GNS SCIENCE TE PŪ AO

OUR STATEMENT OF CORPORATE INTENT

JULY 2019 – JUNE 2024

OUR PEOPLE
OUR SCIENCE
OUR OUTCOMES

Ō tātou tāngata
Tō tātou pūtaiao
Ō tātou putanga

MAI I TE RANGI, KI TE NUKU O TE WHENUA, KA PUTA TE IRA TANGATA I TE PO, I TE WHAIAO, I TE AO MARAMA.

NAU MAI, HAERE MAI KI TE PŪ AO

From the sky and the land came people,
from the night, to the old world, to the world of light.

Welcome to GNS Science

Mt Aspiring National Park, New Zealand | Surveying the Young River Landslide

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INTRODUCTION FROM THE CHAIRMAN AND CEO

We are pleased to introduce the GNS Science Statement of Corporate Intent for 2019-2024. It outlines our ambitious new direction, building on a legacy of excellent science for the benefit of New Zealand. Working in close partnership with our major stakeholders and collaborators, our vision is to achieve a *Cleaner, Safer, More Prosperous New Zealand*.

Our priorities for the next five years reflect the outcomes of our Strategic Review. Increasingly, we will focus on our core strengths, while investing in expertise and ways of working to navigate the changing nature of science, technology and society.

OUR SCIENCE

By making clear strategic choices about the research we do, GNS Science will deliver more tangible benefits to address New Zealand's changing needs. Four new Science Themes will drive our science outcomes from 1 July 2019:

- **Natural Hazards and Risks** – enhancing New Zealand's resilience to geological hazards
- **Environment and Climate** – ensuring sustainable management of the environment, and effective adaptation to a changing climate
- **Energy Futures** – enabling New Zealand to transition to a low-carbon future
- **Land and Marine Geoscience** – providing deeper understanding of the continent Te Riu-a-Māui/Zealandia.

We are also investing in Data Science and Social Science to reflect the changing nature of science and enable a greater focus on people-centred and interdisciplinary research, as well as develop future-facing science capability.

Vision Mātauranga is embedded in our research activities. We are working with iwi/Māori to unlock the science and innovation potential of Māori knowledge, resources and people for the benefit of all New Zealanders.

As a Crown Research Institute (CRI), our science direction reflects Government priorities. We are contributing to cross-institution research to improve the quality of New Zealand's freshwater, enable New Zealand to transition to a low-carbon economy by 2050, and improve understanding of climate change and its effects on New Zealand.

OUR IMPACTS

Through deeper relationships and trusted partnerships with our major stakeholders, we co-design our research to meet the needs of New Zealand. We recognise that there can be multiple pathways to do this, and we will determine the most appropriate delivery mechanisms through early planning and engagement with end users. In particular, we will:

- Provide expert scientific input to policy, regulation, standards and guidance
- Provide integrated advice and tools to decision makers on the effective management of New Zealand's natural hazards, the environment, and energy requirements
- Partner with business to encourage innovation and productivity, and develop new knowledge-intensive technologies in New Zealand
- Contribute to relevant national and global collaborative science initiatives to deepen capability, promote connectivity and enhance science value
- Build on our Host role for the *Resilience to Nature's Challenges* National Science Challenge to strengthen GNS Science's contribution to the Challenge and aligned research.

HE KUPU WHAKATAKI MAI I TE TIAMANA ME TE TUMUAKI

OUR CONNECTIONS

GNS Science is actively collaborating across the science and innovation ecosystem. We are well-positioned to extend links between CRIs, universities and global research institutions. We will build on our high-impact collaborations in Antarctic science, consolidate a new national approach to groundwater research, and work with others to develop a systems-view of energy futures research of relevance to New Zealand.

GNS Science will play a wider leadership role beyond hazards research in bringing together science and stakeholder interests in areas of national priority. For example, through close collaboration with the research community, energy sector, iwi/Māori and regional development interests, we will seek to unlock the potential of New Zealand's renewable geothermal energy resources. Leveraging longstanding international collaborations will be a focus as we scope opportunities to develop next-generation geothermal energy.

OUR PEOPLE

Working with other CRIs, we are building science capability for the future. We are striving to become more diverse and to reflect New Zealand society and provide the expertise to address our country's changing needs.

We will invest in capability, learning and development, and culture programmes to ensure we have future-ready skillsets and ways of working to deliver ongoing benefits for New Zealand.

OUR FUTURE

GNS Science is a world-leading science organisation proudly building on over 150 years of scientific leadership.

The strategies set out in this Statement of Corporate Intent position us to secure a more resilient and sustainable future for New Zealand.

We are working to enable New Zealand to transition to a low-carbon economy by

2050

Dr Nicola Crauford
Chairman

Ian Simpson
Chief Executive

OUR PURPOSE

GNS SCIENCE, TE PŪ AO, IS ONE OF SEVEN CROWN-OWNED RESEARCH INSTITUTES. AS THE NATIONAL ORGANISATION FOR GEOLOGICAL AND NUCLEAR SCIENCES, WE ARE FOCUSED ON DELIVERING BENEFITS FOR NEW ZEALAND FROM NATURAL PROCESSES OCCURRING IN THE EARTH'S CRUST.

GNS SCIENCE'S CORE PURPOSE IS TO UNDERTAKE RESEARCH THAT:

INCREASES
New Zealand's resilience to natural hazards.

ENHANCES
understanding of geological and Earth-system processes.

DRIVES
innovation and sustainable economic growth in New Zealand's geologically-based energy and minerals industries.

DEVELOPS
industrial and environmental applications of nuclear science.

TŌ TĀTOU TIKANGA

Our expertise contributes to a **Cleaner, Safer, More Prosperous New Zealand** by:

- building intergenerational wealth and well-being through wise custodianship of New Zealand's freshwater, energy and mineral resources
- reducing the physical, economic and societal impacts of geological hazards, including through 'early warning' systems, improved hazard awareness and preparedness, enhanced geohazards monitoring and enabling more resilient communities, buildings and infrastructure
- understanding past climates to improve global models that predict the future impacts of a changing climate, including critical tipping points
- developing and applying novel technologies such as nano-scale devices and isotope measurements to create new value for industry.

With around 430 staff at five sites across New Zealand, GNS Science draws on a heritage of over 150 years of excellence in Earth sciences. We undertake a wide range of activities from basic research through to applied science, technology development and knowledge exchange.

Our work is highly collaborative, with deep local and global partnerships across the full spectrum of our research and applied science. This partnering approach enhances our contribution to world-leading science and enables us to adapt it for New Zealand's benefit, to deliver highly-relevant, tailored research, science and technology to central and local government, industry and iwi/Māori.

As Host of the *Resilience to Nature's Challenges* National Science Challenge and as a lead contributor to its research programmes, GNS Science champions the value of cross-system and interdisciplinary research collaborations. To deliver meaningful solutions to those who most need our science, we form teams across institutions and research disciplines, reflective of the growing diversity of New Zealand society.

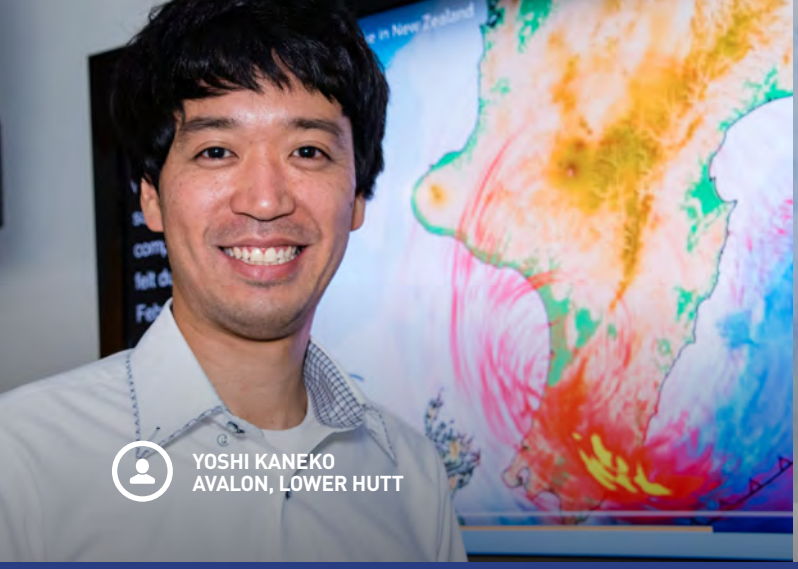
GNS Science has over

150

years of excellence in Earth sciences.

OUR EXPERTISE CONTRIBUTES TO A CLEANER, SAFER, MORE PROSPEROUS NEW ZEALAND

Wellington, New Zealand | Geologists at Red Rocks, South Coast



YOSHI KANEKO
AVALON, LOWER HUTT

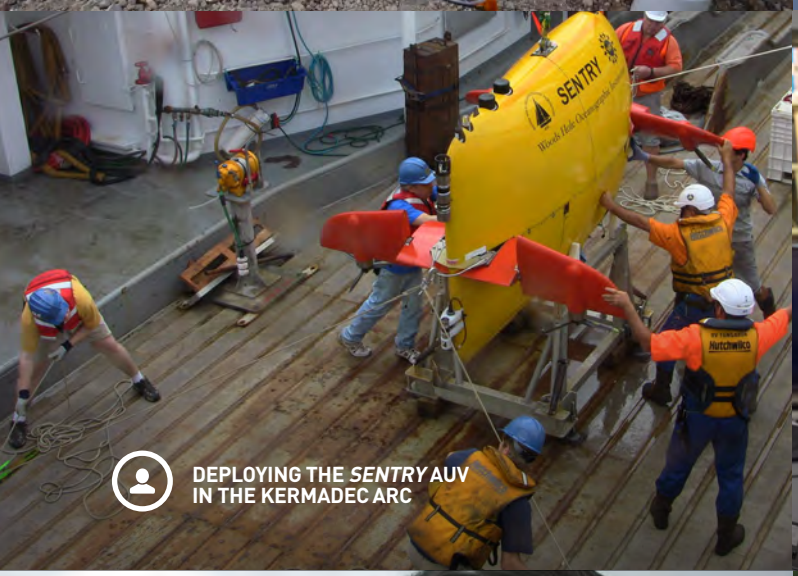
VANESSA TROMPETTER
WATER DATING LABORATORY,
AVALON, LOWER HUTT

OUR PEOPLE ARE OUR GREATEST ASSET.
KO TŌ TĀTOU TĀNGATA Ō TĀTOU TINO TAONGA.

