NIWA
Taihoro Nukurangi

STATEMENT OF CORPORATE INTENT 2017/18

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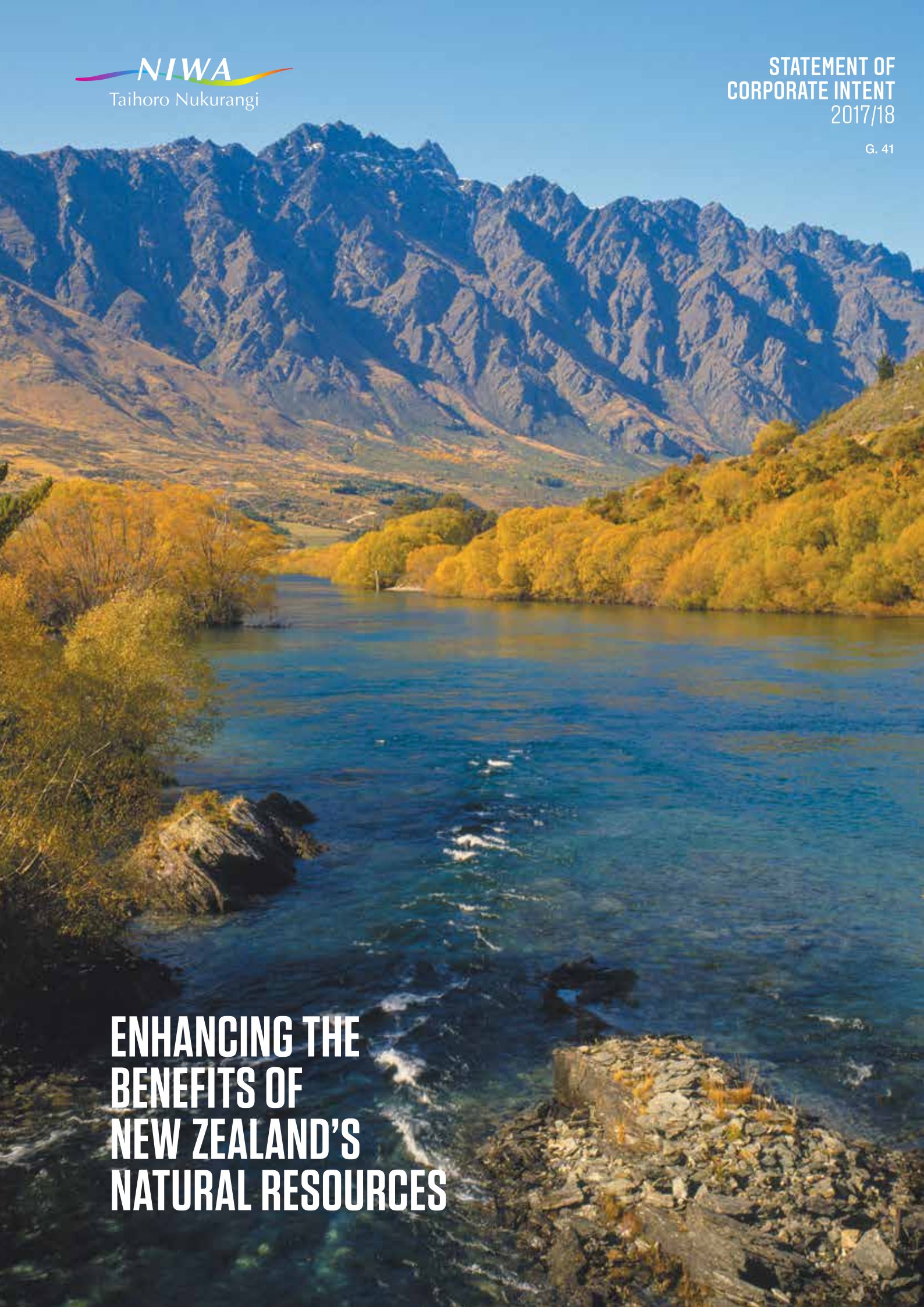

ENHANCING THE BENEFITS OF NEW ZEALAND'S NATURAL RESOURCES

Huka Falls
Dave Allen

NIWA STATEMENT OF CORPORATE INTENT

2017/18

Contents

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June 2017
ISSN 1172-8140 (Print)
ISSN 2423-0901 (Online)

Science that supports New Zealand's economic growth, enhances human well-being and safety, and enables good stewardship of the country's natural resources and biodiversity.

NIWA's world-class deepwater research vessel *Tangaroa.*
Peter Marriott

CHAIRMAN & CHIEF EXECUTIVE'S OVERVIEW

We are pleased to present NIWA's 2017/18 Statement of Corporate Intent (SCI), describing our five-year strategy for meeting the obligations in our Statement of Core Purpose. It illustrates a continuation of our plans for delivering science of national benefit, for building staff capability to ensure long-term performance, and for investment in upgrading key property and science assets. These plans are supported by a forecast of sustained financial performance.

Dimensions

NIWA is New Zealand's largest and pre-eminent provider of climate and atmosphere, freshwater and marine science. In this SCI we describe how our 670 staff and $145M of assets will be deployed to deliver the outcomes expected by our shareholders and stakeholders – namely, science that supports New Zealand's economic growth, enhances human well-being and safety, and enables good stewardship of the country's natural resources and biodiversity.

Context

During the 5-year period of this SCI we expect the nation's need for our science will grow. Debates on the use of New Zealand's natural resources to drive economic growth within socially-accepted environmental limits will intensify. The need to respond to a changing climate poses a significant challenge for our primary sectors, for infrastructure, and for coastal communities. Such debates and challenges will need to be well-founded in science, and the policy and planning decisions that emerge will need a sound evidential base and be explained well. The science described in this SCI has been well-informed by the direction-setting documents of government and the needs of stakeholders. NIWA's science is well-aligned with the recently released *Conservation and Environment Science Roadmap* and the *Primary Sector Science Roadmap,* and these roadmaps will help guide our science strategy and investments in staff capability and equipment during the period of this SCI.

Changing Science System

The *National Statement of Science Investment 2015* (NSSI) clearly articulates what government expects from science and how it will use its investment, alongside that of others, to meet those expectations. The NSSI describes government's strategy to invest more in higher risk science that generates new ideas and develops emerging ideas through the mission-led National Science Challenges and a revised MBIE contestable research fund.

NIWA is committed to supporting this strategy, being the host of the *Sustainable Seas* and *Deep South* National Science Challenges, and developing innovative research proposals for the contestable fund.

The establishment of the Strategic Science Investment Fund and the government's commitment to long-term support of NIWA's applied research in marine, freshwater and climate science provides the level of certainty required to develop deep and enduring relationships with research collaborators and next users and end users.

We expect these changes to the science system to benefit significantly the impact NIWA science has on the way natural resources are managed in New Zealand.

Capability and Assets

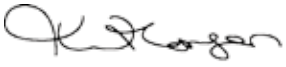
NIWA's ongoing investments in science capability and assets are necessary for it to remain well-positioned as New Zealand's predominant provider of marine, freshwater and climate science. The actions described in this SCI are designed to ensure we maintain a high-performing workforce with skills that are aligned to our science strategy, supported by ongoing investment in scientific equipment, information technology, operational systems and physical infrastructure. In particular, this SCI continues our plan for significant capital investment in upgrading our property assets.

Financial sustainability

In 2017/18, NIWA's revenue is budgeted to be $149M, with an operating surplus before tax of $7M and an adjusted return on equity of 6%. NIWA will seek to have annual operating cash flows in the range of $18M to $26M over the period of this SCI, while undertaking a significant programme of investment in the capital needs of the business.

In summary, the plans described in this Statement of Corporate Intent will ensure NIWA's science is excellent and delivers the impact expected by the shareholder.

Sir Christopher Mace, KNZM
Chairman



John Morgan
Chief Executive

Matthew Evans

NIWA is New Zealand's largest and pre-eminent provider of climate, freshwater and marine science.

OPERATING ENVIRONMENT

1.1 Our purpose

NIWA is New Zealand's largest and pre-eminent provider of climate, freshwater and marine science. As a Crown-owned research institute NIWA is expected to provide national benefit through delivering science that supports New Zealand's economic growth, enhances human well-being and safety, and enables good stewardship of the country's natural resources and biodiversity as defined in its Statement of Core Purpose (SCP).

This SCI describes how NIWA will deploy its staff and assets, leverage its national and international science connections, and utilise its partnerships with stakeholders to deliver its contribution to the following six outcomes in its SCP:

1. Increase economic growth through the sustainable management and use of aquatic resources.
2. Grow renewable energy production through developing a greater understanding of renewable aquatic and atmospheric energy resources.
3. Increase resilience of New Zealand and South-West Pacific islands to tsunami and weather and climate hazards, including drought, floods and sea-level change.
4. Enable New Zealand to adapt to the impacts and exploit the opportunities of climate variability and change and mitigate changes in atmospheric composition from greenhouse gases and air pollutants.
5. Enhance the stewardship of New Zealand's freshwater and marine ecosystems and biodiversity.
6. Increase understanding of the Antarctic and Southern Ocean climate, cryosphere, oceans and ecosystems and their longer-term impact on New Zealand.

1.2 Ensuring relevance

Regular engagement with our partner organisations in government and with relevant sectors has given clear signals on the challenges and opportunities they have and where NIWA's scientific resources can add most value to the broader role of government in supporting these sectors. The details of this alignment are described in section 2 for each of our science platforms, with the key elements described below.

NIWA's science supports those in government implementing the Natural Resources theme of the Business Growth Agenda that "the future prosperity and wellbeing of New Zealanders depends on how we use and manage our natural resources" including:

- The goal of the cross-agency Natural Resources Sector "to improve the productivity of New Zealand's resource-related industries while reducing their environmental impact, to build a more productive and competitive economy."

- The Ministry of Business, Innovation & Employment's (MBIE) Māori Economic Development Strategy – He kai kei aku ringa – that seeks to improve returns from Māori-held assets and its Vision Mātauranga policy, particularly the Taiao theme of achieving environmental sustainability through iwi and hapū relationships with land and sea.
- The Ministry for Primary Industries' Strategy 2030 to double the value of primary sector exports and strengthen their environmental performance, improve sector productivity, increase sustainable resource use, and protect from biological risk.
- The Ministry for the Environment's long-term goals including:
  - New Zealand becomes a world leader in the sustainable management of marine ecosystems that support New Zealand's marine life, society and the economy;
  - New Zealand increases the value from, and improves the quality of, our freshwater;
  - New Zealand has an innovative and productive economy, with fewer greenhouse gas emissions, and is resilient to the physical and economic impacts of climate change and adverse climatic events.
- The Department of Conservation's 10-year Stretch Goals and Priorities in its 2016 Statement of Intent, including that:
  - Fifty percent of New Zealand's natural ecosystems are benefiting from pest management;
  - Fifty freshwater ecosystems are restored from 'mountains to the sea';
  - A nationwide network of marine protected areas is in place, representing New Zealand's marine ecosystems;
  - Whānau, hapū, and iwi are able to practise their responsibilities as kaitiaki of natural and cultural resources on public conservation lands and waters.

These key government agencies have recently defined the science they (and the wider natural resources sector) need to help deliver on these strategies by way of the recently released *Conservation and Environment Science Roadmap* and *Primary Sector Science Roadmap.* There is strong alignment between the science priorities identified by the roadmaps and the science directions signalled in this SCI. NIWA expects that these roadmaps will continue to be influential in our future science planning and prioritisation processes, in developing research collaborations nationally and internationally, and in informing skills and science infrastructure investment decisions.

In addition to providing the science that contributes to government priorities, NIWA also conducts science that supports iwi, local government, sectors and businesses to use, manage and protect natural resources. In developing this SCI we have been influenced by:

- The cross-council Regional Council Research, Science and Technology Strategy 2016 and, in particular, those sub-strategies on surface water, coastal management, air quality, and environmental monitoring and reporting. NIWA's scientists regularly engage with cross-council special interest groups, involve regional council staff in research projects through advisory groups and on-the-ground joint participation, provide training courses to upskill technical staff and, under commission, provide, science advice on specific issues.
- Our engagement with natural resource users, including through their peak bodies (e.g., Dairy NZ, Seafood NZ, The Petroleum Exploration and Production Association of New Zealand). These users of natural resources are most often seeking solution-focused science that provides for economic returns while keeping environmental footprint below acceptable limits. Increasingly, resource availability or societal concerns about the environment are constraining industry growth, so efficient use and clear demonstration of sound environmental practices are a priority.
- The needs and interests of Māori. Iwi and hapū have the responsibility to exercise kaitiakitanga to sustainably manage natural resources within their rohe and are increasingly doing so through co-governance and co-management agreements. At the same time, Māori have significant natural resource assets from which greater economic return is sought (e.g., land, fishing quota, and aquaculture space). Both require good science, and good science is required to help resolve potential conflicts between the two.

1.3 Collaborating to add value

Collaboration with other science and stakeholder organisations, both nationally and internationally, is an essential element of NIWA's strategy to ensure the full benefits of our science are realised. This enables NIWA to:

- Undertake the breadth and depth of the science we do.
- Deliver benefit to widespread communities and sectors.
- Build the 'best teams' based on multiple disciplines and skills.
- Leverage the expertise, knowledge and technologies developed by others.
- Develop the future science capability the nation will need.
- Ensure that key science assets are used efficiently and effectively.

Details of our collaborations are provided in our science plans in Section 2. Collaborations that are particularly important over the period of this SCI include:

- Central and local government agencies, as they develop and implement policies related to land, water and coastal resources, including those related to the effects of climate change. We have strong relationships with these agencies and will look to nurture and grow these relationships by working together on more projects, being part of working groups and forums, and seeking opportunities for staff secondments.
- Key business sectors and their peak bodies, as we seek to better understand the issues and opportunities they have in utilising natural resources and work together on solutions and realisation of those opportunities.
- Māori researchers, tribal authorities and businesses, as we seek to enhance adoption of our science by Māori as they exercise kaitiakitanga and seek greater economic returns from their assets.

- Crown Research Institutes, universities, and other research organisations (nationally and internationally), as we deliver on the National Science Challenges we host and participate in.
- Other global weather research and forecast organisations that participate in the Unified Model Consortium dedicated to improving the accuracy of weather forecasts and climate-change predictions.
- The New Zealand eScience Infrastructure initiative, which ensures nationally coordinated development of and access to e-science and high performance computing.
- Our partnership with the Sir Peter Blake Trust, to promote an awareness of the environment and the opportunities for science careers to young people.
- Joint Graduate Schools between NIWA and the Universities of Auckland and Otago in marine science, and the University of Waikato in freshwater science, to develop future talent.
- Initiatives in marine and climate science with international organisations through Memorandums of Understanding, especially with the US (National Oceanic and Atmospheric Administration, Woods Hole Oceanographic Institution), Japan (Japan Agency for Ocean-Earth Science and Technology), and China (Institute of Oceanology, Chinese Academy of Sciences).

1.4 Being ready, able and agile

NIWA is well-positioned to continue to meet the expectations of its shareholder and make its contribution to the management and use of New Zealand's natural resources. Section 3 details the enabling strategies that ensure organisational readiness, capability and agility in NIWA's people, infrastructure and operating systems.

As signalled in the 2016/17 SCI Addendum, a key focus over the 5 year period of this SCI will be a significant upgrade of NIWA's ageing property assets to make them fit-for-purpose and designed for future flexibility. These upgrades are following a timetabled property renewal plan that depends on sustained financial performance. Some debt financing will be required to undertake these investments, to be serviced by the steady operating cash flows forecast throughout the period.

This SCI forecasts revenue growth from $140M (2016/17 forecast) to $159M in 2021/22, operating surpluses between $7M and $9M per annum, and annual operating cash flows between $18M and $26M. There is some forecasting uncertainty, with NIWA's financial performance depending on sustained investment in NIWA's science by government and non-government customers. NIWA's budgeting has been robust, and we are of the view that there is equal downside risk and upside opportunity.

NgāKaitiaki o NgāWai Māori and NIWA are working together in the Wairua River catchment to find out more about juvenile eel survival. Knowledge gained from this project will help NgāKaitiaki o NgāWai Māori and supporting agencies in their work to increase tuna (freshwater eel) populations in the Wairua catchment.
Stuart Mackay

Giant, tooth-like chunks of ice jostle for position along a walkway near Scott Base, Antarctica. Intensifying research in this remote part of the world is key to understanding the potential impacts on New Zealand of climate variability and change.
Katja Riedel

Increasing our understanding of how Antarctica and the Southern Ocean affect New Zealand's climate.

