

About us

Bioprotection Aotearoa is one of the 11 Centres of Research Excellence that is funded by the Tertiary Education Commission. We exist to train the next generation of bioprotection researchers through world-class research that protects the productive and natural landscapes of Aotearoa New Zealand against biological threats and climate change. Our vision is one where we are working towards an Aotearoa New Zealand where communities are empowered with the knowledge to act as kaitiaki of our whenua, supporting healthy and resilient environments where our mokopuna can thrive. Our mission is to educate future bioprotection leaders through collaborating to conduct pioneering, multi-disciplinary research that addresses the environmental challenges Aotearoa New Zealand is facing. We draw on our collective academic strengths to develop new and innovative solutions that protect our productive and natural landscapes from climate change, pathogens, pests and weeds. Our kaupapa is guided by a unique mātauranga Māori and science framework - *Te Taiao-a-rangi* - which supports a holistic, systems-level approach to achieving intergenerational environmental sustainability.

From this perspective and drawing on the expertise of our members, we would like to comment particularly on the Natural Environment section of the National Adaptation Plan (NAP). We have identified several areas where the research and expertise of Bioprotection Aotearoa can offer some suggestions for a subsequent version of the NAP.

1. Climate change requires transformational adaptation. The way this NAP is presented is as a business-as-usual approach, identifying existing initiatives and providing little beyond incremental changes. Business as usual cannot deliver the transformational change required to address the challenges of climate change in the time frame available. The recent Intergovernmental Panel on Climate Change (IPCC) report on Impacts, Adaptation and Vulnerability highlights the urgency of climate change adaptation, and the need for transformational change¹.

2. In order to develop a meaningful adaptation plan, there is a need for better clarification and understanding in several key areas:

a) Develop a shared view of what is meant by adaptation

The NAP refers to restoring and protecting indigenous ecosystems – but change is the norm in New Zealand’s natural environment.

There is a need to have an inclusive conversation as a nation to identify what we want to protect (and what that would cost), whether we are prepared to allow change, and understand what that

¹ IPCC. (2022). Summary for Policymakers. In H.-O. Pörtner, D. C. Roberts, E. S. Poloczanska, K. Mintenbeck, M. Tignor, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, & A. Okem (Eds.), *Climate Change 2022 - Impacts, Adaptation and Vulnerability*. Cambridge University Press, Cambridge, UK, and New York, NY, USA.

might look like. We need to develop shared goals of adaptation as a nation, including what it is about our natural environment that we value. These are questions of ethics and values² that need to be discussed by citizens across Aotearoa.

b) **Understand the baseline** so that success or failure can be measured. We need a much greater understanding of what constitutes a healthy ecosystem, and we need **monitoring** to understand how this changes over time in response to adaptation (or inaction).

For example, Bioprotection Aotearoa is working to understand what constitutes a healthy ecosystem, including the incorporation of mauri. The health of our plant-based productive ecosystems emerges from interactions amongst plant communities, microbes in and on plants, external stressors, and the broader landscape context at a variety of spatial scales. Knowing what defines the health of a productive ecosystem is crucial to understanding how to protect ecosystems, how to undermine the persistence of undesirable components in ecosystems, and how to monitor whether sustainable ecosystem productivity is improving. In essence, a healthy ecosystem is one that is relatively resistant to change and can also reassemble/reorganise following disruption – meaning it is also resilient to change.

Bioprotection Aotearoa is also working towards understanding the implications of climate change such as wetting and drying cycles, increased atmospheric CO₂ on soil biology and function (carbon storage, P and N plant availability) under kiwifruit and maize crops through experimental manipulation. This will also contribute to informing a baseline so that future changes can be monitored.

In other parts of the programme, integrated measures of productive ecosystem health, building from the holistic concept of mauri, or life force, are being developed. We identify processes that promote productive ecosystem health across scales in the face of pathogen and pest attack, and identify the linked properties of ecosystems that allow them to remain healthy, in terms of crop production, microbial communities, landscape properties, and environmental setting. We also develop a new framework to assess ecosystem health for Aotearoa-New Zealand, by combining our measures and understanding of health to identify where cross-scale interactions are likely to act synergistically or antagonistically to determine ecosystem health outcomes.

² Adger, W. N., Dessai, S., Goulden, M., Hulme, M., Lorenzoni, I., Nelson, D. R., Naess, L. O., Wolf, J., & Wreford, A. (2009). Are there social limits to adaptation to climate change? *Climatic Change*, 93(3–4). <https://doi.org/10.1007/s10584-008-9520-z>

c) Understand how climate change is expected to affect our natural environment, over different time-scales and at different levels of warming. How will this affect our ecosystems and species within them? How will the environment respond to higher levels of CO₂? Currently there are significant gaps in our knowledge of these kinds of changes, and it is challenging to develop an adaptation plan without this understanding.

Research in Bioprotection Aotearoa aims to fill in some of these gaps in soils from both agricultural and native ecosystems. The work aims to study plant resilience to stresses that are likely to be encountered due to a changing climate. The focus will be on understanding and identifying the consequences for plant growth and nutrient uptake from the soil. This is crucial for food security and export markets.

d) How to support the natural environment to adapt (related to the point on adaptation). We need more research that develops an understanding of how to build resilience. Rather than focusing on protecting individual species and/or systems, we need to develop our understanding of questions such as how much change a system can cope with before it becomes a different system, and how to support autonomous adaptation in the natural environment.

An example from Bioprotection Aotearoa of this type of research is on the capacity of soils to resist and recover from a disturbance. Soils are increasingly vulnerable to land-use change, pathogen invasion, and climate change, all of which degrade soil quality and can reduce their resistance and resilience to subsequent perturbations. There are many knowledge gaps relating to how soil resistance and resilience can be elicited, bolstered, and conferred, which this project aims to explore.