NICK MACDONALD
WAIRAKEI GEOTHERMAL FIELD

SAMPLING VOLCANIC GASES ON MT TONGARIRO

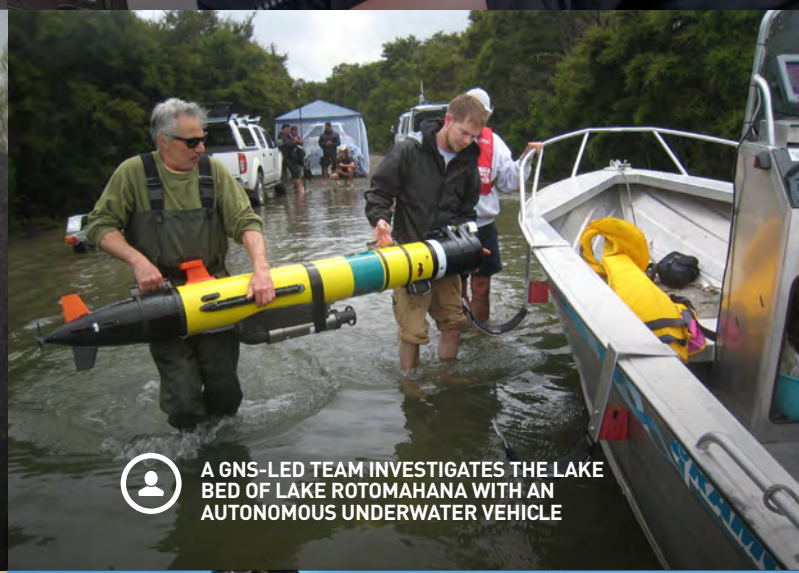
SNOW SAMPLING AT EVANS PIEDMONT GLACIER, ANTARCTICA



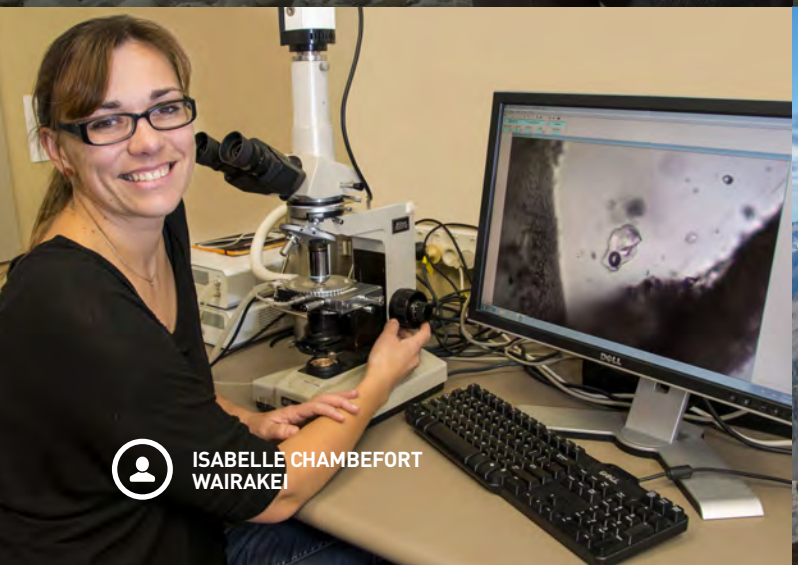
DEPLOYING THE *SENTRY* AUV IN THE KERMADEC ARC

GEOHAZARDS ANALYSTS IN THE 24/7 NATIONAL GEOHAZARDS MONITORING CENTRE IN LOWER HUTT

GEOLOGIST JULIE LEE HUTT RIVER



A GNS-LED TEAM INVESTIGATES THE LAKE BED OF LAKE ROTOMAHANA WITH AN AUTONOMOUS UNDERWATER VEHICLE



ISABELLE CHAMBEFORT WAIRAKEI

NEVILLE PALMER WITH GPS EQUIPMENT ON MT TRAVERS, NELSON LAKES

OUR CHANGING ENVIRONMENT

The world around us is changing. New Zealand is not alone in facing a range of complex societal trends. There are growing pressures on the environment, rapid advances in new technologies, disruption to traditional ways of doing business and the development of new industries. There are greater expectations of community participation in decision-making and increasing recognition of the role of iwi/Māori – including their connection to the natural world and contribution to the future well-being of the country. As New Zealand society becomes more diverse, science needs to be more inclusive.

TOWARDS A LOW-CARBON FUTURE

In New Zealand and globally, there is increasing recognition of climate change and its impacts. Global agreements to reduce greenhouse gas emissions add momentum to increasing consumer preference for more sustainably-produced goods and services. New Zealand has set targets of 100% renewable electricity generation by 2035, and a net-zero-carbon-emissions economy by 2050.

Both the Productivity Commission and Business NZ have highlighted the critical role of research and development to enable New Zealand to transition to a low-carbon economy and meet national targets. Unlocking further potential from our renewable geothermal energy resources, including enabling a future 'hydrogen economy', is key. GNS Science is working closely with the energy sector, iwi/Māori and regional development interests to develop New Zealand's energy future.

Through international collaborations (e.g. in Japan, Indonesia, Taiwan and Iceland) GNS Science is advancing best practice in expanding geothermal development, as well as developing the research direction for next-generation geothermal energy. Science will be critical to accessing the super-heated geothermal resources that exist deep within the Earth's crust. New technologies and materials will also play a role in reducing energy demand and developing new methods of socially acceptable electricity generation.

THE VALUE OF WATER

Freshwater is vital to human health and well-being. It underpins our largest export-earning sectors (dairying and tourism) and supports a number of important cultural and ecological values in our communities. New Zealanders consistently rank freshwater as a top environmental issue.

The National Policy Statement for Freshwater Management 2017 directs regional councils, in consultation with their communities, to set objectives for the state of freshwater bodies in their regions and to set limits on resource use to meet these objectives. These objectives should recognise the environmental, economic, health and cultural costs of degraded waterways and contaminated drinking water supplies. Pressures on our waterways also divide communities, exacerbating rural-urban tensions. GNS Science and our collaborators are working with the Ministry for the Environment, regional councils, iwi/Māori and primary sector partners to improve the characterisation and monitoring of our groundwater aquifers and create new knowledge and solutions to better manage the pressures on our waterways.

Increasingly, our groundwater research is undertaken as part of a national research effort involving other major freshwater research providers such as ESR, Lincoln Agritech, Aqualinc and NIWA. GNS Science co-hosted the inaugural national Groundwater Symposium to showcase advances in groundwater research. Collectively, we are beginning work to better integrate freshwater research with land and soils research. This is well-aligned to the findings of the December 2018 report on cleaning-up New Zealand's waterways by the Parliamentary Commissioner for the Environment.

TŌ TĀTOU TAIAO HURIHURI

RISK, RESILIENCE AND WELL-BEING

New Zealand is ranked as one of the most at-risk nations internationally by the global insurance industry. We have a national imperative to minimise the risk to lives, buildings and major infrastructure from earthquakes, tsunami, volcanoes and landslides. Both the National Disaster Resilience Strategy and the Living Standards Framework recognise that economic, environmental and social well-being critically depend on New Zealand's resilience to the impacts of natural hazards, many of which are geologically-based.

GNS Science has a long history of science leadership in disaster risk management research, working across the value chain from basic research through to tool development and science communication. As a major contributor to the *Resilience to Nature's Challenges* National Science Challenge, we both lead and coordinate interdisciplinary research to more accurately understand and characterise natural hazards, lift awareness and preparedness in New Zealand communities, and ensure we are more resilient to, and can recover well from, geological risks. A focus of our future work is to provide 'forecasts' of major hazard events as well as support the development of accurate early-warning systems when possible.

CHANGING SCIENCE DRIVERS

Science is changing – both globally and in New Zealand. Increasing access to new technology is rapidly altering the way we undertake science, the skills we will need into the future and the opportunities and risks relating to our work. As an example, the swift development of cost-effective 'sensing technologies' – from space using satellites, from air- and sea-borne drones, or even from new uses of everyday telecommunications technologies such as fibre optics – opens the way for novel data collection and analysis to provide new insights into old problems. The implications are substantial: science infrastructure will need to keep pace with significant increases in data volume and complexity, and science career pathways will demand 'data science' expertise.

A changing science environment brings with it major implications. Expectations that publicly-funded science will be made publicly available increase the demand for secure, fit-for-purpose, ethical frameworks for data management. Increasingly, science is being asked to deliver 'whole-solutions' to complex, systemic issues. This raises the need for effective interdisciplinary research and a much broader suite of core science skills. It also means being able to offer science commentary that meets the needs of policy-makers and decision-makers, as well as science engagement, translation and knowledge-brokering to diverse communities and iwi/Māori. Finally, this needs to be complemented by the development, application and use of novel technologies. As mainstream science skills broaden, so too must career pathways.

THERE IS GROWING RECOGNITION THAT SCIENCE NEEDS TO BECOME MORE INCLUSIVE

Fiordland, New Zealand | Neville Palmer with GPS equipment

OUR DIRECTION

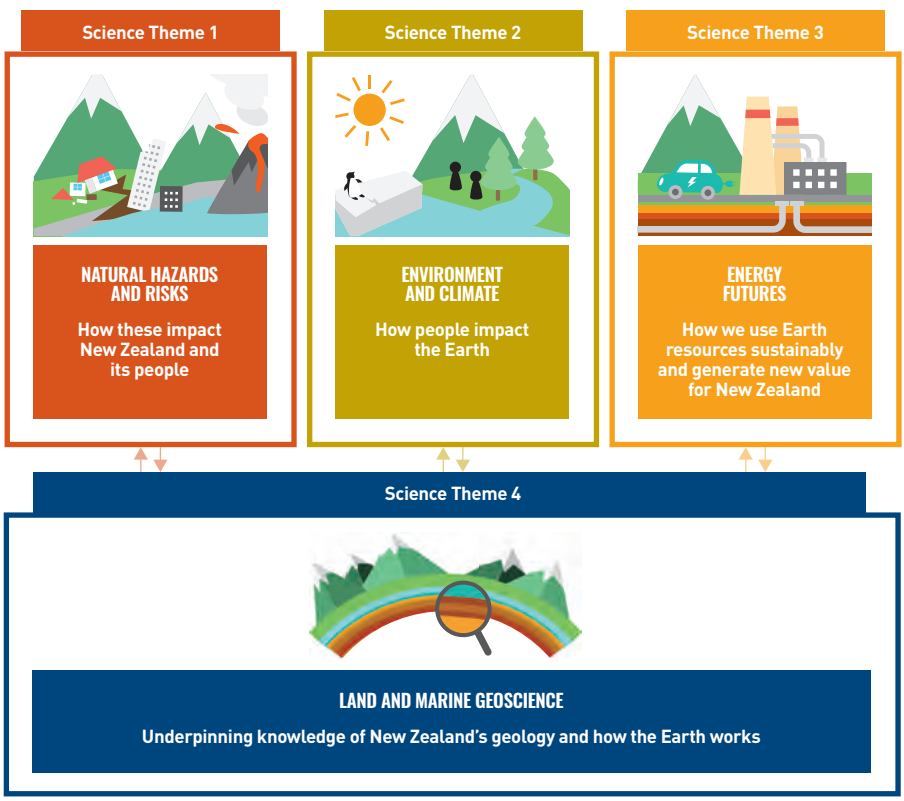
Over the next five years we will build on our legacy of excellent science, focusing on national and sector priorities for a Cleaner, Safer, More Prosperous New Zealand. We are moving from an organisation of world-leading scientists to a world-leading science organisation, harnessing collective efforts for greater impact and benefit for New Zealand and globally.

GNS Science undertook a major Strategic Review over 2018 and 2019, which refocused our science direction to capitalise on our core strengths and use our capability more effectively to respond to current and emerging stakeholder needs. We also refreshed our enabling corporate functions to improve support for our science programmes.