NIWA'S SCIENCE

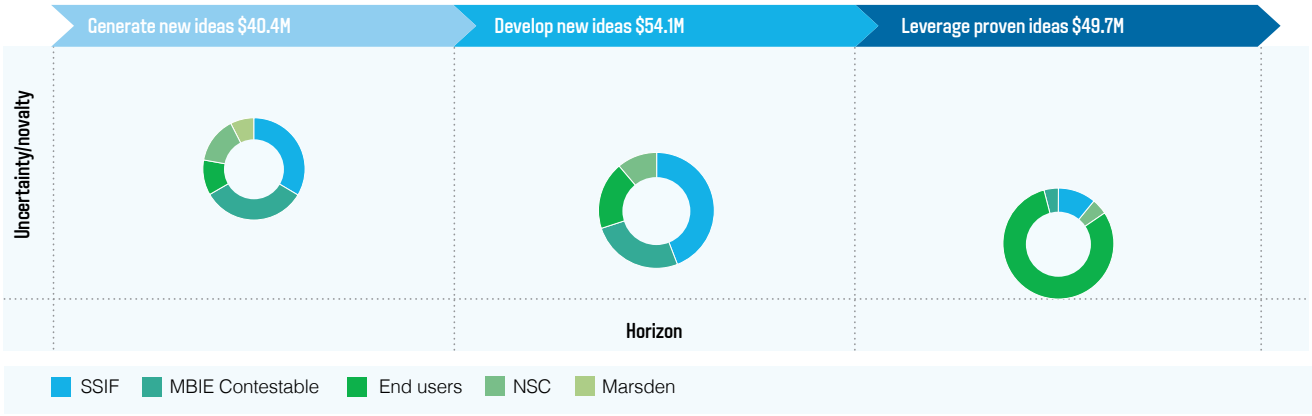
In meeting its core purpose outcomes, NIWA conducts science over a range of horizons, from medium to long-term science that generates new ideas through to short-term science that leverages proven ideas and delivers impact through a variety of technology transfer mechanisms.

The distribution of NIWA's current revenue sources across these horizons shows:

- Strategic Science Investment Funds (SSIF) are primarily used to develop emerging ideas (applied research);
- MBIE Contestable programmes and National Science Challenges (NSC) are largely used to generate new ideas and develop emerging ones;
- End users are the primary funders of applying our science to deliver impact;
- Whilst each revenue source has its horizon focus, all revenue sources (apart from the curiosity-driven Marsden Fund) are utilised to some degree across the horizons. This is appropriate, helping to strengthen the line of sight between the research and its application, even in its early stages.

Revenue secured in the recently established National Science Challenges and the re-defined MBIE Contestable process has led to a re-balancing of NIWA's science portfolio to include increased effort on future-focused and potentially transformative research – this aligns with the government's intentions in the 2015 National Statement of Science Investment. We expect this increased research effort to have a positive effect, in the medium-term, on the co-investment by end users and the impact subsequently derived from NIWA's science.

NIWA delivers its six SCP outcomes through three science platforms (marine, freshwater and climate), as illustrated over page. NIWA manages the Platforms at a finer scale through its eight National Science Centres, five of which closely map to the Platforms while three are cross-Platform in orientation (Environmental Information, Te Kūwaha, and Pacific Rim). The strategic directions, research projects, science services and stakeholder engagement within each Platform are driven from the relevant National Science Centres, overseen by a Chief Scientist. The sections below describe the science strategy of each Platform, its relevance to stakeholder need, and the outcomes and impacts envisaged.



Horizon profile and revenue sources for NIWA's science.

Platform:
CLIMATE & WEATHER HAZARDS

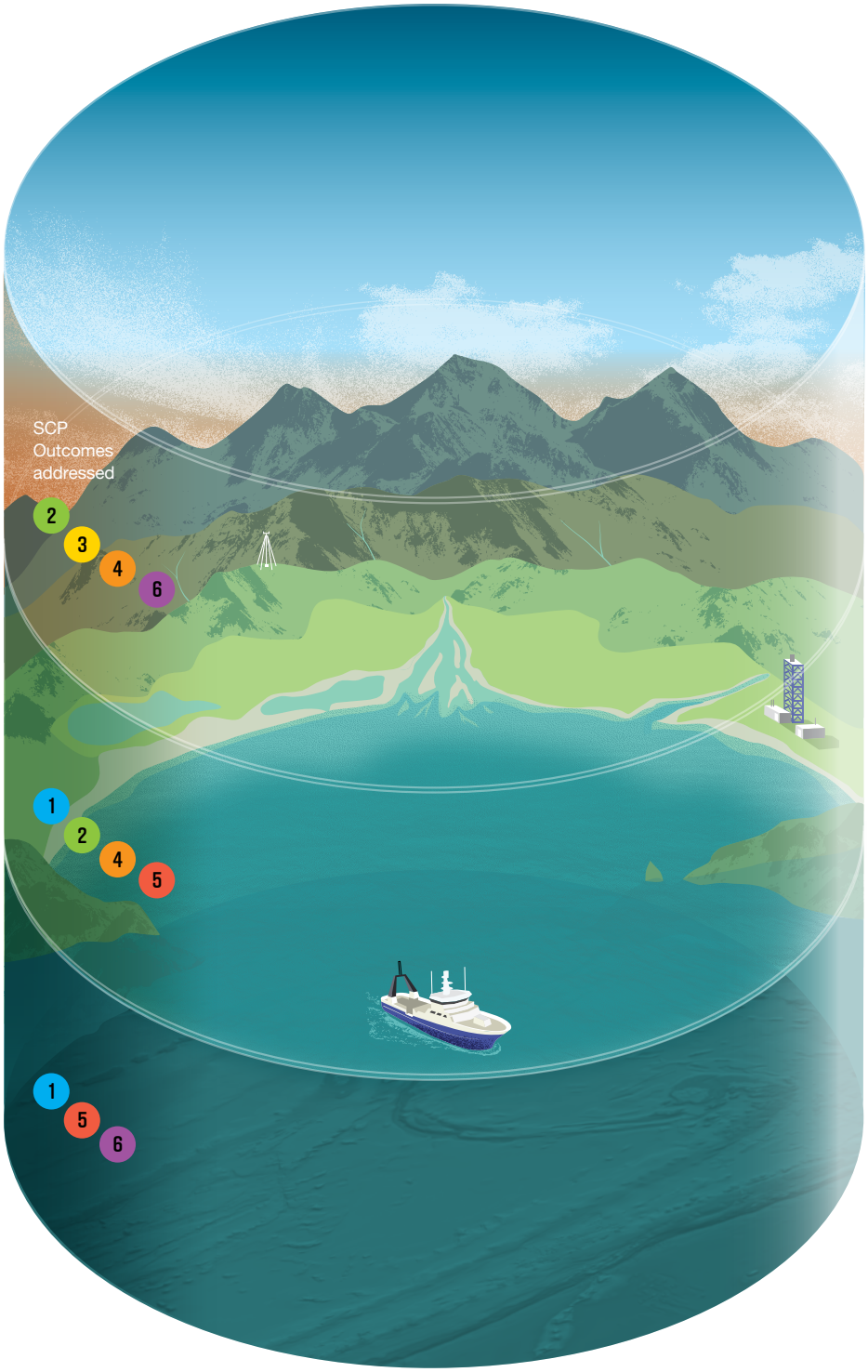
Climate
Atmosphere
Hazards

FRESHWATER ENVIRONMENT

Freshwater
Estuaries

MARINE ENVIRONMENT

Fisheries
Aquaculture
Coasts & Oceans



Environmental Information

Te Kūwaha (Māori development)

Pacific Rim

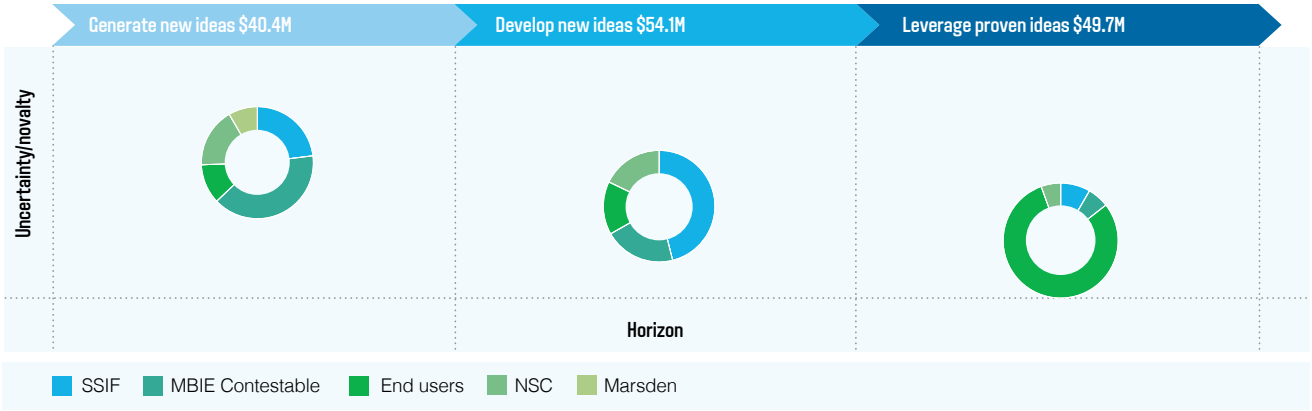
1. Increase economic growth through the sustainable management and use of aquatic resources.
2. Grow renewable energy production through developing a greater understanding of renewable aquatic and atmospheric energy resources.
3. Increase resilience of New Zealand and South-West Pacific islands to tsunami and weather and climate hazards, including drought, floods and sea-level change.
4. Enable New Zealand to adapt to the impacts and exploit the opportunities of climate variability and change and mitigate changes in atmospheric composition from greenhouse gases and air pollutants.
5. Enhance the stewardship of New Zealand's freshwater and marine ecosystems and biodiversity.
6. Increase understanding of the Antarctic and Southern Ocean climate, cryosphere, oceans and ecosystems and their longer-term impact on New Zealand.

NIWA's three science platforms align with the SSIF Platforms we are contracted by MBIE to deliver and the Statement of Core Purpose Outcomes.

2.1 Marine

Dimensions

NIWA is New Zealand's largest marine science organisation, with c. 255 staff who contribute to the c. $55M of coast and ocean, fisheries and aquaculture science conducted annually within this Platform. These experts are supported by the fully equipped research vessel *Tangaroa;* other smaller vessels; specialist remote, on-board, and at-base analysis equipment; the high performance computing facility and the Northland Marine Research Centre.



Horizon profile and revenue sources for NIWA's Marine Science.

The distribution of revenues from SSIF, other research funds and end users across the horizons within the Marine Platform is summarised in the figure above. SSIF, MBIE Contestable and National Science Challenge revenues are all predominantly used to generate new ideas or develop emerging ideas. The end-user revenues, not surprisingly, are primarily used to leverage proven ideas – a significant fraction of this is assessing fishery stocks for the Ministry for Primary Industries. End-user revenue is expected to increase in future years due to a likely increase in investment in fisheries management science, renewed interest in marine mining, and the potential for growth in the aquaculture of finfish species.

Science relevance

Engagement with key government agencies and sectors has yielded a set of key issues across the three areas of aquaculture, fisheries and coasts and oceans, which collectively determine the external drivers for the Marine Platform strategy:

- **Government directions** – a diverse range of government needs are expressed in a range of strategies and policies, for example, (i) the Business Growth Agenda, aiming to increase resource use and the value of exports; (ii) MPI's "Strategy 2030" goals of maximising export opportunities in primary industry, improving sector productivity, increasing sustainable resource use, and enabling the reduction of biological risks to New Zealand's natural resources; (iii) MPI's Future of our Fisheries 2016; and (iv) MfE's and DOC's drive for marine protected areas to conserve biodiversity ("The New Zealand Biodiversity Action Plan 2016–2020"). The marine science requirements of these directions have been well-described in the recently released *Conservation and Environment Science Roadmap* and *Primary Sector Science Roadmap.*
- **Industry directions** – the dynamic needs of industry (e.g., the fall in global oil prices reduced oil and gas sector exploration; the failure of offshore mining applications as a result of scientific uncertainty; increased need for premium quality products and marketing), industry strategies (e.g., aquaculture sector aims to grow exports to $1B by 2025; fishing industry aims to achieve Marine Stewardship Council certification for fisheries), business risk reduction (e.g., unpredictable supply and variable quality of wild spat impact on the ability to expand mussel production, difficulty in attracting capital for new aquaculture ventures), and business as usual issues (e.g., the need for mitigation/adaptive management strategies, and the renewal of existing resource consents).
- **International drivers and obligations** – this includes understanding the processes and implications of global environmental change (e.g., ocean warming and acidification) on ecosystem dynamics and productivity; international obligations (e.g., Paris Agreement, CCAMLR [Convention for the Conservation of Antarctic Marine Living Resources], SPRFMO [South Pacific Regional Fisheries Management Organisation], UNCLOS [United Nations Convention on the Law of the Sea], and Convention on Biodiversity).
- **Vision Mātauranga** – Māori seeking to grow their return from their marine assets (e.g., fisheries, aquaculture) and co-manage the marine estate, as expressed in various strategies (e.g., Vision Mātauranga, the Māori Economic Development Panel's 'Strategy to 2040').

- **Societal drivers** – a variety of social values and drivers, which may conflict, impact on marine resource use (e.g., increasing demand for societal values to be incorporated into marine resource management to secure 'social licence to operate' for industry; a public desire for restoration of degraded systems; growing tension between customary, recreational and commercial access to coastal fisheries resources; increasing tension around the effects of deepsea mining and oil extraction; increasing demand for transparent reporting on the impacts of marine resource use).
- **Complexity of marine management** – the regulatory environment is complex, with multiple organisations being responsible for environmental management and with varying levels of integration; this drives an increasing need for ecosystem-based management approaches to resolve multiple-use conflicts.

Strategic priorities

As developed through the above process, the strategic priorities for this Platform over the next five years are to:

- Improve understanding of marine ecosystems and predictive modelling capability, e.g., defining benthic habitat and validating predictive resource modelling; integrating physical and environmental parameters with biological data at regional scales to enable predictive biodiversity modelling.
- Develop ecosystem approaches to monitoring and management, especially for fisheries, to ensure that the ecosystems that support resources are sustained. For aquaculture, to assess and understand the interaction between aquaculture activities and the marine environment, particularly the development of 'environment facing' and 'farm facing' risk assessment.
- Discover, quantify and assess marine resources (geological and biological, including fisheries) to allow for sustainable utilisation, including low-information stocks for fisheries.
- Quantify and predict the effects of anthropogenic (including biosecurity threats) and natural stressors, and their impacts on the marine environment, and develop risk assessment approaches and tools to mitigate, manage or reduce risks and impacts where feasible.
- Resolve science bottlenecks in aquaculture to facilitate industry entry (e.g., develop a fit-for-commercial-purpose juvenile production system for hāpuku) and expansion (seek commercial entities to advance yellowtail kingfish farming opportunities).
- Enhance value from marine resource utilisation, e.g., develop tools to assess and forecast in-farm environmental conditions to improve aquaculture production and operations; enhance fisheries value and market access through better practices (e.g., bycatch management).
- Continue to provide dedicated research vessels and leading-edge technology to support marine research and surveying, from the coastal margin to the deepsea.

These priorities will be delivered through a set of science programmes that, based on present needs and drivers, will endure for the five year term of this SCI. The detailed science within the programmes is likely to change, but the programmes as a structure are likely to endure as they are addressing big and complex science questions and national needs.

No.	Science programme	Key objectives
1	Marine Physical Processes and Resources: characterisation of the marine geological and oceanic energy resources in New Zealand, the Ross Sea region and the Southern Ocean and the physical processes and environmental factors that affect those resources.	Better understand marine resources, indicators of their presence, the processes that affect them and limitations in use. Facilitate sustainable utilisation of marine resources. Better understand the geological drivers (e.g., undersea faults, landslides, volcanoes) of marine hazards.
2	Marine Biological Resources: delivery of fundamental knowledge about the diversity and distribution of the marine biota in New Zealand's territorial waters, EEZ and Southern Ocean, over a variety of space and time scales.	Define New Zealand's marine biological resources. Enable identification of biosecurity threats, and improve biosecurity understanding and management.
3	Ocean flows and productivity: definition of the spatial and temporal variation in New Zealand's ocean current flows, primary and secondary production, and determination of how biogeochemical and physical oceanographic processes influence biotic variability.	Gain an advanced understanding of oceanic processes that influence transport of nutrients, heat, sediments, propagules and pollutants. Develop predictive capabilities.

4	Ecosystem structure and function: determine the structure of marine ecosystems, the interactions amongst their components that affect ecosystem stability, and develop ecosystem models.	Inform management of the marine estate generally, and the development of ecosystem-based management.
5	Managing marine ecosystems: determine the characteristics and vulnerability of marine communities, habitats and ecosystems by linking knowledge of how marine ecosystems work to how they are affected by human activity, and address limits to capacity, interactions between multiple stressors, the dynamics of cumulative effects and the underlying controlling factors of ecological recovery.	Improve understanding of the ecological function of marine ecosystem components, their resilience to change and ability to recover. Development of scenario modelling capability to inform management decisions. Improve our capacity to forecast the limits of acceptable utilisation of a resource. Inform strategies for marine protection.
6	Marine biosecurity: identifying and evaluating biosecurity threats to marine ecosystems from non-indigenous species, and developing management tools and approaches.	Prevent entry of unwanted marine organisms. Optimise surveillance strategies. Develop management strategies for established pests.
7	Develop reliable and efficient techniques for the commercial-scale production of established and emerging high-value aquaculture species.	Increase value derived from marine resources. Start-up the culture of new, high-value species.
8	Develop the underpinning science, monitoring tools and farm management systems that quantify and minimise both the environmental effects and regulatory compliance costs of aquaculture while optimising production and minimising the risks to aquaculture from environmental stressors.	Increase value derived from marine resources. Improved industry productivity and management of environmental impacts.
9	Develop and apply stock monitoring and assessment methodologies for New Zealand's fisheries to enable monitoring and prediction of changes in fish population biology, fish stock biomass, and size and age composition.	Improve fisheries management and sustainability of resource use. Facilitate fisheries certification processes.
10	Develop and apply standardised methodologies to monitor and assess international fisheries outside the New Zealand EEZ and determine the environmental effects of fishing.	Improve fisheries management and sustainability of resource use. Enhance international standing of New Zealand fisheries management.
11	Determine the impact of fisheries on the aquatic environment and contribute to broader ecosystem-based management approaches.	Inform an ecosystem-based approach to fisheries management.

