

Project Hau Nuku: Weather Forecasting System Review

Terms of Reference

Purpose

The purpose of this review is to determine the most efficient and effective arrangements for the provision of national weather research, observation, modelling, forecasting, warning, severe weather impacts, data access, and communication services in New Zealand (the Weather Forecasting System). The review is named Project Hau Nuku, which means shifting winds.

The Terms of Reference (ToR) sets out the scope and process for the review of the optimal arrangements in the weather forecasting system, including the structural configuration with respect to Meteorological Service of New Zealand (MetService) and National Institute of Water and Atmospheric Research (NIWA), and appropriate arrangements for access to weather data.

Project Hau Nuku will be jointly led by Ministry of Business, Innovation and Employment (MBIE) and the Treasury. The review will be conducted by an independent party, which will deliver a report setting out the problem definition, analysis, findings, and recommendations.

Strategic Context

An efficient, effective and fit for purpose weather forecasting system is of increasing importance given climate change impacts

Weather forecasting is becoming increasingly important given the impacts of climate change. The World Economic Forum has reported that natural disasters and extreme weather events are collectively the second most severe global risk over the next two years, and the third highest global risk over the next ten years.¹ The World Meteorological Organisation (WMO) strategic priorities target national integrated multi-hazard Early Warning Systems as primary means for adapting and responding to increasing severity and frequency of extreme weather.²

We consider that national weather forecasting systems should integrate processes and sub-systems that connect long-term climate science and research through to short-term forecasting and public communications - enabling effective decisions and actions. The processes should follow global standards and practices and rely heavily on observational data processed through atmospheric, ocean and earth systems models. Model output should be enhanced and modified by meteorological expertise and transmitted through multi-channel public communications and networks in the form of impact-based weather forecasts and severe weather warnings. The data-intensive processes require high-powered computing and sophisticated models and technologies.

Each nation has a nominated meteorological service provider that acts as the single authoritative voice regarding severe weather and its impacts. Clear, precise, and actionable communications to communities, councils and business are essential to allow appropriate decisions and actions. In the case of severe weather threats, forecast information is also disseminated through national emergency management systems and therefore must not be diluted, confusing or ambiguous.

¹ The Global Risk Report 2023.

² WMO press release dated 21 March 2023

As a result of climate change, forecasting the intensity of weather events is becoming more difficult due to unprecedented atmospheric forces and behaviours that are challenging for current scientific models. A connected weather forecasting system where intelligence is shared and effectively communicated is critical to support emergency management entities in their timely decision-making during severe weather events.

We consider there is opportunity to have a more connected weather forecasting system that allows a better integration between climate science, forecasting, hydrology, and coastal hazards. This will enable a cohesive understanding of hazards and improve our planning for, and resilience to, severe weather events.

It is critical for New Zealand to have a robust weather forecasting system that can support it during severe weather events, including understanding potential severe weather impacts. The system needs to be fit-for-purpose and designed to meet future requirements.

The current settings of MetService and NIWA may be inefficient and could lead to public safety risk through conflicting messaging

NIWA and MetService, both Crown-owned companies, are closely involved in the science and operational delivery relating to weather, climate, and meteorology. MetService was established as a State-owned enterprise (SOE) to leverage its expertise in weather forecasting to support its operations, reduce the cost of weather services to taxpayers, and pay dividends to the Crown. NIWA was established as a Crown Research Institute (CRI) to perform the weather research function. Over time the boundaries for delivering functions in the weather forecasting system have become blurred. Both organisations are now competing with weather observations, modelling, forecasting and communications.

Given the climate and weather resilience challenges that New Zealand faces, it is important that users receive the best level of service provision over the long-term. This relies upon an optimal interplay between science and weather forecasting service delivery.

As forecasting capability has improved, and climate awareness has grown, the public interest in weather related risks has increased, and the historic distinction between weather and climate has become less relevant. Accurate, accessible, and time-critical weather information is a global public expectation. These activities should be done in ways that provide a clear understanding to the public and an all-hazards integrated collaborative service to government agencies, responders and businesses.

