for better environmental and animal welfare outcomes through upscaling dairy alternatives. The work of precision fermentation start-up Daisy Lab has continued to expand and it is currently seeking $20 million in investment capital (Wannan, 2024). Their work has been supported through approvals from the Environmental Protection Authority to scale up its lab-grown proteins 500-fold from its existing allowance (Steele, 2024). Meanwhile, in a recent report commissioned by domestic company Boring Oat Milk, oat milk is considered the highest-value land use for plant-milk production in Aotearoa. The report found that a research and policy infrastructure is emerging in Aotearoa that favours advanced arable systems through supportive Crown research organisations oriented towards achieving environmental sustainability (Agribusiness Group, 2022).

... transitions need to be carefully planned and managed in ways that can reduce the likelihood of entrenching existing inequalities or creating new ones ...

However, alternative proteins come at both economic and social costs. Economically, enduring challenges for the upscaling of alternative proteins include larger food processors competing on price, placing downward pressure on smaller-scale alternative dairy producers (Campbell et al., 2022). Further to this, insufficient investments on-farm and collaboration to optimise these emerging industries for national benefit remain pertinent barriers (Agribusiness Group, 2022). Most importantly, where incumbent farmers fit in these alternative dairy futures is yet to be fully understood. This is where a just transitions framework is much needed.

Defining just transitions

A just transition is increasingly featured in policy discourses, particularly in the context of international climate negotiations and through the advocacy of global union organisations (Krawchenko and Gordon, 2021). Within these discourses, the aim is to support initiatives, mechanisms and practices that can steer society towards low-carbon futures underpinned by attention to issues of justice and equity (Newell and Mulvaney, 2013). However, as Bennett et al. (2019) observe, when economic efficiency or environmental conservation are the overarching policy goals, issues related to the distribution of benefits may be considered less important in planning and decision making. Modifications in established socioecological systems will require shifts in societal assumptions, beliefs and values, as well as in government regimes, development paradigms and power relations. Therefore, transitions need to be carefully planned and managed in ways that can reduce the likelihood of entrenching existing inequalities or creating new ones (Ellis, 2021).

Just Transitions in Aotearoa

In Aotearoa, *A Guide to Just Transitions* (Just Transitions Aotearoa Group, 2023) was recently published by independent researchers and practitioners and the Ministry of Business, Innovation and Employment. The guide maps out general principles to equip communities 'to develop positive visions for change, transform unfair systems, draw on diverse strengths and worldviews, and come together to

solve problems in ways that work better for everyone' (p.1). The guide focuses on four key steps to initiating and achieving a just transition across communities: connecting and building relationships; planning and designing transition processes; acting on collective decisions; and adapting, monitoring and evaluating progress. Key principles for a just transition in this context include meaningful engagement with Māori world views, emphasising the importance of relationships between nature and people, and drawing on values such as 'consensus building, respect, care, balance, intergenerational equity and relationship building', to support 'representation, collaboration, partnership, co-design and participatory democracy' (ibid., pp.16, 12). To this end, the mapping of relevant connections, responsibilities and obligations across all actors can inform understanding about various chains, production networks, and global exchange and divisions of labour (Stevis and Felli, 2020). Consultation processes must therefore be transparent, and outcomes clearly reported upon, as well as both industry and government kept accountable for policy and decision making.

The Ministry of Business, Innovation and Employment (2023) put forward a series of case studies to showcase just transition principles in practice. While dairy agriculture is not a focus, there are some agriculture-adjacent and government-supported initiatives, such as Southland Just Transition (2023), which promotes research on the primary sector's role in Southland's long-term shift to more sustainable production. Regarding just transitions that may directly affect the dairy sector, efforts are being made to support low-emission plant-based beverage manufacturing for future planning (Beyond 2025 Southland, 2023). These efforts underscore the increasing acceptance of just transitions on local and national scales. A recent report by the Parliamentary Commissioner for the Environment investigating agriculture and land use change argued for an integrated approach to environmental management that focuses on the catchment rather than one-size-fits-all national regulation (Parliamentary Commissioner for the Environment, 2024). Achieving this approach will require more detailed case studies of agri-food transitions to address justice issues for those most affected by transitions.

The field of just food transitions

Just food transitions scholarship (see Tribaldos and Kortetmäki, 2022) aims to critically engage with social and environmental sustainability to encompass the complexity of justice issues, including indigenous land rights, economic and social justice, environmental justice, and justice for non-human others, specifically in agricultural contexts. In more practical terms, the study of agricultural transitions offers guidance and principles for understanding and governing long-term processes of structural systemic change (Tschersich and Kok, 2022): for example, studies of agricultural transitions in Finland (Lehtonen, Huan-Niemi and Niemi, 2022; Kuhmonen and Siltaoja, 2022), work on narratives analysis of agricultural transitions in Brazil (Maluf et al., 2022), and work on agroecological transitions for family farms in Guatemala (Valverde, Mesías and Peris-Blanes, 2022). These studies are collated in a special issue of the journal *Environmental Innovation and Societal Transitions* on 'Just food system transition in the context of climate change: tackling inequalities for sustainability' (Kaljonen et al., 2023). With regard to just agri-food transitions, Tschersich and Kok (2022) argue for a pluralising of knowledge, adopting post-growth strategies for economic development and moving towards greater understanding of human–nature relations to support environmental sustainability. Applying this to the pursuit of low-carbon development is also explored by a study of just transitions towards a bioeconomy in Brazil, India and Indonesia, where Bastos Lima argues that a key challenge for a just transition is the reconciliation of 'sustainable agriculture and land use with the imperative of fossil-resource substitution' (Bastos Lima, 2022, p.1). These studies show the value and importance of applying a social justice lens to avoid placeless or 'even more technocratic' (Stevis, 2023, p.50) theories of change that lack empirical engagement. Context-specific and place-based studies are a key feature of just food transitions planning and process. The case of just transitions for Aotearoa's dairy sector is part of an emerging field of scholarship that weaves together social and ecological concerns about the future state of our food systems within the broader landscape of achieving low-carbon economic development and just outcomes for communities and environments.

… just transitions for Aotearoa's dairy sector is part of an emerging field of scholarship that weaves together social and ecological concerns about the future state of our food systems within the broader landscape of achieving low-carbon economic development and just outcomes for communities and environments.

Research methods

The insights from this article are based on data collected over a three-year doctoral

Figure 1: Key considerations to inform just transition guidance for Aotearoa's dairy sector

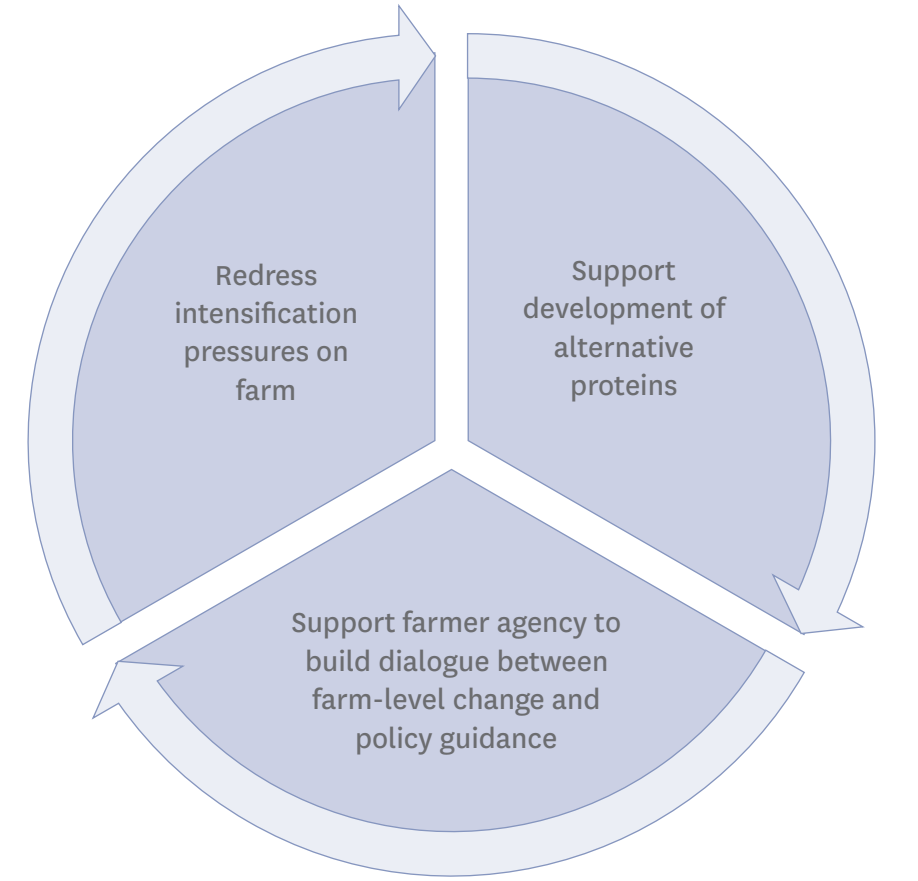


Table 1

Keyword searches for challenges to transition	Keyword searches for justice
transitions	justice
policy	social justice
government	community/ies
challenge/s	animal welfare
opportunity/ies	economy
future/s	economic development
synthetic milk	sustainability
plant-based	environment
precision fermentation	climate change
alternative proteins	social license[2]

project (2021–24) about the future of dairy in Aotearoa. Drawing on interviews with 63 diverse stakeholders across the nation's dairy ecosystem, workshops with dairy farmers and site visits to farms, a milk processing plant and a precision fermentation laboratory. The insights draw upon participants' visions for the future of the sector, with a focus on challenges and opportunities for the dairy industry. This type of engagement reveals how transitions are discursively constructed across a variety of actors (Wang and Lo, 2021). A typology of stakeholders is provided in the Appendix.

Interviews with participants were semi-structured, enabling participants to speak freely on topics of interest (Bryman, 2012) as they related to the broader questions about the future of Aotearoa's dairy sector. Transcripts were coded and analysed to focus on responses that related to themes of social, environmental, economic and political challenges for the sector, currently and in the future. To identify challenges to transitions and dimensions of justice within participant responses, keyword searches were undertaken, as summarised in Table 1.

Analysis of the transcripts was informed by White and Leining's (White and Leining, 2021, p.3) argument that a transitions process should be 'inclusive, informed and iterative', which includes understanding different stakeholder positions for future policy development (Heffron and McCauley, 2018). This is echoed in Loorbach's (2010) work on governance processes towards transition management, acknowledging that diverse networks of business, government, science and civil society can have shared visions and agendas for social reform and are increasingly influencing regular policies in areas such as energy supply or agriculture. Engaging with diverse stakeholders in this context helped to identify shared values and aspirations as well as conflicting views, adhering to the Just Transitions Aotearoa Group approach that effective just transition planning is grounded in fostering relationships, new ideas and innovative collaborations (Just Transitions Aotearoa Group, 2023).

Findings and recommendations

The data collected over the three-year study highlighted how transition processes in the sector will require the involvement of a range key actors, including farmers, industry representatives, alternative dairy producers, researchers, civil society, government and Māori, all of whom have a role to play in shaping the future of the industry. Key considerations that will shape future policy design principles and guidelines for the sector should consider the following: navigating intensification pressures, supporting the development of alternative proteins, and supporting farmer agency in the transition process. These are summarised in Figure 1.

Redressing intensification pressures

Aotearoa is uniquely placed to consider the challenges of dairy intensification[3] across global and local scales due to the role of Fonterra and its strategic partnerships with international customers, such as Nestlé. As observed across the Canterbury and Southland regions through the research

period, market drivers towards high productivity put additional pressure on farmers, who must balance profitability with environmental, social and economic sustainability. Increased productivity requires increased investment on farms, resulting in a more mechanised industry. This pushes dairy farmers to further compete in national and international markets, increasing the risk of more corporatised landscapes emerging that push out smaller-scale operators. For Aotearoa, dairy intensification, with its monoculture grasslands and commodity milk production for export, is not synonymous with sustainability and, indeed, actively harms human and non-human actors, yet it continues partly thanks to its clean and green marketing image (Bond, Diprose and McGregor, 2015). Intensification creates a vicious cycle where economic drivers are perpetuating unjust outcomes at almost every level of the food system. There are fewer but larger beneficiaries and increased milk volumes, which may have some cosmopolitan justice[4] benefits in terms of supporting access to food and some livelihood opportunities for future generations (Kaljonen et al., 2021). The where and how of food production will then need to continuously adapt to changing environmental conditions which may no longer be conducive to intensive pasture-based production. New production paradigms are needed, where sustainability is positioned as a 'moving target' (Gaziulusoy, Boyle and McDowell, 2013, p.105) which focuses on contextual conditions of environments, humans and diverse species, to improve understandings of dynamic conditions and possibilities.

It is also important to note that Aotearoa's dairy industry operates at multiple scales and that those scales are interconnected. The local dairy farmer is connected to global markets, and cattle wellbeing is dependent on technologies, regulations and processes that evolve in very different jurisdictions. Some of the just transitions scholarship argues that 'the most promising approaches to transition studies are those that integrate macro and micro levels of analysis' (Stevis and Felli, 2020, p.7). Such transitions should be a confluence of frameworks and practices that also respect non-human flourishing and species existence, ecosystem health (soil, water, air) and biodiversity, while keeping resource use within planetary boundaries (Kaljonen et al., 2021; Tribaldos and Kortetmäki, 2022; Vermunt et al., 2020). In the Aotearoa context, this also involves ongoing and ethical engagement with Māori across the country to recognise the past and ongoing injustices and give effect to te Tiriti o Waitangi, ensuring the empowerment of Māori people through appropriate regulatory and legal frameworks that can inform ethical and appropriate resource management strategies (Just Transitions Aotearoa Group, 2023, p.14).

> There is significant potential for industry and government, through shared goals of a just and sustainable dairy future, to support farmer agency and engagement at the farm level to inform transitions and policy design.

Support for development of alternative proteins

Fonterra recently invested in a precision fermentation start-up named Vivici, even releasing their first product to market, 'a nature-equivalent whey protein, beta-lactoglobulin' (Vivici, 2023). To ensure just and sustainable transitions for the dairy sector, the opportunities offered by such alternative protein production should avoid entrenching further intensification and cascading environmental impacts, as well as corporatisation and monopolies in the food system (Sexton and Goodman, 2022). Thus far, investments in lab-grown milk have focused on business models that have strong barriers to entry to potential competitors through intellectual property (IP) patents, trade secrets and enacting regulatory barriers (Howard, 2022; Guthman et al., 2022). A just transition should support efforts towards democratisation of knowledge and expertise, which could involve treating the intellectual property of new food technologies as a social good, one from which farmers and proponents of alternative proteins can collectively benefit. How IP is democratised is a challenge and requires more government investment and regulation to support not only diversified land use, but market opportunities that can treat IP as a social good, rather than a private asset to be commodified. In this way, primary food producers can also be included in the transitions process. Such processes may involve regulations that cap growth and encourage entrepreneurship of smaller-scale alternative dairy enterprises, rather than monopolisation of food producers, as in the current system. Continuous research and engagement with diverse stakeholders, which includes recognition of farmers and producers as key stakeholders in the shaping of new food systems, and interrogating the values of our food system are critical aspects in steering the dairy sector to more just and sustainable trajectories.