Outcomes

Expected outcomes from NIWA's marine science through its uptake and application by government agencies and key sectors will be:

- **Coasts & Oceans** – Enhanced stewardship of New Zealand's marine estate, so there are increased economic returns from marine resources, and marine ecosystem integrity and biodiversity are maintained.
- **Fisheries** – New Zealand maximises sustainable, long-term economic benefit from its fisheries and associated ecosystems through a science-informed management system accepted as international best practice.
- **Aquaculture** – New Zealand aquaculture will be a financially and environmentally sustainable billion-dollar export-focused industry by 2025 through the production of high-value species, both established and emerging, that meet market demand for products with verifiable quality and sustainability attributes.

Impacts

Over the period of this SCI the science NIWA undertakes in the Marine Platform (Coasts & Oceans, Fisheries and Aquaculture National Centres) is expected to have a number of beneficial impacts on New Zealand, and in some cases the wider international community. Achievement of these benefits would be reliant on collaboration and support from key stakeholders (i.e., the national and international science community, policy makers from central and local government, Māori, industry, regulatory bodies and communities) to ensure delivery, uptake and adoption. These beneficial impacts include:

1. New Zealand has improved systems for environmental management of marine resources that have reduced the conflict among multiple users, protected vulnerable components and realised economic, social and environmental benefits.
2. Biodiversity metrics are used routinely to identify and manage representative and unique examples of marine communities.
3. Resource exploration has advanced in previously unexplored regions of the New Zealand EEZ.
4. Key stakeholders, including next-user scientists, are using the results of NIWA predictions/observations of ocean flows and primary productivity to inform their activities and research (e.g., predict future biological production, nutrient supply, dispersal of contaminants and invasive species).
5. Border surveillance and incursion response tools reduce the risks to industry and New Zealand's marine ecosystems from the adverse impacts of aquatic pests.
6. New Zealand fisheries are recognised internationally as well managed and sustainably used.
7. The value of New Zealand seafood exports based on wild fisheries increases as premium markets are secured through environmental certification.
8. Industry farming of new species of finfish has been successfully established and is making a significant contribution to sector revenue growth.
9. Improved performance of established aquaculture species has led to increased profitability of the sector.
10. The environmental footprint of marine farming activities has been minimised and the product quality improved, such that New Zealand's aquaculture industry has the social licence to operate and products meet eco-certification and quality criteria for discerning markets.

The contribution that NIWA makes towards achieving these longer-term impacts is delivered through meeting its annual KPIs (see below).

KPIs for 2017/18

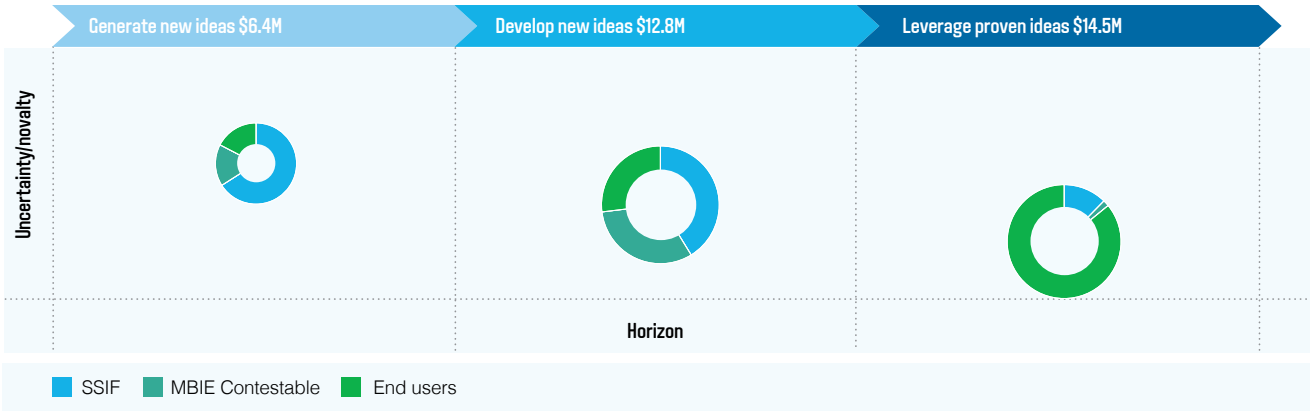
Key performance indicators for completion in the 2017/18 year, and the impacts they contribute to, are:

1. The extent of climatic niche shift by marine invaders has been determined, and its effect on the utility of species distribution models for predicting their potential invaded range is known [Impacts 1, 4 and 5].
2. A method for assessing vulnerability of seafloor habitats, based on functional traits of organisms, resilience of specific habitats and locations, and threat traits has been developed [Impacts 1, 2, 3 and 4].
3. The economic impacts of at least one marine pest have been assessed [Impacts 4 and 5].
4. Climate-change effects on bentho-pelagic coupling in the New Zealand EEZ have been predicted, and potential impact on important demersal fish species made available to end users [Impacts 1, 2 and 4].
5. Provide industry with an opportunity to invest in the farming of kingfish [Impact 8].
6. Commission a recirculating aquaculture research unit for evaluating water treatment systems and fish performance [Impacts 8 and 9].
7. Validate the role of broodstock conditioning on hāpuku larval survival [Impacts 8 and 9].
8. Complete beta testing of a mussel aquaculture forecasting service, revise accordingly, and roll-out for general sector use [Impacts 9 and 10].
9. A new risk approach for informing research prioritisation and management of fisheries bycatch has been developed [Impacts 6 and 7].

2.2 Freshwater

Dimensions

NIWA has c. 232 staff who contribute to the c. $34M of science conducted annually in this Platform. These experts utilise data from NIWA's long-term water monitoring network, as well as from additional data collection campaigns using specialist sampling and analytical equipment.



Horizon profile and revenue sources for NIWA's freshwater science.

The distribution of revenues from SSIF, other research funds and end users across the horizons within the Freshwater Platform is summarised in the figure above. Given the strong public, government and sectoral interest in freshwater issues and how to resolve them, both SSIF and end-user funding is used to expose our latest science and inform the current debates. Revenue from end users over recent years has grown to be in the order of $16M per annum. We expect this demand to be sustained (or grow further) during the period of this SCI as the pressures on freshwater resources grow, the need to meet water quality limits is enforced, and community demand for restoration of degraded waterways and estuaries increases.

Science relevance

Engagement with key government agencies and sectors has yielded a set of key issues which collectively determine the external drivers for the Freshwater Platform strategy:

- **Changes in society** – increased urbanisation is having a greater impact on waterways. Also, increasing trade, travel and intensification of land use means greater risk or exposure of waterways to aquatic pests.
- **Government policy** – multi-dimensional drivers: increased access to water is a key pillar in the government's economic growth strategy; the National Policy Statement for Freshwater Management requires evidence-based science to assist limit setting for both water quantity and quality at national, regional and community deliberation levels.
- **Utilisation drivers** – there is an expanding demand and competition for freshwater resources, with a 50% increase in the last seven years, and this is likely to follow a similar trajectory over the coming years. Along with this is an increased demand for water storage to meet the needs of agriculture.
- **Collaborative drivers** – there continues to be an increasing need for cross-sector research and industry collaboration to ensure biophysical science is placed alongside other considerations such as economics, farm systems and social and cultural impacts.
- **Value drivers** – there is an increased focus on the valuation of water resources, including understanding the market value of resources for pricing, compensation and allocation decisions, as well as non-market values such as ecosystem services and sociocultural values.
- **Vision Mātauranga** – a growing Māori economy focused on the management and use of natural resources, coupled with Māori rights to/ownership and co-management of water and water resources.

Strategic priorities

As developed through the above process, the strategic priorities for this Platform over the next five years are to:

- Engage with multiple stakeholders and science providers on water resources, water quality and ecosystem health issues.

- Provide comprehensive input to the regional implementation of the National Policy Statement for Freshwater Management and to the development of national environmental limits and bottom lines.
- Develop predictive capacity, and mitigation and decision-support tools, required for more effective and integrated management of surface-groundwater ecosystems and resources.
- Develop greater knowledge of, and understandings of how to mitigate, the impact of contaminants (particularly multiple stressors and their interactions) on the fauna and flora of New Zealand's freshwater ecosystems.
- Develop and demonstrate technologies for increased water-use efficiency, reducing contaminant sources and mitigating environmental effects, more innovative water treatment technologies (particularly at the farm scale), more accurate modelling of farm-to-catchment scale implications of development scenarios, and more comprehensive 'effects' assessments.
- Develop tools and techniques for rehabilitation and protection of freshwaters, including the minimisation of biosecurity risks and development of mitigation tools.
- Predict where, when and how much water there is, and how much of this water might be available for use, from catchment to national scales under a range of land use and future climate scenarios.

These priorities align well with those identified in the *Conservation and Environment Science Roadmap* and the *Primary Sector Science Roadmap.* They will be delivered through six research programmes that, based on present needs and drivers, will endure for the five year term of this SCI. The detailed science within the programmes is reviewed every year and is likely to evolve and change in response to new science opportunities and end-user needs.

No.	Science programme	Key objectives
1	Water resources: understanding and predicting the hydrological cycle (how much water, where and when).	Improve water planning and management.
2	Sustainable water allocation: understanding and predicting effects of human use and modification of rivers and groundwater systems for sustainable allocation.	Enable sustainable allocation of water resources and increase primary sector productivity within environmental constraints
3	Causes and effects of water quality degradation: understanding and predicting the sources of contaminants, technologies to clean up the sources, and consequences of water quality degradation for aquatic ecosystems and human uses of water.	Ensure appropriate targeting of contaminant sources in water planning, policies and their implementation. Implement technologies to reduce contamination in waterways and improve water quality and ecosystem health.
4	Catchments to estuaries: understanding and predicting the functional connections between catchments and estuaries.	Improve diffuse-source contaminant management so that the most sensitive receiving ecosystems are protected.
5	Freshwater biosecurity: identifying and evaluating threats from non-indigenous species, minimising risks of their establishment and developing mitigation tools.	Mitigate impacts of biosecurity threats. Minimise and/or eradicate current biosecurity threats and risks.
6	Aquatic rehabilitation and protection: developing techniques for biodiversity enhancement, rehabilitation and protection of freshwater values under future economic growth scenarios.	Rehabilitate and improve quality and value of freshwater resources.

Outcomes

Expected outcomes from NIWA's freshwater science through its uptake and application by government agencies and key sectors will be:

- New Zealand's freshwater and estuarine resources are wisely utilised for economic benefit and have water quality and ecosystem health that meet community expectations.

Impacts

Over the period of this SCI the science NIWA undertakes in the Freshwater Platform is expected to have a number of beneficial impacts on New Zealand, and in some cases the wider international community. Achievement of these benefits would be reliant on collaboration and support from key stakeholders (i.e., the national and international science community, policy makers from central and local government, Māori, industry, regulatory bodies and communities) to ensure delivery, uptake and adoption.

These beneficial impacts include:

1. Increased economic benefit has been derived from use of our water resources with no loss of environmental values.
2. Implementation of new land and water policy and rehabilitation techniques has led to a measurable improvement in the quality and ecosystem health of the nation's freshwaters.
3. Management agencies are able to apply a greater range of options to eradicate or control new and existing freshwater pests.
4. Reduced catchment-derived sediment and nutrient inputs to estuaries will have resulted in expanded seagrass, shellfish and juvenile fish habitats.

The contribution that NIWA makes towards achieving these longer-term impacts is delivered through meeting its annual KPIs (see below).

KPIs for 2017/18

Key performance indicators for completion in the 2017/18 year, and the impacts they contribute to, are:

1. An innovative lamprey population monitoring tool has been developed and made available and promoted to end users in regional councils, iwi, and central government agencies [Impact 2].
2. National best management practice guidance to support decision making for aquatic weed management has been developed and made available and promoted to regional councils and central government agencies [Impact 3].
3. Improved tools for water allocation decisions that balance out-of-stream benefits against in-stream values have been developed and provided to regulatory agencies [Impacts 1 and 2].
4. NIWA's science on deriving targets and limits for water quality and ecosystem health has been provided to policy makers developing amendments to the National Objectives Framework in the National Policy Statement for Freshwater Management [Impacts 2 and 4].
5. Improved predictive tools for managing nutrient limits and effects in estuaries have been developed and made available and promoted to regional councils [Impact 4].
6. Loose coupling of surface and groundwater models has been established and tested within two trial catchments [Impact 1 and 2].
7. A framework that enables Māori values to be proactively and effectively incorporated into the water-allocation decisionmaking process has been developed and tested with both North and South Island iwi [Impact 1 and 2].
8. The feasibility of ROV-deployed, imaged-based monitoring of periphyton cover on stream beds has been established [Impact 2].

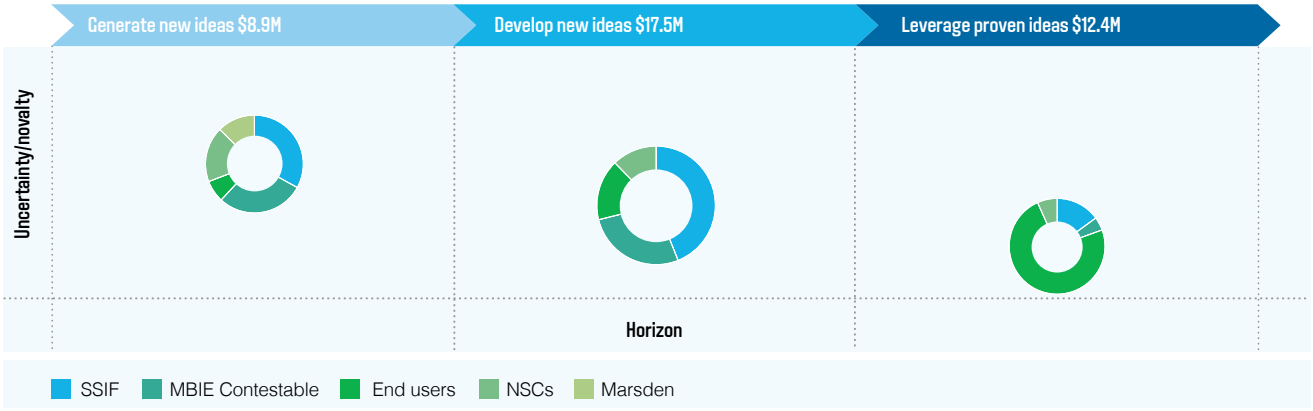
Chris Williams

NIWA's Clean Air Monitoring Station at Baring Head, east of Wellington city, has been in operation for more than 40 years. The station makes significant contributions to our global understanding of greenhouse gases.
Dave Allen

2.3 Climate, Atmosphere and Weather (and related Hazards)

Dimensions

NIWA has c. 223 staff who contribute to the c. $39M of science conducted annually in this platform. These experts utilise NIWA's high performance computing facility, atmospheric composition sampling and analysis equipment, and NIWA's 200 weather measurement sites across the country. They also participate in extensive global collaborations which enrich New Zealand's science and provide opportunity for adding greater benefit.



Horizon profile and revenue sources for NIWA's climate, atmosphere and weather-related hazards science.

The distribution of revenues from SSIF, other research funds and end users across the horizons within the Climate Platform is summarised in the figure above. Current research effort is focused on developing emerging ideas for their application. Revenue from end users over recent years has been in the order of $14M per annum. This is expected to increase in future years due to greater demand for science-informed policy and decision making by central government, local government, and key sensitive sectors to address issues of vulnerability to climate extremes and hazards.

Science relevance

Engagement with key government agencies and sectors has yielded a set of key issues which collectively determine the external drivers for the Climate, Atmosphere & Hazards Platform strategy:

- **International drivers and obligations** – this Platform sits in an area of numerous international agreements and obligations, including the Paris Agreement of the UNFCC, which commits New Zealand to reducing net greenhouse gas emissions; and the Sendai Framework, which puts New Zealand on a path for disaster risk reduction. In addition, New Zealand needs to maintain its interests in the Southern Ocean, sub-Antarctic islands, and the Ross Dependency of Antarctica.
- **Technology drivers** – current trends include a move towards high-density, low-cost distributed instrument sensors and 'smart' cities reliant on wireless technologies, and increasing demand for multi-variate/multi-disciplinary research, through to Earth-system approaches for environmental research and management.
- **Collaborative drivers** – currently there are collaborative structures in place in the science system which influence Platform directions. In particular, the Resilience to Nature's Challenges National Science Challenge plans to rely heavily on the use of RiskScape (developed in the Platform) for natural hazard decision making, and hazards research for underpinning science.
- **Information requirements** – there are ongoing changes to stakeholder demands concerning the type and quality of information provided. For example, there is a demand for increased efficiency and precision, which in turn requires reliable climate, hazard and risk information and projections (with uncertainties) for both policy and operational uses. Similarly, there is an increasing requirement for digestible and immediate climate/weather/hazard/risk information and forecasts for government, industry and other decision makers.
- **Changes in the economy and society** – a variety of structural changes in the country impact on the Platform. For example, population growth and urbanisation drives intensification of development and infrastructure in marginal areas, leading to poorer air quality and increased vulnerability to weather events. There is also increasing demand for climate-sensitive resources (land, water, renewable energy), and this demand will be constrained under a changing climate of more extreme extremes.