Other research in Bioprotection Aotearoa will contribute to understanding the processes involved in the creation of healthy, disease climate-resilient soils that is grounded in indigenous knowledge from the Pacific. This will investigate approaches to shift soil ecosystems towards more disturbance-tolerant states, and considers the connections between soils, vegetation, and Pasifika communities.

Better understanding of the value of these ecosystems and species.

There is very little research and evidence in Aotearoa New Zealand of the value of the natural environment. Questions around critical natural capital, the non-material aspects of choice and culture, are effectively excluded from economic analysis. This means then that economic analyses that aim to compare the costs and benefits of a project that would result in losing aspects of the natural environment, are inevitably biased.

The implications of losing ecosystems and species are not well understood. This relates to (a) above, in that without an understanding of the longer term implications of ecosystem loss, it is difficult to identify the goals of adaptation in an informed way. For example, the loss of 90 per cent of Aotearoa's wetlands will have important implications not only for biodiversity but also on our ability to adapt to future climate change (e.g. through their role in flood control). But their value in terms of ecosystem services is rarely identified or accounted for in development decisions.

Bioprotection Aotearoa is connected to the Wetlands for People and Place collaboration, which provides evidence-based assessments on how wetland restoration can improve habitat for biodiversity as well as the lives of people. Furthermore, the project marks the inception of research in the Wairarapa for Bioprotection Aotearoa, which will explore tipping points for wetlands in the face of myrtle rust incursion. The interviews will guide and underpin future research on wetland restoration, research which aims to inform wetland restoration to promote wetland resilience to myrtle rust, while also upholding and centring cultural values of Ngāti Kahungunu.

We suggest:

- investment into research valuing the natural environment and its ecosystem services with a specific focus on their function in a changing climate;
- improved guidance for accounting for ecosystem services as well as the use of low and/or declining discount rate when considering investments relating to climate change and the natural environment. The UK Treasury's Green Book may be a useful starting point, which recommends a declining discount rate for long-lived projects (beyond 30 years)³.

3. Ministries and Agencies tasked with implementing the plan are siloed and stretched.

The NAP talks about integration and takes a more holistic approach to ecosystems at a high level, but there is little detail on implementation and accountability. The various ministries and agencies responsible for the natural environment generally focus on their own areas of interest (e.g. MPI for example, focuses on individual pathogens/diseases rather than an overarching perspective of biosecurity or the natural environment). DOC is already stretched, and the impacts of increasing frequency and intensity of extreme events on tracks and huts will require a greater proportion of the budget to be spent on repair and maintenance rather than the natural environment itself.

We suggest a ministerial group comprised of staff across all ministries, carving a budget from existing ministries, to ensure the integration of climate change adaptation across ministries, provide

³ <https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-government/the-green-book-2020#a6-discounting>

oversight of climate change action and hold individual ministries accountable for failures to prioritise adaptation in their decision-making.

We further suggest a devolution of decision-making authority to communities, following the principles outlined in Pisor et al. (2022)⁴, within a national strategic framework (ideally an effective NAP).

4. Risk of considering the outcome areas in isolation.

Continuing from point (3), the impacts of climate change will cascade from the natural environment to businesses, communities, and the national economy. We acknowledge the system-wide actions identified in the NAP, but again are concerned that with the current structure, the intention of integration will not be realised.

The creation of a ministerial group as identified in (3) may help achieve integration and also provide direction for the prioritisation of climate change adaptation and mitigation across all policy areas. For example, urban development in regions like Selwyn (physically distant from most employment options and public transport) potentially puts pressure on the natural environment both directly (through the draining of wetlands for example), and indirectly (by covering high-quality productive soils with housing, requiring agriculture to expand into lower quality areas that require greater inputs of fertiliser, for example, to achieve the same outputs). Furthermore, these types of developments risk exposing future generations to flood risk as well as locking them into a high-emissions future dependent on individual car transport. Policy coherence is required to ensure these types of decisions are not able to continue.

There is a need to develop policy and legislation with enforcement abilities to curb this type of development both to support the natural environment as well as ensure that generations of New Zealanders are not being locked into climate risks and a dependency on fossil fuel use.

5. Little acknowledgement of the interactions with mitigation. For example, climate change impacts on the natural environment may affect our ability to sequester and store carbon. For example, as the climate changes, wildfire weather will become more likely, potentially damaging Carbon stores. These kinds of impacts will affect New Zealand's ability to meet international and domestic emissions reduction targets.

⁴ <https://www.nature.com/articles/s41558-022-01303-x>

Conversely, mitigation activities may have implications for the natural environment and its ability to adapt. Examples include the widespread planting of monocultures for Carbon sequestration.

We suggest the inclusion of a framework to consider mitigation outcomes in adaptation actions and vice versa.

6. A lack of detail on implementation. The document is currently vague on what adaptation would mean at different scales, and how it would be implemented. This relates to point (2) on the need to develop greater understanding in several key areas.

As discussed in (1), adaptation to climate change will in many areas require transformative change. This document lacks detail in how transformation (or even incremental adaptation in many cases) will be implemented in practice. How will the structural changes required to our infrastructure planning, travel, food production and land management (to name a few) be achieved? Perhaps lessons can be learned from the Covid-19 response in terms of communication and measures. However in general we believe considerable more thought needs to be applied to this crucial area. It is not enough to list existing measures and hope that transformation will occur.

7. Rauora Framework -while this framework appears promising, it does not appear to be woven throughout the rest of the NAP. It remains unclear how it will be given effect.