Support for farmer agency

Although advances in food technology have the potential to address environmental issues such as land use and emissions, the impact these advances have on primary food producers and rural communities is a key consideration for just transitions. Recognition of farmer agency and the development of policy dialogues that engage at the farm level of change, particularly in the context of alternative protein development, is needed to support just outcomes. As observed throughout engagement with participants and through the literature on transitions to alternative proteins,

farmers and rural communities are rarely examined in the proposed frameworks regarding alternative dairy futures (Lonkila and Kaljonen, 2021). Therefore, a focus on recognition justice is a key aspect of a just and sustainable transition, which includes meaningful engagement with stakeholders most affected by change. Further to this, there needs to be a clear acknowledgement that 'farmers' are not a homogenous group so a nuanced approach to understanding impacts of transitions must take into consideration the differences between small- and medium-scale dairy farmers, those who do not own land (sharemilkers) and farm workers (paid wages not salary). The Ministry of Business, Innovation and Employment has begun some of this work through its recent guide (Just Transitions Aotearoa Group, 2023); however, more work is needed to address the specificities of agricultural transition across different regions in Aotearoa. As economies shift towards low-carbon development, the new market opportunities offered by plant-based and precision fermentation dairy will shift society and environments too. If not managed carefully, these advances could reinforce existing inequalities or create new ones, furthering uneven impacts across people, animals and environments.

There is little clarity regarding the role of traditional dairy farmers within Fonterra's plans to pursue precision fermentation; nor is there firm guidance from national government in this area. If a just and sustainable transition to alternative forms of dairy is to occur, then dairy farmers and their interests and preferences should be central to those discussions. Continuous engagement and the co-production of knowledge around the challenges, impacts and opportunities of transitions are needed. There is significant potential for industry and government, through shared goals of a just and sustainable dairy future, to support farmer agency and engagement at the farm level to inform transitions and policy design. Such a balance requires engagement with diverse actors across the dairy ecosystem and consideration of how the future livelihoods of animals, environments and emerging alternative dairy enterprises can support efforts towards de-intensifying traditional dairy herds. Key risks must be considered regarding the distribution of benefits, especially if transitions are driven by growth-focused market logics and dominated by corporate investment. Such approaches may limit the inclusion of farmers' perspectives, which are crucial for meaningful agricultural land use change. Ultimately, a just transitions approach puts social justice at the heart of transformation research and management to support more inclusive and just pathways towards sustainability (Bennett et al., 2019).

As the climate changes, so too does the predictability of pastoral practices, creating further uncertain food futures. A just transition requires recognition that transitions to low-carbon development are inherently social and are shaped by a diversity of values, cultures and politics (Avelino et al., 2016; Avelino, 2017; Köhler et al., 2019). The transition towards intensification has been a disaster for many, but this has been hidden from view through the emphasis on economic profitability. Transitioning to more sustainable modes of dairy agriculture will require a just transition framework to ensure fair and equitable distribution of future costs and benefits for both traditional and novel dairy protein production.

Conclusion

This article has offered guidelines to enable a just transition for Aotearoa's dairy sector.

Table 1: Participants and their descriptions

Stakeholder type	N	Description
Academic	7	Participants working for Universities or Crown Research Institutes who were researching Aotearoa's dairy industry in some capacity. Researchers varied in their knowledge and expertise with some focusing on fresh-water ecology, while others worked on the future development of alternative proteins.
Activist/NFP	3	Each of these participants worked and/or volunteered for grassroots activist groups (for the environment or for animal rights) that share similar perspectives in terms of reducing herd numbers across the country. While attempts were made to interview participants who were pro-dairy farming in an activist capacity, these interviews did not transpire.
Dairy Farmer	19	This category of participants includes dairy farmers from across the country, though a majority come from the South Island in the Canterbury and Southland regions. These regions have experienced the most significant growth in dairy production in the last few decades, as explained in the introduction chapter. Dairy farmers tended to be white, middle-aged men – only 4 of the 19 dairy farmers identified as female.
Dairy Industry Representative	8	Dairy Industry representatives were from either DairyNZ or Fonterra.
Economist	2	These participants identified themselves as economists who actively study and report of the economics of dairy farming in Aotearoa in their professional careers.
Farm/Food Consultant	8	This participant group is made up of consultants of different expertise – some provide advice directly to farmers about farm planning and resource management. Other consultants work for alternative protein companies and provide advice on the marketing and sustainability of alternative dairy.
Government	4	These included participants from key governmental Ministries that manage transitions for different sectors of Aotearoa society.
Media/Journalist	5	These were participants who worked as independent content producers or for major news/media organisations across Aotearoa and have a record of researching and reporting on the dairy industry.
Alternative Dairy Representative	7	Participants in this category either owned or worked for Aotearoa-based plant-based or precision fermentation dairy businesses and initiatives.
Total:	63	

A sustainable transition is not as simple as merely reducing cattle numbers. It is a much more complex process and will require a diversity of ideas and efforts to steer the dairy sector towards more sustainable trajectories that also engage with the complexities of the geographical context, in terms of Tiriti obligations, industry and government roles facilitating intensification and diversification of the sector, and, finally, farmers' capabilities to adapt in the face of social, economic and environmental change.

A specific guide for agri-food transitions in Aotearoa would share the same principles as set out in the *Guide to Just Transitions*. The principles for agri-food transitions need to be grounded in contextual and relational understandings of what is already unfolding across different scales, from farm-level to national-scale environmental management and policies for the sector. In terms of government-led initiatives, the Ministry of Business, Innovation and Employment could lead the way in providing more detailed case studies for affected communities, while Treasury could engage in research towards investment and regulation to support IP in precision fermentation and safeguard these technologies as a national social good. Such initiatives will need to also consider broader economic diversification in rural communities, which should include supporting a shift away from intensive pastoral farming, embracing land diversification and supporting the growth of alternative dairy industries. A just transition framework is a useful and practical mechanism to guide the process for meaningful engagement with diverse stakeholders and communities towards achieving broader social, economic and environmental sustainability.

1 This refers to a 24–47% reduction in biogenic methane emissions below 2017 levels by 2050, including a 10% reduction by 2030.
2 Referring to community acceptance for intensive industries to operate; for further explanation of this, see Edwards and Trafford, 2015.
3 Intensification in this context refers to large-scale, high-resource and capital inputs for high productivity.
4 Cosmopolitan justice in the just food transitions literature emphasises the importance of global fairness and intergenerational justice, wherein transition pathways in one place should not cause disadvantage to or negatively impact the food security or wellbeing of distant, marginal or future populations (Tribaldos and Kortetmäki, 2022).

References

Agribusiness Group (2022) 'Environmental impact assessment of oat milk production at the farm level', Agribusiness Group for Boring Oat Milk, https://cdn.shopify.com/s/files/1/0606/4632/6505/files/Boring_Oat_Milk_Report.pdf?v=1675300118 {29p pdf}

Avelino, F. (2017) 'Power in sustainability transitions: analysing power and (dis)empowerment in transformative change towards sustainability', *Environmental Policy and Governance*, 27 (6), pp. 505–20

Avelino, F., J. Grin, B. Pel and S. Jhagroe (2016) 'The politics of sustainability transitions', *Journal of Environmental Policy and Planning*, 18 (5), pp. 557–67

Bastos Lima, M.G. (2022) 'Just transition towards a bioeconomy: four dimensions in Brazil, India and Indonesia', F*orest Policy and Economics*, 136, 102684

Bennett, N.J. J.Blythe, A.M. Cisneros-Montemayor, G.G. Singh and U.R. Sumaila (2019) 'Just transformations to sustainability', *Sustainability*, 11 (14)

Beyond 2025 Southland (2023) 'Beyond 2025 Southland: regional long term plan', https://beyond2025southland.nz/

Bojovic, M. (2022) 'Not like udder milk: "synthetic" dairy milk made without cows may be coming to a supermarket near you', *The Conversation*, 29 August, https://theconversation.com/not-like-udder-milk-synthetic-dairy-milk-made-without-cows-may-be-coming-to-a-supermarket-near-you-189046

Bojovic, M. and A. McGregor (2022) 'A review of megatrends in the global dairy sector: what are the socioecological implications?', *Agriculture and Human Values*, 40 (1), pp.373–94

Bond, S., G. Diprose and A. McGregor (2015) '2precious2mine: post-politics, colonial imaginary, or hopeful political moment?', *Antipode*, 47 (5), pp.1161–83

Booth, P.L., F.D. Kenneth, G.N. Hughey and P.S. Kerr (2022) *New Zealand Environmental Perceptions Survey: 2022*, Manaaki Whenua Landcare Research, https://www.landcareresearch.co.nz/assets/Discover-Our-Research/Environment/Sustainable-society-policy/EPS/report-nz-environmental-perceptions-survey-2022.pdf

Bryman, A. (2012) *Social Research Methods*, 4th edn, New York: Oxford University Press

Campbell, A., L. Kok, L. Wilson, S. Harburg and S. Glennie (2022) 'New crops for Southland: an analysis of the oat milk value chain and potential business models as an exemplar for Southland', https://www.thrivingsouthland.co.nz/site_files/24893/upload_files/NewCropsforSouthland(OatsReporttoThrivingSthld)AbacusBioJuly2022.pdf?dl=1

COP28 (2023) 'Food and agriculture', https://www.cop28.com/en/food-and-agriculture

Dairy Companies Association of New Zealand (2023) 'The New Zealand dairy industry', https://dcanz.com/the-new-zealand-dairy-industry/

Day, L., E. Altermann, R. Chanyi, T. Hicks, D. Knowles, J. Mullaney and M. Weeks (2022) F*ermentation for Future Food Systems*, AgResearch, https://www.agresearch.co.nz/assets/Uploads/Fermentation-for-future-food-systems.pdf

Edwards, P. and S. Trafford (2016) 'Social licence in New Zealand – what is it?', *Journal of the Royal Society of New Zealand*, 46 (3–4), pp.165–80

Ellis, E. (2021) 'A just transition to climate-resilient coastal communities in Aotearoa New Zealand', *Policy Quarterly*, 17 (3), pp.23–30

Fonterra (2023a) 'Fonterra announces climate plans for the future', 9 November, https://www.fonterra.com/nz/en/our-stories/media/fonterra-announces-climate-plans-for-the-future.html

Fonterra (2023b) 'Nestlé partnership sees extra payment offered to Fonterra farmers this season', 14 December, https://www.fonterra.com/nz/en/our-stories/media/nestle-partnership-sees-extra-payment-offered-to-Fonterra-farmers-this-season.html

Foote, K.J., M.K. Joy and R.G. Death (2015) 'New Zealand dairy farming: milking our environment for all its worth', *Environmental Management*, 56 (3), pp.709–20

Gaziulusoy, A.İ., C. Boyle and R. McDowall (2013) 'System innovation for sustainability: a systemic double-flow scenario method for companies', *Journal of Cleaner Production*, 45, pp.104–16

Guthman, J., M. Butler, S.J. Martin, C. Mather and C. Biltekoff (2022) 'In the name of protein', *Nature Food*, 3, pp.381–93

Heffron, R. and D. McCauley (2018) 'What is the "just transition"?', *Geoforum*, 88, pp.74–7

Howard, P.H.C. (2022) 'Cellular agriculture will reinforce power asymmetries in food systems', *Nature Food*, 3, pp.798–800

Jay, M. (2008) 'Farmer innovations in environmental management: new approaches to agricultural sustainability?', in R. Le Heron and C. Stringer (eds), *Agri-Food Commodity Chains and Globalising Networks*, London; New York: Routledge

Julian, J.P., K.M. de Beurs, B. Owsley, R.J. Davies-Colley and A.-G.E. Ausseil (2017) 'River water quality changes in New Zealand over 26 years: response to land use intensity', *Hydrology and Earth System Sciences*, 21 (2), pp.1149–71

Just Transitions Aotearoa Group (2023) *A Guide to Just Transitions for communities in Aotearoa New Zealand*, Wellington: Motu Economic and Public Policy Research, https://www.motu.nz/assets/Uploads/A-guide-to-just-transitions_He-puka-arataki-whakawhitinga-tika-FINAL.pdf

Kaljonen, M., T. Kortetmäki and T. Tribaldos (2023) 'Introduction to the special issue on just food system transition: tackling inequalities for sustainability', *Environmental Innovation and Societal Transitions*, 46, 100688

Kaljonen, M., T. Kortetmäki, T. Tribaldos, S. Huttunen, K. Karttunen, R.S. Maluf, J. Niemi, M. Saarinen, J. Salminen, M. Vaalavuo and L. Valsta (2021) 'Justice in transitions: widening considerations of justice in dietary transition', *Environmental Innovation and Societal Transitions*, 40, pp.474–85

Köhler, J., F.W. Geels, F. Kern, J. Markard, E. Onsongo, A. Wieczorek, F. Alkemade, F. Avelino, A. Bergek, F. Boons, L. Fünfschilling, D. Hess, G. Holtz, S. Hyysalo, K. Jenkins, P. Kivimaa, M. Martiskainen, A. McMeekin, M.S. Mühlemeier, B. Nykvist, B. Pel, R. Raven, H. Rohracher, B. Sandén, J. Schot, B. Sovacool, B. Turnheim, D. Welch and P. Wells (2019) 'An agenda for sustainability transitions research: state of the art and future directions', *Environmental Innovation and Societal Transitions*, 31, pp.1–32

Krawchenko, T.A. and M. Gordon (2021) 'How do we manage a just transition? A comparative review of national and regional just transition initiatives', *Sustainability*, 13 (11), 6070

Kuhmonen, I. and M. Siltaoja (2022) 'Farming on the margins: just transition and the resilience of peripheral farms', *Environmental Innovation and Societal Transitions*, 43, pp. 343–57

Ledgard, S.F., S.J. Falconer, R. Abercrombie, G. Philip and J.P. Hill (2020) 'Temporal, spatial, and management variability in the carbon footprint of New Zealand milk', *Journal of Dairy Science*, 103 (1), pp.1031–46

Lehtonen, H., E. Huan-Niemi and J. Niemi (2022) 'The transition of agriculture to low carbon pathways with regional distributive impacts', *Environmental Innovation and Societal Transitions*, 44, pp.1–13

Lonkila, A. and M. Kaljonen (2021) 'Promises of meat and milk alternatives: an integrative literature review on emergent research themes', *Agriculture and Human Values*, 38 (3), 625–39