- **Impacts on Māori communities and businesses** – Climate change will have a significant impact on Māori business, especially on primary producers (i.e., farming, forestry and fisheries). Decision-ready information about potential climate change impacts is required to meet the long-term planning horizons typical of Māori land-based agribusiness. As holders of significant land-based assets and areas over which they have kaitiaki responsibilities, Māori are vulnerable to weather-related hazards.

Strategic priorities

The strategic priorities for this Platform over the next five years are:

To develop:

- Environmental forecasting models and delivery systems for decision-support and real-time response.
- A world-class Earth System Model for long-term climate projections.
- Ultra-high resolution climate projections over New Zealand (convective-scale) to better predict changing extremes.
- Climate planning tools, building on our experience with the urban climate environmental toolbox.

To quantify:

- The risks of hazards associated with weather, coastal processes, and sea-level rise to inform emergency response and long-term planning and design.
- New Zealand's atmospheric and oceanic carbon budget.

To implement:

- Novel community-based air quality monitoring systems and new approaches for assessing urban air quality hot spots.

These priorities will be delivered through a set of research programmes that will endure for the five year term of this SCI. The detailed science within the programmes is reviewed every year and is likely to evolve and change in response to new science opportunities and end-user needs.

No.	Science programme	Key objectives
1	Monitor atmospheric constituents relevant to climate change.	Report the state of the atmosphere Quantify New Zealand's greenhouse gas emissions for validating mitigation options.
2	Determine the role of oceans in climate variability and change.	Ocean measurements and modelling to improve understanding. Understanding how oceans govern climatically important gases and aerosols.
3	Determine the role of the atmosphere and cryosphere in climate variability and change.	Understand how the dynamics of the atmosphere, glaciers and sea ice influence the climate of the New Zealand region, including Antarctica. Use climate measurements and identify the causes of changes.
4	Develop improved predictions of climate and climate extremes on all timescales.	Understand the future impact of potential climate change, extremes and vulnerability. Improve dynamical climate modelling (Earth System Models) and statistical techniques.
5	Determine present and future vulnerability, impacts and adaptation options to climate variability and change in New Zealand, the South-West Pacific, Southern Ocean and Antarctica.	Reduce the vulnerability to, and impacts of, climate extremes and climate-related hazards.
6	Monitor air pollutants and determine their impacts.	Improve air quality and reduce health and environmental impacts. Evaluate mitigation options.
7	Develop predictive models of weather-related hazards and incorporate them into an operational multi-hazard forecasting system.	Reduce risk and improve planning and response to natural hazards.
8	Evaluate the risk, impacts and potential losses due to weather-related hazards.	Inform planning for risk reduction and emergency response.

Outcomes

Expected outcomes from NIWA's climate, atmospheric and hazards science and its uptake and application by government agencies and key sectors will be:

- New Zealand communities will be more resilient to weather-driven hazards, proactively planning and reducing losses and speeding recovery, now and in an environment that is being modified by changes in climate and land use.
- New Zealand manages long-term climate change by reducing emissions of greenhouse gases and related pollutants and responds effectively to the opportunities and impacts of current and future climate.

Impacts

Over the period of this SCI the science NIWA undertakes in the Climate, Atmosphere and Weather (and related Hazards) Platform is expected to have a number of beneficial impacts on New Zealand, and in some cases the wider international community. Achievement of these benefits would be reliant on collaboration and support from key stakeholders (i.e., the national and international science community, policy makers from central and local government, Māori, industry, regulatory bodies and communities) to ensure delivery, uptake and adoption.

These beneficial impacts include:

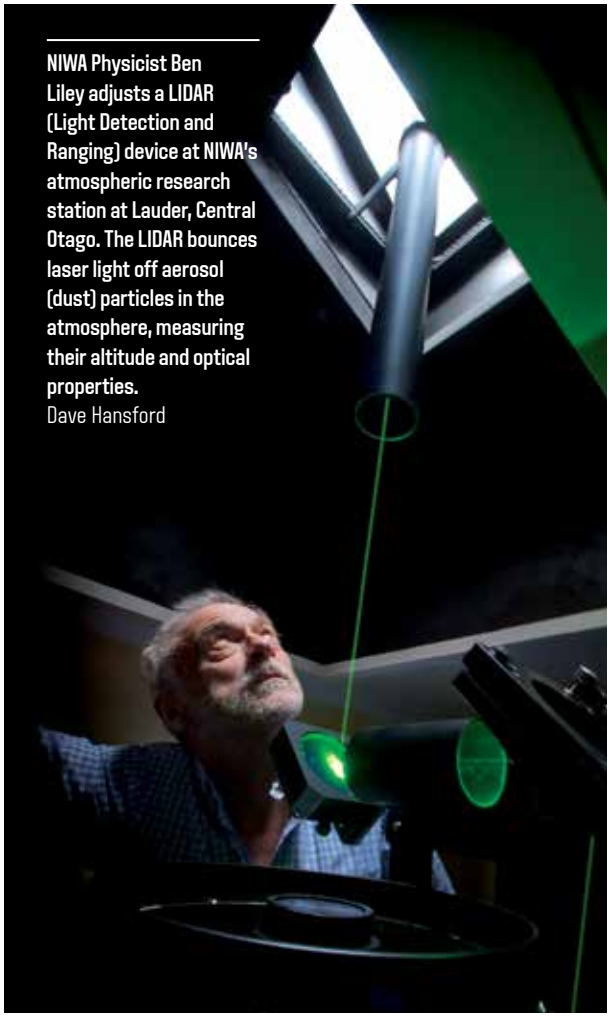
1. Economic, social and environmental impacts of extreme weather events have been reduced through the application of improved hazard forecasts.
2. Investment in hazard-risk management (both physical measures and sustainable land-use planning) has been optimised through quantifying the risks from weather-related hazards and tsunami.
3. Atmospheric composition measurements from the New Zealand region, climate data and analyses, and direct scientist input have been used in international programmes that inform global science and policy on emissions and climate change.
4. National Environmental Standards for air quality have been refined, regional councils are able to assess their air quality and meet standards, and exposure projections are used in urban planning.
5. Improved climate prediction and weather forecasting products provide efficiencies and productivity gains for climate and weather sensitive sectors of the New Zealand economy.
6. New Zealand's proportion of renewable electricity generation has increased through the successful integration of new energy resources and more efficient operation of existing resources.
7. Organisations, sectors and councils manage vulnerabilities and exploit opportunities related to climate extremes and change.

The contribution that NIWA makes towards achieving these longer-term impacts is delivered through meeting its annual KPIs (see below).

KPIs for 2017/18

Key performance indicators for completion in the 2017/18 year, and the impacts they contribute to, are:

1. Measures to assess resilience to hazards, climate extremes and climate change are in place and are available via the RiskScape tool to inform planning and mitigation priorities [Impacts 1, 2 and 7].
2. High-resolution weather re-analysis data for all of New Zealand for a period within the current climate (1980–2010) are available for application across both productive and hazard sectors [Impacts 1, 2, 5, 6 and 7].
3. A new earth system global climate model has been implemented, achieving reduced biases in Southern Hemisphere radiation balance and sea ice [Impacts 1, 2, 5, 6 and 7].
4. Hazard (and quiet time) forecasts are based on a combination of very high-resolution models and model ensembles that provide uncertainty estimates [Impacts 1 and 5].
5. The rate and variability of atmospheric CO2 uptake and acidification has been established for New Zealand open-ocean and coastal waters [Impact 3].



NIWA Physicist Ben Liley adjusts a LIDAR (Light Detection and Ranging) device at NIWA's atmospheric research station at Lauder, Central Otago. The LIDAR bounces laser light off aerosol (dust) particles in the atmosphere, measuring their altitude and optical properties.
Dave Hansford

2.4 Cross-Platform Science Capability

2.4.1 Te Kūwaha

Dimensions

Te Kūwaha is a group of Māori researchers who play a key role across NIWA's three Science Platforms (marine, freshwater and climate), combining their scientific expertise with expertise in mātauranga Māori and tikanga Māori to influence science planning and execution so that the benefits of that science to Māori are realised.

These researchers are supported from revenues within the three Science Platforms, working alongside subject matter experts on a variety of projects funded from a variety of sources (SSIF, National Science Challenges, MBIE Contestable, End users). Where those projects are Māori-centric a member of the Te Kūwaha team will typically take the lead.

Te Kūwaha has been in a capability and capacity building phase over the last 18 months as we have sought to meet the demand for these skills. During the 5 year period of this SCI we anticipate further increases in demand and will recruit accordingly.

Science relevance

Led by Te Kūwaha, NIWA has built strong and enduring relationships with Māori entities and the following understanding of the context within which our science needs to find relevance:

- Mana whenua are looking for approaches to freshwater management that enable the expression of iwi aspirations.
- Māori have expressed concerns regarding the state and use of the environment, the impacts on customary wild kai (food) resources, and how this is affecting their health and wellbeing.
- Māori are playing an increasingly critical role in co-management of freshwaters, and the rehabilitation of freshwaters is a key element of Treaty of Waitangi Deeds of Settlement.
- Māori are seeking multidisciplinary science and advice to underpin their strategic planning and investment decision making for the sustainable management of resources for the long term.
- Māori landowners' access to water is a major constraint to improving land productivity.
- Demand for improved monitoring and data to aid planning and operational decision making that will improve productivity, comply with regulations, and meet market, shareholder and community expectations.
- Upswell of pan-iwi sector-based collaborations to deliver scale and respond to export market opportunities.
- Key Māori business networks (i.e., FOMA, Te Tumu Paeroa, Tuhono, Whenua, Poutama Trust) are driving national strategies, collaborations, and innovation across key primary industries (i.e., red meat, forestry, manuka honey, tuna aquaculture).
- Government focus aligned with regional economic development will provide momentum and Crown support for Māori development (i.e., Northland, Bay of Plenty, Whanganui/Manawatu and East Coast).
- Climate change poses risks for Māori investment in the primary sector (i.e., farming, forestry and fisheries) and is impacting on the social and cultural landscapes of Māori people.
- Desire of iwi/hapū/whānau and Māori business to address climate-change impacts and risks as part of long-term planning.
- Iwi/hapū communities (incl. marae and papakainga) are seeking multidisciplinary approaches and sustainable solutions for water, wastewater, infrastructure, and energy.

Strategic priorities

Key priorities over the five year duration of this SCI are:

- Continue to align research programmes across NIWA to meet the needs, priorities and aspirations of Māori as part of their unique responsibilities as owners and managers of significant natural resources.
- In partnership with Māori fishing companies, iwi and hapū, assist in the development of an integrated approach to the management of Māori commercial and non-commercial fisheries interests.
- Engage with Māori entities seeking to invest in new ventures arising from our aquaculture R&D, explaining the opportunity and risks.
- Engage with Māori land-based businesses to trial the application of climate, weather and water information in their operations and demonstrate benefits to farm profitability.
- Help Māori prepare rohe-specific research strategies that will provide the information needed to protect and enhance their values and aspirations for aquatic ecosystems and associated taonga species.
- Engage in community-based aquatic restoration projects, transferring scientific knowledge and tools to other participants and monitoring the projects' success.

To deliver these priorities, Te Kūwaha will focus on four programmes, three of which are aligned with the Platforms (providing Māori-centred research in Climate, Freshwater and Marine), while the fourth is to provide knowledge and tools that support increased investment and returns from Māori business enterprises involved in utilising natural resources.

No.	Science programme	Key objectives
1	Develop tools for the management and restoration of freshwater taonga species.	Māori successfully implement restoration plans for freshwater taonga species such as tuna and piharau. Māori are better enabled to carry out their role as co-governors and co-managers of freshwaters.
2	Develop tools for the management and restoration of marine taonga species.	Māori successfully implement restoration plans for marine taonga species. Māori are better enabled to carry out their role as kaitiaki and contribute to the long-term sustainable use of marine resources.
3	Determine the vulnerability and adaptation options of Māori businesses and communities to climate variability and change.	Increased awareness of climate and weather hazards. Māori businesses and communities have built resilience to the impacts of climate variability and change.
4	Develop knowledge and tools that support increased investment and returns from Māori businesses.	Māori business entities incorporate new science that adds value and meets the sustainability requirements of their iwi. Economic returns from Māori-held assets increase.

Outcomes

Enhance the economic, social and environmental outcomes of Māori for the benefit of all New Zealanders.

Impacts

Over the period of this SCI the science NIWA undertakes in Te Kūwaha is expected to have a number of beneficial impacts on New Zealand. Achievement of these benefits would be reliant on collaboration and support from key stakeholders (i.e., the national and international science community, policy makers from central and local government, Māori, industry, regulatory bodies and communities) to ensure delivery, uptake and adoption. These beneficial impacts include:

1. NIWA's marine, freshwater and climate research is well-aligned with Vision Mātauranga.
2. Māori play a prominent role in the restoration of freshwater and marine environments, with improvement in the stocks of taonga species reviving cultural practices and restoring mana to hapū/iwi.
3. Māori businesses and communities are well-informed and prepared to manage vulnerabilities and exploit opportunities related to climate extremes and change.
4. Māori businesses show increased profitability and sustainability through the adoption of new innovations and tools.

The contribution that NIWA makes towards achieving these longer-term impacts is delivered through meeting its annual KPIs (see below).

KPIs for 2017/18

Key performance indicators for completion in the 2017/18 year, and the impacts they contribute to, are:

1. Establish collaborative projects between NIWA and Māori entities to investigate the role of precision forecasting and irrigation scheduling in increasing productivity of Māori land assets [Impacts 3 and 4].
2. Support Māori entity investment in aquaculture opportunities arising from NIWA's aquaculture research [Impact 4].
3. Produce updated guidance on the potential impacts and implications of climate change for iwi/hapū/whānau and Māori business to support resilience-endurance planning and decision making [Impact 1 and 3].
4. Assess the potential of cognitive modelling and a cultural biography in collaborative freshwater scenario planning with one rūnanga or hapū group [Impacts 1 and 2].

2.4.2 Environmental Information

Dimensions

NIWA staff that contribute to this cross-platform science include those who gather data, those who quality-assure and curate it, and those who supply and display it. NIWA has key capabilities in hardware, firmware and software development for remote environmental data collection, and real-time communication, modelling, and decision making based on that data.

Science relevance

New Zealand's economy is founded on weather-sensitive and climate-sensitive primary industries, our freshwater is one of our most valuable natural assets, and our marine and freshwater biological communities show a high level of endemism. New Zealand's climate and aquatic data require improvements in monitoring technology and consistency, quality assurance, spatial coverage, innovation in data collection and dissemination, and integration of monitoring networks to be able to better serve decision making, management and reporting needs both in industry and local and central government. Science in this Centre seeks to provide proven examples of best practice for environmental monitoring, management and quality assurance, and to support development of products and tools based on sound data across the three platforms of marine, freshwater and climate for uptake by resource managers and natural resource-based industries.

Strategic priorities

Key priorities over the five year duration of this SCI are:

- Continue national freshwater network optimisation with regional councils, and as part of that operate NIWA freshwater benchmark sites (this is ongoing).
- Continue operating the NIWA climate station network, including upgrades to take advantages of advances in technology and better match stakeholder expectations (this is ongoing).
- Maintain and develop a set of central information management systems across NIWA as part the NIWA database strategy and plan (this is ongoing).
- Maintain and develop a set of standards-based data interfaces to ensure seamless data delivery into end-user facing applications.
- Develop a new web/device-enabled information delivery platform that provides easy deployment of NIWA and external data sources (including decision support) for end users.
- Continue to provide data access to all users at an appropriate price.

These priorities will be delivered through the following three programmes:

No.	Science programme	Key objectives
1	Environmental monitoring: develop innovative environmental monitoring technologies, demonstrate these through benchmark sites, and work with other agencies to ensure consistent and robust environmental monitoring across New Zealand.	Improve the efficiency and quality of State of the Environment monitoring and reporting.
2	Information management: implement and maintain robust information infrastructures to provide future-proof archives for New Zealand's climate, freshwater, marine and biological information.	Data on New Zealand's natural resources is well-managed and preserved for future generations.
3	Information delivery: develop state-of-the-art, user-centric delivery services that enable information access and re-use for improved resource management and business decisions.	Resource managers and businesses utilise environmental data to make decisions that reduce environmental stresses and increase productivity.

Outcomes

This Centre will contribute to the following outcome:

Environmental data and information are collected, stored, processed and disseminated through innovative, integrated and robust systems, so that environmental state and trend reporting, resource use, business decisions, and responses to environmental hazards are improved.

Impacts

Over the period of this SCI the science NIWA undertakes in the Environmental Information Centre is expected to have a number of beneficial impacts on New Zealand, and in some cases the wider international community. Achievement of these benefits would be reliant on collaboration and support from key stakeholders (i.e., the national and international science community, policy makers from central and local government, Māori, industry, regulatory bodies and communities) to ensure delivery, uptake and adoption. These beneficial impacts include:

1. Reporting of the state and trends in the nation's atmosphere, climate, freshwater, and marine systems and biota is more consistent and supported by national standards and qualification frameworks.
2. New Zealand fulfils its international environmental reporting obligations and is seen as a leading nation in environmental monitoring.
3. Management, planning, and policy processes related to New Zealand environments and natural resources operate more efficiently through the availability of higher quality, more consistent, and more comprehensive environmental datasets.
4. Climate-sensitive and weather-sensitive industries are more profitable and resilient and operate more sustainably through greater use of environmental data to make better decisions.