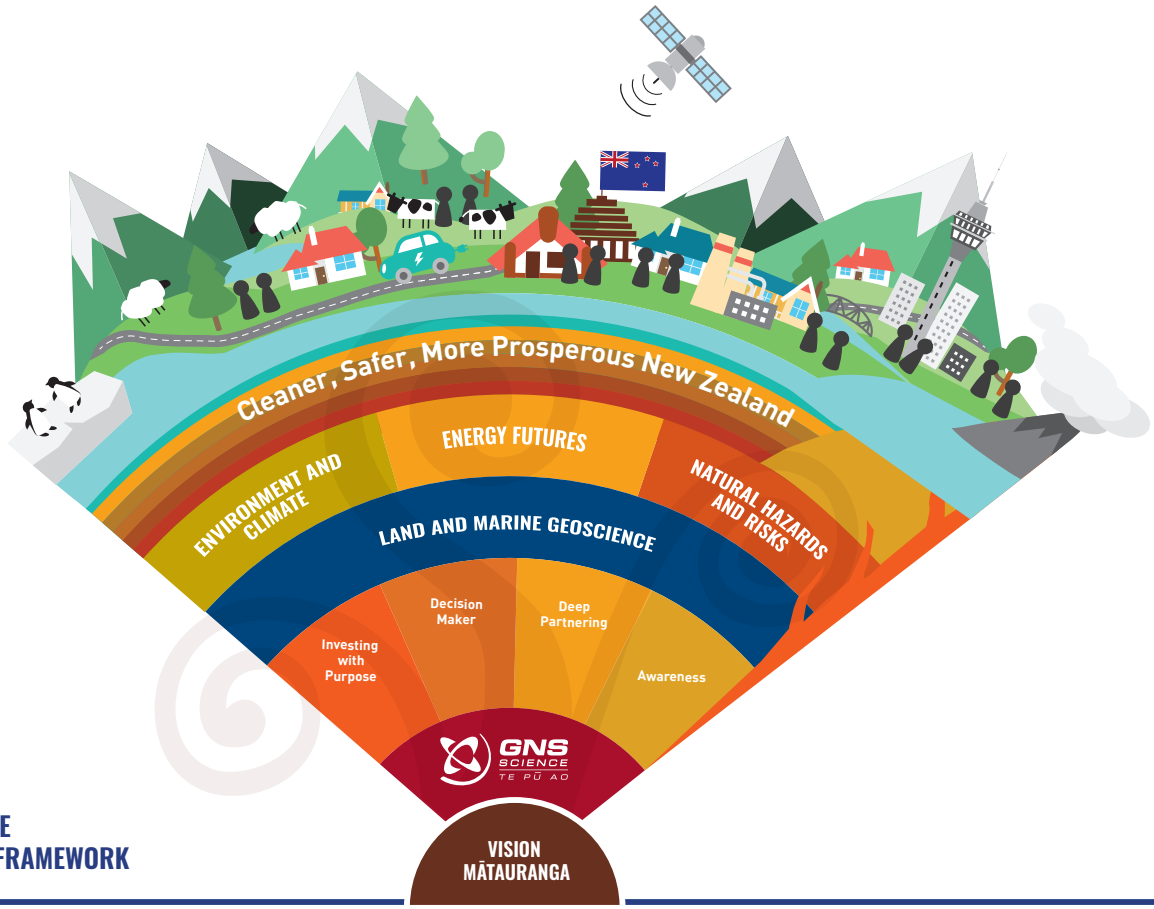
Our strategic direction will be more transparently aligned to the priority needs of New Zealand stakeholders in central and local government (our largest end-user sectors), major industry partners and iwi/Māori interests. Investing purposefully to ensure we are a strategy-led organisation is a key element of our future approach.

The development of outcomes-focused Science Themes will drive greater interdisciplinary research and help broaden research expertise beyond the physical sciences. Investment in Data Science, Vision Mātauranga and Social Science priority areas will support the development of our extended capabilities. Planned leadership, learning and development, and culture programmes will strengthen our organisation and diversify our workforce over time, to meet future needs and aspirations.

We will invest strategically in the following Science Themes:



TŌ TĀTOU AHUNGA



GNS SCIENCE STRATEGIC FRAMEWORK

The **GNS Science Strategic Framework** highlights our research direction and shows how our Science Themes, ways of working, plans and performance are aligned to deliver benefits for New Zealand. The framework enables clear line-of-sight throughout the organisation. Vision Mātauranga permeates all our activities, as we work in partnership with iwi/Māori on their science needs.

WHY

Cleaner, Safer, More Prosperous New Zealand

Our science enables a more sustainable environment and better quality of life for New Zealanders.

WHAT

We will unlock environmental, social, cultural and economic benefits through our work across four Science Themes:
- Natural Hazards and Risks
- Environment and Climate
- Energy Futures
- Land and Marine Geoscience

HOW

The way we work is key to us operating effectively as a world-class science institution. Our four **Strategic Pillars** – Investing with Purpose, Deep Partnering, Decision Maker and Awareness – reinforce our culture and values, so that our science is useful, usable and used.

WHO

All our people – from the Science, People and Culture, Stakeholder Relations and Business Services groups – working together. We connect with stakeholders and collaborators from research, government and industry to build and deliver fit-for-purpose science. We will partner with iwi/Māori to explore the science and innovation potential of Māori knowledge, resources and people to benefit all New Zealanders.

OUR SCIENCE

Excellent science, where it matters most

We have made clear, strategic choices about the areas of research we will prioritise and invest in over the next five years to progress towards a **Cleaner, Safer, More Prosperous New Zealand**.

Through our four Science Themes, we will build on the strong foundations of our world-renowned expertise to contribute international thought-leadership and deliver practical solutions of high relevance to our major stakeholder sectors and end users. We are investing in Data Science and Social Science to provide effective linkages across our Science Themes and enable us to provide data-driven, outcome-oriented science for the benefit of all New Zealanders.

Science Theme 1

NATURAL HAZARDS AND RISKS

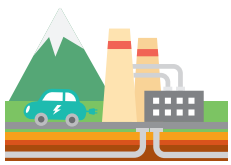
Research priority areas:
- Managing Risk to the Four Capitals[1]
- Enabled and Informed Public, Community and Business
- Effective Early Warnings and Forecasts
- Improved Response Decision-Making and Recovery Planning
- Improved Risk Governance

Science Theme 2

ENVIRONMENT AND CLIMATE

Research priority areas:
- Our Groundwater Systems
- Antarctica in a 2°C world[2]
- Ecosystem Response to a Warming World
- Revealing the Drivers of Our Climate
- Carbon Cycle Dynamics
- Our Rising Tide

Science Theme 3



ENERGY FUTURES

Research priority areas:
- Maximising Geothermal Direct Use
- Knowledge of the Deeper Taupō Volcanic Zone
- Reducing Risks Associated with Geothermal Developments
- Kaitiakitanga of Geothermal Ecosystems
- Superhot Geothermal Fluids
- Energy Efficiency and Storage
- Energy Innovations

Science Theme 4

LAND AND MARINE GEOSCIENCE

Research priority areas:
- Thermal Processes
- Plate Boundary Tectonic Processes
- Continental Tectonic Processes
- Surface Geological Processes
- Databases/Geoscience Information

Each Science Theme is underpinned by our SSIF programmes that provide long-term strategic research to support end-to-end science delivery along the value chain (Appendix 1).

1 The New Zealand Treasury Living Standards Framework covers four capitals: Natural, Human, Social and Financial/Physical
2 The potential temperature increase above pre-industrial levels

TŌ TĀTOU PŪTAIAO

MEASURING OUR SCIENCE PERFORMANCE

We have developed Science Theme priorities using an outcome-oriented approach and following stakeholder engagement. The global and national drivers, focus and impacts of the four Science Themes are described in more detail in the following sections, along with the measures that will demonstrate the impacts of our work over the next five years. The overall performance of GNS Science is monitored against the set of GNS Science Key Performance Indicators (KPIs) shown in Appendix 2.

EXTERNAL ADVICE

Our Strategic Scientific and User Advisory Panel has an important role in evaluating our science quality and delivery for and with stakeholders. Reporting directly to our Board, the Panel meets for two days annually to review our performance, future research directions and capability needs to ensure our research is both excellent and relevant, and that we are taking advantage of key developments in international science and technology. We plan to refresh membership of the panel in 2019 to reflect the changes in our Science Themes and deepen expert advice in areas of increasing focus (e.g. data science).

Antarctica | Scientists unpack equipment for a field camp

OUR SCIENCE
OUR PRIORITIES

Science Theme 1

NATURAL HAZARDS AND RISKS

Research priority areas:

- Managing Risk to the Four Capitals
- Enabled and Informed Public, Community and Business
- Effective Early Warnings and Forecasts
- Improved Response Decision-Making and Recovery Planning
- Improved Risk Governance

NEW ZEALAND'S CHANGING NEEDS

Natural hazards and their consequences are part of the 'DNA' of New Zealand. Increasingly the risks imposed by earthquakes, volcanoes, tsunami and landslides are compounded by weather events and the additional stresses of climate change. At the same time, the impacts of hazard events are intensifying through population growth and aging, continued urbanisation, and business vulnerabilities of fast-moving consumer goods and just-in-time supply chains. Risk is increasing and New Zealand's ability to manage future impacts from natural hazards is being tested.

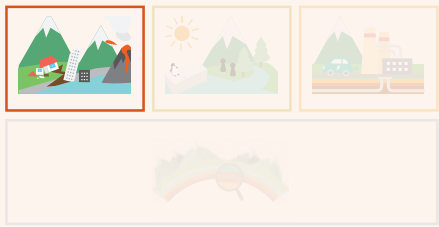
Across the country, communities and cultures build resilience in different ways, including using traditional knowledge and practice. The learnings from mātauranga Māori and other knowledge systems can enhance how all of New Zealand society can adapt in the face of natural hazards.

Managing the increasing exposure to natural hazard events is critical to New Zealand's future well-being and prosperity. The social and economic cost of natural hazards has been estimated as an annualised loss of $6 billion – around 2% of GDP. There is a pressing need to provide better real-time forecasts for all four geological hazards and their impacts, so the public, businesses and government can be better prepared for adverse events and know how to respond when they happen.

Research on geological risks and impacts has a very broad range of stakeholders and users across many sectors. We have a role to play in ensuring that, as a country, New Zealand's management of natural hazard risks is based on scientific evidence. We support the national guiding framework for hazard risk management in a number of ways to ensure that New Zealand society can make deliberate decisions about appropriate risk management, i.e. to accept, avoid, transfer or adapt to risks.

Kaikōura, New Zealand | Road damage at Mounsey Creek bridge, SH1 caused by Kaikōura Earthquake 2016

OUR SCIENCE
OUR PRIORITIES



OUR FOCUS

GNS Science has the lead role for research on the causes, risks and consequences of geological hazards. We have extensive scientific knowledge in Earth processes, and globally and nationally recognised expertise in hazard and risk modelling, forecasting socio-economic impacts of events, and system modelling of consequences and resilience options. We apply our social science capability to increase community resilience, improve risk communication and develop tools for hazard preparedness.

We work across the system as the co-ordinator of key research providers and data suppliers in the university, CRI, central and local government and private sectors. Our work involves collaboration with a wide range of users, through engagement with communities, iwi/Māori, industry bodies, government agencies and the hazard management sector, and communication through multiple channels to ensure stakeholders understand and manage the risks in their areas/roles.

Increasingly, under this theme we will work alongside the *Resilience to Nature's Challenges* National Science Challenge, Centres of Research Excellence and other major collaborative programmes, to ensure that our work complements and augments the work of others across the New Zealand science and innovation system. Our aim is to enable an integrated view of 'who is doing what,' leading to a coherent scientific evidence base for hazard risk management.