Loorbach, D. (2010) 'Transition management for sustainable development: a prescriptive, complexity-based governance framework', *Governance*, 23 (1), pp.161–83

Maluf, R.S., L. Burlandy, R.P. Cintrão, E. Jomalinis, T.C.O. Carvalho and T. Tribaldos (2022) 'Sustainability, justice and equity in food systems: ideas and proposals in dispute in Brazil', *Environmental Innovation and Societal Transitions*, 45, pp.183–99

Ministry for Environment (2024a) 'Greenhouse gas emissions target and reporting', Ministry for Environment, https://environment.govt.nz/what-government-is-doing/areas-of-work/climate-change/emissions-reductions/emissions-reduction-targets/greenhouse-gas-emissions-targets-and-reporting/

Ministry for the Environment (2024b) 'New Zealand's greenhouse gas inventory: snapshot', Wellington: Ministry for the Environment, https://environment.govt.nz/publications/new-zealands-greenhouse-gas-inventory-19902022-snapshot/

Ministry for Primary Industries (2017) *New Zealanders' Views of the Primary Sector*, https://www.mpi.govt.nz/dmsdocument/27582-new-zealanders-views-of-the-primary-sector

Ministry of Business, Innovation and Employment (2023) 'Just transition', https://www.mbie.govt.nz/business-and-employment/economic-development/just-transition/

Nestlé (2023) 'Dairy', https://www.nestle.co.nz/sustainability/raw-materials/dairy

Newell, P. and D. Mulvaney (2013) 'The political economy of the "just transition"', *Geographical Journal*, 179 (2), pp.132–40

Norton, D.A., F. Suryaningrum, H.L. Buckley, B.S. Case, F.C. Cochrane, A.S. Forbes and M. Harcombe (2020) 'Achieving win-win outcomes for pastoral farming and biodiversity conservation in New Zealand', *New Zealand Journal of Ecology*, 44 (2), 3408

OECD (2022) 'New Zealand's plans for agricultural emissions pricing', https://www.oecd.org/en/publications/ipac-policies-in-practice_22632907-en/new-zealand-s-plans-for-agricultural-emissions-pricing_d4f4245c-en.html

OECD and FAO (2023) *OECD FAO Agricultural Outlook 2023–2032*, https://www.oecd-ilibrary.org/agriculture-and-food/oecd-fao-agricultural-outlook-2023-2032_37c7b798-en

Otis Oat Milk (2024) 'Otis returns production to NZ world class facility opens in Auckland', press release, 27 June, Scoop, https://www.scoop.co.nz/stories/BU2406/S00500/otis-returns-production-to-nz-world-class-facility-opens-in-auckland.htm?_gl=1*5ddf6h*_ga*MjEoNTYzMzM3My4xNzIzNTk4NjM1*_ga_GGVMM3MB82*MTcyMzU5ODYzNS4xLjEuMTcyMzU5ODY1Mi40My4wLjA

Parliamentary Commissioner for the Environment (2024) *Going with the Grain: changing land use to fit a changing landscape*, Parliamentary Commissioner for the Environment, Wellington: https://pce.parliament.nz/publications/going-with-the-grain-changing-land-uses-to-fit-a-changing-landscape

Sexton, A. and M. Goodman (2022) 'Of fake meat and an anxious Anthropocene: towards a cultural political economy of alternative proteins and their implications for future food system', in S. Colin (ed.), *A Research Agenda for Food Systems*, London: Elgar

Southland Just Transition (2023) 'Land use', Southland Just Transition, https://southlandjusttransition.nz/land-use/

Statistics New Zealand (2021) 'Irrigated land', https://www.stats.govt.nz/indicators/irrigated-land

Steele, M. (2024) 'Daisy Lab, company creating cow-less dairy products, given green light to expand', *RNZ News*, https://www.rnz.

co.nz/news/business/517062/daisy-lab-company-creating-cow-less-dairy-products-given-green-light-to-expand

Stevis, D. (2023) *Just Transitions: promise and contestation*, Cambridge: Cambridge University Press

Stevis, D. and R. Felli (2020) 'Planetary just transition? How inclusive and how just?', *Earth System Governance*, 6

Treasury (2023) 'FEU special topic: medium-term outlook for dairy exports', https://www.treasury.govt.nz/publications/research-and-commentary/rangitaki-blog/feu-special-topic-medium-term-outlook-dairy-exports

Tribaldos, T. and T. Kortetmäki (2022) 'Just transition principles and criteria for food systems and beyond', *Environmental Innovation and Societal Transitions*, 43, pp.244–56

Tschersich, J. and K.P.W. Kok (2022) 'Deepening democracy for the governance toward just transitions in agri-food systems', *Environmental Innovation and Societal Transitions*, 43, pp.358–74

UNEP (2007) *Labour and the Environment: a natural synergy*, United Nations Environment Programme, https://wedocs.unep.org/bitstream/handle/20.500.11822/7448/-Labour%20and%20the%20Environment_%20A%20Natural%20Synergy-2007739.pdf?sequence=3andisAllowed=y

Valverde, R.O., P.A. Mesías and J. Peris-Blanes (2022) 'Just transitions through agroecological innovations in family farming in Guatemala: enablers and barriers towards gender equality', *Environmental Innovation and Societal Transitions*, 45, pp.228–45

Vermunt, D., S. Negro, F.S. Van Laerhoven, P. Verweij and M. Hekkert (2020) 'Sustainability transitions in the agri-food sector: how ecology affects transition dynamics', *Environmental Innovation and Societal Transitions*, 36, pp. 236–249

Vivici (2023) 'Vivici successfully scales up it's beta-lactoglobulin process, producing food grade product', 6 October, https://www.vivici.com/newsroom/vivici-successfully-scales-up-its-beta-lactoglobulin-process-producing-food-grade-product

Vivici (2024) 'Our process', https://www.vivici.com/our-process

Wang, X. and K. Lo (2021) 'Just transition: a conceptual review', *Energy Research and Social Science*, 82

Wannan, O. (2024) 'Start-up seeks investment to make milk without cows', Stuff, 15 January, https://www.stuff.co.nz/climate-change/350146680/start-seeks-investment-make-milk-without-cows›

White, D. and C. Leining (2021) 'Developing a policy framework with indicators for a "just transition" in Aotearoa New Zealand', *Policy Quarterly*, 17 (3), pp.3–12

Paula Feehan

The Missing Ingredient in New Zealand's climate policy: food

Abstract

The food system is a major producer of greenhouse gas emissions. There is a growing consensus that to achieve net zero we need to change production and consumption patterns. Mitigation policies that rely on improving production methods used to farm animals, rather than reducing the number of animals farmed, will likely, for multiple reasons, have only a limited overall impact. Policies that fail to address consumption miss opportunities for reducing emissions, as well as a range of other co-benefits. This article proposes that the representation of agriculture and its impact on climate needs to change. There is a compelling case for the food system to be included in climate policy as a coherent whole.

Keywords agriculture, food, climate policy, production, consumption, meat, dairy

We are experiencing a global crisis. The world's food system has been a major contributor to the planet's greatest challenges: climate change, biodiversity loss, poor human health and animal suffering (Ruggeri et al., 2024). The scale and urgency of the climate crisis is such that no potential policy levers should be excluded from climate mitigation strategies. We need to transition away from emissions-intensive production and consumption across all sectors, including the food system. We need to move towards nature-positive food production, healthier and more sustainable diets, and radically reduced food loss and waste.

Actions to mitigate emissions in the food sector have so far been siloed. It is increasingly recognised that a 'food system' approach is necessary. Such an approach encompasses the entirety of the production, transport, retailing, consumption and waste of food, and includes impacts on nutrition, human health and the environment (Chatham House, 2021, p.11). Climate policies have been almost silent on the questions of what food we produce and what food we consume: in other words, our diets. This applies as much to New Zealand as to anywhere else.

The premise of this article is that if New Zealand is committed to achieving significant reductions in emissions by 2030, and net zero (including biogenic methane reductions of 24–47%) by 2050, the government will need to reframe the problem of climate change and take greater account of emissions from the food system. This has the potential to enable New Zealand not only to achieve its emissions targets, but also to address multiple other issues, including social, economic and health challenges (Aotearoa Circle, 2022).

Two policy levers could achieve this goal. First, Nationally Determined Contributions (NDCs, the country-specific

Paula Feehan has recently completed an MSc in food policy at the Centre for Food Policy, City University, London. She has worked at the intersection of food and climate issues for international development and environmental justice NGOs. She currently works at Feedback Global in the United Kingdom.

climate commitments central to the Paris Agreement) provide a strategic opportunity for governments to integrate a food system approach across their climate mitigation policies. Second, the development of a national food strategy has the potential to deliver multiple co-benefits for human health, the environment and climate.

This article outlines the growing scientific evidence to support integrating the food system into a nation's climate and public policies. It explores the (limited) extent to which this has happened, globally and in New Zealand. Finally, it considers the necessary conditions for change and what policy options support this goal.

What is the problem?

The global food system is among the principal drivers of our current planetary crisis, responsible for up to 34% of all global anthropogenic greenhouse gas emissions (Crippa et al., 2021), as well as driving soil degradation, deforestation, biodiversity loss, nitrogen and phosphorous cycle disruption, diet-related public health issues and animal suffering (Willett et al., 2019). The need for food system change is urgent. The term 'global syndemic' has recently been coined to describe how the global food system is driving climate change, obesity and undernutrition (Swinburn et al., 2019). Studies now estimate that even if we stopped using fossil fuels entirely, current emissions from the global food system would make it 'impossible to limit warming to 1.5°C and difficult even to realise the 2°C target' (Clark et al., 2020).

The evidence for the food system's role in addressing these challenges and helping to live within planetary boundaries is now firmly established and has been growing over the last 15 years. It features in many sources, including those from international institutions (IPCC, 2018; UNEP, 2019; FAO, 2020; FAO, UNDP and UNEP, 2021; Ghebreyesus, 2023), national institutions (Committee on Climate Change, 2020; Willett et al., 2019; Chatham House, 2015, 2021), academics (Rockström et al., 2009; Lang, 2020) and civil society (WWF, 2022).

To the extent that climate policy has engaged with agriculture or food, it has largely been about changing the methods used to produce what we eat – production – rather than what we eat – consumption.

> A global transition to healthy and nutritionally adequate dietary patterns that focus on sustainable food choices could reduce premature mortality by as much as 22% and cut diet-related emissions by between 54% and 87% ...

State of the science – it's the cow not the how

A phrase used to describe the flaw in this approach is 'it's the cow not the how'. Recent scientific studies have assessed the greenhouse gas emissions of individual food products, and, broadly, show that the production of meat and dairy emits substantially higher emissions than plant-based proteins (Clune, Crossin and Verghese, 2017; Poore and Nemecek, 2018; Springmann et al., 2018; Hayek et al., 2020; Santo et al., 2020). There are biophysical reasons for this discrepancy, which cannot be significantly addressed by technology. These include: (1) feed to edible protein conversion ratios are greater for animals; (2) deforestation for agriculture is dominated (67%) by feed for animals (soy, maize and, in New Zealand, palm kernel expeller for dairy feed), resulting in release of carbon; (3) enteric fermentation is the digestive process from ruminant animals that releases methane, and chicken and pigs create emissions from manure that generates nitrous oxide, another potent greenhouse gas; (4) emissions from processing (especially slaughterhouse effluent) are greater than processing emissions from most other products; and (5) wastage is high for fresh animal products, which are prone to spoilage (Poore and Nemecek, 2018; Hayek et al., 2020).

Thus, mitigation policies that rely on trying to improve the production methods used to farm animals will necessarily have limited impact. Instead, multiple changes are needed: reducing the number of animals farmed, changing what food is produced and shifting consumption patterns.

It's only going to get worse – but there's a win-win solution

Globally, meat consumption is projected to grow due to population increase, greater economic prosperity and dietary shifts within some middle-income countries (FAO, 2020). As well as being emissions-intensive, the consumption of red and processed meat is also associated with increased risk of non-communicable diseases, including cardiovascular disease, type 2 diabetes and certain cancers (Godfray et al., 2018).

Because meat-free foods such as vegetables, fruits, legumes and wholegrains produce lower relative emissions (Willett et al., 2019), one way to reduce greenhouse gas emissions is to reduce demand for greenhouse gas-intensive foods by encouraging shifts to more sustainable diets (Harwatt et al., 2024). A global transition to healthy and nutritionally adequate dietary patterns that focus on sustainable food choices could reduce premature mortality by as much as 22% and cut diet-related emissions by between 54% and 87% (Springmann et al., 2018). In 2020, over 50 scientists called for a transformation of agriculture (Harwatt et al., 2020) and to reach 'peak meat' by 2030 to tackle the climate crisis.

Why has this solution not been grasped?

This win-win solution relies on an understanding that climate mitigation strategies should recognise the relationship between production and consumption: in other words, between supply and demand (UNEP, 2019). But more often food systems continue to be analysed in their siloed, component parts, than viewed as

a coherent whole (Chatham House, 2021, p.33). The United Nations Environment Programme contends that we need to 'acknowledge that consumption drives the shape and the design of production systems' (2019, p.13). Likewise, Chatham House argues that we should recognise that 'to change supply-side practices, we need to change demand-side markets and vice versa' (Chatham House, 2021, p.34). It follows, therefore, that reducing meat and dairy production and consumption in favour of plant-based foods should feature prominently in climate policy (Ruggeri et al., 2024). Given this potential to yield substantial greenhouse gas reductions, not to mention the co-benefits across these other domains, current policy incoherence represents a vast missed opportunity.

Significance for New Zealand

Arguably, New Zealand has developed a narrative of 'exceptionalism'. This holds that New Zealand, with its relatively small population and domestic demand, but with a prominent primary industry export sector, is an efficient and sustainable producer of quality food for various markets around the world. But does this narrative stand up to scrutiny? New Zealand's food sector is dominated by meat and dairy production – largely for export: 95% of total dairy production is exported (Agriculture and Horticulture Development Board, 2022). Although New Zealand's contribution to global greenhouse gas emissions is relatively low, 48% of our emissions come from agriculture, which is a much higher proportion than for other countries, even those with similar agricultural sectors, including Ireland at 37.8% (Environmental Protection Agency, 2023), Denmark at 28% (Neilsen et al., 2023) and the Netherlands at 16.7% (Statistics Netherlands, 2023).

Viewed through an economic lens, agricultural export revenue contributes $54.6 billion to the New Zealand economy, of which meat, dairy and wool contribute $35.6 billion (Ministry for Primary Industries, 2023). But these figures fail to capture the wider harms attributable to New Zealand's animal agriculture, the so-called 'externalities'. Significant costs arise from nitrate contamination of drinking water, nutrient pollution of lakes, soil compaction and erosion, and, of course, greenhouse gas emissions (Ministry for the Environment, 2023). Added to this, the food sector itself is vulnerable to climate shocks, as demonstrated by the extreme weather events of recent years.