The contribution that NIWA makes towards achieving these longer-term impacts is delivered through meeting its annual KPIs (see below).

KPIs for 2017/18

Key performance indicators for completion in the 2017/18 year, and the impacts they contribute to, are:

1. Data from NIWA's climate and hydrological networks continue to be collected to high quality standards, archived, audited and available to stakeholders [Impacts 1, 2, 3 and 4)
2. The National Freshwater Fish Database continues to be operated, with approximately 500 new fish observation records submitted annually by users and quality controlled, and with online interfaces providing data access for stakeholders [Impacts 1 and 3].
3. The NIWA Data Catalogue is used as part of the NIWA Project Management System by NIWA scientists to document datasets produced as part of projects [Impacts 1, 2 and 3].

NIWA Hydrologist MS Srinivasan alongside an eddy covariance tower in Canterbury. The eddy covariance network allows NIWA to investigate the role of climate, vegetation and management practices on evaporative water loss from agricultural land uses.
Dave Allen

4. Requirements for a web/device-enabled information delivery platform for easy deployment of NIWA and external data sources and evaluation of existing products have been identified [Impacts 1 and 2].
5. A collaborative trial of high-density, low-cost wireless environmental sensor technology has been completed and evaluated with partners [Impacts 3 and 4].
6. New laser-level monitoring technology has been fully operationalised and, if market analysis supports it, developed into a commercial product [Impacts 1 and 3].

2.4.3 Pacific Rim

Dimensions

NIWA's Statement of Core Purpose requires us to contribute to the increased resilience of the South-West Pacific islands to tsunami and weather and climate hazards. We also recognise the contributions we can make to the Pacific islands through our skills in marine and freshwater science. We focus these contributions through a dedicated Pacific Rim National Centre, which has the mandate to engage fully with the relevant agencies in New Zealand and the Pacific to understand needs and then to leverage the skills across our science platforms to meet those needs.

Revenue to support these activities is primarily from next-users and end users, which is appropriate given the technology transfer focus. Between 2015 and 2019, 60% of New Zealand's overseas development assistance will be directed to the Pacific, and NIWA will continue to align its offshore efforts with that priority.

Science relevance

The Pacific region faces ever-increasing environmental challenges, especially in relation to food and water security and its vulnerability to natural hazards. There is an urgent need for science-informed responses to these challenges to ensure sustainable management of marine and freshwater resources, to reduce community and economic vulnerability to natural hazards and to adapt to the impacts that climate change will increasingly cause. New Zealand's assistance is increasingly focused on developing sustainable fisheries, increasing aquaculture opportunities and improving infrastructure such that it is resilient to natural hazards.

Strategic priorities

- Continue to provide service to the Pacific in the areas of climate services/forecasting, natural hazards/risk and sanitation and water quality.
- Grow our presence and relationships in fisheries, aquaculture, deepsea mineral and waste-to-energy activities in the Pacific, inline with the region's Blue Economy initiatives.
- Strengthen relationships with other providers and organisations in the Pacific to help ensure a multidisciplinary approach and enhanced uptake of the science.

No.	Science programme	Key objectives
1	Provide scientific advice and build local capacity in the Asia-Pacific region to support environmental, infrastructure and economic decision making and development.	Pacific nations are more resilient to natural disasters Pacific nations become more self-sufficient and use natural resources sustainably

Outcomes

This Centre will contribute to the following outcome:

New Zealand has contributed to the capacity of the Asia-Pacific region to increase prosperity through sustainably managed natural resources and to increase resilience to the impacts of natural disasters.

Impacts

Over the period of this SCI the science NIWA undertakes in the Pacific Rim Centre is expected to have a number of beneficial impacts. Achievement of these benefits would be reliant on collaboration and support from key stakeholders to ensure delivery, uptake and adoption. These beneficial impacts include:

1. New Zealand's science-based activities and initiatives in the Pacific Rim have helped lift economic performance, increased water security and water sanitation, and reduced the impacts of climate-driven and weather-driven hazards.
2. New Zealand's foreign affairs relationships in the Pacific Rim have been enhanced as a result of increased collaborative science in the region.

The contribution that NIWA makes towards achieving these longer-term impacts is delivered through meeting its annual KPIs (see below).

KPIs for 2017/18

Key performance indicators for completion in the 2017/18 year, and the impacts they contribute to, are:

1. Tools to support risk-based urban and infrastructure planning for Pacific island countries are developed and demonstrated to end users [Impacts 1 and 2].
2. Tools to improve coastal/flood inundation forecasting for Pacific island countries are developed and demonstrated to end users [Impacts 1 and 2].
3. NIWA is represented and attends at least eight key regional meetings annually in the Pacific-Asia region to develop networks, identify assistance opportunities and facilitate implementation of work programmes, and advance New Zealand's international reputation [Impacts 1 and 2].

2.4.4 Vessels

Dimensions

NIWA has a fleet of three research vessels (*Tangaroa, Kaharoa* and *Ikatere*), associated equipment and staff that provide New Zealand's platform for marine research and survey. These vessels are used to conduct NIWA's science and that of third-party researchers and stakeholders under charter.

Science relevance

NIWA's vessel fleet is an essential component of the nation's science infrastructure, providing the platform from which the following research and surveys of New Zealand's marine estate are undertaken:

- Assessment of New Zealand's fish stocks.
- Exploration of New Zealand's offshore oil, gas and mineral resources.
- Determining the impacts of climate change (global warming, sea-level rise, ocean acidification, changes in marine productivity) on marine ecosystems.
- Delineation of submarine faults.
- Description of New Zealand's unique marine biota and habitats, their vulnerabilities and options for their protection.
- Support for projects within the *Sustainable Seas* and *Deep South* National Science Challenges.
- Understanding the impacts of contaminant runoff from land on coastal waters.

Operational priorities

Key priorities over the five year duration of this SCI are:

1. Maintain operational excellence, continue to enhance high health and safety procedures and practices, and comply with maritime security and regulatory requirements.
2. Implementing maintenance and capex programmes to ensure the vessels remain reliable, safe and fit for purpose, and keep abreast of marine technological advances.
3. Updated systems are in place on the vessels for the acquisition, processing, storage and streaming of data.
4. Implementing training programmes for the vessel crews to enable them to adapt to changes in the external/internal vessel operating environment and continue to provide a sought-after platform for science research and surveys.
5. In consultation with others, determine the future vessel requirements for New Zealand's marine science and survey.

KPIs for 2017/18

Key performance indicators for completion in the 2017/18 year are:

1. Reduce the total recordable injury frequency rate.
2. Meet or exceed the planned objectives for each voyage.
3. Limit lost voyage time, due to operational issues within our control, across all vessels to 10 days or less.
4. Utilise *Tangaroa, Kaharoa* and *Ikatere* to collectively meet sea-days budget.
5. Produce a fleet replacement strategy and socialise with shareholders and stakeholders.

NIWA and DML (Discovery Marine Ltd) used state-of-the-art multibeam echosounder technology to map more than 43,000 hectares of seabed in the Marlborough Sounds. Hamish McCormick

NIWA Chief Executive John Morgan with Land Information Minister Mark Mitchell during the Marlborough Sounds seabed mapping survey. Hamish McCormick

Our customers expect us to understand and be responsive to their needs and external demands.

ENABLING SERVICES

3.1 Science Delivery

Expectations in the way we deliver our science are changing, along with the growing need for more and accurate scientific evidence to support decision making in nearly all matters involving the natural environment. Societal, regulatory and commercial issues are also more complex, with expectations that those issues need to be resolved at shorter notice. This is contributing to the requirement for more digitally based solutions that connect and integrate directly with a range of internal and external operational systems.

Customers are also expecting more involvement in the scientific discovery process and want to be active partners in the delivery of science. Responding to these challenges will require NIWA to be exceptionally customer focused to enable us to fully understand all their requirements. These include:

- Being more agile and efficient.
- Being fast adopters of new technologies to deliver high quality information over broader geographic areas.
- Ensuring excellence in project management to ensure that we deliver to specification, on time and within budget.
- Maintaining the best workplaces and facilities in the science sector to enable our people to perform to their potential.
- Maintaining systems and processes which enhance the excellence and relevance of our products and services.
- Above all, keeping our people safe.

During the period of this SCI we will respond to these expectations through consistently achieving the following key objectives:

Keeping our people safe

NIWA's view is that every person working for and with us should return home unharmed every day. We expect this no matter how demanding the science task we undertake, whether it be on top of a mountain measuring the rain and snowfall that will eventually feed our rivers and irrigate our lands, or at the bottom of the ocean discovering previously unknown species. For NIWA, safety and health is a never-ending journey of continuous improvement. Our focus over the next few years will be:

- Increasing our skills in science project safety risk assessment, down to the task level.
- Developing more effective project-based safety plans.
- Investing in further training to improve safety sensitive behaviour.
- Ensuring that we have and use the best safety equipment at all times.

Excellent customer focus

Our customers, from government departments to consultant engineers, regional councils to mussel farmers, or conservation organisations to the energy and farming sectors, all expect NIWA to understand and be more responsive to their needs and the external demands being placed upon them. Furthermore, they expect our services to be delivered in a way that is socially, environmentally and commercially responsible. We will address this by:

- Investing further in training our people to enhance their customer engagement and responsiveness.
- Integrating our customers' people and capabilities within our science project operational plans.
- Refining our contracting systems and internal administration to reduce barriers to rapid and positive engagement.

Fast adopters of new technologies

NIWA's work is technologically intense. We need to be early adopters of proven new technologies to be at the forefront of climate, marine and freshwater science, and to better meet the growing complexity of our customers' needs. These technologies include remote-controlled vessels and drones, high-resolution and multispectral imaging systems, precision field sensing and satellite systems, undersea gliders and acoustic sensing equipment, and high-resolution multidimensional modelling and presentation systems. Bringing together many of these new technologies can often also help us create new technologies to even further enhance our science delivery. To facilitate this journey we will:

- Enhance our review of, and investment in, relevant emerging technologies.
- Invest in upskilling our people to keep us at the forefront of technological innovation.
- Continue to invest in R&D in areas where NIWA has the ability to develop new technologies.

Excellent project management

Delivering our science services efficiently and effectively within scope, time and budget is key to NIWA's success. Whilst we pride ourselves on being amongst the best project managers in the science sector, we are conscious that continuous improvement in project management is critical to meeting our customers' needs. Translating the problem-solving abilities and imagination of our people to tractable work programmes that fulfil customer expectations demands significant project planning and organisational skill. This is more acute in NIWA's domain where we have to contend with the vagaries of weather, sea state, and topography. To enhance our project management, we will:

- Invest in new software to enhance all aspects of our project management.
- Provide further training in project scoping, activity scheduling, and quality assurance.
- Enhance project administrative support, project monitoring and coaching.

Contemporary and collaborative workplaces

NIWA needs to provide a working environment that is appealing to staff, collaborators and customers alike. Our workplaces and infrastructure are key to this. As in many sectors, we are seeing a new generation of staff who expect modern, more user-friendly and interactive workspaces where information is held digitally, collaborative interactions are open and easy, and their external needs are more easily accommodated. Recently we initiated a five-year programme to upgrade a number of our facilities with the aim of creating a workplace that will attract and retain high-performing people and present NIWA as a contemporary and relevant organisation to our customers and stakeholders. Accordingly, we will:

- Invest in new buildings and the associated infrastructure at several of our sites.
- Integrate more collaborative and user-friendly workspaces into these facilities.
- Better capture the benefits of working more flexibly, wherever our people reside.

Enhancing our focus on excellence and relevance

A key contributor to NIWA's success has been maintaining a good balance, at both organisational and individual levels, between research and applied science services. This has resulted in NIWA having access to, and deploying, the latest science tools and knowledge, whilst being closely linked to the needs of our customers and end users. We will continue to foster this approach by:

- Bringing the 'best teams' available together to focus on customers' requirements.
- Ensuring all our people are involved in both research and applied science service work.
- Enhancing our quality assurance systems and processes to ensure we generate the best science possible.

KPIs for 2017/18

Key performance indicators for completion in the 2017/18 year are:

1. More than 90% of projects are delivered on time.
2. Implement key actions from the refreshed 2017–2020 NIWA health and safety strategy.
3. Review and recommend an upgraded software tool for project management.

3.2 Science Communication

The science NIWA does is fundamental to decisions on how natural resources are managed. That can expose us to challenges to the integrity of our science and our scientists from those with an advocacy position. Furthermore, environmental science has uncertainties, providing opportunities for confusion, misinterpretation and misrepresentation.

Although NIWA has a very strong brand, based on a reputation for excellent science and impartial advice, trust in this brand is increasingly being challenged as debates on natural resource use intensify. Communication of our science must facilitate its uptake, reinforce our position as the authority, and demonstrate the impartiality and value of our research.

There are several key trends and drivers that influence our communications strategy:

Increased interest in, and challenge to, science

There is a significant increase in the focus on science as a solution provider, not merely an issues informer. Challenges and expectations are correspondingly higher. More parties are presenting their interpretations as definitive, in contrast to the desired outcome of fundamental science – decision making and policy development that are informed by science.

A profound shift in the way individuals decide what is the truth

There are now many sources of 'truth'. Individuals often use internet search engines to make their judgement, on the basis of their own environment, experiences and beliefs, as to which 'authority' or solution suits them most. It is no longer as apparent who the real authority is. In an era of post-truth, alternative facts, fake news and many other persuasive presentations, it is increasingly difficult not only to get heard, but also to gain and keep trust. There are many more readily accessible channels and global 'authorities' where opinion and ideology can override facts, and populism – as opposed to credible, evidence-based information – can inform decision making. NIWA's key customers will still seek information from the authority they trust, but increasingly seek help in promulgating the correct information.

Increased speed of public debate and communication

There is widespread expectation of immediate availability of information – multimedia, across many platforms, relevant, accessible, understandable and usable, dynamic and highly visual – fuelled by the internet and mobile devices and underscored by societal change. In this environment, individuals can form their views on the basis of information from their trusted 'authority', and very quickly decide their desired outcomes. However, many of NIWA's customers will still need full technical reports with baseline data to inform their decision making, and increasingly they also need the key issues distilled for multiple audiences.

A paradigm shift in the media environment, including mainstream media, to digital and social networks

Mobile devices are increasingly the primary tool for accessing information, coupled with a concomitant rapid decline in the use of traditional sources – people don't wait for the radio news on the hour, the evening television news, or the morning newspaper; they Google it and pick a favoured source or follow it on Facebook or Twitter. In this environment, there is less demand or time for traditional investigative journalism, and analysis is often more superficial. NIWA's key customers, however, often still predominantly use mainstream media, although this is changing fast.

Rapidly evolving technology

Technology is changing the message, not only the way it is delivered and received, but also how it is interpreted and assimilated. Mobile technology has turned millions of people into reporters, with their 'news' being available immediately – live recordings and live feed – to millions more, enabling conversations to be had before any qualification or analysis can be applied. New technologies, like drones and ubiquitous high-resolution cameras, have also contributed to making the inaccessible instantly accessible.

NIWA will continue to respond to these trends and drivers by focusing on achieving six key objectives:

Pre-eminence in climate & atmosphere, freshwater and marine science

- Reinforce NIWA's position as the most respected and trusted authority in climate & atmosphere, freshwater, and coasts & oceans science, and recognise and quickly respond to trends and developing issues in these areas.

Highly visual imagery and innovative technologies

- Enhance knowledge transfer and stakeholder engagement through increased development and use of highly visual imagery and innovative technologies, and by the use of relevant and precise executive summaries, usable elevator pitches, and dynamic multimedia presentations as a key part of science delivery.

Precise, relevant and arresting communication

- Ensure that our communications are precise, relevant and arresting, and that our position is clear and accessible to inform discussion and debate.

Proactive and responsive media engagement

- Maintain proactive and responsive media engagement across mainstream traditional and digital media and selected social media platforms – by providing full, entertaining and appealing packages that reinforce our position of authority and innovation.

Informative website and social media channels

- Ensure that our website and social media channels continue to attract and reward visitors with continually improving, dynamic and highly visual content that is aligned with our stakeholder and customer engagement and marketing strategies, is a foundation for our science communication, and complements other outreach activities.

Early adopters of new presentation and digital delivery technology

- Remain early adopters of new technologies, continually seeking opportunities to increase our capabilities in presentation and digital delivery.

KPIs for 2017/18

Key performance indicators for completion in the 2017/18 year are:

1. Profile NIWA as the authority in climate, freshwater and marine sciences through *Water & Atmosphere* (3 issues), Annual Report, conferences and events (15+), mainstream and social media (50+ engagements), and videos (50+).
2. Increase use of multimedia output through 100 knowledge transfer and corporate videos.
3. Maintain high media profile and engagement by achieving mainstream audience (70 million) and a social audience on Facebook (350,000+) and Twitter (250,000+).

3.3 People & Capability

There are several key trends and drivers that influence our People & Capability strategy.

Principles rather than rules-based culture

NIWA covers a diverse range of environmental and natural resources science activity, with a highly dispersed, highly skilled workforce operating out of 16 different locations. We have developed a mode of operation of high trust and high accountability, with a relatively flat structure and decentralised decision making. Individuals and teams have a high degree of autonomy and self-management. In this environment, management through detailed rules and monitoring of compliance works less well than a more flexible management approach based on essential high level principles and values.