GNS Science hosts the **Resilience to Nature's Challenges** research programme – one of eleven National Science Challenges. The Resilience Challenge uses co-creation methods to produce practical outputs, such as coastal management strategies and earthquake response and recovery plans, for communities, organisations, and agencies who are working to improve New Zealand's natural hazard resilience.

The Challenge is embarking on a further five years of collaborative research. New, expanded research plans are in development, extending many of the Challenge research programmes in the areas of urban, rural, mātauranga Māori and infrastructure resilience.

These will be complemented by exciting new research to advance our understanding of natural hazard processes, including multi-hazard risk assessments as well as a range of tools to help build resilience into practice

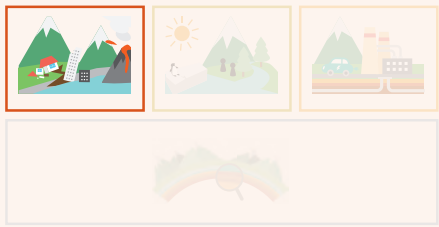
RESILIENCE TO NATURE'S CHALLENGES | Kia manawaroa – Ngā Ākina o Te Ao Tūroa | National SCIENCE Challenges

Through GeoNet we are building on nearly two decades of operations and are looking for new opportunities to capitalise on this for the benefit of New Zealand, our Pacific neighbours and beyond. As an integral component of GeoNet, the National Geohazards Monitoring Centre Te Puna Mōrearea i te Rū provides 24/7 active monitoring for natural hazards. Timely and robust geohazard datasets are disseminated to decision makers and users in all sectors of society. We are working closely with stakeholders to ensure that strong governance, service and funding arrangements support the ongoing effective and efficient delivery of all GeoNet services.

The social and economic cost of natural hazards has been estimated as an annualised loss of

$6 billion

OUR SCIENCE
OUR PRIORITIES



RESEARCH DIRECTION

Our research aims to generate critical scientific knowledge for the benefit of New Zealand and drive its uptake and use to improve resilience to natural hazards at national, regional, business, community and individual levels.

Our five outcome-oriented programmes span the full value chain of information, from underpinning knowledge to better understand the hazards, through to risk management options to help communities mitigate their destructive effects and advise on policy and regulation.

NATURAL HAZARDS AND RISKS THEME RESEARCH PRIORITIES:

1. Managing Risk to the Four Capitals (Natural, Human, Social, Financial/Physical)

Through better understanding of the geological processes that cause hazards, and their frequency and magnitude, we will enhance impact forecasts, develop higher accuracy risk models and identify the optimal mix of risk treatments for geohazards. Increasingly, in partnership with other New Zealand agencies, natural hazards and their secondary impacts such as landslides, floods, fire and liquefaction will be integrated with weather risks and the stresses associated with climate change.

2. Enabled and Informed Public, Community and Business

Our research will focus on better understanding of how people think about hazard and risk, the fragilities and vulnerabilities of different groups in society including cultural context and values, and methods for effective communication to collectively achieve improved resilience to future events.

3. Effective Early Warnings and Forecasts

This priority area includes behavioural responses to warnings, best practice warning communications, scenario visualisation, evacuation planning and event forecasts. The onset of 'unrest' or a change from a background state varies between perils and forecast methods and communication approaches may vary.

4. Improved Response Decision-Making and Recovery Planning

We will enhance provision of fast, accurate and effective information once an event has occurred, planning for response and recovery via scenarios and exercises before events happen, as well as build-back-better planning and policy. The GeoNet programme has a major role in delivering these activities.

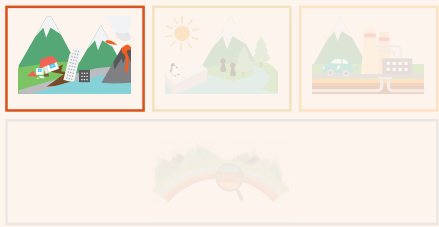
5. Improved Risk Governance

We will support the review of building, planning and resource management codes, guidance, standards, legislation, policy, land use, business continuity, integrated planning and other processes to improve risk governance arrangements in New Zealand.

Maintaining volcano monitoring equipment

Viewing coastal tsunami damage

OUR SCIENCE
OUR PRIORITIES



IMPACTS		MEASURES OF SUCCESS
BETTER RISK MITIGATION PLANNING	A cohesive evidence base on the causes, frequency and consequences of hazard events in New Zealand provides response agencies with tools to make more effective and timely mitigation plans, and enables the design of safer buildings and infrastructure, reducing risks across all hazards.	**By June 2022**, an updated National Seismic Hazard Model is the basis for all earthquake risk modelling in New Zealand.
NATURAL HAZARD RISK MODELLING	There is comprehensive modelling for refined hazard-risk assessment, risk-based land use planning, informed emergency responses, and appropriate investment in mitigation and risk-transfer mechanisms.	**By June 2024**, RiskScape version 2.0 provides a modular and adaptable basis for modelling direct losses from earthquake, volcano, tsunami, landslide and storm events.
IMPROVED PREPAREDNESS FOR HAZARD EVENTS	Early warning/forecasting capability for all perils has been established and is utilised, leading to more timely decision-making by Civil Defence and Emergency Management (CDEM) and other response groups and planners, lessening the impacts of hazard events on people and infrastructure.	**By June 2021**, GeoNet has doubled its speed of detection and assessment of geohazard risks in New Zealand from the 2018 baseline.
BETTER INFORMED PUBLIC, COMMUNITY, IWI/MĀORI AND BUSINESS	Our hazards, risk and resilience research is embedded in government policy, advice to stakeholders and publicly available resources so that New Zealanders can plan and respond effectively to natural hazards.	**By June 2023**, resilience decision support tools are used by at least 50% of local authorities.

OUR SCIENCE
OUR PRIORITIES

Science Theme 2

ENVIRONMENT AND CLIMATE

Research priority areas:

- Our Groundwater Systems
- Antarctica in a 2˚C world
- Ecosystem Response to a Warming World
- Revealing the Drivers of Our Climate
- Carbon Cycle Dynamics
- Our Rising Tide

NEW ZEALAND'S CHANGING NEEDS

Climate change is a global reality. Between 2030 and 2052 temperatures are on track to reach 1.5˚C warmer than pre-industrial temperatures. Warming is likely to continue to increase through the 21st century, unless large emissions reductions are achieved. This has major implications for our society, including the need to adapt to changing availability of freshwater resources; sea level rise affecting coastal communities and infrastructure; and more extreme weather events.

Groundwater availability and quality is fundamental to life in New Zealand. We have extensive aquifers and 40% of our people depend on groundwater for drinking water. Eighty percent of the annual river flow comes from groundwater and it is critical in sustaining aquatic ecosystems and cultural values, such as mahinga kai. Irrigation from groundwater contributes approximately $2 billion to the economy annually.

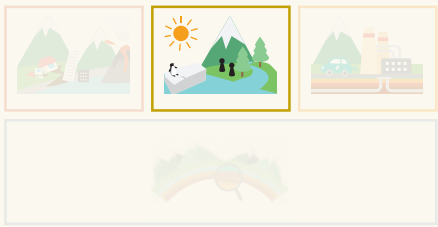
Antarctica's response to climate change will have a significant impact on our country. As the Southern Ocean warms, ice shelves and ice sheets melt and contribute to rising seas. Improved understanding of change in Antarctica and the Southern Ocean will allow us to better assess the potential changes to our climate and the ecology and productivity of New Zealand waters.

As sea levels rise, we must understand the effects on our coastlines and the communities living there. This is an important issue for iwi/Māori as there are many settlements on the coast. Much of New Zealand's critical infrastructure follows our coastlines and is subject to ongoing threat from storm surges.

Science plays a vital role in providing insight into past climate change, developing deeper knowledge of modern environmental systems, forecasting future environmental impacts, and monitoring current carbon budgets. This work is critical as New Zealanders seek to identify effective pathways to a low-carbon economy and adapt to unavoidable climate change.

McMurdo Sound, Antarctica | ANDRILL seismic survey, McMurdo Ice Shelf

OUR SCIENCE
OUR PRIORITIES



OUR FOCUS

We are taking an integrated approach to our research on the environment, environmental change and climate hazards and risks, so that we can adequately consider the feedback loops in Earth systems. For example, freshwater quality and availability are both inherently linked to climate change. We are also poised to link research into the causes, rates, and magnitude of sea level change to the risks to New Zealanders and our economy due to changes in our coastal regions.

Groundwater is an important taonga for iwi/Māori and a critical resource for all New Zealanders. By documenting the groundwater resource and evaluating its vulnerabilities, we will establish a more comprehensive understanding of freshwater systems to provide new insights and improve policy, management and restoration approaches. Using a values-based approach, we will make sure that our research is fit-for-purpose for those who need it.

We have a global leadership role in collecting and analysing data that exist naturally in our geology to extend more recent 'instrumental' records of environmental change further back in time. This long-term view aims to provide a more complete and evidence-based picture of our changing environment, which is critical to informing management and adaptation strategies for the future.

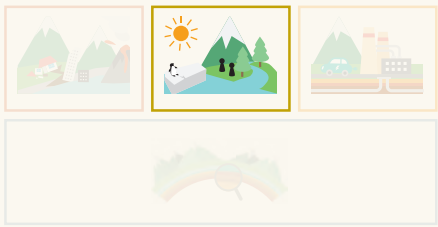
We have world-leading expertise in analysing and monitoring carbon budgets for our major New Zealand cities, to better inform decisions on emissions mitigation approaches. Our proven capability in air particulate matter research allows us to monitor air quality and guide local government in better understanding and managing air contaminants and their sources.

As part of a wider system of environmental and climate change research, we are committed to deepening collaborations with research teams nationally and internationally in order to achieve better outcomes. In part, this will be achieved through cooperative research enabled by various large-scale research initiatives like the National Science Challenges (e.g. *Our Land and Water*, *Deep South*) and the newly established Antarctic Science Platform. Working in more connected ways will enable our research contributions in groundwater, air quality and climate change to complement efforts by others. Together, we will develop and refine more accurate environmental and climate models and forecasts, more effectively communicate expected future impacts, and provide tailored guidance to mitigate the risks from our changing natural world.

40%

of New Zealanders depend on groundwater for drinking water.

OUR SCIENCE
OUR PRIORITIES



RESEARCH DIRECTION

Our research will focus on groundwater resources, sea level rise, climate change impacts on ecosystems, and the carbon cycle. Working with our major partners, we have redesigned our programmes to meet their current and future needs.

Processing ice cores on the Roosevelt Ice Shelf

ENVIRONMENT AND CLIMATE THEME RESEARCH PRIORITIES:

1. Our Groundwater Systems

We will extend work to measure, map and model groundwater systems to characterise national aquifers. Recognising the social, environmental and cultural value of New Zealand's precious groundwater resource is a crucial part of understanding and effectively managing groundwater systems, particularly in the face of increasing pressures from human activities and climate change.

2. Antarctica in a 2°C World

We will continue to develop and improve understanding of how ice shelves, ice sheets and sea ice will change as temperatures increase and how this will impact the Southern Ocean and New Zealand.

3. Ecosystem Response to a Warming World

We will continue to improve understanding of the effect of previous episodes of climate change on plankton in our oceans and native terrestrial flora. Revised models offer an important tool to project ecosystem change and identify the likely implications for conservation policy and ocean resource management as the world transitions to warmer climatic conditions. We will also characterise the state of our lake systems prior to the influence of human activity. Analysing the signals of environmental change in these systems will help us understand causality and help inform future management and mitigation policy and planning.