A study from Otago University looking to explore this 'exceptionalism' demonstrates that, even allowing for contextual differences specific to New Zealand's food system, ... it is still the case that changes in consumption patterns would deliver positive impacts for emissions and public health ...

This all presents risks to the economy. A lack of transparency about New Zealand's food production and its relatively low level of regulation in the face of the 'clean and green' narrative poses a degree of reputational risk on the international stage. New Zealand's Climate Change Commission warns that some overseas markets in future might restrict access unless steps are taken to reduce emissions (Climate Change Commission, 2024a, p.114).

The holy grail of 'clean and green'

In developing policy, what matters is how problems are represented, defined or framed. It is important to explore what is included and what is left out of that representation (Bacchi, 2009, p.3). Policy around climate, agriculture and food is an example where some issues are very obviously left out. New Zealand's narrative of a 'clean and green' exporter of food to the rest of the world is deeply entrenched, a part of the nation's cultural identity (Sharp, Rayne and Lewis, 2024). New Zealand's farming industry bodies consistently describe production methods as sustainable and more efficient at growing food for export and domestic consumption than other countries' (Trebilcock, 2024). Global comparisons of the impact of animal agriculture are often met with the framing of: 'we are different' (Ministry for Primary Industries, 2022). And, the argument goes, changing consumption patterns domestically would not yield significant emissions reductions, given the volume of New Zealand's produce that is exported. But are we different? Two recent studies would challenge this representation.

A study from Otago University looking to explore this 'exceptionalism' demonstrates that, even allowing for contextual differences specific to New Zealand's food system (grazing, use of renewable energy, transport-related emissions from food imports), it is still the case that changes in consumption patterns would deliver positive impacts for emissions and public health (Drew et al., 2020). In the Otago study, a New Zealand-specific life cycle assessment database was developed by 'modifying cradle to point-of-sale reference emissions estimates according to the New Zealand context' (ibid., p.5). It found that, as elsewhere, New Zealand vegetables, fruits, legumes and wholegrains produced substantially less greenhouse gas emissions than animal-based foods (particularly red and processed meats). Diet change and reduction in food waste could confer national diet-related emissions savings of between 4% and 42%, the range reflecting the extent to which diets conform to the New Zealand dietary guidelines (p.1). Health gains and healthcare system cost savings could also be identified.

A 2023 Auckland University study supports these findings. It found that

household purchases of red and processed meat and dairy were responsible for 54% of dietary greenhouse gas emissions, concluding that 'encouraging New Zealanders to purchase foods with lower carbon footprints could feasibly help the country reach its emission reduction goals' (Kliejunas et al., 2023, pp.1, 7).

While there are important differences that apply to New Zealand, these do not appear to cause notable deviation from global trends. We are not so exceptional after all. Shifting demand away from emissions-intensive food would support greenhouse gas emissions reduction, as well as other environmental and health benefits. Again, it is a win-win.

Meat and dairy are significant contributors to several of our long-term challenges. Their negative externalities are not currently priced in. But these inconvenient truths are missing from the way the policy problem has been represented. Our reliance on animal agriculture has New Zealand frozen in what some have called a 'policy lock-in', whereby economic and social forces reinforce a 'no change' approach by hiding the very nature of the problem (Lang, 2020, p.197).

What about export demand?

But even if the New Zealand public changes its diet, what about export demand for New Zealand meat and dairy? Consumer and policy trends abroad would suggest that agricultural disruption lies ahead. As the Climate Change Commission points out, '[c]hanges in consumer preference could significantly affect the value of these exports' (Climate Change Commission, 2024a, p.114). This is happening and we need to be prepared.

A Bloomberg Intelligence report estimates that 7.7% of the global protein market will be plant-based food, with a potential value of over US$162 billion, by 2030 (Bloomberg, 2021). Bloomberg projections for alternative dairy products in the Asia-Pacific region are striking, predicting an estimated 57% majority share of the market by 2030. The story in Europe is similar. Retail sales data from Nielsen IQ covering 13 European countries analysed by Good Food Institute Europe shows that 'sales of plant-based foods grew by 6% in 2022 – and 21% from 2020 to 2022 – to reach €5.8 billion' (Good Food Institute, 2023).

The Global Alliance for the Future of Food report assessed 14 NDCs [Nationally Determined Contributions]. It found that they rarely included policies to reduce emissions through demand-side measures, and instead focused largely on changing food production methods.

Policy shifts are evident as well. A 2024 European Commission report, 'Strategic dialogue on the future of EU agriculture', found that Europeans consume more meat and dairy than scientists recommend, and have signalled that more needs to be done to promote plant-based foods. The report recommends the EU to introduce an 'Action Plan for Plant-Based Foods by 2026' (European Commission, 2024).

These examples demonstrate a shift in consumer preference and in government policy direction abroad. New Zealand should take heed. The European Commission strategic focus on diet change is particularly significant, considering the political context of farmers' protests and industry lobbying resisting environmental legislation. And yet the report still made recommendations targeting diet change towards plant-based foods.

Food system thinking

To what extent have climate policies, around the world and specifically in New Zealand, integrated food system thinking? Despite evidence supporting the inclusion of food system thinking in climate policies, two recent reports (WWF, 2022; Global Alliance for the Future of Food, 2022), as well as this author's own research (Feehan, 2021), demonstrate the failure of most countries to include food in their Nationally Determined Contributions.

The WWF report assessed 132 countries' NDCs. It showed that NDCs were not taking a holistic approach to food system transformation. The majority addressed emissions from agriculture by recommending improved farming methods and technological changes, not changing what was produced. Only two NDCs included policy measures and targets for a shift to sustainable and healthy diets and addressing food loss and waste (Botswana and Costa Rica). The Global Alliance for the Future of Food report assessed 14 NDCs. It found that they rarely included policies to reduce emissions through demand-side measures, and instead focused largely on changing food production methods.

This author's own findings were consistent with these analyses. I examined nine NDCs[1] to gain a deeper understanding of why countries were not including food in climate policy, using qualitative methods including interviews with policymakers and civil society actors, as well as analysis of the NDCs themselves. Of the nine, six NDCs made no reference to food, diet, consumption, meat or dairy as part of their climate mitigation strategies. None identified decreasing animal agriculture or increasing plant-based agriculture. Five mentioned health in the context of wellbeing and/or negative health impacts due to climate change, not in relation to the positive impact of dietary change. None mentioned funding for dietary change. Press releases accompanying the NDCs most frequently mentioned emissions reduction through technology, changes to agricultural production methods and economic growth.

These analyses of NDCs indicate that the role of agriculture in assisting climate policy is represented as technological innovations

and on-farm improvements. In other words, they see climate change being addressed through relatively modest adaptations to the current system, rather than a more fundamental rethinking of what we choose to produce and consume. It's a framing that says, somewhat nonsensically: animal agriculture itself is not the problem, but how we do it is a solution.

What about New Zealand?

New Zealand's first NDC was submitted to the United Nations Framework Convention on Climate Change (UNFCCC) in April 2020. In 2021, the newly established Climate Change Commission produced a report to advise the government on the next NDC, titled *Ināia Tonu Nei: a low emissions future for Aotearoa* (Climate Change Commission, 2021). The next NDC was then submitted to the UNFCCC in November 2021, covering the period 2021–30.

Ināia Tonu Nei, produced by the new statutory body designed to provide independent advice to government, was the key piece of research informing the 2021 NDC. The report does not adopt a food system approach. It does offer a section on 'options for alternative farming systems and practices', including diversifying land use from animal to arable. But, significantly, it then goes on to outline the multiple challenges facing diversification of land use, such as a 'lack of existing markets, supply chains, access to resources such as water, and a lack of experience, skills, labour, support, and infrastructure' (ibid., p.311). In its final recommendation on reducing 'emissions from agriculture', the focus is on technological approaches and improved farming methods (p.312). There is one recommendation on exploring low-emissions food production, but this is linked to international market opportunities, again seeing agriculture through the lens of trade and economy, not food or diet. There is no mention of changing consumption patterns when outlining the widespread changes that are required (p.17).

The resulting NDC submitted in November 2021 includes no ambition for reducing the number of animals farmed to meet emissions targets or changing consumption patterns. New Zealand's next NDC is due to be submitted by February 2025. The Climate Change Commission will base its advice to government on the modelling work used in the 2024 'Draft advice on the fourth emissions budget' (EB4), and in the 2024 *Review of the 2050 Emissions Target* discussion document (Climate Change Commission, 2024a, 2024b).[2]

> [Regarding the Climate Change Commission's draft advice on the fourth emission's budget] 'food' is used seven times ... referring specifically to food waste, processing, cost and services. The word 'diet' does not feature.

Are we closer to a more holistic view?

Encouragingly, both documents indicate that the Climate Change Commission will 'take a "systems view"' and consider 'how government policies, economy, industry, society and the environment are all connected' (Climate Change Commission, 2024a, p.16, 2024b, p.15). However, a closer reading reveals signs of familiar siloed thinking, failing to connect emissions reductions with both production and consumption, or supply with demand.

The EB4 document outlines opportunities for reducing and removing emissions in each sector. The Climate Change Commission has structured emissions budgets representing the total allowable net volume of greenhouse gas emissions across a five-year period (Climate Change Commission, 2024a, p.33). On agriculture, it advises that this can be met through a combination of actions improving agricultural productivity. However, these are production-focused mitigation strategies, essentially producing the same type and volume of food.

Agriculture is framed as an issue of growth and trade, not diet, food, consumption or health. Food consumption is not mentioned as a strategy to mitigate emissions. The word 'food' is used seven times in the document, referring specifically to food waste, processing, cost and services. The word 'diet' does not feature. By contrast, co-benefits and behaviour change do feature – just not related to food. The document takes a far more systemic view of the transport and energy sectors, going further in encouraging behaviour change and seeing possible co-benefits. It's not clear why the same systems thinking is not applied to food or agriculture.

A similar framing of agriculture is found in the *Review of the 2050 Emissions Target* document: a focus on changing production methods only. Behaviour change is mentioned once. Food is mentioned twice, in relation to basic needs and New Zealand as a food exporter. Diet is not mentioned, and health benefits are discussed in the context of changes in climate patterns, not food.

Discussion: problem representation

As discussed, there appear to be two 'problem representations' about reducing emissions from animal agriculture. The first is as a 'production' problem, which largely sees the current model of New Zealand agriculture as fundamentally sound or unchangeable, and which offers only minor or modest adaptations to existing practices, that can only ever have a limited role in reducing emissions or other harms. The second represents the problem as one of production and consumption, and sees the opportunities of more radical change in helping New Zealand achieve significant emissions reductions, as well as delivering benefits across a wide range of other domains.

Like the other countries explored in the analyses above, New Zealand's climate policy, as evidenced in its early NDCs and supporting advice from the Climate Change Commission, sits very much in the first category. It sees emissions from the food system as a 'production problem'. It envisages supply-side interventions to reduce emissions, including technological solutions

or on-farm improvements, but has so far fallen short of capturing consumption, or individuals' food choices. It assumes that New Zealand's food system will stay the same, but just done slightly differently.

This is indicative of a siloed view of the food system. My own research revealed that the EAT-*Lancet* report (Willett et al., 2019), which provided scientific targets for healthy diets and sustainable food systems, was included as evidence to inform New Zealand climate policy, but with apparently little influence over its broad direction or formal policy documents.

What's the alternative?

The alternative would be to recognise the need for supply-side and demand-side changes within the food system. This representation acknowledges that there are limits to mitigation strategies that only cover production methods, due to the biophysical constraints inherent in current meat and dairy farming (Bordisky et al., 2018; Garnet, 2013; Springmann et al., 2018). By contrast, it sees demand-side interventions as necessary, and that 'dietary change can deliver environmental benefits on a scale not achievable by producers' (Poore and Nemecek, 2018, p.991). A focus on food production alone does not allow for, or represent, food system thinking. The current state should be replaced with a food system approach, 'recognising that all the elements of the food system interconnect' (Hawkes and Parsons, 2019, p.6).

An opportunity

With the submission of the second NDC due by February 2025, New Zealand has an opportunity to follow through on transformative change to the food system. The current position is short-sighted and incoherent: short-sighted, as it fails to grasp the opportunity for greater and quicker emissions reductions, at a time of urgent planetary crisis, let alone the wider benefits to accrue in respect of human health, improved biodiversity and beyond; and incoherent, in the sense that climate policy seems open to behaviour change and shifts in consumption patterns in its treatment of some sectors (energy and transport), but not others (individuals' food choices).

[T]wo policy levers can achieve this goal: integration of food production and consumption into NDCs, and the development and implementation of a national food strategy.

As my own research has shown, the limited inclusion of measures that facilitate and accelerate dietary changes likely reflects the challenges around encouraging people to change something as personal as what they eat. Changing diets is seen as politically sensitive. Politicians are understandably wary of being seen to dictate choices. Alongside this, New Zealand, like other countries, is moulded by powerful vested interests in the agriculture sector. And, perhaps more than for other comparable countries, what New Zealand grows and eats, and its 'clean and green' image, are incredibly strong components of the nation's history, culture and identity.

But while these challenges are real, they need not be insurmountable, and other countries show what might be possible. France and Germany have strong agricultural lobbies associated with the livestock sector, but their climate policies include measures to promote the consumption of sustainable and healthy foods (Global Alliance for the Future of Food, 2022, p.33). Denmark has developed an 'action plan for plant-based foods' and declared that 'plant-based food is the future' (Ministry of Food, Agriculture and Fisheries, 2024).

Indeed, there are signs of a growing social licence for change in New Zealand. A biennial report on public perceptions of New Zealand's environment (Hughes, Kerr and Cullen, 2019) indicated that greenhouse gas emissions and climate change are the most common global concerns among citizens. Many New Zealanders increasingly recognise that food production has significant deleterious environmental implications locally and globally (Sharp, Rayne and Lewis, 2024).

How to make change happen

How do policymakers meaningfully integrate food system thinking in New Zealand and beyond? As mentioned at the beginning of this article, two policy levers can achieve this goal: integration of food production and consumption into NDCs, and the development and implementation of a national food strategy.

Nationally Determined Contributions

UNFCCC guidelines are a useful start for successfully integrating food into NDCs. Changing what we produce and consume is included under section 3 of the NDC format in the 'planning processes, preparation and implementation section' (see the United Kingdom's 2021 NDC (UK Government, 2020)). Section 3 provides an opportunity for countries to outline any proposed changes in food production and consumption to drive emissions reductions.