To strengthen the system, Ministers have agreed that a research-to-operations pathway between NIWA and MetService should be explored. Collaboration between the companies across the system under the current settings is challenging due to competitive tensions and competition law³. The Crown provides funding to NIWA for weather forecasting research⁴, however there are barriers to sharing research, innovation, and observation data with MetService or any other weather researchers or forecasting providers due to the competitive environment. Similarly, there is limited sharing and coordination of investment in infrastructure and access to weather forecasting networks are not shared by either entity.

³ Recent changes in the Commerce Act 1986 section 36, have strengthened the law to prohibit firms with market power from engaging in conduct that substantially lessens competition, regardless of whether they would have done the same thing if they didn't have market power. [Review of section 36 of the Commerce Act and other matters Ministry of Business, Innovation & Employment \(mbie.govt.nz\)](#)

⁴ MBIE provides \$14.3 million to NIWA for developing a better understanding of large-scale weather and climate systems through numerical prediction techniques, monitoring and advanced measurement, e.g., predicting extreme weather events and impacts, climate adaptation and mitigation. The platform aims to help communities be more resilient to weather-driven hazards and more able to manage long-term climate change impacts.

Competition for media commentary between NIWA and MetService during severe weather events, can create risks to public safety through conflicting and potentially confusing narratives. MetService is designated as the Crown’s authorised provider of severe weather warnings through the Meteorological Services Act 1990, and hence is the ‘single authoritative voice’ for public information about severe weather in New Zealand⁵. The purpose of this designation is to provide clarity in authorised messaging and minimise confusion for the public during severe weather events and ensure warnings comply with the international standards set by the WMO. NIWA has the designation on matters related to hydrology.

In addition, both MetService and NIWA are entering periods of significant investment where there are potential opportunities to:

- align some of this investment with government objectives and the wider Crown portfolio, and
- allow for the ability of the entities to sustainably fund aligned and coordinated investments into the future, as well as conduct normal business operations within a sector facing significant future change.

A collaborative system and a focus on appropriate arrangements for access to weather data

Public access to observational weather data is more restricted in New Zealand compared to many other countries. While large amounts of raw data are freely available and provided through WMO data sharing systems, some modified and commercially valuable data is not free. In the context of climate change the benefits for New Zealand of limiting access to data are becoming less clear. This review will also consider the appropriate arrangements around access to weather data.

Project Hau Nuku Key Objectives

The key objectives of Project Hau Nuku are to:

1. Identify and recommend the optimal arrangements and responsibilities in the weather forecasting system that will best position New Zealand to meet future weather-related challenges and impacts in the context of climate change.
2. Consider the structural configuration of MetService and NIWA, based on the optimal system arrangements identified in point 1 above.
3. Identify if changes in access to weather data should be made and what these should be.

Project Hau Nuku will specifically consider the following key matters:

- Identify global standards, expectations, benchmarks and functions for a national weather research and forecasting system that is fit for the climate change future.
- Understand the current and future demand for weather forecasting services in New Zealand. Identify inefficiencies, deficiencies, gaps and overlaps in New Zealand’s current system.

⁵ The WMO’s GENEVA DECLARATION 2019: BUILDING COMMUNITY FOR WEATHER, CLIMATE AND WATER ACTIONS calls on all Governments to “Safeguard and strengthen the authoritative voice of NMHSs [National Meteorological and Hydrological Services] for the issuance of warnings and relevant information to support critical decisions related to natural hazards and disaster risks, in collaboration with national disaster management authorities”.

- Define the attributes of an optimal weather forecasting system encompassing weather research, observation, modelling, forecasting, hydrology, warning, severe weather impacts, data access, and communication services in New Zealand
- Outline the current responsibilities of MetService and NIWA within the existing forecasting system and identify any future capability requirements.
- Identify the most efficient and beneficial use of national weather observing infrastructure, technology platforms and assets, and to what degree the outputs should be independent, integrated and/or shared. National resilience should be considered.
- The review will outline a number of options, including a preferred option, for the most appropriate and financially sustainable institutional and structural arrangements for MetService and NIWA. This would include how best to develop a pathway for research-to-operation-to-decision which incentivises investment in the system and adoption of new technology. This involves consideration of institutional and funding arrangements, their costs, benefits, risks and opportunities.
- Analyse the degree to which competition is desirable in the delivery of weather forecasting functions and services and, if so, what that should look like with regard to the implications of competition law under the Commerce Act 1986.
- Provide high-level options for more rationalised funding arrangements for weather-forecasting-related science that supports the new arrangements that are recommended (having regard to existing aggregate funding and staffing levels).
- Analyse the current issues associated with the constraints around data access, the public and private good nature of data, costs of providing it, funding, and options on how problems with data access could be resolved.