4. Revealing the Drivers of Our Climate

Our climate is influenced by atmospheric and oceanic processes. We will generate highly resolved records of past climate from sediment layers and ice cores to identify and examine patterns not currently captured in short-term datasets (e.g. thermometers and satellites). These extended climate time-series will enable us to identify thresholds and tipping points in the climate system to improve our ability to model and project future climate.

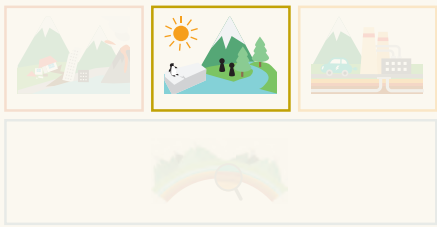
5. Carbon Cycle Dynamics

We will extend the development and use of world-leading techniques to improve the national carbon inventory, so New Zealand can meet its global commitments. Measurement techniques and models will be used to examine carbon uptake and/or release in the Southern Ocean and land-based ecosystems.

6. Our Rising Tide

We will extend our research to understand the causes, rate and magnitude of past, present, and future sea level change and its impact on New Zealand and the South Pacific. This involves connecting our ice sheet research with global sea level datasets and coastal vertical land movement to improve regional projections of sea level. This information will be incorporated into groundwater models as well as coastal hazard and risk models to guide climate change adaptation policy and planning.

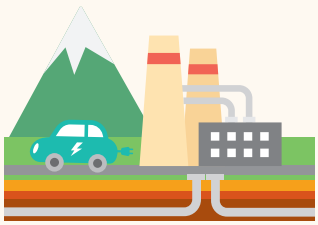
OUR SCIENCE
OUR PRIORITIES



IMPACTS		MEASURES OF SUCCESS
BETTER GROUNDWATER MANAGEMENT	Our major national groundwater systems are mapped and quantified, which improves our fresh water security and leads to more sustainable management of this critical resource.	**By June 2021**, 20% of our coastal aquifers have been mapped, measured, and modelled.
ENHANCED ECOSYSTEM MANAGEMENT	The response of our native terrestrial vegetation and ocean plankton to past warm intervals when global temperature was similar to Paris targets (1.5 to 2°C) is documented. These data inform New Zealand's ecosystem management plans.	**By June 2024**, a revised ocean model is being used to simulate future changes in primary productivity in the oceans around New Zealand.
IMPROVED CLIMATE PROJECTIONS	The likely response of our climate to increased average surface temperature is better constrained by projections using models that also capture the range of variability and feedbacks observed in datasets from geological records of past climate change. Outputs from these improved climate models guide New Zealand's climate adaptation response.	**By June 2023**, improved climate projections are integrated into national climate change policy and at least one Regional Plan.
ADAPTING TO ENVIRONMENTAL CHANGE	Reduced uncertainty in Antarctic ice sheet contribution to global sea level leads to improved local sea level projections for New Zealand's coastline. This enables New Zealanders to better assess, manage and adapt to change along our coastal systems.	**By June 2021**, new sea level projections are incorporated into coastal hazards guidance.
IMPROVED UNDERSTANDING OF OUR CARBON EMISSIONS	Carbon flux data obtained across an expanded measurement network lead to improved constraints on carbon fluxes in New Zealand and the Southern Ocean and refined reporting to meet New Zealand's Paris Agreement commitments.	**By June 2023,** the carbon budgets across our four major urban centres are more accurately understood.

OUR SCIENCE
OUR PRIORITIES

Science Theme 3



ENERGY FUTURES

Research priority areas:

- Maximising Geothermal Direct Use
- Knowledge of the Deeper Taupō Volcanic Zone
- Reducing Risks Associated with Geothermal Developments
- Kaitiakitanga of Geothermal Ecosystems
- Superhot Geothermal Fluids
- Energy Efficiency and Storage
- Energy Innovations

NEW ZEALAND'S CHANGING NEEDS

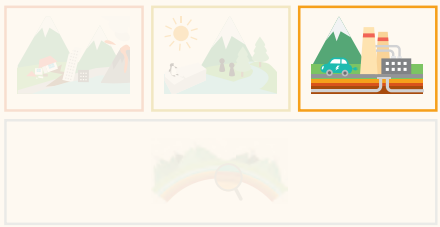
Energy powers our economy and underpins the well-being of our communities. Energy generation and use are inextricably linked to environmental impacts, including greenhouse gas emissions. Like other countries, New Zealand is grappling with how it can meet increasing demands for energy without causing irreversible changes to our environment.

The global energy system is built on three interdependent pillars: affordability, sustainability and reliability. Around the world, there is growing demand for low-carbon energy supply and more equitable access to energy resources. This has meant a global shift towards a greater diversity in energy resources, reducing reliance on coal, oil and gas producers and transitioning to low-carbon economic settings.

Global data indicates that CO_2 emissions will continue to increase over the next 20 years as hydrocarbon products continue to dominate global energy supplies. Science can play a critical part in identifying and developing innovative solutions to reverse the emissions of CO_2 to the atmosphere from energy production and use.

Rotorua, New Zealand | Hells Gate, Tikitere Geothermal Field

OUR SCIENCE
OUR PRIORITIES



OUR FOCUS

As 'the Energy CRI', GNS Science will play a major role in enabling New Zealand's transition to a low-carbon future. The solutions that result from our research will enhance New Zealand's energy security and economic competitiveness, while reducing our national carbon footprint.

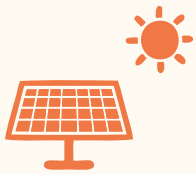
We will invest in diverse research to grow New Zealand's renewable electricity supply, develop new sustainable energy sources (which will be needed to develop a 'hydrogen economy' in New Zealand) and achieve net-zero emissions. Information gained from our partnerships with international collaborators, industry and iwi/Māori will be key to New Zealand unlocking next-generation geothermal energy resources.

Our expertise in understanding the geological framework of the country is essential to assess the feasibility of future energy potential from deeper geothermal resources, and also to maximise opportunities for business, iwi/Māori and the community from 'direct use' of geothermal heat. In order to inform decision-making at all levels, we will communicate evidence-based advice to our stakeholders about future energy resources and current resource availability, as well as the implications of resource use, including social and cultural impacts.

Efficient use of renewable energy is another area where our science can contribute to New Zealand's reduction in carbon emissions. We will focus our research in new materials to reflect increasing demand for new technologies, processes and materials that reduce energy demand (and carbon-intensity) and develop new paradigms for energy generation on the supply-side.

In line with Government goals to grow private-sector-led R&D activity, over the next three years we will foster external partnerships which will focus our research where there is high industry demand. Through our work, we will enable the creation of new, high-value industries in New Zealand and also develop new value streams for export.

Through thought leadership and robust science, GNS Science is well placed to ensure that New Zealand understands the opportunities and risks relating to a changing energy mix into the future. We will play an important role in bringing a science voice to national conversations alongside central and local government, industry, iwi/Māori and community interests.

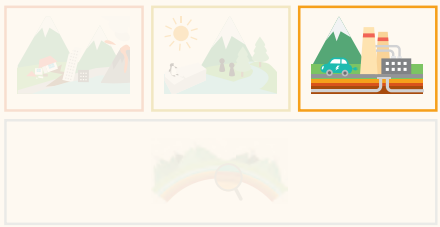


New Zealand aims to generate

100%

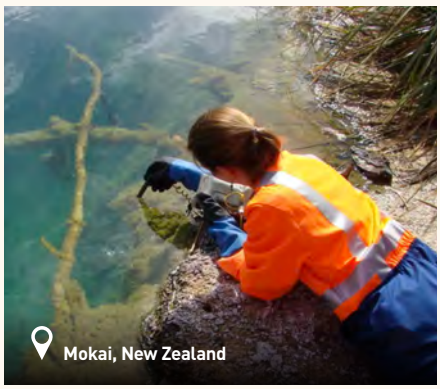
of its electricity from renewable sources by 2035.

OUR SCIENCE
OUR PRIORITIES



RESEARCH DIRECTION

Our research aims to increase energy resource security using renewable resources and reduce emissions from energy use through efficiency gains. This will be achieved through increased use of geothermal energy for electricity generation, direct use of geothermal energy, the development of enabling technology to increase the use of renewable energy and the identification of new energy sources that contribute to a low-emissions energy future.



Sampling a geothermal hot spring

ENERGY FUTURES THEME RESEARCH PRIORITIES:

1. Maximising Geothermal Direct Use

We will focus on the acquisition of geoscience data on low enthalpy, near surface geothermal systems including geology, geophysics and geochemical properties. These data will be used to construct numerical models that can be used to delineate resources, assess sustainability and encourage direct use of New Zealand's geothermal resource.

2. Knowledge of the Deeper Taupō Volcanic Zone

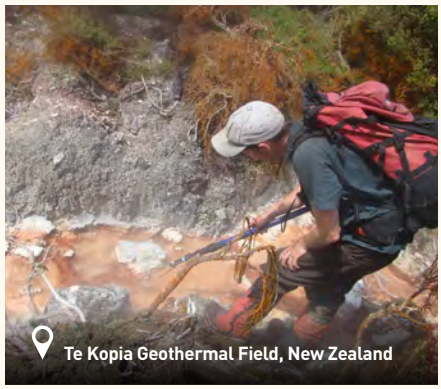
We will enhance understanding of hydrothermal systems and their heat sources from depth to surface in the Taupō Volcanic Zone, to contribute to a comprehensive 3D model of the region, with an emphasis on geology, geochemistry and hydrodynamics of the heat sources and associated hydrothermal properties.

3. Reducing Risks Associated with Geothermal Developments

We will keep developing new methods for integrating and analysing datasets and models to reduce risk for geothermal developments.

4. Kaitiakitanga of Geothermal Ecosystems

We will continue to combine science and mātauranga Māori to improve environmental outcomes, by providing iwi/Māori with the information to effectively achieve sustainable use and kaitiakitanga of geothermal resources.



Sampling a geothermal hot spring

5. Superhot Geothermal Fluids

We will extend our understanding of magmatic degassing and natural greenhouse gas emissions in volcanic areas to better understand the transfer from source to surface of heat and gases.

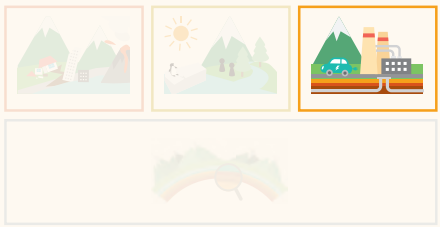
6. Energy Efficiency and Storage

We will focus on the synergistic use of physical and chemical techniques to modify the surface properties of materials to develop novel technologies and materials for energy storage. A key measure of success is the level of industry engagement in new R&D projects developed in this programme.

7. Energy Innovations

We will develop novel, proof of concept innovations for new ways of generating and sustainably using energy through our world-class materials science expertise.