There are also tools to integrate a food system approach into NDCs. A report from the Global Alliance for the Future of Food (2022) developed a framework to do this. It assists policymakers to identify opportunities and entry points for food systems at key stages of NDC cycles. The 'Food Forward NDCs' framework created by Climate Focus and WWF (Climate Focus and WWF, 2020) presents policymakers with evidence-based measures, using a food system lens to meet their NDC commitments. Both tools could usefully be adopted by New Zealand policymakers.

National food strategy

Another policy lever is a national food strategy. Eat New Zealand (2024), the New Zealand Cancer Society (Peniamia

et al., 2024) and the report from the nutrition research community in the Healthy Food Environment Policy Index (see Mackay et al., 2023) have all called for the development of a community-led, government-facilitated national food strategy. This would set out a plan for independent oversight of our whole food system, ensuring food security and sovereignty and the welfare of citizens (including access to quality, nutritious food for all), the environment and animals, while also delivering on global commitments.

The problem needs to be reframed

But first and foremost, how the problem of animal agriculture and its impact on climate change is represented by policymakers needs to change. It needs to be reframed. Policies so far have looked to tweak the current production system. There has been no serious discussion about the fundamental problem: over-reliance on animal agriculture. By contrast, adopting a systemic approach to the problem of climate change and food offers solutions. Policymakers could explore how New Zealand could diversify the economy towards low-emissions industries that are proven to be environmentally sustainable, produce value-added products (not at the mercy of volatile commodity markets), and that respond to growing consumer trends nationally and globally. Agricultural policy could support farming communities to transition away from intensive meat and dairy to lower-emissions primary commodities. Transitioning from intensified meat and dairy would also encourage a shift from volume-based production towards high value-added commodities. New Zealand did this successfully when we entered the wine industry at the higher end of the value chain over 30 years ago.

Policy implications

If the Paris Agreement targets are to be met and net zero achieved by 2050, we will need a more coherent recognition of the interdependencies between food production and consumption. Further action is required by government ministries, academics and civil society.

> The future of our economy, the livelihoods of farmers and the health and wellbeing of our people and animals should not suffer due to a siloed view of the system.

- Integrating a food system approach requires government departments to work together to ensure policy coherence across agriculture, trade, environment, foreign policy, health and education. Changes will be needed across the political and economic system; an 'all government' approach should be adopted. The development of a national food strategy could be a first step. Within the strategy, there are a number of policy options to change consumption patterns, including: dietary guidelines that reflect scientific evidence and government targets; reducing demand for meat and dairy through public procurement choices within public services; labelling meat and dairy to reflect environmental impact; and public education campaigns to build understanding about the links between meat and dairy and climate change.
- The Ministry for the Environment should integrate a food system approach within the ambition of the next NDC, including changing what food is produced, reducing the number of animals farmed, behaviour change specifically relating to food consumption, and reduced meat, dairy and food waste metrics.
- The Ministry for Primary Industries should explore alternative export revenue opportunities, how to support farmers during this transition, and economic opportunities afforded by plant-based industries. Studies have explored alternative land use and production pathways (Sutton et al., 2018), but more are needed to understand the risks and opportunities. The global movement for a 'just rural transition' for farming communities is growing (Just Rural Transition, 2023). More work needs to be done to explore how a rural transition could be fair, inclusive and of benefit to all New Zealand farmers.
- Civil society is largely absent from the debate about food and climate change. Its contribution would help shift the national conversation and drive social licence for change.
- Finally – and perhaps most importantly – the government must have the courage to talk explicitly about what people eat. There is a self-serving alliance of interests preventing an open discussion of the role of food in mitigating climate change. The government seems wary of appearing to infringe on peoples' rights regarding food preferences and of challenging the farming sector. But, without strong messaging from government, individuals feel less accountable for climate change in their own choices and, crucially, they lack access to reliable information about the impacts of them. A lack of information and accountability denies individuals agency and represents an own goal in the fight against planetary destruction. If government reframes the issue and conveys the climate, environmental and public health benefits that can directly result from dietary change, it will drive consensus to support future interventions. Consumers may be initially wary, but with greater awareness of the impact of current consumption, and the benefits of a shift, they are more likely to accept policies that might otherwise be seen as limiting their personal choices. This has been the case for a range of other issues, such as congestion charges, smoking bans and taxes on sugary drinks (Peniamina et al., 2024). Changing diets may be a challenge, but is not an

insurmountable one, and need not be any more difficult than shifting other behaviours in order to address the climate emergency. Government must lead this: as Chatham House argues, the state is the only actor with the 'financial and human resources to implement policy levers to make the changes required' (Chatham House, 2015, p.20).

In sum, the policy response to climate change needs to take a systemic view and include the food system. The future of our economy, the livelihoods of farmers and the health and wellbeing of our people and animals should not suffer due to a siloed view of the system. We need a broader national conversation about the relationships between agriculture, food, trade and animals, that includes all aspects of the system: production and consumption. There is no 'silver bullet'; we need an 'all of the above' approach. Our future depends upon it.

1 Australia, Brazil, EU, Japan, Mexico, New Zealand, Russia, USA and UK.

2 The New Zealand Climate Change Commission report is due on 31 October 2024. At the time of writing it has not been delivered and NDC2 has not been submitted. This article therefore focuses on the EB4 and 2050 target documents, as they represent the best available evidence informing the likely content of the new NDC.

Acknowledgements

The author would like to thank Alex Brocklehurst, Briege Feehan, Leo Mercer and the two reviewers for their insightful and helpful feedback, as well as Jonathan Boston for his support and guidance.

References

Agriculture and Horticulture Development Board (2022) 'New Zealand trade and production', https://ahdb.org.uk/trade-and-policy/news/new-zealand-trade-and-production

Aotearoa Circle (2022) 'Mana Kai framework', https://www.theaotearoacircle.nz/reports-resources/mana-kai-framework

Bacchi, C. (2009) *Analysing Policy: what's the problem represented to be?*, New South Wales: Pearson

Bloomberg (2021) 'Plant based food market to hit $162 billion in next decade', https://www.bloomberg.com/company/press/plant-based-foods-market-to-hit-162-billion-in-next-decade-projects-bloomberg-intelligence

Bordisky, B., P. Dietrich, E. Martinelli, A. Stenstad, P. Pradham and S. Gabrysch (2020) 'The ongoing nutrition transition thwarts long-term targets for food security, public health and environmental protection', *Nature Research*, 10, pp.1–14

Chatham House (2015) *Changing Climate, Changing Diets: pathways to lower meat consumption*, London: Royal Institute of International Affairs

Chatham House (2021) *Food System Impact on Biodiversity Loss*, London: Royal Institute of International Affairs

Clark, M., N. Domingo, K. Colgan, S. Thakrar, D. Tilman, J. Lynch, I. Azevedo and J. Hill (2020) 'Global food system emissions could preclude achieving the 1.5˚ and 2˚C climate change targets', *Science*, 370, pp.705–8

Climate Change Commission (2021) *Ināia Tonu Nei: a low emissions future for Aotearoa*, https://www.climatecommission.govt.nz/public/Inaia-tonu-nei-a-low-emissions-future-for-Aotearoa/Inaia-tonu-nei-a-low-emissions-future-for-Aotearoa.pdf

Climate Change Commission (2024a) 'Draft advice on Aotearoa New Zealand's fourth emissions budget', https://www.climatecommission.govt.nz/our-work/advice-to-government-topic/preparing-advice-on-emissions-budgets

Climate Change Commission (2024b) *Review of the 2050 Emissions Reductions Target*, discussion document, https://www.climatecommission.govt.nz/our-work/advice-to-government-topic/review-of-the-2050-emissions-target

Climate Focus and WWF (2020) *Food Forward NDCs*, https://foodforwardndcs.panda.org

Clune, S., E. Crossin and K. Verghese (2017) 'Systematic review of greenhouse gas emissions for different fresh food categories', *Journal of Cleaner Production*, 140, pp.766–83

Committee on Climate Change (2020) *Land Use: policies for a net zero UK*, https://www.theccc.org.uk/wp-content/uploads/2020/01/Land-use-Policies-for-a-Net-Zero-UK.pdf

Crippa, M., E. Solazzo, D. Guizzardi, F. Monforti-Ferrario, F. Tubieloo and A. Leip (2021) 'Food systems are responsible for a third of global anthropogenic GHG emissions', *Nature Food*, 2, pp.198–209

Drew, D., C. Cleghorn, A. Macmillan and A. Mizdrak (2020) 'Healthy and climate friendly eating patterns in the New Zealand context', *Environmental Health Perspectives*, 128 (1)

Eat New Zealand (2023) *National Food Strategy Update–February 2024*, https://www.eatnewzealand.nz/food-stories/national-food-strategy-update-feb-2024

Environmental Protection Agency (2023) 'Greenhouse gas emissions: agriculture', https://www.epa.ie/our-services/monitoring--assessment/climate-change/ghg/agriculture

European Commission (2024) 'Strategic dialogue on the future of EU agriculture', https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/agriculture-and-green-deal/strategic-dialogue-future-eu-agriculture_en

FAO (2020) *The State of Food Security and Nutrition in the World*, Rome: Food and Agriculture Organisation

FAO, UNDP and UNEP (2021) A Multi-Billion-Dollar Opportunity: repurposing agricultural support to transform food systems, Rome: Food and Agriculture Organisation

Feehan, P. (2021) 'Meat, dairy, climate change: an exploration of the logic behind Nationally Determined Contributions and pathways for change', MSc dissertation, Centre for Food Policy, City University, London

Garnett, T. (2013) 'Food sustainability: problems, perspectives and solutions', *Proceedings of the Nutrition Society*, 72, pp.29–39

Ghebreyesus, T. (2023) 'Our food systems are harming the health of people and planet', address to UN Climate Summit, https://www.youtube.com/watch?v=kHXJ5O5EDI

Global Alliance for the Future of Food (2022) *Untapped Opportunities for Climate Action: an assessment of food systems in Nationally Determined Contributions*, Global Alliance for the Future of Food

Godfray, C., P. Aveyard, T. Garnett, J. Hall, T. Key, J. Lorimer, R. Pierrehumbert, P. Scarborough, M. Springmann and S. Jebb (2018) 'Meat consumption, health and the environment', *Science*, 261, pp.1–8

Good Food Institute (2023) 'Market insights on European plants based sales 2020–2022', https://gfieurope.org/market-insights-on-european-plant-based-sales-2020-2022

Harwatt, H., M. Hayek, P. Behrens and W. Ripple (2024) *Options for a Paris-Compliant Livestock Sector*, Animal Law and Policy Programme, Harvard Law School

Harwatt, H., W. Ripple, A. Chaudhary, M. Betts and M. Hayek (2020) 'Scientists call for renewed Paris pledges to transform agriculture', *Lancet*, 4

Hawkes, C. and K. Parsons (2019) Brief 1. *Tackling Food System Challenges: the role of food policy*, London: Centre for Food Policy

Hayek, M., H. Harwatt, W. Ripple and N. Mueller (2020) 'The carbon opportunity cost of animal-sourced food production on land', *Nature Sustainability*, 4, pp.21–4

Hughes, K.F.D., G.N. Kerr and R. Cullen (2019) *Public Perceptions of New Zealand's Environment: 2019*, Lincoln: Lincoln University

IPCC (2018) *Summary for Policymakers: global warming of 1.5C: special report*, Geneva: Intergovernmental Panel on Climate Change

Just Rural Transition (2023) *Principles for Just Food System Transitions*, https://justruraltransition.org/wpcontent/uploads/sites/12/2023/04/JRT_Principles_Report_170423.pdf

Kliejunas, E., A. Cavadino, B. Kidd, C. Cleghorn, J. Drew, C. Ni Mhurchu and D. Bradbury (2023) 'Quantifying the greenhouse gas emissions of New Zealand household's food purchases: an analysis by demographic variables', *Journal of Cleaner Production*, 430

Lang, T. (2020) *Feeding Britain*, London: Pelican

Mackay, S., H. Percival, L. Morenga and B. Swinburn (2023) *Benchmarking Food Environments 2023: progress by the New Zealand government on implementing recommended food environment policies and priority recommendations*, Auckland: University of Auckland

Ministry for Primary Industries (2022) *The Future of Aotearoa New Zealand's Food Sector*, Wellington: Ministry for Primary Industries, https://www.mpi.govt.nz/dmsdocument/55306-The-future-of-Aotearoa-New-Zealands-food-sector-Exploring-demand-opportunities-in-the-year

Ministry for the Environment (2019) *Environment Aotearoa 2019*, Wellington: Ministry for the Environment, https://environment.govt.nz/assets/Publications/Files/environment-aotearoa-2019.pdf

Ministry for the Environment (2023) *Agriculture Emissions and Climate Change*, Wellington: Ministry for the Environment, https://environment.govt.nz/facts-and-science/climate-change/agriculture-emissions-climate-change

Ministry for Primary Industries (2023) *Situation and Outlook for Primary* Industries, Wellington: Ministry for Primary Industries, https://www.mpi.govt.nz/dmsdocument/62637-Situation-and-Outlook-for-Primary-Industries-SOPI-June-2024

Ministry of Food, Agriculture and Fisheries (2024) *Danish Action Plan for Plant-Based Foods*, https://en.fvm.dk/news-and-contact/focus-on/action-plan-on-plant-based-foods

Nielsen, O., M. Plejdrup, M. Winther, M. Nielsen et al. (2023) *Denmark's National Inventory Report 2023: emission inventories 1990–2021*, scientific report 541, Danish Centre for Environment and Energy, Aarhus University

Peniamina, R., B. McNoe, J. Kerr, C. Cleghorn and L. Signal (2024) 'Strong public support for healthy food policies in Aotearoa', https://www.phcc.org.nz/briefing/strong-public-support-healthy-food-policies-aotearoa

Poore, J. and T. Nemecek (2018) 'Reducing food's environmental impacts through producers and consumers', *Science*, 360, pp.987–92

Rockström, J., W. Steffen, K. Noone, Å. Persson, F.S. Chapin, E.F. Lambin, T.M. Lenton, M. Scheffer, C. Folke, H.J. Schellnhuber and B. Nykvist (2009) 'A safe operating space for humanity', *Nature*, 461 (7263), pp.472–5

Ruggeri, C., H. Lotze-Campen, F. DeClerck, B.L. Bordisky, Q. Collignon, M. Crawford et al. (2024) 'The economics of the food system transformation', global policy report, Food System Economics Commission

Santo, R., B. Kim, S. Goldman, J. Dutkiewicz, E. Biehl et al. (2020) 'Considering plant-based meat substitutes and cell-based meats: a public health and food systems perspective', *Sustainable Food Systems*, 4 (134), doi:10.3389/fsufs.2020.00134

Sharp, E.L., A. Rayne and N. Lewis (2024) 'The "good Kiwi" and the "good environmental citizens": dairy, national identity and complex consumption-related values in Aotearoa New Zealand', *Agriculture and Human Values*

Springmann, M., M. Clark, D. Mason-D'Croz, K. Wiebe, B.L. Bordisky and L. Lassaletta (2018) 'Options for keeping the food system within environmental limits', *Nature*, 562 (7728), pp.519–25

Springmann, M., Wiebe, K., Mason-D'Croz M., Sulser, T et al. (2018) 'Health and nutritional aspects of sustainable diet strategies and their association with environmental impacts: a global modelling analysis with country-level detail', *The Lancet Planetary Health*, Vol 2, Issue 10, pp. 451-461.

