

Our land-use challenges: connecting economy, agriculture, resilience and environmental sustainability

Long-term opportunities and challenges for Aotearoa New Zealand

Briefing for the incoming Prime Minister and Government

October 2023



Introduction

The economy and environment have traditionally been regarded as apart, each with its own policy priorities and rules. But whether for primary production, extractive industries, tourism or property development there is growing understanding of how various land-use activities and decisions affect each other. To maximise ecosystem health and get the most from our land-based activities we need to take a co-ordinated governance approach to individual sectors.

Key points

- Our economic prosperity will be tied to the land for the foreseeable future.
- The downstream consequences of poorly regulated and ill-advised land use practices are now being felt and will be aggravated by climate change.
- Co-ordinated land use and stewardship based on the latest knowledge and technologies and bolstered by new public-engagement methodologies can avert negative spill-over effects for all key land-based economic and recreational activities.
- Changes in land use should be subject to science-based modelling to reveal compounding effects across time, space and sectors.
- Industry's accounting for such effects as emissions and pollution is improving in line with our climate commitments and consumer expectations, but inadequate measurement of biodiversity loss and harm to natural landscapes persists. Land-use effects need to be tracked and managed holistically.
- Conservation and biosecurity science together with research and development in key areas of agricultural technologies can help to model scenarios, propose mitigating strategies and provide new tools and solutions.
- Innovations in citizen engagement can produce sound decisions especially where a shared understanding of interacting issues and collective action is needed.

Context

Situation analysis

Aotearoa New Zealand is a small landmass from which we have excelled at extracting value. Until recently we have largely used our unique physical geography to develop the limited available land for settlement, agriculture, forestry, mineral, gas and aggregate extraction, and for harnessing geothermal energy and changed our waterscape for irrigation and hydropower and wetlands have been degraded. We have also protected huge tracts of largely mountainous or otherwise unproductive land through our conservation estate. Until recently, our small population, predictably temperate climate and weather have meant each land-based activity has developed its own community of practice and institutional framework that has served well for generations.

But conditions are changing. Labour market needs and a growing population are putting pressure on urban and semi-urban space; export opportunities are incentivising more-intensive farming and clear-fell forestry practices; and changing weather patterns mean traditional methods of engineering our landscapes for development and production are increasingly untenable. Climate change and its related consequences are having increasingly obvious impacts.

There is now a clear understanding of the interacting effects of our various land-use practices. The downstream (quite literally) consequences of poorly regulated and cumulative land-use practices are being felt, often disastrously. The need to find ways to co-ordinate land-based activities with the changing forces of nature is urgent.

(Eco)systems thinking in land-based sectors

Agriculture remains an essential driver of the economy. From 2018 to 2022 total New Zealand pastoral exports increased from \$23.87 billion to \$31.63 billion. Pastoral agriculture has typically been categorised as an “industrial sector”. However, considering half the country’s land area is dedicated to pastoral agriculture and given its associated spill-over effects on the environment, agriculture is increasingly being seen as integral to New Zealand’s environment. Thus, a systems-based understanding of the interactions between the sector and the natural environment – and adapting our management practices on this basis – are essential. High-quality science can offer solutions especially in light of the effects of climate change. In particular, ongoing land-use intensification, especially conversions to dairy farming sometimes on soils quite unsuitable for this purpose, have caused widespread decline in water quality through silt and fertiliser nutrients finding their way into rivers, lakes, wetlands and harbours. The loss of the amenity value of waterways is apparent and there are concerns about adverse health effects from pathogens and high nitrate levels in drinking water.

How agriculture affects the environment fuels an urban-rural divide, in part as a shrinking proportion of New Zealanders have social or family connections to the rural economy. This is putting pressure on successive governments. Similarly, international attention – trading and political – is being directed towards the quality of the country’s products and its desirability as a tourist destination.

Governments and the sector as a whole have been attempting to find carrot and stick solutions for use on farms to incentivise practices such as use of low-emission livestock breeds and high-nutrition forages to reduce gas and nutrient flows. Efforts are also going into measurement of greenhouse-gas emissions on a per farm basis to assist with more sophisticated accounting and management. However, progress to date has been limited in fulfilling the legislated reduction of methane emissions by 10 per cent by 2030 and much further by 2050, in part due to resistance to using available technological tools and because of doubt over the cost effectiveness of different measures and who carries these costs.

At the same time impacts on water-quality are difficult to attribute solely to farming practice and there is growing change in farming behaviours to protect waterways. Various human activities are increasingly disrupting established land-use patterns and creating new and cumulative risks, for example industrialisation, intensified and greenfields urbanisation as well as the incentives that lead to intensified dairying, large-scale irrigation, and increased fertiliser use.

The resulting challenges of ecosystem degradation and carbon emissions are complex and interacting, as has been canvassed by past and current Parliamentary Commissioners for the Environment. The incumbent commissioner has pointed to the complexity of land-use decision-making by revealing the limitations and trade-offs involved in relying too heavily on forestry to off-set for carbon dioxide. This includes how the land area required would eat into agricultural land and depopulate rural economies, and the stark lessons recently learned about the downstream consequences of forest clear-felling.