Competition for talent

NIWA competes for much of its science capability on the world stage, against a backdrop of increasing demand and skill shortages in key areas of environmental and natural resources science. Our workforce has an international perspective in terms of their professional and personal networks, and options for mobility. We are fortunate that New Zealand is an attractive location for environmental science, and NIWA maintains a strong employment brand. Factors valued most highly by our employees are the interesting, varied and important nature of NIWA's environmental science work, the calibre of the people they work with, and the flexible nature of the work environment. Our continued success depends on maintaining an international reputation as an employer of choice, and these factors are key in this.

Positive leadership

In a rapidly changing and uncertain world, NIWA needs to foster a culture that is adaptable, innovative, entrepreneurial and collaborative. New ways of thinking and operating are required. Openness to change and new possibilities, and the ability to operate with speed and agility are becoming critical capabilities for NIWA's success. NIWA's leaders must reflect these capabilities, and provide positive leadership for others in a time of ambiguity and conflicting trends and demands.

The climate, riparian planting and bug life were all on the agenda for visitors who dropped by to see the NIWA team at Fieldays 2017.
Stuart Mackay

They will increasingly need to be able to engage diverse, dispersed teams with differing levels of digital competence. The ability to listen, understand, gain trust and communicate effectively with a range of different people is becoming even more important for our leaders.

Changing workforce

An increasingly diverse NIWA workforce brings real advantages for the vitality and sustainability of the organisation, but also the challenge of providing a work environment where each individual feels welcome, is treated well, valued for their contribution, and able to perform at their best. Generational differences must be recognised and responded to. Younger employees bring different priorities and expectations to work. They exist in a highly connected world that is 'always on', with a continuous flow of real-time information and opinion, characterised by frequent, short, simple messages. They are values-driven, collaborative, and technologically savvy, and seek a work environment that accommodates their preferences and modus operandi. For older employees, there is pressure to get to grips with new technology and less familiar ways of operating, with the need to unlearn and relearn in order to remain relevant.

We will continue to respond to these trends and drivers by focusing on six key objectives:

Recruitment and retention

- We will recruit nationally and internationally for high performers with the right technical capability, attitude and performance.
- We will strive to provide a work environment that enables our people to excel – a positive, respectful, flexible workplace that offers varied, interesting and challenging work in appealing and contemporary facilities.

Reward and recognition

- We are of the view that historically the science sector in New Zealand has been under-valued in terms of remuneration. We will continue with our long-term goal to provide an attractive and competitive package of remuneration and benefits relative to the general market, without putting at risk jobs or the financial viability of the organisation.
- Celebrating success is a core element of NIWA's culture, and we will continue to recognise the efforts and achievements of employees who go above and beyond with their contribution to NIWA's success.

Developing capability

- We will emphasise proactive workforce planning and development, and invest in our workforce for long-term benefit.
- We will provide a range of varied and interesting learning and development opportunities so people can be challenged, grow their capability, advance their career, and achieve their full potential. These opportunities include access to relevant internal and external training programmes, challenging and developmental work assignments, national and international conference attendance, sponsored higher study, secondments and sabbatical opportunities.
- We will actively identify those with high potential and provide accelerated development opportunities for them, promoting from within where possible.

Positive leadership

- In selecting and developing our leaders we will emphasise the importance of leaders actively reflecting the NIWA values, demonstrating an openness to change and adaptability, and having the ability to communicate and engage positively and effectively with a diverse range of people.
- We will evolve our in-house Leadership and Management Development programme, with an emphasis on mind-set change and adaptive leadership, promoting dialogue and collaboration, developing resilience in an environment of rapid change, recognising unconscious bias and fostering diversity, and preventing and responding to inappropriate behaviour at work.
- We will continue to invest in the annual NIWA Leaders' Forum to focus on key challenges and opportunities and create shared goals and strategies.

Open and effective communication

- Effective internal communication is vital to our success. We need to communicate on relevant topics in a proactive and timely manner, ensuring a free flow of information direct to employees, to ensure they are well and accurately informed.
- We need to adapt our communication approaches to respond to the propensity and desire for short, simple messaging that is quick and easy for busy people to understand and act on.

Maximising the benefits of diversity

- We value diversity, and will continue our efforts to ensure that every person at NIWA feels welcome and respected for their individual qualities and contribution, and has an equal opportunity to achieve their full potential.
- We will continue work on reviewing and updating policies on equal employment opportunity and diversity, and providing training and information supporting diversity.
- A particular focus recently has been gender equity in terms of remuneration, recognition and career opportunity. Whilst our analysis of relevant NIWA data indicates that our processes are fair and equitable, we will continue to monitor this closely and provide regular staff updates on NIWA's performance on gender equity.

KPIs for 2017/18

Key performance indicators for completion in the 2017/18 year are:

1. Complete annual workforce planning process by December 2017 and use outcomes to guide recruitment and staff skill development.
2. Provide training workshops for managers and staff on developing resilience in an environment of rapid change, unconscious bias and diversity, and preventing and responding to inappropriate behaviours at work, by December 2017.
3. NIWA policies relating to equal employment opportunity and diversity reviewed and updated by September 2017, and an annual update on gender equity at NIWA provided to staff in April.

3.4 Information Technology

Both science and business are becoming increasingly dependent on technology. In NIWA's case, our staff need to be able to access data, documents and emails anytime and anyplace, and be able to work collaboratively with shared documents often via high-resolution video conferencing. They now have access to a growing range of devices – mobiles, tablets, laptops, and specialist workstations – right up to state-of-the-art supercomputing and cloud platforms. Furthermore, increases in computing power and storage capacity are making it possible for new science challenges to be tackled and existing computational models to be run in ever more detail.

Our customers also expect more from our information technology enabled services – innovative, sector specific, human centric, decision support products and services, as well as interfaces that give rapid, direct access to NIWA data and reports.

NIWA has responded to this demand in recent years by investing in a contemporary IT infrastructure that enables reliable acquisition, safe storage, accurate analysis and sustained delivery of scientific and business information. It also enables the modelling and visualisation of a growing range of phenomena at ever finer spatial and temporal scales providing clearer insights and better understanding of our natural environment and resources.

Information security is also an ever increasing challenge. We need to protect against, and manage and recover from, a range of potential threats ranging from earthquakes to cyber-criminals. NIWA has a resilient infrastructure spread across multiple data centres with a range of layered defensive measures including a focus on user awareness.

In developing our IT services our strategy is for in-house projects and development teams to focus on the specialist needs of the science domain, while favouring third party, mainstream or best-in-class suppliers for more traditional business services.

In responding to these key trends and drivers, the IT strategy has the following key objectives:

Company-wide IT literate workforce making effective use of contemporary tools

- Staff will have the best equipment and software for science and business, will be confident in its use and well supported in the process of acquiring new technical skills.
- Staff will be supported by a highly skilled team of IT specialists providing infrastructure, operations, development, business analysis, project management and training.
- A new Knowledge and Records Management team will bring a renewed focus to business information management and analysis with a remit to raise people's ability to make full use of the tools provided.

Comprehensive, interoperable business and research information, records and projects management systems

- Information resources will be accurate, secure, discoverable, well managed, compliant, and accessible and support modern effective work practices.
- Science data is open, accessible, and usable.
- This past year has seen our first move to online productivity tools with Microsoft Office365 being adopted for business document management and collaboration following an extensive cloud risk assessment. This will continue into the provision of team and project collaboration spaces followed by new project management and research information management systems in the next few years.

New Zealand's principal provider of high performance computing

- NIWA will maintain its state-of-the-art science-focused computing capability supported by advanced equipment and software development resources that will enable large-scale data sensing, storage, modelling and analysis, coupled where necessary with a visualisation platform, to deliver targeted products and services to NIWA's customers and collaborators.
- This year NIWA plans to replace its IBM P6 supercomputer with a new supercomputer that is expected to be about 10 times faster with 5 times more storage. In collaboration with New Zealand's National eScience Infrastructure (NeSI), a dual high capability and high capacity supercomputing system based at NIWA's Wellington site will provide a major advance in New Zealand's science computing resources.

Ability to effectively and safely respond to new demands and opportunities

- Processes, systems and services that promote agility, collaboration and interoperability on an underpinning IT platform of stable systems, information security, monitoring, risk management and business continuity.

Innovative and early adoption of emerging technologies

- NIWA will proactively explore, investigate, engage, innovate and adopt emerging technologies that will positively impact on NIWA's ability to meet its objectives.
- This year will see proof-of-concept developments in 'Internet of Things' (IoT) sensors and artificial intelligence as well as the continued adoption of advanced tools supporting mobility and remote access, 3D printing and scanning, unmanned aerial and submarine vehicles (drones), 3D data visualisation and virtual and augmented reality tools (VR/AR).

Automation enabled IT and business workflows

- NIWA will continue to invest in automated systems that support the management of IT platforms and infrastructure, that streamline code development, integration and deployment and provide support for workflows and business processes.

KPIs for 2017/18

Key performance indicators for completion in the 2017/18 year are:

1. Deliver increased staff productivity and information management capability through the migration of personal, project and team document management systems to Microsoft Office365.
2. Enable advanced environmental science modelling and forecasting through the delivery and operation of new resilient, high performance computer systems for NIWA and NeSI.
3. Improve the long-term resilience and performance of NIWA's environmental information through the migration of the climate database and web delivery platforms to new infrastructure, database and application server technology.

3.5 Finance, Procurement and Legal Services

NIWA's Finance, Procurement and Legal function supports and enhances the organisational health of the company by delivering the following four outcomes:

- Effective processes which 'just happen'.
- Insight to guide decision making.
- A source of trusted professional advice.
- Properties fit for world-class science.

In recent years NIWA has streamlined its financial and administrative operations. This has been achieved by centralising processes where possible while retaining local decision making and autonomy where appropriate. Additionally, many aspects of NIWA's administrative processes that were previously manual and paper-based have been automated and digitised. In many cases systems and processes have been simplified and delegated to allow staff to undertake their tasks with a high degree of autonomy, consistent with the high trust, high accountability culture that is central to NIWA's success.

However, in a rapidly changing world the ability to make well-informed decisions frequently, rapidly and accurately is becoming more important than ever. Equally, the need for the organisation to be able to accurately and transparently account for the use of its resources remains undiminished.

Given this context, the Finance, Procurement and Legal strategy has the following key objectives:

Accurate and timely financial reporting

- Financial accounting and external reporting will be delivered on time, free from material error and as efficiently as possible.

Effective and efficient financial operations and administration

- Financial and administrative operations will be effective, efficient and well controlled, while allowing seamless interaction with our customers, suppliers and staff.

Insightful management reporting that supports decision making

- Management reporting and financial analysis will be insightful, intuitive and well positioned to support agile decision making at all levels of the organisation.

Risk management that helps the business to prosper

- Risk management activities will help all areas of the business prosper by ensuring that risks are managed to an acceptable level while facilitating an agile and responsive operating environment.

Property upgrades that bring all our facilities to contemporary standards

- Property upgrades will be consistent with an overarching property strategy that ensures that all NIWA's properties are of a contemporary standard and closely align with its future needs.

Internal audit that tests and verifies the operational health of the organisation

- Internal audit activities will identify opportunities to improve systems and processes while providing assurance to the Executive and Board that risks are being appropriately managed.

KPI's for 2017/18

Key performance indicators for completion in the 2017/18 year are:

1. Complete construction of a new office facility in Rotorua and infrastructure upgrades at Bream Bay.
2. Issue a revised risk-based contracts manual and train senior management and key project staff in its use.
3. Design and implement business intelligence reporting improvements, including senior management dashboards, and investigate the automation of pricing into the current systems.

Waimakariri River
Dave Allen

PERFORMANCE TARGETS 2017/18

NIWA will measure its performance against the outcomes and operating principles in its Statement of Core Purpose using the following set of indicators.

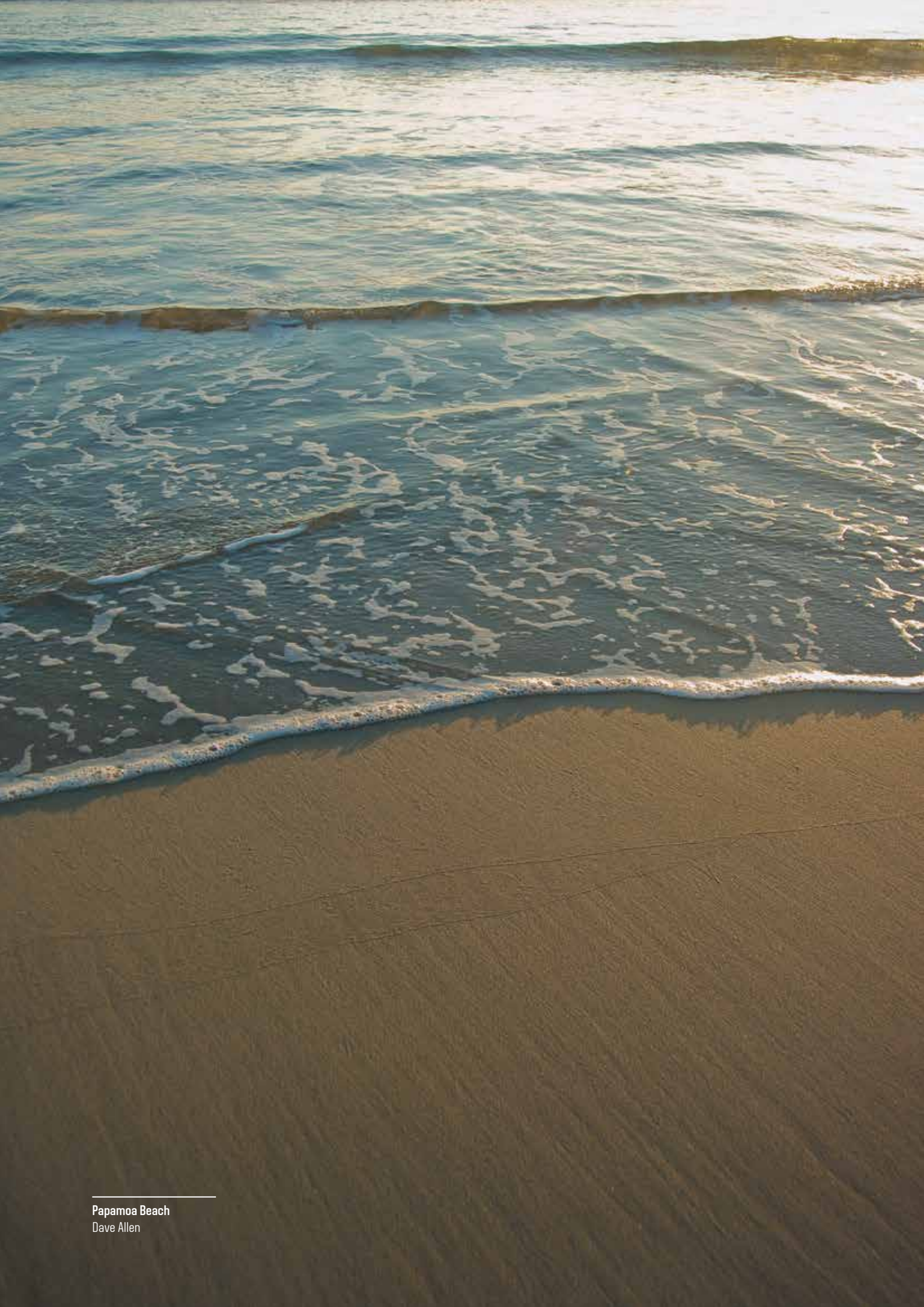
Financial Indicators

Measure	Calculation	Reporting frequency	Forecast 2016/17	Target 2017/18
Operating margin	Earnings Before Interest, Tax, Depreciation, Amortisation and Fair-value (EBITDAF)/Revenue	Annual	14.1%	15.8%
Profit per FTE	EBITDAF/ FTE	Annual	$30,000	$36,000
Quick ratio	Current assets less inventory less prepayments/ Current liabilities less revenue received in advance	Quarterly	2.59	2.00
Interest coverage	EBITDAF/ Interest paid	Quarterly	Not applicable	Not applicable
Profit volatility	Standard deviation of EBITDAF for past five years/ Average EBITDAF for the past five years	Annual	5.4%	6.9%
Forecasting risk	Five year average of return on equity less forecast return on equity	Annual	1.1%	1.1%
Adjusted return on equity	NPAT excluding fair value movements (net of tax)/ Average of share capital plus retained earnings	Quarterly	4.2%	6.2%
Revenue growth	% change in revenue	Annual	10.9%	5.9%
Capital renewal	Capital expenditure/Depreciation expense plus amortisation expense	Quarterly	85.9%	209.6%

Organisational Performance Indicators – 2017/18 at a glance

Measure	Calculation	Reporting frequency	Forecast 2016/17	Target 2017/18
End-user collaboration*	Revenue per FTE from commercial sources	Quarterly	$87,000	$91,000
Research collaboration*	Publications with collaborators	Quarterly	73%	75%
Technology and knowledge transfer*	Commercial reports per scientist FTE	Quarterly	0.9	1.0
Science quality*	Impact of scientific publications	Annually	2.5	2.5
Operational efficiency*	Revenue per FTE	Quarterly	$216,000	$229,000
Operational delivery	% projects delivered on time	Annually	85%	>90%
Strategic progress – operations	% Enabling Plan KPIs in Section 3 achieved	Annually	95%	>90%
Strategic progress – science	% Science Plan KPIs in Section 2 achieved	Annually	95%	>90%
Stakeholder engagement*	% stakeholders confident in NIWA's priority setting process	Biennial	N/A	>70%
Stakeholder engagement*	% collaborators confident in NIWA's ability to take a best team approach	Biennial	N/A	>90%
Stakeholder engagement*	% end users who have adopted knowledge or technology developed by NIWA	Biennial	N/A	>90%

* Ministry of Business, Innovation & Employment generic indicators.