Statistics Netherlands (2023) 'GHG emissions 6 percent lower in 2023', https://www.cbs.nl/en-gb/news/2024/11/greenhouse-gas-emissions-6-percent-lower-in-2023

Sutton, K., N. Larsen, G-J. Moggre, L. Huffman, B. Clothier, R. Bourne and J. Eason (2018) *Opportunities in Plant-Based Protein*, Wellington: Plant and Food Research for the Ministry for Primary Industries

Swinburn, B. et al. (2019) 'The global syndemic of obesity, undernutrition, and climate change', *Lancet*, 393 (10173), pp.791–846

Trebilcock, K. (2024) 'The price of milk', *North and South*, March

United Kingdom Government (2020) 'United Nations of Great Britain and Northern Ireland's Nationally Determined Contribution', https://unfccc.int/sites/default/files/NDC/2022-09/UK%20NDC%20ICTU%202022.pdf

UNEP (2019) *Collaborative Framework for Food Systems Transformation: a multi-stakeholder pathway for sustainable food systems*, Nairobi: United Nations Environment Programme

WWF (2022) *Unlocking and Scaling Climate Solutions in Food Systems: an assessment of Nationally Determined Contributions*, WWF Germany and WWF Food Practice

Willett, W., J. Rockström, B. Loken, M. Springmann, T. Lang, S. Vermeulen et al. (2019) 'Food in the anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems', *Lancet*, 393 (10170), pp.447–2

Emily Carr, Shelley Stevens,
Thomas Kay and Mike Joy

Too Many Cows?

An exploration of relationships between livestock density and river water quality in Aotearoa New Zealand

Abstract

Intensive cattle farming is a major driver of freshwater pollution in Aotearoa New Zealand, yet research on the link between cattle intensity and river water quality is limited. This exploratory study investigated relationships between livestock intensity and freshwater indicators – nitrates and macroinvertebrates. We found that higher dairy stocking rates and total cattle numbers are linked to increased nitrate pollution at regional and district levels, with no significant correlations for beef cattle or MCI (macroinvertebrate community index) scores. Our findings underscore an urgent need for further research, particularly at the catchment level, to inform farm management plans and freshwater policy.

Keywords livestock density, river quality, nitrates, macroinvertebrates, input controls

Emily Carr has a BSc in environmental science and is currently undertaking her MSc in environmental science at the School of Geography, Environment and Earth Sciences, Te Herenga Waka Victoria University of Wellington. **Shelley Stevens** is a teaching and research fellow at the School of Geography, Environment and Earth Sciences, Te Herenga Waka Victoria University of Wellington. **Thomas Kay** has a BSc in environmental science and an MSc in ecology from Massey University in Palmerston North. He is the freshwater advocate at Forest & Bird. **Mike Joy** is the Morgan Foundation senior research fellow in freshwater ecology and environmental science at the School of Geography, Environment and Earth Sciences, Te Herenga Waka Victoria University of Wellington.

Over the last 30 years, the health of freshwater environments in Aotearoa New Zealand has significantly declined (Canning and Death, 2021; Julian et al., 2017). The primary contributor to this decline has been the expansion of the agriculture industry, with the cattle population nationwide increasing from 3.4 to 6.3 million since 1990 (Ministry for the Environment and Statistics New Zealand, 2020; Pangborn and Woodford, 2011; Statistics New Zealand, 2021b). Consequently, ecosystem health has been substantially impacted, with over 85% of rivers in pasture catchments degraded by excess nutrients and pathogens (Joy and Canning, 2021; Joy et al., 2022; Statistics New Zealand, 2022). Public pressure to address freshwater pollution has been high, with surveys indicating that for a period of time it was among the top concerns of New Zealanders (Booth et al., 2022; Ministry for the Environment, 2018; Statistics New Zealand, 2019). Additionally, over 80% of New Zealanders wanted the government to do more to prevent freshwater pollution (Cosgrove, 2019).

Table 1: Factors impacting freshwater quality

Factor	Example
Contamination from livestock	Excess nutrients and pathogens from cattle waste (e.g., nitrate leached from soils supplied by urine. Phosphate bound to soils and pathogens enter rivers via surface runoff from excrement).
Contamination from sedimentation	Removal of riparian vegetation, direct stock access to water, and erosive processes in upper catchments.
Contamination from other sources	Industrial discharges and septic tanks.
Fertiliser application	Increased application supports higher livestock intensity, leading to more nitrate leaching and phosphate runoff from cattle waste.
Soil characteristics	Greater nitrate losses in light free draining soils versus heavier textured and poorly drained soils.
Lag times	Lag times vary and may be more than 50 years depending on lithology, location, elevation, and groundwater flows.
Topology and catchment hydrology	Animals spend more time on flatter land so the proportion of urine deposited on low slopes is greater than on sloping landscapes. Sloping landscapes tend to have higher rates of sediment runoff.
Plant life	Amount, type, and arrangement of plant life in catchment and along waterway.
Climate	Temperature and rainfall (amount and intensity) can lead to variations in the flow and leaching rates, alongside the occurrence of eutrophication.

At present, the agriculture industry does not shoulder the environmental costs of its activities. For instance, assuming a cost of $400 to prevent one kilogram of nitrate from entering a waterway, and with 200 million kilograms of nitrate leached from agriculture into lakes, rivers and groundwater in 2017, the annual negative externalities related to freshwater are estimated at $79 billion (Foote, Joy and Death, 2015; Joy, Marriott and Chapple, 2022a). The environment bears the primary costs, but the wider public faces economic burdens from environmental remediation and the loss of ecological and cultural values, all of which will have a heavy impact on future generations.

In response to public concerns, different policy mechanisms have been considered to tackle freshwater pollution. To date, policy has largely focused on output controls which regulate the amount of pollution a system produces, such as through limits on nitrogen and phosphorus loading or point source discharges. This has been the primary mechanism of pollution management under the Resource Management Act 1991 (RMA), which focuses heavily on managing the effects of activities rather than the activities themselves (Environment Foundation, 2018). However, other policy mechanisms are available, including input controls (regulating what enters the system, such as the amount of fertiliser used) and land use controls (controlling what activities can happen where). Currently, the National Policy Statement for Freshwater Management 2020 (NPS-FM), guided by the Māori concept of 'te mana o te wai' to ensure that the health and wellbeing of water is put first, directs freshwater management by regional councils. Within the NPS-FM, input and land use controls are referred to as 'limits on resource use' (Ministry for the Environment, 2024, p.19). These controls are two types of limits that could be used to manage activities under the NPS-FM framework.

One mechanism for implementing an input control is a limit on stocking rates. Previous guidance from the Ministry for the Environment suggested that introducing a stocking rate limit may be appropriate across a catchment or on specific soil types at certain times of the year (Ministry for the Environment, 2023). In line with this guidance, Otago Regional Council proposed a 2.5 cow/ha stocking rate limit in the Manuherekia rohe (area) in its draft land and water regional plan (Otago Regional Council, n.d.), while Greater Wellington Regional Council proposed 12 stocking units (~1.4–3.4 cows, depending on the type) per hectare for small farms (4–20 ha) in planned changes to its natural resources plan (Greater Wellington – Te Pane Matua Taiao, 2023). Activities above these thresholds would require either a resource consent (Otago Regional Council, n.d.) or certain standards to be met to operate as a permitted activity (Greater Wellington – Te Pane Matua Taiao, 2023). It is unclear how each council decided on these stocking rate limits, as the calculations and explanations are not provided in public documents or on council websites.

The NPS-FM requires councils to use the 'best information available' when setting limits for output, input or land use controls (Ministry for the Environment, 2023, p.29). Ministry guidance states that 'the first time limits … are set, they may be based on very general estimates and assumptions that methods will be a move in the right direction toward [targets]', and 'when more information becomes available from monitoring, councils can adjust their limits' (ibid., p.84). In the context of setting limits on stocking rates, councils would ideally use data on (past and existing) stocking rates across their regions, districts and catchments (or even sub-catchments). They would then assess these stocking rates against water quality indicators across the same periods, preferably incorporating other factors that influence freshwater outcomes, such as fertiliser application, lag times for nutrient leaching, and slope variation (see Table 1). However, significant data limitations exist in some of these areas (discussed in the methods section below), and there has been limited research on the associations between these factors and outcomes. This makes setting such limits under the NPS-FM direction challenging.

Our research aims to provide an initial exploration of relationships between cattle density and two freshwater indicators for rivers – nitrates and macroinvertebrates – at regional and district scales. We recognise that research into the complex interactions of factors other than livestock density is also limited. While this article does not cover all factors affecting freshwater quality

and their interactions, our analysis is an important first step in understanding the relationships between cattle intensity and freshwater quality. It also highlights several limitations, including data availability, that must be addressed for future research and effective policy development in this area.

Methods

Spearman's correlation coefficient was used to examine the strength and direction of relationships between cattle intensity and two water quality indicators: nitrates and the macroinvertebrate community index (MCI). This method was chosen because it is suitable for small, non-normally distributed samples, and does not rely on the assumptions of a parametric test (Field, 2017). All statistical analyses were conducted in IBM SPSS Statistics for Mac, version 29.

The country's 16 regions and all 61 districts (where possible) were included in the analysis. For the regional analysis, the Chatham Islands were excluded due to the lack of data for cattle intensity and freshwater indicators. Additionally, the Nelson and Tasman regions were combined because Nelson is relatively small (422km^2) and the two regions are commonly combined for other purposes, such as emergency management and tourism.

While a finer-scale analysis was desirable, it was not possible due to data limitations. Despite multiple Official Information Act (OIA) requests sent to various agencies, access to catchment-level and farm-level cattle density datasets could not be obtained. Requests were also made for nitrogen fertiliser use on dairy farms, as reported under the national environmental standards for freshwater, as well as for farm intensity data across catchments from farm plans held by Environment Canterbury. These OIA requests were declined due to fragmented datasets, lack of data recorded by councils, and the refusal to provide data on the grounds that it would need to be 'created' (Williams, 2023; M. Prickett, personal communication).[1]

Data sources

Cattle stocking rates at the regional level were calculated using farm livestock and land use data from the agricultural production survey conducted by Statistics New Zealand and the Ministry for Primary Industries (Statistics New Zealand, 2021a, 2021b). The latest census of all farms was used (52,300 farms in 2017). Cattle stocking rates were separately calculated for dairy cattle and beef cattle, as well as for dairy and beef cattle combined. Stocking rates were calculated by dividing the total number of cattle by the total land area under that land use – for example:

$$\frac{1{,}308{,}058 \textit{ dairy cattle}}{359{,}081 \textit{ hectares of land used for dairy farming}} = 3.6$$

As Statistics New Zealand does not hold livestock data at the district level, data for cattle stocking rates from the *New Zealand Dairy Statistics 2020–21* report was used (DairyNZ and Livestock Improvement Corporation Limited, 2021). This limited the district level analysis to dairy cows only.

Nitrates were chosen as an indicator of freshwater pollution, as elevated nitrate levels promote rapid algal growth, leading to eutrophication (Canning and Death, 2021; Joy et al., 2022; Snelder et al., 2020). Two nitrate indicators were included: nitrate-nitrogen (NO_3-N) and total nitrogen (TN). NO_3-N represents the proportion of nitrogen in the form of the nitrate ion, which typically enters rivers through leaching, primarily from cattle urine (Land, Air, Water Aotearoa, 2023a). In contrast, TN includes the sum of NO_3-N, nitrite nitrogen, ammoniacal nitrogen and organic nitrogen (Ausseil et al., 2024). Although TN and NO_3-N are different forms of nitrogen, the values are similar in most rivers in the absence of point source discharges. When ammoniacal nitrogen is present, it is usually from point source discharges since it is highly immobile in soils (Land, Air, Water Aotearoa, 2023a); then measurement of TN and NO_3-N can differ.

While the National Policy Statement for Freshwater Management gives councils the flexibility to choose which form of nitrogen they wish to manage, Table 6 (Appendix 2A) of the statement specifies the measurement of NO_3-N. However, data for NO_3-N is not available through the LAWA (Land, Air, Water Aotearoa) database for all regions and districts (and thus individualised data requests to specific councils would have been required). TN data, on the other hand, was accessible for all regions and districts. Therefore, both NO_3-N and TN data was included in this analysis. As LAWA river water quality datasets do not include district assignments for sites, they were manually assigned using Local Government New Zealand maps.

OIA requests were declined due to fragmented datasets, lack of data recorded by councils, and the refusal to provide data on the grounds that it would need to be 'created'

For both NO_3-N and TN, median values and the percentage of samples over 1 mg/L were calculated for the period 2017–21. A 1 mg/L threshold was used to align with the dissolved inorganic nitrogen (DIN) limit recommended by the Science Technical Advisory Group (Science Technical Advisory Group, 2019; 2020). While DIN, NO_3-N and TN are all different measures, a maximum limit of 1 mg/L is generally accepted as an optimal limit for ecosystem and human health (Australian and New Zealand Governments, 2000; Death, 2020; Joy and Canning, 2021; Richards et al., 2022; Science Technical Advisory Group, 2020; Schullehner et al., 2018). This is because, at levels above 1 mg/L, waterway health declines, and eutrophication (algal bloom) sets in if other factors also favour eutrophication (Koolen-Bourke and Peart, 2022; Science

Table 2: Degree of correlation

Weak -	Very weak -	Very weak +	Weak +	Moderate +	Strong +
-0.20 to -0.39	-0.19 to -0.01	0.00 to 0.19	0.20 to 0.39	0.40 to 0.59	0.60 to 0.79

Table 3: Correlations between different measures of cattle intensity and nitrates (NO3-N and TN)

	Median NO3-N	% NO3-N samples >1 mg/L	Median TN	% TN samples >1 mg/L
Dairy SR	0.553*	0.665*	0.536*	0.750**
Beef SR	0.127	0.126	0.464	0.354
Dairy & Beef SR	0.696**	0.753**	0.642**	0.789**
Total cattle head (dairy and beef)	0.360	0.379	0.586*	0.682**

* = correlation significant at 0.05 ** correlation significant at 0.01
SR = stocking rate, NO3-N = nitrate nitrogen, TN = total nitrogen

Table 4: Correlations between MCI and different measures of cattle intensity

	% MCI samples < 90
Dairy SR	-0.121
Beef SR	-0.232
Dairy & Beef SR	-0.232
Total head cattle (dairy & beef)	0.032

MCI = macroinvertebrate community index.