Annex One includes questions that provide further detail to these areas.

Other relevant matters for Project Hau Nuku to consider

Project Hau Nuku will also consider:

- Financial viability and sustainability into the future of both entities (including major capital requirements).
- The weather forecasting markets in which these entities operate, any overlap between their services, functions, research and services, and investments, and whether any overlaps are desirable.
- Māori needs in relation to weather forecasting and data should be considered as part of the assessment.

Out of scope of Project Hau Nuku

The scope of Project Hau Nuku will **not** include:

- Other SOEs, CRIs or related science-entities.
- The level of aggregate Crown funding provided to both entities. The report will not make specific recommendations on funding levels, but it will comment on rationalisation of funding arrangements within the existing Crown funding envelope.
- The monitoring arrangements for any new structural arrangements. This would be determined by MBIE and the Treasury respectively as appropriate.

Interdependencies

The reviewer should consider the interdependence between Project Hau Nuku and *Te Ara Paerangi - Future Pathways* (TAP).

TAP is a multi-year programme focused on the future of Aotearoa New Zealand's Research, Science and Innovation system. The programme involves an open and wide-ranging review of the issues facing the system, how these might be addressed, and how to take advantage of emerging opportunities within the relevant sectors. The focus of TAP includes consideration of institutional form, landscape and funding. Through the TAP White Paper, the Government has explicitly committed to 'consider opportunities for consolidation of building investments to support co-location of functions where this offers synergies that will enhance collaboration and the quality and effectiveness of public investment.'

Principles and Requirements of Project Hau Nuku

Project Hau Nuku Principles are:

- additive – ensuring the work considers and builds from previous reviews to avoid duplication.
- future focused – on future New Zealand needs, trends in the context of climate change, and the weather forecasting system adaptability to future shifts in these areas.
- facilitative – ensuring participation of expert voices across participating institutions.
- open and transparent – ensuring that there are “no surprises” for either system actors, MBIE and Treasury.
- inclusive of Māori particularly around:
 - stakeholder consultation on policy development,
 - effective communication channels in extreme weather events, and
 - ensuring their needs around Māori data sovereignty are identified and considered.

- efficient – ensuring compliance costs for gathering information is minimized.
- sensitive to the need to ensure appropriate protection of information.

Output of Review

The final product of this review will be a report setting out the feasible options (including the preferred option) for the optimal arrangements in the weather forecasting system that will best position New Zealand to meet future weather-related challenges and impacts in the context of climate change. The report will be focused on the matters identified in the ToR.

The report will set out in detail each of the feasible options along with a detailed discussion of each option's likely costs, benefits, opportunities and risks, including further work that may be required to give effect to the preferred option. All conclusions and recommendations will be supported by robust evidence and grounded within the system and authorising environment in which the entities are operating.

Project Hau Nuku Governance and Indicative Process

The Governance arrangements and oversight of Project Hau Nuku are the following:

- **Sponsors of the Project:** Ministers will approve the ToR of the review, provide feedback on the findings of the review, and will decide on the implementation of any recommendations.
- **Steering Group:** The purpose of the Steering Group is to provide oversight of, and guidance for, major milestones of Project Hau Nuku, including the ToR, the appointment of the external provider that will undertake the review and to provide feedback on the final report and its recommendations. The Steering Group will also support the identification and management of project risks. The Steering Group includes senior members from Ministry of Transport (MOT), MBIE and the Treasury.
- **Project Leads:** MBIE and Treasury are the project leads and will be the main point of contact for the review and for delivering on administration and day-to-day activities. This includes engaging with stakeholders and the reviewer.
- **Officials Working Group:** Officials that are key project stakeholders and subject matter experts to provide insights on the review. The working group includes Managers, Principal Advisors, Senior Analysts/Advisors and Analysts from MOT, NEMA, MBIE and the Treasury.
- **The Reviewer:** Independent party that will undertake the review and provide recommendations.