OUR SCIENCE
OUR PRIORITIES



IMPACTS		MEASURES OF SUCCESS
INCREASED ACCESS TO RENEWABLE ENERGY	Growing uptake by geothermal companies of geoscientific information relating to geothermal systems, improved modelling and monitoring tools and efficiency solutions to process efficiency issues will result in a more secure and sustainable renewable energy supply providing a greater contribution to New Zealand's energy needs.	**By June 2022**, a new resource assessment model is being used to increase renewable electricity generation from geothermal energy. **By June 2023**, new geoscience data and modelling of low enthalpy geothermal systems are being used to unlock greater direct use of geothermal energy.
REDUCED CO_2 EMISSIONS	New geoscientific data and numerical models of non-traditional geothermal systems will lead to next-generation renewable energy resources that contribute to New Zealand's energy mix, advancing the transition to a low-emissions future.	
OPTIMISED GEOTHERMAL ENERGY	Improved characterisation and new understanding of New Zealand's geothermal resources reduces environmental impacts and improves evidence-based investment and resource planning.	**By December 2021**, an assessment of surface features in a geothermal system is available to iwi/Māori to inform resource management decisions.
NEXT-GENERATION ENERGY EFFICIENCY AND GENERATION	Technological innovations that increase energy efficiency or enable novel energy generation have been picked up by New Zealand companies, leading to more energy-efficient primary and manufacturing industries and products and greater wealth creation.	**By June 2024**, R&D created by GNS Science is taken up and used by at least one primary industry or manufacturing company.

OUR SCIENCE
OUR PRIORITIES

Science Theme 4

LAND AND MARINE GEOSCIENCE

Research priority areas:

- Thermal Processes
- Plate Boundary Tectonic Processes
- Continental Tectonic Processes
- Surface Geological Processes
- Databases/Geoscience Information

Te Rui-a-Māui/Zealandia, Earth's eighth continent

NEW ZEALAND'S CHANGING NEEDS

Te Riu-a-Māui/Zealandia is Earth's eighth continent. It forms the surface landscape and continental shelf areas under New Zealand's jurisdiction – extending over nearly 5 million square kilometres. New Zealand has continental-scale challenges, opportunities and stewardship responsibilities for this large area of the South Pacific.

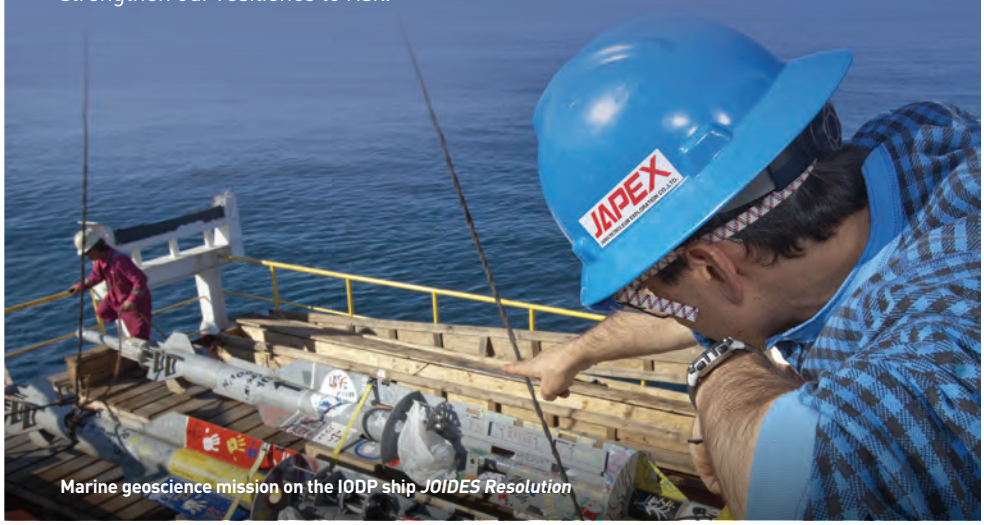
Fundamental geoscientific research plays an essential part in providing an accurate and up-to-date framework for New Zealand's natural geological and biological environment. It also adds to iwi/Māori knowledge of culturally, environmentally and economically significant solid earth materials and processes. All New Zealanders benefit from better knowledge of New Zealand's geological landscape's heritage, hazards and resources.

Deeper knowledge of fundamental Earth deformation and plate boundary structure and processes is critical for research on the causes and impacts of geological hazards such as earthquakes, landslides and volcanoes. As we develop greater understanding of the planet's dynamic processes we will be able to strengthen our resilience to risk.

In a low-carbon future, there will be continuing demand for a sustainable, secure supply of energy and "green" mineral resources. We need an accurate appraisal of New Zealand's on-land and offshore resource potential to enable sustainable custodianship of the continent's natural resources. Greater understanding of Te Riu-a-Māui/Zealandia helps ensure that as a country we can make scientifically informed decisions about the conservation of geologically important landscapes (e.g. through Geoparks or conservation management areas).

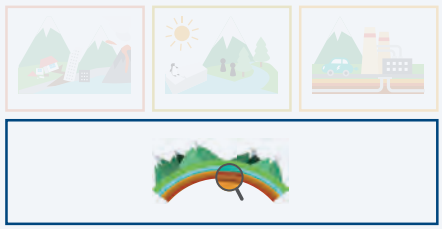
High resolution deep-time analysis of coastal climate and biological changes will give us greater insight into what has led to the current condition of our native biota and environment and how these systems will respond to future change.

Importantly, underpinning geoscience in Te Riu-a-Māui/Zealandia also informs solutions to global problems and supports New Zealand's diplomacy efforts through science, particularly in the South West Pacific.



Marine geoscience mission on the IODP ship *JOIDES Resolution*

OUR SCIENCE
OUR PRIORITIES



This Science Theme includes research and custodial activities to enhance the value from the eight **Nationally Significant Collections and Databases** that GNS Science holds on behalf of all New Zealanders (see Appendix 3). We will continue to focus on improving the findability and accessibility of these major datasets, many of which have global importance, as well as enhancing their interoperability and re-use for the benefit of New Zealand. We will also support, grow and enhance our many other nationally important geoscience datasets. Our Scientific Collections and Databases will form a key plank in our emerging work to develop a more systematic science communication and engagement strategy.

Not only are these Databases and Collections national science assets, they are also a priceless part of New Zealand's cultural heritage and history. Engaging New Zealanders with these taonga will be a growing part of our strategic approach to delivering greater value and impact from our scientific custodianship of Nationally Significant Collections and Databases.

OUR FOCUS

As the national geological sciences agency in New Zealand, we hold more than 150 years of knowledge about the continent of Te Riu-a-Māui/Zealandia and exercise scientific custodianship of national datasets. Our Nationally Significant Collections and Databases are precious taonga that underpin Te Riu-a-Māui/Zealandia's heritage and history. We will invest heavily in basic targeted research. Insights gained will be openly available to all parts of the science system and wider society.

Our underpinning research on Te Riu-a-Māui/Zealandia will have a holistic focus: modelling Earth systems, processes and behaviours with a seamless mountain-to-undersea and deep-time perspective; and framing our work in terms of environmental, cultural, health and economic outcomes. Primarily, our focus is on the marine and on-land parts of Te Riu-a-Māui/Zealandia that are under New Zealand jurisdiction, the Ross Dependency in Antarctica as well as our neighbouring Pacific islands.

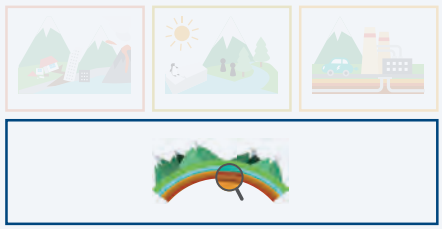
We will continue our national co-ordination of geoscience research initiatives, collaborating with New Zealand government, university and other providers, and lead international initiatives of benefit to New Zealand. Our participation in major international collaborative consortia, for example, the International Ocean Discovery Program and the International Continental Drilling Program, enables us to grow capability, leverage co-funding and brings to New Zealand significant new knowledge and critical thinking, as well as additional scientific infrastructure and equipment.

We hold more than

150 years

of knowledge about the continent of Te Riu-a-Māui/Zealandia.

OUR SCIENCE
OUR PRIORITIES



RESEARCH DIRECTIONS

We are investing in an extensive research programme to address fundamental questions about the composition and architecture of the continent Te Riu-a-Māui/Zealandia and understand the geological processes that have shaped it. Our foundation programme aims to close critical knowledge gaps that relate to societal challenges including undertaking research on the physical processes that control geohazards, characterising natural resources and appreciating the consequences of past environmental change. Discoverable and accessible data, information and collections will underpin a wide variety of research applications, models and real-world impacts in GNS Science, and more broadly across the New Zealand science system.

Our Land and Marine Geoscience work underpins and complements research in other GNS Science Themes: it provides a wider context for tectonic and volcanic hazards, delivers an improved framework for energy and mineral resource management and supplies a richer perspective on current and future environmental change.

Our datasets are a national resource. In partnership with government, we will continue to provide expert knowledge to enable best use of those data. Using novel techniques such as machine learning, we will add further value to our nationally important legacy datasets.

***JOIDES Resolution* ocean drilling research ship**

Gold mining tunnels

LAND AND MARINE GEOSCIENCE THEME RESEARCH PRIORITIES:

1. Thermal Processes

Our research will address the major question of how heat, magma and metals are transferred within the crust.

2. Plate Boundary Tectonic Processes

Supplementing our Natural Hazards and Risks research, we will investigate and model the crustal structure and deformation mechanisms in and near parts of the modern plate boundary.

3. Continental Tectonic Processes

We will continue to establish how and why Te Riu-a-Māui/Zealandia became an individual continent, with its special situation of submergence, examining the deep-time geological record of the split from Gondwana.

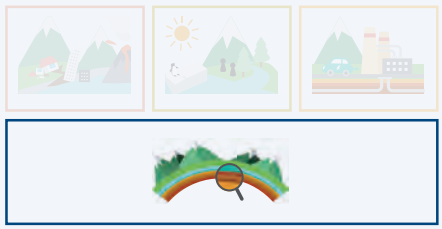
4. Surface Geological Processes

We will extend work to trace the evolution of Te Riu-a-Māui/Zealandia's geography, shorelines and native flora and fauna since isolation from Gondwana in order to recognise the role of environment-shaping events and to examine how life is affected through geologic time.

5. Databases/Geoscience Information

We will continue to enhance the value of the Nationally Significant and other major Collections and Databases that we hold on behalf of New Zealand and integrate them with the new on-land and off-shore data from other the programmes.

OUR SCIENCE
OUR PRIORITIES



IMPACTS		MEASURES OF SUCCESS
IMPROVED RESILIENCE TO NATURAL HAZARDS	Understanding of Te Riu-a-Māui/Zealandia's geohazards by making interpretations of plate boundary processes and resolving physical controls on the generation of earthquakes, tsunami and volcanic eruptions is strengthening New Zealand's resilience to natural hazards.	**By June 2022**, greatly improved characterisation of potential for Hikurangi subduction earthquakes and their likely impacts is provided for natural hazard risk assessment.
MANAGING NATURAL RESOURCES SUSTAINABLY	Sustainable stewardship and management of New Zealand's natural land and marine resource endowments is enhanced by more accurately characterising the composition and structure of Te Riu-a-Māui/Zealandia spatially and over time.	**By June 2024**, tectonic, geological and geophysical information is utilised for marine and land-use planning and decision-making.
ADAPTING TO CHANGING CLIMATE	Understanding the consequences of past ocean and climate change on Te Riu-a-Māui/Zealandia by acquiring baseline paleo-environmental data will inform forecasts of future change and development of effective adaptation strategies.	**By June 2023**, underpinning paleo-environmental information from the SW Pacific, Antarctica and New Zealand is available for use in climate assessments and policies.
WIDER USAGE OF COLLECTIONS AND DATABASES	Our most important underpinning databases and collections are widely, efficiently and confidently used to deliver new insights and context for applied geoscience, education, policy setting, community engagement and industry benefit in New Zealand.	**By June 2021,** our Nationally Significant Collections and Databases meet FAIR Data Principles[3], as appropriate, with growing usage by industry, research bodies and iwi/Māori.