Technical Advisory Group, 2020). Furthermore, levels above 1 mg/L in drinking water have been associated with an increased risk of colorectal cancer (Schullehner et al., 2018). This threshold is higher than the 0.44 mg/L trigger level of NO_3-N recommended by the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC and ARMCANZ, 2000; ANZECC, 2018), but lower than the national bottom line of 2.4 mg/L of NO_3-N set in the NPS-FM. The NPS-FM limit was not used in this study, as it has been heavily criticised by freshwater scientists for being irrelevant and inappropriate outside laboratory conditions. This is because it is the level at which nitrate would directly kill fish if they had not already died from lack of oxygen (Death et al., as cited in Science Media Centre, 2013; Joy and Canning, 2021).

For the regional-level analysis, we also examined relationships between stock intensity and the MCI. The MCI was chosen as another indicator of ecosystem health because macroinvertebrates are relatively sedentary and long-lived, and respond to multiple stressors or changes in their habitat (Clapcott et al., 2017). We used the percentage of MCI samples with scores lower than 90, as scores below this are indicative of severe organic pollution or nutrient enrichment. It is important to note that there are limitations to using the MCI in these sorts of analyses, as there is no standardised sampling regime and different councils use different methodologies, and therefore the quality of data can vary (Canning and Death, 2023). The data for this analysis was accessed through the LAWA database (Land, Air, Water Aotearoa, 2023b, 2023c, 2023d, 2023e: see 'Supplementary files 1 – datasets used').

Results

Regional-level relationships

Correlations were examined for stocking rates and freshwater quality indicators.

Table 5: Correlations between dairy cattle stocking rates, total head of dairy cattle and nitrates (NO3-N and TN)

	Median NO3-N	% NO3-N samples >1 mg/L	Median TN	% TN samples >1 mg/L
Dairy SR	0.367*	0.484**	0.211	0.311*
Total head dairy cattle	0.384**	0.457**	0.372**	0.357*

* = correlation significant at 0.05 ** correlation significant at 0.01
SR = stocking rate, NO3-N = nitrate-nitrogen, TN = total nitrogen

The degree of correlation (Table 2) was interpreted and recorded following the procedures outlined in Field (2017). A range of moderate to strong positive correlations were observed between dairy stocking rates, beef and dairy stocking rates, total cattle head and both NO_3-N and TN (Table 3). This indicates that increased dairy cattle stocking rates, combined dairy and beef cattle stocking rates, and the total number of dairy and beef cattle are associated with increased nitrate pollution in rivers at the regional level.

There were no statistically significant correlations between beef stocking rates and NO_3-N, or between beef stocking rates and TN (Table 3). There were also no statistically significant correlations between MCI scores and NO_3-N or TN (Table 4).

District-level relationships

There are moderate positive correlations between the percentage of NO_3-N samples greater than 1 mg/L and both dairy cattle stocking rates and total head of dairy cattle (Table 5). All other correlations are weak positive. These findings indicate that an increase in both dairy stocking rates and total head of dairy cattle is associated with an increase in nitrate pollution in rivers at the district level.

Discussion

The aim of this study was to assess relationships between cattle density and two freshwater indicators (nitrates and macroinvertebrates) at regional- and district-level scales. The research is exploratory in nature, but provides an initial step for assessing appropriate stocking rates to protect ecosystem health, which may assist regional councils in considering and setting appropriate limits on resource use. Our findings highlight the urgent need for further research in this area to guide potential policy on implementing limits on stock intensity.

At the regional level, we found strong positive correlations between dairy cattle stocking rates and nitrate levels, as well as between beef and dairy stocking rates and nitrate levels. Additionally, there were strong positive correlations between total head of cattle and TN. What is particularly interesting is there were no statistically significant correlations between beef

stocking rates and either NO_3-N or TN. This may be due to differences in cattle density, landscape, topography and fertiliser use between each farming type. Beef farms in New Zealand typically occupy hilly terrain with limited irrigation systems and fertilisation, resulting in lower stocking rates (Beef + Lamb New Zealand, 2020). In contrast, dairy farms are generally located on flat to gently rolling land with extensive irrigation and fertilisation to support higher stocking rates (Schipper et al., 2010). As a consequence, this intensive pasture management and irrigation can accelerate nitrate leaching into rivers, compromising ecosystem health (Manaaki Whenua Landcare Research, 2020; Vogeler et al., 2019). Physiological differences may also play a role, as dairy cattle typically produce more urine and waste nitrogen than beef cattle (Misselbrook et al., 2016).

The absence of statistically significant correlations between cattle intensity and macroinvertebrates in this analysis was unexpected, given the well-documented impacts of pollution on ecosystem health and a waterbody's capacity to sustain a diverse macroinvertebrate population (Wright-Stow and Wilcock, 2017). The absence of a relationship between stocking rates and macroinvertebrates likely stems from the inherent limitations of single indices like the MCI, which aggregate the response of multiple invertebrate species into a singular score. Therefore, when calculating the MCI score there is a loss of crucial information, such as the relationships between individual species and their stressors, and it may not be sensitive enough to reflect the impacts of nitrate pollution in this context. Recent research examining the link between nitrate concentrations in Aotearoa New Zealand rivers and invertebrate indices found that while the MCI score exhibits a weak correlation with nitrate levels, modelling individual invertebrate taxa reveals strong relationships (Canning and Death, 2023).

The lack of correlation between cattle intensity and macroinvertebrates may also be related to the way an individual score within the MCI record was calculated. This is because sensitivity scores have been changed since the MCI was developed. To illustrate, new tolerance scores proposed by Greenwood et al. (2015), meant that MCI scores increased by ~5 points; thus, scores previously indicative of stress are now classified as healthy (Joy and Canning, 2021). As a result, any correlation between macroinvertebrates and nitrate pollution in this study may have been obscured, as methodological choices in calculating MCI scores could misrepresent the true environmental impact. Furthermore, a smaller sample size and the selective sampling strategies employed by regional councils may also explain the absence of correlations. Responsibility for freshwater monitoring falls mostly on regional councils, each with different priorities and funding constraints. This can lead to a focus on problem areas or uneven coverage of pristine sites, rather than a balanced distribution of monitoring locations (Stevens, 2024).

Our district-level analysis was restricted to correlations between dairy cattle and nitrates, as there was no accessible data for beef cattle densities. Moderate positive correlations were found between dairy stocking rates and all measures of NO_3-N and TN. Additionally, moderate positive correlations were identified between the total head of dairy cattle and both nitrate indicators. These findings highlight a positive relationship between nitrate pollution and both dairy cattle stocking rates and the total head of cattle, and underline the value of further investigation of the potential effectiveness of stocking rate limits as input controls within a district to protect ecosystem health.

Figure 1: Regional heat map of stocking rates (cows/ha) and TN pollution (using LAWA data for the five-year period 2017–21)

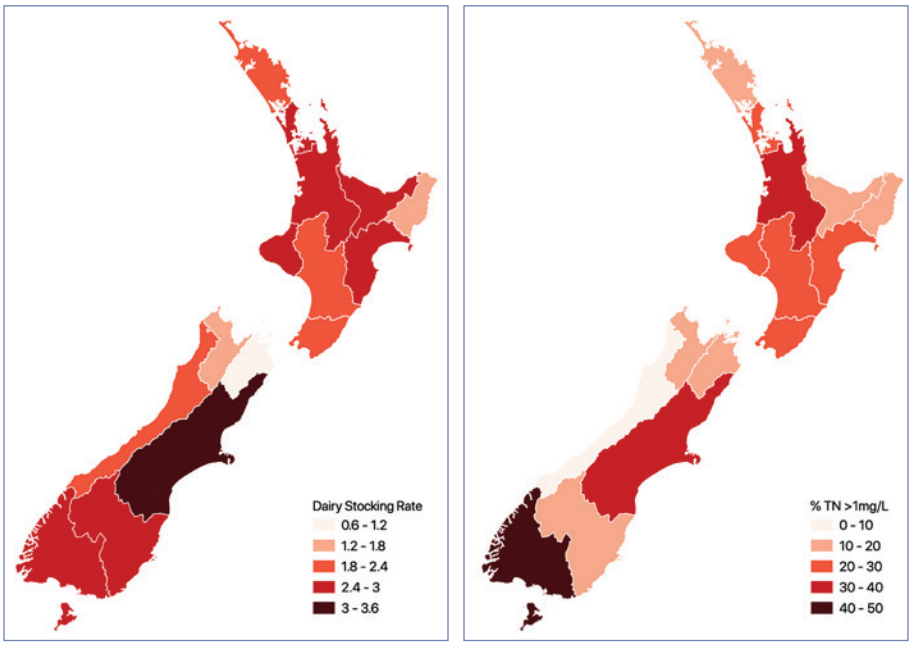


Table 6: Regions and districts with highest rates of TN pollution (using LAWA data for the 5 year time period 2017 to 2021).

District	TN % samples >1mg/L	Number of samples > 1mg/L	Total number of sites
Franklin	94.87	111	117
Hamilton City	84.35	97	115
Invercargill	76.50	179	234
Selwyn	74.55	416	558
Gore	72.79	214	294
Matamata-Piako	68.72	312	454
Carterton	61.01	169	277
Waipa	55.34	254	459
Waimate	54.29	418	770
Waikato	53.48	837	1565

In this analysis, we have focused on the impacts of livestock density on above-ground (river) systems at the regional and district scale. Ideally, we would have also included analysis at the catchment and farm level. However, analysis at this scale was not possible because of data limitations. If data could be accessed, future research should investigate relationships between livestock density and water quality indicators at this scale. It may also be possible to determine potential stocking rate density thresholds above which water quality issues are observed. We note that data is also lacking for other important inputs that can be controlled through regulation, such as fertiliser use. For fertiliser application, where a national cap of 190 kg/ha exists, access to good-quality data could enable a reassessment of this cap and guide policy development on fertiliser caps for different catchments (Ministry for the Environment, 2021).

Future research could investigate relationships between livestock density and groundwater contamination. Another potential area of research is an investigation of time series data to better understand any trends or underlying patterns. This would be particularly important for regions and districts with significant nitrate pollution (and higher stock intensity), such as the Waikato, Canterbury and Southland regions, alongside Franklin and Carterton districts (Figure 1 and Table 6).

The association between cattle farming and fresh water is well established in science and policy, and this is why it has been a focus of this analysis. It is important to acknowledge that factors beyond livestock intensity – such as fertiliser application, soil characteristics, plant life, topology and catchment hydrology – also have an impact on freshwater quality. However, there is limited understanding of the complex interactions between these factors for different catchments across Aotearoa New Zealand and further research would be useful.

Despite multiple OIA requests being sent to various agencies for access to catchment-level datasets on cattle density, such datasets could not be obtained. This highlights a severe lack of information on farm intensity across Aotearoa New Zealand, particularly within regulator databases. Even where councils have had farm plan frameworks in place for many years, data on farming intensity could not be, or was not, provided. This also underscores the challenge for anyone beyond individual landowners or industry bodies to understand the intensity of freshwater pollution drivers in their community or catchment. The limited data available on farm intensity also represents a significant failure of the resource management system and regional council monitoring systems. It also highlights the lack of transparency from industry bodies in communicating with communities about the activities that might be polluting their local area.

While the RMA and Resource Management (Freshwater Farm Plans) Regulations 2023 require farm plans to be developed for many farms, these provisions do not mandate providing information on land use pressures (e.g., stocking rates, land cover, fertiliser use) to regional councils as part of the farm planning process. As it stands, regulators will continue to operate with limited information unless farmers are mandated through regional plans to provide their data. If councils do not require the provision of this data, they might be unable to accurately assess the effectiveness of their plans or appropriately determine or adjust any input controls or limits on resource use in the future. Without access to catchment-level or farm-level data, drawing conclusions beyond those presented in this study or determining potential per-hectare stocking area limits is challenging. However, in the absence of more detailed data, and having determined a relationship between stocking density and freshwater nitrate pollution, the question arises: should initial stocking rate limits be implemented based on general estimates using currently available data?

The current coalition government, which took office in late 2023, has stated that it is committed to improving freshwater quality for the benefit of all New Zealanders and wants to improve farm plans (McClay, Simmonds and Hoggard, 2023). Industry bodies have also stated they want to encourage the use of farm plans and improve freshwater outcomes (DairyNZ, n.d.; Fonterra, 2024). The current government has indicated that it intends to repeal and replace the National Policy Statement for Freshwater Management (New Zealand National Party and ACT New Zealand, 2023; Bishop, 2024) – an announcement which has drawn criticism from freshwater ecologists, public health experts and other specialists (Joy et al., 2023). With the repeal of key freshwater regulations, it remains uncertain how these improvements will be achieved. Despite this, the need to consider input controls, including regulating stocking rates, to address freshwater pollution in catchments remains unchanged. If government and industry's commitment to improving freshwater outcomes is genuine, farm management plans will need to be developed with limits on inputs in mind. There is an opportunity for industry to demonstrate their commitment to freshwater improvement and transparency by openly sharing farm- and catchment-level data on stock intensity. These datasets could help establish thresholds necessary to protect ecosystem health and set appropriate caps to improve freshwater outcomes, thereby reducing or avoiding remediation costs, now and in the future.