Sustainability science recognises the need for more complex analyses using systems-based approaches and extending across all the domains of the sustainable development goals (SDGs) to which New Zealand is a signatory. Some of these goals focus on addressing essential needs and the extraction economy (SDG 2, 6, 7, 14, 15), some focus on desired societal objectives (SDG1, 3, 4, 5, 8,10,16) and the appropriate balance needs to be found between them. Indeed, others including climate change require interdisciplinary analysis and policy governance (SDG 9, 11, 12, 13, 17) (Fu et al., 2019). But nowhere in the New Zealand system is there a whole-of-government integrated analysis of the challenges ahead. The Climate Change Commission alone cannot have an overview of the broad range of objectives that needs to be looked at together, from equity issues to land-use, for instance. Central agencies have a more critical role to play.

Ecosystem-based management

Thus, a more sophisticated answer would be to widen the frame to take ecosystem health into account as a key input in decision-making about land-based industries and infrastructure. We have pioneered ecosystem-based management in the marine space but have not yet translated this approach in a meaningful way to land-based activities. Regional authorities' implementation of Te Mana o te Wai – recognition of freshwater's life-supporting capacity – is a start, but ecosystems crossing many private property lines are inherently vulnerable. We need to find ways to prioritise and maintain ecosystem health and integrity, as the very foundation of our own economic and social resilience.

Taking an ecosystem-based approach to land-use will help decision makers in all sectors to identify and manage interacting and cumulative effects and in turn, improve our economic, infrastructural and societal resilience. In this work, collaborative statutory and regulatory solutions are needed to get beyond the confused state of land management by councils and central government.

Role of science and research

As mentioned, sustainability science can play an important role in underpinning a shift to a more holistic better-informed ecosystem-based land use management and governance paradigm. But so too can more fundamental research. For the primary sector to continue to contribute fully to the economy while minimising environmental effects, there must be ongoing scientific research in combination with the development of well-informed and socially sound policies. From plant genetics and landscape science to biotechnology and innovations in citizen engagement, numerous research disciplines contribute important data and insights.

For instance, there is a need for ongoing scrutiny and assessment through systematic research of such proposed solutions as destocking, riparian-strip planting and restorative agriculture. Here continued basic science is also vital. We need deep understanding of the mechanisms of nutrient movement associated with farm erosion and its effect on water quality including eutrophication. We need to know how on-farm actions such as riparian planting, keeping stock from riverbanks, and allowing river corridors to erode and build up naturally in appropriate places, can help water quality while limiting erosion damage to property. The depth of knowledge required extends to whole catchments and landscapes.

There is also the issue of our globally disproportionate volume of agricultural greenhouse-gas emissions. Significant research and development effort is going into reducing methane belching by grazing livestock focusing on changing the biology of the rumen and modifying stock feed. Detailed ecological and genetic science is also aimed at limiting the potential of biosecurity threats to our (agri)ecosystems. But biotechnological solutions will need social acceptance and New Zealand has not been as open to the potential of genetic tools as other countries. A broadened frame of ecosystem health may be helpful to gain popular support for the urgent solutions needed.

Biosecurity threats are being made worse by climate change; this includes plant pathogens, weeds and animal diseases. Border biosecurity failure can result in costly responses such as the aerial spraying of large parts of Auckland against painted apple moth, the culling of hundreds of thousands of *Mycoplasma bovis*-infected cattle and most recently the discovery of the voracious fall armyworm in maize crops now requiring the use of synthetic insecticides. It is also important to note also that already-established species will become more damaging. Again, detailed ecological and genetic understanding is required if such threats are to be effectively managed.

For agriculture to continue its critical role in the New Zealand economy while minimising negative environmental impacts, there must be ongoing scientific research and access to the full suite of available technologies along with the development of well-informed policies. Such activities must include close scrutiny through systematic and systems-based research of potential solutions.

Actions for consideration

- **We need a game-changing shift in land-use oversight that unambiguously links economic prosperity and community resilience with environmental wellbeing.**
- **There needs to be the creation of a ministerial portfolio or agency empowered to take an ecosystem-based view of the entirety of our land-based activities rather than a sector-by-sector approach.**
- **We need policy and legislative coherence between central, regional and local governments to address land-use consenting processes. This must include appropriate regulatory reform and the development of compliance mechanisms.**
- **Flexible and transdisciplinary research funding could bring together the numerous disciplines related to land use and their stakeholders and would provide the evidence needed to underpin positive change.**

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Key contacts



Kristiann Allen is the associate director (policy and international engagement) at Koi Tū and runs the secretariat of the International Network for Government Science Advice (INGSA).

✉ kristiann.allen@auckland.ac.nz



Professor Stephen Goldson is an academic associate at Koi Tū and an emeritus principal scientist in AgResearch.

✉ stephen.goldson@agresearch.co.nz



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This document was developed as part of a comprehensive briefing to the incoming prime minister and government. The full document is available informedfutures.org/briefing-to-incoming-government-2023

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Professor Sir Peter Gluckman

Director, Koi Tū: The Centre for Informed Futures

Phone: +64 21 775 568

Email: pd.gluckman@auckland.ac.nz

THANK YOU TO OUR SUPPORTERS

Andrew and Elle Grant

Anita Baldauf

Bernard Pesco

Bernard Sabrier

David Levene Foundation

The Gluckman Family

Graeme and Robyn Hart

Gus Fisher Charitable Trust

Kelliher Charitable Trust

Modena Trust

The MSA Trust

Norman Barry Foundation

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