Indicative Process

The expected review phases are:

1. ToR finalised in consultation with key stakeholders.
2. Appointing the reviewer to undertake the review.
3. Reviewer to engage with key stakeholders.

4. Reviewer to share and confirm with officials the criteria for assessing different structural configuration.
5. Reviewer to provide an interim update (e.g. presentation) with initial findings of the first two objectives of the review and before initiating the assessment of the appropriate data access. This will give confidence on the direction of the recommendations and ensure the appropriate data access arrangements.
6. Reviewer to provide a draft report for feedback.
7. Report finalisation, including Key Stakeholders' feedback.

The review is expected to commence by July 2023, with a final report targeted by the end of 2023.

Other considerations:

The reviewer will test preliminary findings with MBIE, the Treasury, MOT and NEMA at the earliest opportunity.

The reviewer will have access to MBIE and the Treasury Monitoring and Policy staff to facilitate the review. The reviewer will similarly have access to staff at MetService and NIWA to assist in the review.

Staff at MBIE and the Treasury will be available to seek out the information required by the reviewer and fact-check reviewer assertions made and findings as needed by the reviewer.

On completion of the review the reviewer will present their report and findings to the MBIE Labour, Science and Enterprise Group General Managers and the Treasury Director and Managers of the Commercial Performance and Governance Directorate.

Stakeholders to be consulted:

We expect the reviewer to undertake a comprehensive consultation process including:

- NIWA
- MetService
- Ministry of Transport
- Department of Conservation
- MFAT (relating to work in the Pacific)
- Waka Kotahi NZ Transport Agency
- National Emergency Management Agency
- Fire And Emergency New Zealand
- Māori Stakeholders
- Local and Regional Councils

We also expect that the reviewer engages with key customers / sectors such as:

- Aviation
- Electricity
- Infrastructure
- Marine
- Media
- Recreational Users

Annex One: Questions to guide reviewer approach to Project Hau Nuku

Optimal arrangement in the weather forecasting system

- What is the demand for weather forecasting services in New Zealand?
- Are there any gaps in the weather forecasting system in New Zealand in light of climate change?
- What is the international landscape (including best practice) for the provision of weather forecasting services in light of climate change? What are the future trends, capabilities and investments required?
- Considering climate change and increasing frequency of severe weather events, what is the likely future demand from existing and future weather forecasting services in New Zealand?
- How should New Zealand be positioning its weather forecasting capabilities into the future?

Configuration of MetService and NIWA

- What are the areas of overlap of services between MetService and NIWA?
- Are NIWA and MetService's current institutional arrangements fit for purpose?
- What are the risks and opportunities of continuing with NIWA and MetService's existing institutional arrangements?
- What are the opportunities for closer collaboration between MetService and NIWA?
- What are the options for a research-to-operations pathway between NIWA and MetService considering competition law?
- What degree of competition is desirable in the delivery of research and weather forecasting services? Consider the pros and cons of competition in the system.
- Is there a more appropriate and financially sustainable set of institutional and structural arrangement between NIWA and MetService that could lead to a better outcome for New Zealand? This question should canvas incentives for the sector to invest and adopt new technology.
- Considering the current levels of science funding for weather forecasting, are there options for a more rationalised funding arrangement that supports the new arrangements that are recommended? (assuming the same aggregate level of funding)
- Is the connection between NIWA, MetService and the emergency management agencies effective during severe weather events?
- What are the implications for competition in the wider weather forecasting services market in New Zealand for the options proposed regarding institutional arrangements?

Access to weather data

Based on the recommendations of the sections above.

- What are the appropriate arrangements for access to weather data?
- What are the costs and benefits and risks of opening the access to weather forecasting data (e.g. would this have any impact on public safety)?
- Would regulation regarding data quality and accuracy of weather forecasting be required if there is open access to data?