3 The FAIR Guiding Principles for scientific data management and stewardship were published in *Scientific Data* in 2016 and provide guidelines to improve the Findability, Accessibility, Interoperability, and Reuse of digital assets.

Innovative, multi-disciplinary approaches

We aim to extend the impact of our science, gain new insights and deepen the value and usability of our science for society through increased investments in Social Science and Data Science. This will also ensure strong linkages across our four Science Themes.

SOCIAL SCIENCE

To maintain social, environmental, economic and cultural well-being in New Zealand's geological landscapes, we have to understand the interplay between geological resources and processes, and the people who live on and with them. Through a better appreciation of how society functions, we expect there will be a greater uptake of the physical science that GNS Science invests in, to ensure our research results are useful, usable and used.

Previously, we have applied our social science expertise extensively to mitigate risks and build resilience to natural hazards by understanding how to influence individuals, communities, and organisations, including Māori resilience frameworks. Increasingly, we will embed social science approaches across our Science Themes to better understand public perceptions and values, identify barriers to adopting new practices and technologies, and ensure effective public discussion on critical issues. Social science will be particularly important for us in delivering impact in the Energy Futures and Environment and Climate Science Themes.

DATA SCIENCE

Across all our Science Themes we are applying leading-edge techniques and expertise in data science to make the most of our information and insights. This includes using satellite data, artificial intelligence and machine learning technologies and methods. We will be investing more in data science, firstly to build capability and capacity in relevant disciplines, and secondly to integrate data science approaches across the Science Themes. We will actively promote and invest internally in interdisciplinary research and foster innovation through application of data science approaches.

Both elements will enable us to make the best use of our significant data resources in a joined-up way, for the benefit of the wider science community and to deliver greater value and impact for New Zealand.

VISION MĀTAURANGA

WORKING IN PARTNERSHIP

Māori success is New Zealand's success. GNS Science's drive to embed Vision Mātauranga in our work is about unlocking, in partnership with Māori, the science and innovation potential of Māori knowledge, resources and people to benefit all New Zealanders.

We are committed to developing partnerships with iwi/Māori interests and entities to identify and deliver primary science needs that best contribute to the social, economic, cultural and environmental well-being of New Zealand.

EMBEDDING VISION MĀTAURANGA IN OUR WORK

GNS Science is committed to growing our ability to effectively implement the Vision Mātauranga policy in our work. We will do this through a new programme which aims to:

- **Implement** an engagement strategy that enhances our relationship with iwi/Māori
- **Support** the development of iwi-led research and development strategies
- **Collaborate** with other CRIs to develop whole-of-government approaches, including engagement with educational providers to develop Māori research and innovation capability
- **Develop** our capability and capacity to support Vision Mātauranga and our relationships with iwi/Māori
- **Develop** Māori research and innovation capability through partnerships with individuals, businesses, incorporations, rūnanga, trusts, iwi, hapū and marae
- **Partner** with regional business partners to improve collaboration between iwi/Māori, researchers and firms to enhance knowledge transfer and business success.

Through a new approach to engagement with Māori interests, our focus will be on building strong, meaningful relationships so that GNS Science can better understand Māori science needs and expectations. This quality engagement will build firm relationships and equip us to work in partnership with iwi/Māori on agreed priority areas of research. Our aspiration is that Māori worldviews, priorities and needs are clearly visible and reflected in our organisational ways of working as well as our strategic direction.

As we build on our relationships with iwi/Māori, we will increase our visibility within te ao Māori and the integration of te ao Māori within GNS Science, supporting our commitment to increase Māori capacity and capability within our organisation.

HOW WE WORK

Our four Strategic Pillars signal how we want to work to achieve continued growth and success for GNS Science and to deliver greater value and impact. They serve as focus areas for shaping our culture, guiding our decision-making and priorities as well as assessing the effectiveness of our organisation.

INVESTING FOR AND WITH PURPOSE

We focus our work on meeting New Zealand's needs

We will gear our activities to making a difference for New Zealand and be transparent and accountable with our investments. We will be more purposeful in how we invest our science capabilities and our funding will be strategy-led. We are actively managing our non-contestable funding from the Strategic Science Investment Fund (SSIF) to make the most of our strengths and as a springboard for other revenue opportunities. We will be clear about our priorities to increase the impact of everything we do, across the scientific world, for the benefit of New Zealand.

DECISION MAKER

We use our knowledge to influence stakeholder decisions

We will improve our connections with a wide range of stakeholders in government, business and communities to proactively become part of the decision-making agenda. We want to be at the table to contribute meaningfully in the conversations about New Zealand's future. We will have the confidence to get involved with key stakeholders to influence their decisions – talking to the right people at the right time.

Our teams are empowered to make decisions and will proactively explore opportunities with our stakeholders. It's about situational awareness to know when, who and how we might have influence and then going for it.

WE WANT TO RAISE AWARENESS OF WHO WE ARE AND WHAT WE DO

Radiocarbon scientist Albert Zondervan

PEHEA TĀ TĀTOU MAHI

DEEP PARTNERING

We partner for long-term success

This means building significant relationships that can be identified as long term – where there's value in engaging, building trust and working together for mutual long-term benefit. It can involve conscious decisions to collaborate rather than compete in a contestable funding environment.

Our relationships with other CRIs, universities, local and central government, iwi/Māori, and international science organisations enable us to work together in making New Zealand a Cleaner, Safer and More Prosperous place to live. A good example is our work on the RiskScape modelling tool in partnership with NIWA, the lead CRI for research on weather-related hazards.

We will build on great iwi/Māori relationships that have endured over time, collaborations with other CRIs and researchers that maximise the value of the work to New Zealand, and develop ongoing projects with commercial clients to respond to their changing needs.

AWARENESS

We are recognised for the great work we do

We want to raise awareness of who we are and what we do so we can engage New Zealanders in the significance of our work. This will be done with a compelling shared narrative that puts us firmly in the science space where we are uniquely placed and strong. As we demonstrate the benefits of our work and build trust with our partners and communities, they will recognise the value that we add and advocate for us.

This means our people will be active in places where we can have influence. Internally we are creating and fostering pride in the breadth and depth of what we do, and what others say about us, so we can celebrate together.

OUR ORGANISATION

Our People are the Science

Our people are our greatest asset – it is the work we do using our collective skills and experience that drives our success. We are intent on working as a team (both internally and externally in collaborative relationships) to meet our strategic goals and deliver value to New Zealand.

We are making sure that our investment and planning is clearly linked to our strategic outcomes. This means that we are building capability and diversity, investing in learning and development and focusing on Health and Safety.

THE VALUE OF DIVERSITY

We are actively seeking diversity in our science and research workforce, reflecting the cultural and societal diversity in New Zealand. We are building a diverse pipeline of talented people, to create an inclusive research environment. This will contribute to our research productivity and impact as well as strengthen the relationship between science and society.

Already, 30% of our staff come to us from other countries and we value the breadth of views and experience this brings to our work and interactions. We also recognise the need for greater representation of Māori staff to enhance our capability and capacity to support Vision Mātauranga and our engagement with iwi/Māori.

We believe that being a good employer means that a clear career path, staff retention and a safe place to work are only part of the story. Our continuing focus is on a welcoming culture that is highly collaborative and inclusive, where people can innovate and learn from one another. This is vital for us to compete for talent in New Zealand and internationally.

As part of this work, we have established an Early Career Network. From 1 July 2019, we will implement a programme that has been designed by the Network to enhance connectivity among our early-career people and provide development opportunities in ways that meet their needs.

CAPABILITY PLANNING AND DEVELOPMENT

Investing in the development of our people is fundamental to our ongoing success and ability to deliver transformational science.

Leadership development is a key area for our organisation. In a rapidly changing world, our leaders must be equipped to build the capability of their teams, lead our culture, and champion new ways of thinking and operating. Our Science Theme Leaders must also provide scientific thought leadership.

CULTURE AND ENGAGEMENT

Following a major organisational restructure, our focus is now on embedding the new structures and ways of working and re-defining who we are and what we want our organisational culture to be. This work will engage our staff so we build on our current strengths as well as identify opportunities for change.

We will measure our progress on this journey through staff surveys, supported by targeted actions to develop the culture that will best support the achievement of our strategy.

Key areas of focus to enhance our capability, make us easier to work with and develop our culture include:

- **Leadership development** – growing leaders at all levels of the organisation, ensuring they are equipped with the skills to lead, coach and develop those they are responsible for
- **Succession planning** – to ensure we have the right capability to meet the needs of the future
- **Māori Intern programme** – this will support and develop Māori entering the science sector through study or further research. This programme and the development of other diversity opportunities will foster a culture of shared learning
- Implementation of the **Culture Change Plan**
- **Building diversity and inclusion** into 'the way we do things here' through systematic approaches to all aspects of engaging, leading and managing our people
- **Gender Pay Equity** – working to apply the Gender Pay Principles and close gender pay gaps.

HEALTH AND SAFETY

Providing a work environment that keeps our people safe and supporting a productive environment is central to our beliefs. Over the next few years our focus is on better management of our critical risks and building a safety-focused culture. This will involve new ways of working and is part of our progress towards achieving recognised Health and Safety standards.

- Over a longer-term horizon, we will develop a culture where 'safety first' is so well integrated into 'the way we do things here' that it is second nature
- More immediately, we will implement actions to better manage critical Health and Safety risks to reduce incidents of harm

TŌ TĀTOU ROOPŪ WHAKAHAERE

Connectivity and Innovation

We will be developing and implementing new science programmes to ensure we deliver meaningful value with and for our major stakeholders. This includes producing a new Stakeholder Engagement framework, and a new approach to co-design and co-innovation which will embed our major partners and end users in the research process from the start. An Innovation Hub within GNS Science will provide internal mechanisms and incentives to support higher-risk innovation. We will also refresh our approach to commercialisation and intellectual property management – recognising that both 'open science' and industry-led innovation are needed to grow new industries and value-streams for New Zealand.

Key areas of focus include:

- Developing and implementing a new **Stakeholder Engagement programme**
- Designing and piloting a GNS **Stakeholder Survey**
- Refreshing GNS's **Contract Management** approaches
- Developing and implementing a new **Value Chain programme**, including refreshed approaches to commercialisation and intellectual property management.

Project Management

With an overall shift to greater investment in more fundamental, technology-led and data-driven research, our investments will also have a higher risk profile overall. To mitigate this, we have put in place greater management oversight of our new Science Themes, and new governance and accountability frameworks.

Key areas of focus include:

- Developing our **project-based operating model**, where our work is delivered through projects and programmes
- Further implementation of **project methodologies** by the Project Management Office.

Information Technology

Science is a data-driven activity. GNS holds nationally- and in some cases globally-significant data resources, models and associated technologies to unlock their value. Our use of data-centred technology will directly impact on how well we can realise our strategic approach to fulfil our potential as a world-leading science organisation. Increasing our influence, impact and relevance nationally and internationally, and sustaining our ability to do large-scale collaborative research, requires that our IT strategy, capability and enterprise systems are fully integrated to maximise delivery opportunities.