1 See https://osf.io/qfd54/files/osfstorage, 'Supplementary file 5 – OIAs and data requests' for a summary of requests.

References

Ausseil, O., J. Clapcott, D. Hamilton, A. Noble, R. Westerhoff and M. Kittridge (2024) 'Monitoring nitrogen in rivers', Our Land and Water, https://ourlandandwater.nz/wp-content/uploads/2024/07/Nitrogen_factsheet_final.pdf

ANZECC (2018) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, https://www.waterquality.gov.au/anz-guidelines

ANZECC and ARMCANZ (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Australian and New Zealand Environment Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, https://www.waterquality.gov.au/anz-guidelines/resources/previous-guidelines/anzecc-armcanz-2000

Australian and New Zealand Governments (2000) 'Aquatic ecosystems: rationale and background information', in *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, https://www.waterquality.gov.au/sites/default/files/documents/anzecc-armcanz-2000-guidelines-vol2.pdf

Beef + Lamb New Zealand (2020) 'Factsheet: hill country sheep and beef farms', https://beeflambnz.com/knowledge-hub/PDF/hill-country-sheep-and-beef-farms.pdf

Bishop, C. (2024) 'Development of fast-track consenting legislation and changes to the National Policy Statement of Freshwater Management', 31 January, letter to Greater Wellington – Te Pane Matua Taiao, https://www.gw.govt.nz/assets/Documents/2024/02/Letter-from-Hon-Chris-Bishop.pdf

Booth, P.L., K.F.D. Hughey, G.N. Kerr and P. Stahlmann-Brown (2022) *New Zealand Environmental Perceptions Survey*: 2022, report LC4207, Manaaki Whenua Landcare Research, https://www.landcareresearch.co.nz/assets/Discover-Our-Research/Environment/Sustainable-society-policy/EPS/report-nz-environmental-perceptions-survey-2022.pdf

Canning, A.D. and R.G. Death (2021) 'The influence of nutrient enrichment on riverine food web function and stability', *Ecology and Evolution*, 11 (2), pp.942–54, https://doi.org/https://doi.org/10.1002/ece3.7107

Canning, A.D. and R.G. Death (2023) 'Establishing riverine nutrient criteria using individual taxa thresholds', *Water Research*, 246, 120731, https://doi.org/https://doi.org/10.1016/j.watres.2023.120731

Clapcott, J., A. Wagenhoff, M. Neale, R. Storey, B. Smith, R.G. Death, J. Harding, C. Matthaei, H. Quinn, K. Collier, J. Atalah, R. Goodwin, H. Rabel, J. Mackman and R. Young (2017) *Macroinvertebrate Metrics for the National Policy Statement for Freshwater Management*, report 3073, Nelson: Cawthron Insttitue for the Minstry for the Environment, https://environment.govt.nz/assets/Publications/Files/macroinvertebrate-metrics-for-the-npsfm.pdf

Cosgrove, R. (2019) 'Kiwis want tougher water quality rules to protect rivers from polluters', 28 January, https://www.fishandgame.org.nz/environment/news/kiwis-want-tougher-water-quality-rules-to-protect-rivers-from-polluters/

DairyNZ (n.d.) 'Freshwater farm plans', https://www.dairynz.co.nz/regulation/policy/freshwater-farm-plans/

DairyNZ and Livestock Improvement Corporation Limited (2021) *New Zealand Dairy Statistics 2020–21*, https://www.dairynz.co.nz/publications/dairy-industry/new-zealand-dairy-statistics-2020-21/

Death, R.G. (2020) 'Even China's waterways are better protected than New Zealand's', *Spinoff*, 29 May, https://thespinoff.co.nz/science/29-05-2020/even-chinas-waterways-are-better-protected-than-new-zealands

Environment Foundation (2018) 'Key philosophies', https://www.environmentguide.org.nz/rma/

Field, A.P. (2017) *Discovering Statistics using IBM SPSS Statistics* (5th edn), SAGE Publications

Fonterra (2024) *Regernative Agriculture: our natural advantage*, https://indd.adobe.com/view/e75cbd02-7f3f-4b7d-a7ca-1dac75cd5340

Foote, K.J., M.K. Joy and R.G. Death (2015) 'New Zealand dairy farming: milking our environment for all its worth', *Environmental Management*, 56 (3), pp.709–20, https://doi.org/10.1007/s00267-015-0517-x

Greater Wellington – Te Pane Matua Taiao (2023) *Proposed Change 1 to the Natural Resources Plan for the Wellington Region*, https://www.gw.govt.nz/assets/Documents/2023/10/Full-Plan-Provisions-including-Clause-16-changes-made-on-6-December-2023.pdf

Greenwood, M., D. Booker, J. Stark and J. Clapcott (2015) *Updating MCI Tolerance Values for Freshwater Invertebrate Taxa*, Envirolink, https://envirolink.govt.nz/assets/Envirolink/1501-ESRC268-Updating-MCI-tolerance-values-for-freshwater-invertebrate-taxa.pdf

Joy, M.K. and A.D. Canning (2021) 'Shifting baselines and political expediency in New Zealand', *Marine and Freshwater Research*, 72 (4), https://doi.org/10.1071/MF20210

Joy, M.K., L. Marriott and S. Chapple (2022) 'Levelling the grazing paddock', *Policy Quarterly*, 18 (4), pp.40–45

Joy, M.K., D.A. Rankin, L. Wöhler, P. Boyce, A. Canning, K.J. Foote and P.M. McNie (2022) 'The grey water footprint of milk due to nitrate leaching from dairy farms in Canterbury, New Zealand', *Australasian Journal of Environmental Management*, 29 (2), pp.177–99, https://doi.org/10.1080/14486563.2022.2068685

Joy, M.K. et al. (2023) 'Open letter to Prime Minister Christopher Luxon: Don't take freshwater policy backwards', https://waterqualitynz.info/wp-content/uploads/2023/12/fifty-freshwater-experts-and-leaders-urge-christopher-luxon-not-to-make-a-terrible-mistake-on-clean-drinking-water-and-healthy-rivers-final.pdf

Julian, J.P., K.M. De Beurs, B. Owsley, R.J. Davies-Colley and A.G.E. Ausseil (2017) 'River water quality changes in New Zealand over 26 years: response to land use intensity', *Hydrology and earth system sciences*, 21 (2), pp.1149–7, https://doi.org/10.5194/hess-21-1149-2017

Koolen-Bourke, D. and R. Peart (2022) *Science for Policy: the role of science in the National Policy Statement for Freshwater Management*, Environmental Defence Society, https://eds.org.nz/wp-content/uploads/2022/08/Freshwater-Policy-Report_FINAL-2.pdf

Land, Air, Water Aotearoa (2023a) 'Factsheet: nitrogen', https://www.lawa.org.nz/learn/factsheets/nitrogen

Land, Air, Water Aotearoa (2023b) 'River macroinvertebrate monitoring results (2004–2022)', https://www.lawa.org.nz/download-data/

Land, Air, Water Aotearoa (2023c) 'River water quality monitoring results: North Island (2004–2022): 1 of 2', https://www.lawa.org.nz/download-data/

Land, Air, Water Aotearoa (2023d) 'River water quality monitoring results: North Island (2004–2022): 2 of 2', https://www.lawa.org.nz/download-data/

Land, Air, Water Aotearoa (2023e) 'River water quality monitoring results: South Island (2004–2022)', https://www.lawa.org.nz/download-data/

Manaaki Whenua Landcare Research (2020) 'Lysimeter research identifying management practices to reduce nitrogen leaching', https://www.landcareresearch.co.nz/publications/soil-horizons/soil-horizons-articles/lysimeter-research-identifying-management-practices-to-reduce-nitrogen-leaching/

McClay, T.H., P.H. Simmonds and H.A. Hoggard (2023) 'Government takes first step towards pragmatic and sensible freshwater rules', media release, 14 December, https://www.beehive.govt.nz/release/government-takes-first-steps-towards-pragmatic-and-sensible-freshwater-rules

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

Ministry for the Environment (2021) 'Understanstanding the synthetic nitrogen fertiliser cap: a quick guide to implementing the cap on dairy farms', https://environment.govt.nz/assets/publications/N-Cap-guidance-for-dairy-farms-infosheet.pdf

Ministry for the Environment (2023) *Guidance on the National Objectives Framework of the National Policy Statement for Freshwater Management*, https://environment.govt.nz/assets/publications/NOF-Guidance-ME1753-Final-Oct2023.pdf

Ministry for the Environment (2024) *National Policy Statement for Freshwater Management 2020*, https://environment.govt.nz/assets/publications/National-Policy-Statement-for-Freshwater-Management-2020.pdf

Ministry for the Environment and Statistics New Zealand (2020) *Our Freshwater 2020*, https://environment.govt.nz/publications/our-freshwater-2020/

Misselbrook, T., H. Fleming, V. Camp, C. Umstatter, C.-A. Duthie, L. Nicoll and T. Waterhouse (2016) 'Automated monitoring of urination events from grazing cattle', *Agriculture, Ecosystems and Environment*, 230, pp.191–8, https://doi.org/10.1016/j.agee.2016.06.006

New Zealand National Party and ACT New Zealand (2023) 'Coalition agreement', https://assets.nationbuilder.com/actnz/pages/13849/attachments/original/1715133581/National_ACT_Agreement.pdf?1715133581

Otago Regional Council (n.d.) 'Manuherekia rohe (area)', https://www.orc.govt.nz/your-council/plans-and-strategies/water-plans-and-policies/freshwater-management-units/cluthamata-au/manuherekia-rohe-area/#proposed-new-rules-and-regulations-for-the-manuherekia-rohe

Pangborn, M.C. and K.B. Woodford (2011) 'Canterbury dairy farming: a study in land use change and increasing production', https://researcharchive.lincoln.ac.nz/server/api/core/bitstreams/a52eb750-7a40-40d2-9312-d01054450551/content

Richards, J., T. Chambers, S. Hales, M. Joy, T. Radu, A. Woodward, A. Humphrey, E. Randal and M.G. Baker (2022) 'Nitrate contamination in drinking water and colorectal cancer: exposure assessment and estimated health burden in New Zealand', *Environmental Research*, 204, https://www.sciencedirect.com/science/article/pii/S0013935121016236#bib33

Schipper, L.A., R.L. Parfit, C. Ross, W.T. Baisden, J.J. Claydon and S. Fraser (2010) 'Gains and losses in C and N stocks of New Zealand pasture soils depend on land use', *Agriculture, Ecosystems and Environment*, 139 (4), pp.611–17, https://doi.org/10.1016/j.agee.2010.10.005

Schullehner, J., B. Hansen, M. Thygesen, C.B. Pedersen and T. Sigsgaard (2018) 'Nitrate in drinking water and colorectal cancer risk: a nationwide population-based cohort study', *International Journal of Cancer*, 143 (1), pp.73–9, https://doi.org/10.1002/ijc.31306

Science Media Centre (2013) 'Bottom lines for freshwater quality: experts respond', 7 November, https://www.sciencemediacentre.co.nz/2013/11/07/national-bottom-lines-for-freshwater-quality-experts-respond/

Science Technical Advisory Group (2019) *Freshwater Science Technical Advisory Group: report to the minister*, Ministry for the Environment, https://environment.govt.nz/assets/Publications/Files/freshwater-science-and-technical-advisory-group-report.pdf

Science Technical Advisory Group (2020) *Freshwater Science and 278 Technical Advisory Group: supplementary report to the minister for the environment*, https://environment.govt.nz/assets/publications/freshwater-policy/freshwater-science-and-technical-advisory-group-supplementary-report.pdf

Snelder, T.H., A.L. Whitehead, C. Fraser, S.T. Larned and M. Schallenberg (2020) 'Nitrogen loads to New Zealand aquatic receiving environments: comparison with regulatory criteria', *New Zealand Journal of Marine and Freshwater Research*, 54 (3), pp.527–50, https://doi.org/10.1080/00288330.2020.1758168

Statistics New Zealand (2019) 'Wellbeing statistics: 2018', https://www.stats.govt.nz/information-releases/wellbeing-statistics-2018

Statistics New Zealand (2021a) 'Agricultural and horticultural land use', https://www.stats.govt.nz/indicators/agricultural-and-horticultural-land-use

Statistics New Zealand (2021b) 'Livestock numbers', https://www.stats.govt.nz/indicators/livestock-numbers

Statistics New Zealand (2022) 'River water quality: nitrogen', https://www.stats.govt.nz/indicators/river-water-quality-nitrogen

Stevens, S.M. (2024) 'Assessing Aotearoa New Zealand's national and regional natural environments: a review of existing environmental indices and development of a new regional index', PhD thesis, Te Herenga Waka Victoria University of Wellington

Vogeler, I., S. Thomas and T. van der Weerden (2019) 'Effect of irrigation management on pasture yield and nitrogen losses', *Agricultural Water Management*, 216, pp.60–9, https://doi.org/https://doi.org/10.1016/j.agwat.2019.01.022

Williams, D. (2023) 'Thousands of dairy farms aren't reporting fertiliser use', Newsroom, 28 March, https://www.newsroom.co.nz/sustainable-future/thousands-of-dairy-farms-arent-reporting-fertiliser-use

Wright-Stow, A.E. and R.J. Wilcock (2017) 'Responses of stream macroinvertebrate communities and water quality of five dairy farming streams following adoption of mitigation practices', *New Zealand Journal of Marine and Freshwater Research*, 51 (1), pp.127–45, https://doi.org/10.1080/00288330.2016.1269814

Policy Quarterly is looking for two new co-editors

Following the review of *Policy Quarterly* in April 2024, and a request from the current editor Emeritus Professor Jonathan Boston, the School of Government is seeking two new co-editors. *Policy Quarterly* is targeted at readers in the public sector, including politicians and their staff, public servants, and a wide variety of professions, together with others interested in public issues. Its length and style are intended to make the journal accessible to busy readers.

We envisage that one of the two co-editors will have academic experience and a research interest in public policy. The second co-editor is expected to be a practitioner with experience within New Zealand's policy ecosystem and have a genuine interest in encouraging informed public debate on a wide range of policy issues, including those related to governance and public management. The two editors will report to the Head of School of Government and will be supported by an editorial assistant (0.2 FTE). The journal has secured funding from the School of Government until mid-2026.

The roles of the two editors will include:

- Co-chairing the editorial board.
- In collaboration with the editorial board continuously review the aims, scope, and ethics of the journal in line with the *Policy Quarterly* Publication Ethics & Publication Malpractice Statement.
- Make sure that four issues per year are published and compose short introductions for each issue.
- Oversee the editorial process including assigning and monitoring reviewers to manuscripts (using the editorial content system of the university) and making final editorial decisions.
- In collaboration with the University library and an editorial assistant make sure manuscripts are delivered expeditiously for online publication.
- Solicit special issues for the journal (typically one per year).
- Seek opportunities to promote the journal.
- Report back to the Head of School of Government on a regular basis.

We are looking for interested candidates who are willing to commit themselves to this task for around one and half years starting **1 February 2025**, with the possibility of a continuation for a further six months to a year. Regarding remuneration, we will be able to pay a modest sum ($10,000 per annum) to each of the successful candidates. While we are not permitted to remunerate employees of Victoria University of Wellington, we are able to pay via Contract for Services those not on employment contracts within the University.

Prospective candidates should feel free to contact the current editor, **Jonathan Boston**, by email **jonathan.boston@vuw.ac.nz** if they wish to discuss the nature of the editing task and related production matters.

If you are interested in applying, please send a cover letter and CV to **Professor Karl Löfgren** by email **karl.lofgren@vuw.ac.nz**.

Applications will close on 13 December 2024.

Develop your skills for an evolving public sector

As the public sector evolves, now is the time to build the skills needed to adapt, lead, and thrive. Te Herenga Waka—Victoria University of Wellington's postgraduate programmes in Public Management and Public Policy offer pathways to future-proof your career.

Study part time, full time, on campus, or online. Our flexible study options are designed to fit with your busy schedule.

Check out our diverse selection of courses designed to enhance your skill set and boost your career prospects.

FIND OUT MORE

wgtn.ac.nz/professional

ppo@vuw.ac.nz

VICTORIA UNIVERSITY OF WELLINGTON
TE HERENGA WAKA