Papamoa Beach
Dave Allen

FINANCIALS

Announcements in the Government's Budget 2016, combined with the securing of new contestable research funding, have resulted in a significantly more secure platform for NIWA's research programmes than had been signalled in NIWA's two most recent Statements of Corporate Intent.

This sustainable platform for the future means that NIWA now has the confidence to:

1. Build its capability in areas of science that are critical to national needs.
2. Engage in detailed planning to deliver the upgrades to its facilities signalled in previous SCIs, which are needed to ensure that they are fit for purpose and of a contemporary standard, consistent with the need to attract and retain the best available scientific talent.

Whilst the financial assumptions reflected within this SCI provide for the capital investment programmes required to deliver these facility upgrades, the amounts included are preliminary and indicative. The accuracy of these estimates will be improved as planning for these programmes continues over the coming year. Additionally, the budget for next year includes provision for investment in a replacement for NIWA's high performance computing capability, given that its existing facilities are approaching the end of their design life.

The funding uncertainty of recent years made it necessary for NIWA to take a cautious approach to managing staff numbers whilst maintaining our investment in assets and operational efficiency initiatives. NIWA is now able to rebuild its core capability across a range of freshwater, marine and climate & atmosphere science disciplines. While revenue growth from FY17 to FY18 is expected to be driven primarily by increases in research funding, in future years it is applied science services that will deliver further growth.

Other than as discussed above, we have assumed only marginal changes to NIWA's current operating environment in developing our financial projections. MBIE Strategic Funding is assumed to remain broadly flat throughout the period of the business plan, and we have taken a conservative approach to our assumptions around commercial charter voyages for the RV *Tangaroa.*

The five year financial plan reflects ambitious but realistic revenue growth together with continuing tight control on operating costs, albeit reflecting the staff cost increases required to build the science capability discussed above. The budgeted Group revenue for 2017/18 is $148.67M, with total costs of $141.94M, creating an operating surplus before tax (EBIT) of $6.72M and an adjusted return on equity of 6.2%. NIWA expects to continue to deliver strong operating cash flows, with a budgeted EBITDAF of $23.43M in 2017/18.

Revenue

In 2017/18 NIWA Group revenue is budgeted at $148.67M, up by $8.72M compared with the forecast for the last year and by $8.17M compared with the revenue contemplated by last year's SCI. The increase on last year is broad-based, with an expectation of continued growth in contestable research revenue won by NIWA, increased activity by the National Science Challenges that NIWA hosts, growth in applied science services revenue made possible by actions to increase NIWA's core science capability, and MBIE funding for a biennial Antarctic scientific research voyage conducted by the RV *Tangaroa.*

Operating Expenditure

In 2017/18, operating expenses are budgeted at $141.94M, up from $135.95M in 2016/17. Of this increase, $3.39M is due to increases in personnel costs as we build our capacity to deliver research and in critical areas in light of the new funding environment. The balance of the cost increase primarily reflects costs directly related to revenue growth, including relating to the cost of science subcontracted to collaborators. In addition, we expect an increase in depreciation expense related to the replacement of NIWA's high performance computing capability.

Beyond 2017/18 we expect a further increase in personnel costs of $1.88M into the following year due to the full year effect of the capacity building anticipated for the 2017/18 year. Beyond that period we expect our total operating expenditure to increase, on average, by about 1.0% per annum. We have assumed our internal operating environment, including staffing, will remain at the levels established by the end of 2017/18. Operating cost efficiency gains of recent years are expected to be maintained, and we have assumed that inflation will continue at a low level.

Balance Sheet Management

NIWA's science is capital intensive and requires an ongoing investment in scientific equipment if we are to secure revenue and be financially sustainable. Beyond this underlying capital spending requirement, and as signalled in last year's SCI, NIWA expects to make significant strategic investments in renewing both its high performance computing capability (HPC) and many of its properties and facilities. The forecast set out in this SCI contemplates a requirement to spend $18M on the HPC and a little over $90M on renovating or replacing the physical infrastructure and buildings at most of NIWA's main sites, as well as continued development of the Northland Marine Research Centre.

NIWA expects to fund these investment requirements from a combination of its existing resources, operating cash flows, and limited debt funding.

During the 2017/18 year NIWA intends to complete upgrades to the infrastructure at its Northland Marine Research Centre as well as the construction of a replacement field office in Rotorua, to be located on Scion's research campus. NIWA also intends to progress the redevelopment of its Greta Point, Wellington site to the preliminary design and business case stage, and will undertake concept design work in respect of its facilities in Hamilton and Christchurch.

Cash Flow

NIWA expects its operating cash flow to remain steady, with EBITDAF of $23.43M in 2017/18 rising to $26.10M in 2021/22. NIWA expects to require debt financing of about $29M to support its strategic capital investment needs during the second half of the business plan period, such financing being repaid over the five following years. This financing requirement represents a preliminary estimate only at this point. It is expected to evolve as estimates both of the costs of NIWA's strategic capital spending needs and of the Company's profitability in the SCI out-years are improved in accuracy over time.

Dividend

Based on the strategic capital investment needs identified above, no dividends are planned during the period of this SCI; however, the NIWA Board will review this on an annual basis.

Adjusted Return on Equity

NIWA's budgeted adjusted return on equity in 2017/18 is 6.2%. This is expected to decline to about 4% by the end of the SCI period as interest income from significant cash balances is replaced by interest expense as NIWA incurs debt to support the capital investments discussed above.

Risks

There is some forecasting uncertainty associated with NIWA's revenue expectations. The revenue assumptions built into the SCI forecast reflect an expectation that applied science revenue will grow to fill excess capacity currently being put in place as NIWA grows its staffing levels to address growing demands for science research. The assumptions also reflect an expectation that NIWA will continue to be successful in growing its share of contestable revenue contracts. If these expectations are not realised to the extent forecast, then profitability will be adversely impacted in the short term while in the longer term NIWA would need to adjust its cost structure to restore its financial sustainability.

Uncertainty also exists around revenues from commercial charters of RV *Tangaroa.* The SCI reflects an expectation that in the alternate years without MBIE funding to support a voyage to Antarctica, the revenue shortfall will be made up with additional commercial voyage days. If this expectation is not realised, then NIWA's profitability will be adversely impacted.

NIWA's budgeting has been realistic and we are of the view that there is equal downside risk and upside opportunity. NIWA is confident that its plans remain robust in the near-term to potential negative volatility and we will actively monitor and respond to any emerging risks.

Cray XC50 - one element of NIWA's $18M investment in high performance computing in 2017/18.

Statement of Corporate Intent ($M)	Forecast 2016/17	SCI 17/18	SCI 18/19	SCI 19/20	SCI 20/21	SCI 21/22
Revenue	139.95	148.67	158.15	155.47	157.74	159.52
Revenue growth	10.9%	5.9%	6.0%	(1.7)%	1.4%	1.1%
Operating Results						
Operating expenses and depreciation	135.95	141.94	148.74	147.76	150.20	152.02
EBITDAF	19.69	23.43	27.73	25.93	26.15	26.10
EBIT and dividend received	4.00	6.72	9.41	7.71	7.53	7.50
Profit before income tax	5.10	8.07	10.35	8.24	6.90	6.45
Profit after Tax	3.67	5.81	7.45	5.93	4.97	4.64
EBITDAF per FTE	0.030	0.036	0.043	0.040	0.040	0.040
Average total assets	145.86	159.39	163.75	173.36	193.07	205.74
Average equity (Shareholders' funds)	109.30	116.22	122.99	129.72	135.17	140.03
Adjusted average total assets*	118.63	132.16	136.51	146.13	165.83	178.50
Adjusted average equity*	86.44	93.36	100.13	106.86	112.31	117.16
Capital expenditure (incl. Capital committed)	13.48	35.01	28.70	49.60	40.80	19.80
Capital expenditure % to Revenue	9.6%	23.5%	18.1%	31.90%	25.9%	12.4%
Liquidity						
Current ratio	166.4%	141.1%	137.4%	82.8%	78.0%	74.9%
Quick ratio (aka Acid test)	2.59	2.00	1.58	0.83	0.79	0.75
Profitability						
Adjusted return on equity*	4.2%	6.2%	7.4%	5.5%	4.4%	4.0%
Return on equity	3.4%	5.0%	6.1%	4.6%	3.7%	3.3%
Return on assets	2.7%	4.2%	5.7%	4.4%	3.9%	3.6%
EBITDAF margin (aka Operating profit margin)	14.1%	15.8%	17.5%	16.7%	16.6%	16.4%
Operational Risk						
Profit volatility	5.4%	6.9%	6.9%	12.9%	13.6%	11.4%
Forecasting risk (non-adjusted ROE)	1.1%	1.1%				
Coverage						
Interest cover	N/A	N/A	N/A	29.3	7.68	5.51
Growth/Investment						
Capital renewal	85.9%	209.6%	156.7%	272.3%	219.1%	106.5%
Funds available for distribution ($M)	0.0	0.0	0.0	0.0	0.0	0.0
Financial Strength						
Gearing		2.5%	2.3%	9.3%	18.7%	16.8%
Equity ratio (aka Proprietorship)	74.9%	72.9%	75.1%	74.8%	70.0%	68.1%
Cash and short-term deposits	36.21	21.18	13.77	0.50	0.50	0.50
Financial debt	0.00	0.00	0.00	10.53	28.64	25.76

* Agreed with Officials after adjustment in 2006/07 for restatement of certain land and buildings cost figures.

Key: Statement of Corporate Intent indicators.

OTHER MATTERS REQUIRED BY THE CRI ACT 1992

6.1 Information to be reported to Shareholders

NIWA will provide information that meets the requirements of the:

- Crown Research Institutes Act 1992 (the Act);
- Companies Act 1993;
- Financial Reporting Act 1993;
- Crown Entities Act 2004; and
- New Zealand Institute of Chartered Accountants (NZICA) with regards to Generally Accepted Accounting Practice (GAAP).

The following information is made available to enable our shareholders to make an informed assessment of NIWA's performance:

- A Statement of Corporate Intent (SCI) which sets out NIWA's strategy for delivering against its core purpose and the company's financial and non-financial performance targets. The draft SCI is due not later than 1 month before the start of the financial year (31 May).
- An Annual Report containing sufficient information to allow an informed assessment to be made against the performance targets in the SCI. This report includes comments on our core business and how we communicate our science, financial statements (including audit report), and a report from the Directors to the shareholders. The Annual Report is to be provided within three months of the financial year ended 30 June. A public Annual General Meeting is to be held no later than six months after balance date and not later than 15 months after the previous AGM.
- A Half-Yearly Report containing unaudited financial statements (including comparatives of the same period in the previous year) and major highlights during the period. The Half-Yearly Report is due within two months of the first half of each financial year ended 31 December.
- A Quarterly Report containing information such as unaudited financial statements (including current quarter and year-to-date budgets and a forecast for the financial year ended 30 June). The Quarterly Report also includes financial performance measures and progress towards meeting non-financial performance targets. The Quarterly Report is currently requested within one month of each financial quarter ended 30 September, 31 December, 31 March, and 30 June.
- Any other information relating to the affairs of the company, as reasonably required by shareholders, under section 20 of the Act and section 45B of the Public Finance Act 1989.

6.2 Policy and Procedure Statements

NIWA Group consists of:

- National Institute of Water and Atmospheric Research Ltd
- NIWA Vessel Management Ltd
- NIWA Environmental Research Institute
- NIWA Natural Solutions Ltd
- NIWA Australia Pty Ltd
- EcoConnect Ltd
- Unidata Pty Ltd.

All companies have 100% ownership and voting interests, except Unidata Pty Ltd which has 80% ownership and voting interest. NIWA Group will adhere to the following procedures, as required to be discussed under section 16 of the Crown Research Institutes Act.

6.2.1 Accounting Policies

NIWA adopts generally accepted accounting practice in New Zealand as prescribed by the External Reporting Board. The accounting policies for the measurement and reporting of financial performance, movements in equity, financial position, and cash flows are detailed in Appendix 2.

6.2.2 Dividend Policy

Profit retention and dividend distribution will be determined from year to year by the Board. The policy's objective is to ensure that an appropriate level of funds is maintained in the company to sustain financial viability, whilst providing an adequate return to the shareholders.

In considering this objective, the Board each year determines the level of surplus funds by reference to NIWA's:

- medium- and long-term capital investment requirements (including equity investments);
- ability to maintain and expand operational capability;
- ability to repay debt (if any);
- funding requirements for subsidiaries;
- capacity to fund RV *Tangaroa*;
- working capital requirements;
- legislative requirements, e.g., ensuring section 4 of the Companies Act 1993 (Solvency test) has been satisfied.

Any dividend would be paid within two months of the financial year-end.

6.2.3 Shareholder Consent for Significant Transactions

The Board will obtain prior written consent for any transaction or series of transactions involving full or partial acquisition, disposal, or modification of property (buildings, land, and capital equipment) and other assets with a value equivalent to or greater than $10 million or 20% of the company's total assets (prior to the transaction), whichever is the lesser.

The Board will obtain the prior written consent of Shareholding Ministers for any transaction or series of transactions with a value equivalent to or greater than $5.0 million or 30.0% of the company's total assets (prior to the transaction):

- the acquisition, disposal, or modification in a joint venture, partnership, or other similar association;
- the acquisition or disposal in full or in part of shares or interests in external companies, subsidiaries, and business units;
- transactions that affect the company's ownership of a subsidiary or a subsidiary's ownership of another equity;
- other transactions that fall outside the scope of the definition of the company's core business or may have a material effect on the company's science capabilities.

The Board will advise the Shareholding Ministers in writing (in the Quarterly Report) before entering into any transaction below this threshold related to property or to a specific commercialisation venture which involves change in intellectual property ownership or control.

6.2.4 Ratio of Shareholders' Funds to Total Assets

The target ratio of 'shareholders' funds to total assets' is as follows:

	As at 30 June 2017 Forecast	2018 Plan	2019 Plan	2020 Plan	2021 plan	2022 plan
%	74.9%	72.8%	74.4%	76.0%	75.2%	73.0%

Shareholders' funds are defined as the sum of the 'share capital' and 'equity reserves' (otherwise called 'total equity').

Total assets are defined as the sum of the net book value of 'current' and 'non-current assets'. This is 'as disclosed' in the company's balance sheet as per the Annual Report, prepared in accordance with the accounting policies adopted by the Board.

Shareholders' funds and total assets are averaged over two years.

6.2.5 Commercial Value of the Shareholders' Investment

Section 16(3) of the Act requires the NIWA Group to furnish an estimate of the current commercial value of the Crown's investment.

The NIWA Board is satisfied that the net asset position (or shareholders' funds) as at 30 June 2016 is a fair and reasonable indication of the commercial value of the Group. The net asset position as shown in accordance with the company's accounting policies for 30 June 2016 was $109.337 million.

6.2.6 Activities where Shareholder Compensation would be required

The Board would look to seek compensation from the shareholders in the following circumstances:

- Where the shareholders instruct NIWA to undertake activities or assume obligations that would result in a reduction of the company's profit or net realisable value.
- Where the Board may consider undertaking strategic investments for the wider benefit of the New Zealand public, involving financial outlays beyond those incorporated within the company's Statement of Corporate Intent or financing capabilities.

No request for compensation is currently being sought from the shareholders. At this time no such investment has been identified, nor have any financial projections for such investment been included in NIWA's 2017/18 Statement of Corporate Intent. In the longer-term NIWA will be reviewing deep-sea marine capability and future high-performance computing capability (beyond its current purchase plans in 2017/18) and how investment in these national science infrastructure assets may be supported.

6.2.7 Other Matters Specifically Requested by the Shareholder

There are no other matters that have been specifically requested by the shareholders.

The following information can be found on NIWA's website:

- Personnel policy that complies with the principles of a good employer;
- Equal Employment Opportunities programme;
- Corporate Social Responsibility policy.

Sir Christopher Mace, KNZM
Chairman

Nick Main
Director

APPENDICES

Appendix 1: NIWA's Statement of Core Purpose

Purpose

NIWA's purpose is to enhance the economic value and sustainable management of New Zealand's aquatic resources and environments, to provide understanding of climate and the atmosphere and increase resilience to weather and climate hazards to improve safety and wellbeing of New Zealanders.

Outcomes

NIWA will fulfil its purpose through the provision of research and transfer of technology and knowledge in partnership with key stakeholders including industry, government and Māori to:

- Increase economic growth through the sustainable management and use of aquatic resources.
- Grow renewable energy production through developing a greater understanding of renewable aquatic and atmospheric energy resources.
- Increase the resilience of New Zealand and South-West Pacific islands to tsunami and weather and climate hazards, including drought, floods and sea-level change.
- Enable New Zealand to adapt to the impacts and exploit the opportunities of climate variability and change and mitigate changes in atmospheric composition from greenhouse gases and air pollutants.
- Enhance the stewardship of New Zealand's freshwater and marine ecosystems and biodiversity.
- Increase understanding of the Antarctic and Southern Ocean climate, cryosphere, oceans and ecosystems and their longer-term impact on New Zealand.

Scope of operation

To achieve these outcomes, NIWA is the lead CRI in the following areas:

- Aquatic resources and environments (with a focus on surface freshwaters and coastal environments).
- Oceans.
- Freshwater and marine fisheries.
- Aquaculture.
- Climate and atmosphere.
- Climate and weather hazards.
- Aquatic and atmospheric-based energy resources.
- Aquatic biodiversity (including biosystematics) and biosecurity.

NIWA will work with other research providers and end users to contribute to the development of the following areas:

- Biosecurity, freshwater and hazards management.
- Climate change adaptation and mitigation.
- Ocean floor exploration.
- Seafood sector.
- Urban environments.
- Antarctica.

Operating Principles

NIWA will:

- Operate in accordance with a Statement of Corporate Intent and business plan that describes how NIWA will deliver against this Statement of Core Purpose, and describes what the shareholders will receive for their investment.
- Meet its obligations as a Crown Company and remain financially viable, delivering an appropriate rate of return on equity.
- Develop strong, long-term partnerships with key stakeholders, including industry, government and Māori and work with them to set research priorities that are well linked to the needs and potential of its end users.
- Maintain a balance of research that provides for both the near-term requirements of its sectors and demonstrates vision for their longer-term benefit.
- Transfer technology and knowledge from domestic and international sources to key New Zealand stakeholders, including industry, government and Māori.
- Develop collaborative relationships with other CRIs, universities and other research institutions (within New Zealand and internationally) to form the best teams to deliver its core purpose.
- Provide advice on matters of its expertise to the Crown.
- Represent New Zealand's interests on behalf of the Crown through contribution to science diplomacy and international scientific issues and/or bodies as required.
- Seek advice from scientific and user advisory panels to help ensure the quality and relevance of its research.
- Establish policies, practices and culture that optimise talent recruitment and retention.
- Enable the innovation potential of Māori knowledge, resources and people.
- Maintain its databases, collections and infrastructure and manage the scientific and research data it generates in a sustainable manner, providing appropriate access and maximising the reusability of data sets.
- Seek shareholder consent for significant activity beyond its scope of operation.

Appendix 2: Detailed accounting policies

Statement of compliance

The financial statements have been prepared in accordance with New Zealand generally accepted accounting practice (NZ GAAP). They comply with New Zealand equivalents to international financial reporting standards (NZ IFRS) and other applicable financial reporting standards appropriate for profit-oriented entities.

The financial statements comply with international financial reporting standards (IFRS).

Basis of preparation

The measurement basis adopted in the preparation of these financial statements is historical cost, except for financial instruments as identified in specific accounting policies below. Cost is based on the fair value of consideration given in exchange for assets.

The presentation and functional currency used in the preparation of these financial statements is New Zealand dollars.

Accounting policies are selected and applied in a manner to ensure that the resulting financial information meets the concepts of relevance and reliability, ensuring that the substance of the underlying transaction or event is reported.

Accounting judgements and major sources of estimation uncertainty

In the application of the Group's accounting policies, the directors are required to make judgements, estimates and assumptions about the carrying amounts of assets and liabilities that are not readily apparent from other sources. The estimates and associated assumptions are based on historical experience and other factors that are considered to be relevant. Actual results may differ from these estimates.

Significant accounting policies

The following significant accounting policies have been adopted in the preparation and presentation of the financial reports and have been applied consistently to all periods, unless otherwise stated.

a) Basis of consolidation

The Group financial statements incorporate the financial statements of the company and entities (including special purpose entities) controlled by the Company (its subsidiaries). Control is achieved where the Company has the power to govern the financial and operating policies of an entity so as to obtain benefits from its activities.

Non-controlling interests in the net assets of the consolidated subsidiaries may be initially measured either at fair value or at the non-controlling interest's proportionate share of the fair value of the acquirer's identifiable net assets. The choice of measurement basis is made on an acquisition-by-acquisition basis. Subsequent to acquisition, non-controlling interests consist of the amount attributed to such interests at initial recognition and the non-controlling interest's share of changes in equity since the date of the combination. Total comprehensive income is attributed to non-controlling interests even if this results in the non-controlling interests having a deficit balance.

The results of subsidiaries acquired or disposed of during the year are included in profit or loss from the effective date of acquisition or up to the effective date of disposal, as appropriate. Where necessary, adjustments are made to the financial statements of subsidiaries to bring the accounting policies used into line with those used by other members of the Group.

All intra-group transactions, balances, income and expenses are eliminated in full on consolidation.

Changes in the Group's interests in a subsidiary that do not result in a loss of control are accounted for as equity transactions.

Any difference between the amount by which the non-controlling interests are adjusted and the fair value of the consideration paid or received is recognised directly in equity and attributed to owners of the Company.

When the Group loses control of a subsidiary, the profit or loss on disposal is calculated as the difference between:

- the aggregate of the fair value of the consideration received and the fair value of any retained interest; and
- the previous carrying amount of the assets (including goodwill), and liabilities of the subsidiary and any non-controlling interests.

Amounts previously recognised in other comprehensive income in relation to the subsidiary are accounted for (i.e. reclassified to profit or loss or transferred directly to retained earnings) in the same manner as would be required if the relevant assets or liabilities were disposed of. The fair value of any investment retained in the former subsidiary at the date when control is lost is regarded as the fair value on initial recognition for subsequent accounting under NZ IAS 39 Financial Instruments: Recognition and Measurement or, when applicable, the cost on initial recognition of an investment in an associate or jointly controlled entity.

Investments in subsidiaries are recorded at cost less any impairment in the parent company's financial statements.

b) Revenue recognition

Rendering of services

Revenue from services rendered is recognised in profit or loss in proportion to the stage of completion of the transaction at reporting date. The amount of revenue unbilled is represented by 'un-invoiced receivables', which is stated as the proportion to the stage of completion in the statement of financial position. Revenue received but not earned is recognised as revenue in advance on the face of the statement of financial position.

Goods sold

Revenue from the sale of goods is measured at the fair value of the consideration received or receivable, net of returns and allowances. Revenue is recognised when the significant risks and rewards of ownership have been transferred to the buyer, recovery of the consideration is probable, the associated costs and possible return of goods can be estimated reliably, and there is no continuing management involvement with the goods.

Transfers of risks and rewards vary depending on the individual terms of the contract sale. For sales of instruments, transfer occurs upon receipt by the customer.

Dividend revenue

Dividend revenue from investments is recognised when the shareholder's right to receive payment has been established.

c) Strategic Science Investment Fund

NIWA and the Crown are parties to a 7-year Strategic Science Investment Fund (SSIF) agreement under which the Crown contracts NIWA to perform research activities in three science platforms that support its Statement of Core Purpose. Platform plans, which describe the outputs expected, are reviewed and agreed annually.

For financial reporting purposes SSIF is treated as a Government Grant in terms of NZ IAS 20. SSIF is recognised as income in profit or loss on a systematic basis in the period in which the expenses related to the research activities performed under the SSIF are recognised.

d) Finance costs

Interest expense is accrued on a time basis using the effective interest method.

e) Goods and services tax (GST)

These financial statements are prepared on a GST-exclusive basis, except for receivables and payables, which are stated GST inclusive.

f) Employee benefits

Liabilities for wages and salaries, including non-monetary benefits and annual leave, long service leave, retirement leave and training leave are recognised when it is probable that settlement will be required and they are capable of being measured reliably. Provisions, in respect of employee benefits, are measured at their nominal values using the remuneration rate expected to apply at settlement. Employee benefits are separated into current and non-current liabilities. Current liabilities are those benefits that are expected to be settled within 12 months of balance date.

Provisions made in respect of employee benefits which are not expected to be settled within 12 months are measured at the present value of the estimated future cash outflows to be made by the Group in respect of services provided by employees up to the reporting date.

g) Impairment of tangible and intangible assets (excluding goodwill)

Intangible assets that have an indefinite life are not subject to amortisation and are tested annually for impairment. Other assets are reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount may not be recoverable. If such an indication exists, the recoverable amount of the asset is estimated in order to determine the extent of the impairment loss. The recoverable amount is the higher of fair value less cost to sell and value in use.

If the recoverable amount of the asset is estimated to be less than its carrying value, the carrying value is reduced to its recoverable amount. An impairment loss is recognised in profit or loss.

Where an impairment loss subsequently reverses, the carrying amount of the asset is increased to the revised recoverable amount, but only to the extent that the increased carrying value does not exceed the carrying amount that would have been recognised if the asset had no impairment loss recognised in the past. This reversal is recognised in profit or loss.

h) Income tax

The income tax expense for the period is the tax payable on the current period's taxable income, based on the income tax rate for each jurisdiction. This is then adjusted by changes in deferred tax assets and liabilities attributable to temporary differences between the tax bases of assets and liabilities and their carrying amounts in the financial statements, and changes in unused tax losses.

Deferred tax is accounted for using the balance sheet liability method in respect of temporary differences arising from the carrying amount of assets and liabilities in the financial statements and the corresponding tax base of those items. Deferred tax liabilities are generally recognised for all taxable temporary differences. Deferred tax assets are generally recognised for all deductible temporary differences to the extent that it is probable that sufficient taxable amount will be available against which those deductible temporary differences can be utilised.

Deferred tax liabilities are recognised for the taxable temporary differences arising on investment in subsidiaries, associates and joint ventures, except where the consolidated entity is able to control the reversal of the temporary differences and it is probable that the temporary difference will not reverse in the foreseeable future. Deferred tax assets arising from deductible temporary difference from these investments are only recognised to the extent that it is probable there will be sufficient taxable profits against which to utilise the asset and they are expected to reverse in the foreseeable future.

Such assets and liabilities are not recognised if the temporary difference arises from the initial recognition (other than in a business combination) of other assets and liabilities in a transaction that affects neither the taxable profit nor the accounting profit.

Deferred tax assets and liabilities are measured at the tax rates that are expected to apply to the period when the asset and liability giving rise to them are realised or settled, based on the tax laws that have been enacted or substantively enacted at balance date.

Current and deferred tax is recognised in profit or loss, except when it relates to items recognised in other comprehensive income or directly in equity, in which case the deferred or current tax is also recognised in other comprehensive income or directly in equity, or where it arises from the initial accounting for a business combination. In the case of a business combination, the tax effect is taken into account in calculating goodwill or in determining the excess of the acquirer's interest in the net fair value of the acquiree's identifiable assets, liabilities and contingent liabilities over the cost of the business combination. The carrying amount of deferred tax assets is reviewed at each balance date and reduced to the extent that it is no longer probable that sufficient taxable profits will be available to allow all or part of the asset to be recovered.

i) Identifiable intangibles

Purchased identifiable intangible assets, comprising copyrights, and software, are recorded at cost less amortisation and impairment. Amortisation is charged on a straight-line basis over their estimated useful lives. The estimated useful life and amortisation method are reviewed each balance date.

Intangible assets which arise from development costs that meet the recognition criteria are recognised as an asset in the statement of financial position.

Capitalisation is limited to the amount which, taken together with any further related costs, is likely to be recovered from related future economic benefits. Any excess is recognised as an expense.

All other development and research costs are expensed as incurred.

Category	Useful life
Copy rights	5 years
Development costs	5 years
Software	3 years

j) Property, plant and equipment

Property, plant and equipment are stated at cost less accumulated depreciation to date less any impairment losses.

Expenditure incurred on property, plant and equipment is capitalised where such expenditure will increase or enhance the future economic benefits provided by the assets' existing service potential. Expenditure incurred to maintain future economic benefits is classified as repairs and maintenance.

The gain or loss arising on the disposal or retirement of an item of property, plant and equipment is determined as the difference between the sales proceeds and the carrying amount of the asset and is recognised in profit or loss.

k) Depreciation

Property, plant and equipment, except for freehold land and work in progress, are depreciated on a straight-line basis at rates estimated to write off the cost of the property, plant and equipment over their estimated useful lives, which are as follows:

Category	Useful life
Buildings and leasehold improvements	5–40 years
Vessels	20–31 years
Plant and equipment	8–10 years
IT equipment	3–8 years
Office equipment	5 years
Furniture and fittings	10 years
Motor vehicles	6 years
Small boats	10 years

Appendix 3: NIWA's Organisational Responsibility Charter

NIWA is committed to contributing positively to the social, economic and environmental wellbeing of New Zealand:

Economic

NIWA is committed to operating with fiscal discipline to ensure that we retain our long-term viability and meet our core purpose science responsibilities to generate sustainable economic benefit to New Zealand.

We are committed to:

- Fair trading and observing high standards of behaviour, integrity and ethics.
- Maintaining positive relationships with our customers, partners and collaborators.
- Taking a broad approach to decision making and business development with the aim of benefitting all of New Zealand.

Social

NIWA is committed to work practices, operations and science outcomes that support our staff and the wider community.

We are committed to:

- Ensuring that people are safe in our workplaces and subject to zero harm.
- Engaging positively with the communities in which we operate and live.
- Respecting cultural values and diversity in New Zealand and in the countries where we work.
- Fostering positive interactions with, and outcomes for, Māori.

Environmental

NIWA is committed to operating in an environmentally responsible way when carrying out our activities, and ensuring that we meet our core purpose science responsibilities to contribute to better environmental outcomes for New Zealand.

We are committed to:

- Minimising the environmental effects of performing our business.
- Integrating environmental perspectives into our wider business planning.
- Complying with all regulatory requirements, standards and best practice guidelines.

Operating to our Charter Principles

We must ensure that the commitments we give are owned by all our people and demonstrated by their actions.

Economic

We will support the Organisational Responsibility Charter by:

- Being fair and honest in all our business dealings.
- Maintaining objectivity in our service provision and avoiding actions that could damage NIWA's reputation for impartiality.
- Taking a 'NZ Inc' approach to business decisions and using any market advantage responsibly.
- Delivering on our project commitments – on time, to budget and with the expected quality.
- Employing our assets responsibly both to benefit the company and the wider community.
- Abiding by the laws of the lands in which we operate.
- Resolving differences without the need for litigation.

Social

We will support the Organisational Responsibility Charter by:

- Being a good employer, particularly in relation to;
  - providing equitable access to employment opportunities
  - leadership, accountability and culture
  - recruitment, selection and induction
  - employee development, promotion and exit
  - flexibility and work design
  - remuneration, recognition and conditions
  - harassment and bullying prevention.
- Treating our employees and all others with whom we interact with dignity and respect, including fostering long-term relationships built on trust and mutual benefits.
- Ensuring staff have opportunities to participate in work-place improvement programmes.
- Making available best practice systems and training to achieve a fit and healthy workforce.
- Empowering our employees to identify and resolve safety concerns so that potential hazards are eliminated and safe processes and work methods are under continual improvement.
- Maintaining open communication with local communities and ensuring our activities and staff respect their traditions and cultures.
- Supporting our employees to participate in voluntary activities that benefit the wider community.
- Working closely with individual employees to help them reach their goals and provide NIWA with talent for the future.
- Striving for 'no surprises' in our internal and external relationships.

Environmental

We will support the Organisational Responsibility Charter by:

- Ensuring that all our activities and assets comply with resource consents, relevant environmental standards, biosecurity and biodiversity regulations, and permitting requirements.
- Maintaining full compliance with animal ethics procedures and ensuring that all sampling and work with live animals complies with the Animal Welfare Act 1999.
- Minimising material waste and resource use, and making maximum practical use of recycling and electronic media.
- Minimising energy consumption and greenhouse gas emissions, within the constraints of business sustainability.
- Supporting our employees to take positive actions to reduce the effects of their activities on the environment at work and beyond.

Appendix 4:
NIWA's Data Management and Access Policy

NIWA is committed to the development of robust information infrastructure for the management, stewardship and accessibility of its research data and information. This includes:

- Procedures and systems for the capture, quality assurance, storage, back-up and curation of data and information that conforms to national and international standards and best practice.
- Protection of personal, confidential or third-party data and information.
- Open transfer web services for the discovery, display and access of data and information, consistent with those specified in the New Zealand Interoperability Framework.
- Licence agreements to maximise access and re-use of data and information, based on the New Zealand Government Open Access and Licensing framework.
- Public access to data and information, with appropriate commercial pricing when appropriate.
- Continuous improvement to accommodate technological advances and ensure long-term custodianship and access to data and information.

DIRECTORY

Board of Directors

Sir Christopher Mace (Chairman)
Nick Main (Deputy Chairman)
Dr Helen Anderson
Professor Keith Hunter
Professor Gillian Lewis
Michael Pohio
Jason Shoebridge

Executive Team

John Morgan (Chief Executive Officer)
Geoff Baird (General Manager, Communications & Marketing)
Patrick Baker (Chief Financial Officer)
Dr Barry Biggs (General Manager, Operations)
Dr Bryce Cooper (General Manager, Strategy)
Dr Mary-Anne Dehar (General Manager, Human Resources)
Dr Rob Murdoch (General Manager, Research)
Andrew Watkins (General Manager, Information Technology)

Solicitors

Bell Gully
Atkins Holm Majurey Ltd

Auditors

PricewaterhouseCoopers on behalf of the Auditor-General

Bankers

ANZ National Bank of NZ Ltd

Insurance Broker

Marsh Ltd

Registered Office

41 Market Place
Auckland Central 1010
New Zealand

Private Bag 99 940
Newmarket
Auckland 1149
New Zealand

Website

facebook.com/nzniwa
twitter.com/niwa_nz
google.com/+niwanz
linkedin.com/company/niwa

www.niwa.co.nz

NIWA
Taihoro Nukurangi

Enhancing the benefits of New Zealand's natural resources