GNS will look to invest in its IT systems and infrastructure to ensure that we are well-positioned to take advantage of the growing opportunities across the New Zealand science and innovation system for high-performance computing and associated data science opportunities.

Key elements of our Information Systems strategy will be:

- **Collaboration and knowledge dissemination** – providing better tools with a focus on dataset availability and management. This will enable our people to work from any external organisation or scientific disciplines to deliver shared goals
- **Organisational intelligence and efficiency** – providing better contract, project, financial and performance management information across our organisation. This involves improved information flow management tools
- **ICT Infrastructure modernisation** – continuing our programme of consolidation and redesign of the GNS ICT Infrastructure to better provide resiliency, immediacy, scalability and cost savings
- **Continuing development of our people** to improve data literacy across the organisation and optimise the benefits of big data.

Finance and Assets

FINANCE

We apply funding so that the whole organisation is well-positioned to succeed over the long term. This means thinking about capital as well as operating income and having enough flexibility to reassign funding as priorities change.

We will invest in our budgeting and forecasting processes to ensure alignment with our strategies, and we will put greater emphasis on value for money and contribution to our goals. Sustainable financial leadership will enable us to achieve our science and organisational objectives while remaining profitable. In meeting our deliverables, we will have:

- A mechanism that links funding to organisational priorities and is flexible enough to reassign funding as priorities change
- A plan for infrequent but larger investments in science and research
- A mechanism that enables us to understand contract profitability to inform bid pricing.

PROPERTY ASSETS

A Property Strategy will provide a high-level framework for a co-ordinated planning approach across our national portfolio of research laboratory, workshop, office accommodation and public interface property. This will integrate the operation, maintenance, improvement, adaption, construction and disposal of buildings and infrastructure. It will be set within the context of the people, places, processes and technologies required to create a built environment that underpins the delivery of our science. Key areas of focus include:

- Improving our maintenance and renewal programme, so that our buildings meet science and research requirements
- Completing asset management planning to allow us to optimise maintenance renewal and improvement decisions
- Aligning our property investment with our organisational strategy and direction
- Assessing our future capability needs, and the physical refreshment, repurposing, refitting or replacement of GNS Science buildings and infrastructure.

ORGANISATION KEY DELIVERABLES FOR 2019/20

1. **Implement** an engagement strategy that enhances our relationship with iwi/Māori
2. **Develop and implement** a GNS Stakeholder Survey and initiate a GNS Stakeholder Engagement programme
3. **Develop** a Programme and Project Management Framework for science delivery
4. **Implement** our Organisational Development Strategy, including delivery of leadership programmes and shaping our diversity plans
5. **Develop** our capability and capacity to support Vision Mātauranga and our relationships with iwi/Māori
6. **Implement** actions to better manage critical Health and Safety risks and build a safety-focused culture
7. **Implement** the Information Systems Strategic Plan projects, and service and security improvements
8. **Finalise and implement** our Business Resilience and Crisis Management Plan
9. **Develop** a Property Strategy aligned with our science directions and capability needs

FINANCIAL FORECASTS

GNS Science is re-focusing its research direction to build on core strengths and respond more effectively to changing stakeholder needs and priorities for New Zealand. Delivering on our strategies requires investing in the development of our people, systems and science infrastructure.

Investing purposefully as a strategy-led organisation is a key element of our future direction, focused on our vision for a **Cleaner, Safer, More Prosperous New Zealand**. Our Strategic Review over 2018/19 and the resulting reorganisation of our science and corporate functions have set us up well for ongoing success in achieving tangible value for New Zealand and the global community.

To achieve this, further investment is required in the organisation in the medium term, to develop the people and systems capabilities and science facilities to support our strategic intent. This investment will be phased over the next four to five years and is reflected in a moderation of our 2019-24 financial forecasts compared to the previous five-year financial projections in our last Statement of Corporate Intent.

Our forecasts include $6.5M of capital investment per annum to enable development of fit-for-purpose assets over time. The capital budget will be prioritised each year to align with our strategy development and investments in the broader science system. We have sufficient actual and forecast cash flows to meet business needs over the SCI period.

Our increased investment in Vision Mātauranga recognises the need to develop capability and culture to support increased engagement and scientific development in partnership with iwi/Māori. We champion the value of cross-system and interdisciplinary research collaborations, and alignment of other funding with our SSIF enables greater outcome delivery.

DEPLOYMENT OF SSIF AND OTHER REVENUE

The prime levers for execution of our new strategy are the $27.6M annual allocation of SSIF and reinvestment of our surplus. While our financial forecasts assume that the level of SSIF is static through the next five years, there are shifts in the deployment of SSIF in line with the strategic direction set through our new Science Themes.

In addition to government funding, we seek sustainable and profitable commercial revenue in New Zealand, which demonstrates that we are aligned with stakeholder needs and priorities. Revenue projections for contestable funding from national and international sources are considered achievable during this reinvestment phase.

We remain committed to financial sustainability. Our priority over the short to medium term is reinvestment of growth in net profit after tax (NPAT) to develop our organisational capability, to ensure delivery on our science direction in the longer term.

COMMERCIAL VALUE

Section 16(3) of the CRI Act requires the Company to furnish an estimate of the current commercial value of the Crown's investment. We use net asset value as a proxy for the commercial value of the Group. The net asset position as shown in accordance with the Company's accounting policies for 30 June 2018 was $34.1 million.

DIVIDEND POLICY

Our dividend policy states that the Company may elect to return surplus cash to shareholders in the form of a dividend when no sound investment opportunities exist (including reinvestment, commercialisation, capital expenditure, and the retention of important capabilities).

GNS Science is investing in people, systems and science infrastructure to enable delivery of its research strategies over the longer term. Therefore, no dividend is proposed in the short to medium term.

COMPENSATION

Where the Crown wishes us to undertake activities or assume obligations that will result in a reduction of our profit or net worth, the Board will seek compensation sufficient to allow the Company's position to be restored. No compensation is currently being sought from the Crown.

GROUP RATIOS AND STATISTICS

Year ending 30 June	Forecast 2019	Outlook 2020	Outlook 2021	Outlook 2022	Outlook 2023	Outlook 2024
Revenue ($000s)						
Total revenue	97,309	102,571	105,060	107,655	110,569	112,279
Revenue growth		5%	2%	2%	3%	2%
Operating results ($000s)						
Operating expenses (excluding depreciation)	90,647	95,815	97,871	100,409	103,049	104,780
EBITDA	6,662	6,756	7,189	7,246	7,520	7,499
EBIT	515	609	1,042	1,099	1,373	1,352
Profit before tax	1,171	1,159	1,592	1,649	1,923	1,902
Profit after tax	843	834	1,146	1,187	1,385	1,369
EBITDA per FTE	16	16	17	17	18	18
Total assets	59,722	59,865	60,438	61,558	62,874	64,243
Total equity	34,952	35,786	36,932	38,119	39,504	40,873
Capital expenditure	5,500	6,500	6,500	6,500	6,500	6,500
Liquidity						
Quick ratio	2.4	2.3	2.2	2.2	2.2	2.3
Interest coverage	n/a	n/a	n/a	n/a	n/a	n/a
Profitability						
Return on equity	2.4%	2.4%	3.2%	3.2%	3.6%	3.4%
Operating margin	6.8%	6.6%	6.8%	6.7%	6.8%	6.7%
Operational risk						
Profit volatility	27.7%	26.9%	26.6%	11.9%	5.1%	4.3%
Forecasting risk	-1.4%					
Growth/investment						
Capital renewal	0.9	1.1	1.1	1.1	1.1	1.1
Financial strength						
Equity ratio	58.5%	59.8%	61.1%	61.9%	62.8%	63.6%

ACCOUNTING POLICIES

Reporting entity and activities

The Institute of Geological and Nuclear Sciences Limited is established under the Crown Research Institutes Act 1992 and the Companies Act 1993. Its subsidiary companies are established under the Companies Act 1993. The financial statements have been prepared in accordance with the Crown Research Institutes Act 1992, the Public Finance Act 1989, the Companies Act 1993, the Crown Entities Act 2004 and the Financial Reporting Act 2013.

Consolidated financial statements for the group comprising the Institute of Geological and Nuclear Sciences Limited (the Company) and its subsidiaries are presented and the effects of intra-group transactions are fully eliminated in the consolidated financial statements. Subsidiaries are those entities controlled by the Company.

Control is achieved where the Company has the power to govern the financial and operating policies of an entity to obtain benefits from its activities.

The subsidiaries of the Company are:

- Isoscan Limited
- Isoscan Food Limited
- Geological Surveys (New Zealand) Limited
- Geological Risk Limited
- GNS Science International Limited

The principal activities of the Group are to undertake geoscience and isotope science research, development and commercial projects, predominantly in New Zealand.

Revenue

STRATEGIC SCIENCE INVESTMENT FUND

The Company is party to a Strategic Science Investment Fund (SSIF) agreement with the Crown to perform research activities. Revenue under this contract is treated as a Government Grant under NZ IAS 20.

REVENUE FROM OTHER RESEARCH AND COMMERCIAL CONTRACTS

Revenue earned from the supply of goods and services is measured at the fair value of consideration received. Revenue from services is recognised based on the percentage of work completed. Any amounts received in relation to work not yet commenced are recorded as revenue in advance. Revenue from the supply of goods is recognised when the significant risks and rewards of ownership of the goods have been transferred to the buyer.

Revenue from other research and commercial contracts are accounted as revenue from contracts with customers under NZ IFRS 15.

Property, plant and equipment

Property, plant and equipment are stated at cost less accumulated depreciation and impairment. Cost includes expenditure that is directly attributable to the acquisition of the item. Assets have been depreciated on a straight-line basis at rates calculated to allocate the assets' cost over their estimated remaining useful lives. Freehold land is not depreciated. The estimated useful lives, residual values and depreciation methods are reviewed annually, with the effect of any changes in estimate accounted for on a prospective basis. The gain or loss arising on the disposal or retirement of an item of property, plant and equipment is recognised in profit or loss.

Heritage assets – collections, library and databases

The Company owns various collections, library resources and databases that are an integral part of the research work undertaken by the Company. These collections are highly specialised and there is no reliable basis for establishing a valuation. The two major collections are:
The National Paleontological Collection
The National Petrological Reference Collection.

Intangible assets

Software, patents and capitalised development costs have a finite life and are included at cost less accumulated amortisation and impairment. Amortisation is charged on a straight-line basis at rates calculated to allocate the assets' cost over their estimated remaining useful lives.

The estimated useful life and amortisation method are reviewed annually, with the effect of any changes in estimate being accounted for on a prospective basis. The following useful lives are used in the calculation of amortisation:

- Software 4–8 years
- Patents 4–17 years
- Capitalised development costs 4–8 years.

Deferred tax

Deferred tax is accounted for using the comprehensive balance sheet liability method in respect of temporary differences arising from differences between the carrying amount of assets and liabilities in the financial statements and the corresponding tax base of those items. In principle, deferred tax liabilities are recognised for all taxable temporary differences. Deferred tax assets are recognised to the extent that it is probable that sufficient taxable amounts will be available against which deductible temporary differences or unused tax losses and tax offsets can be utilised. The carrying amount of deferred tax assets is reviewed 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 assets to be recovered. Deferred tax assets and liabilities are measured at the tax rates that are expected to apply in the period in which the liability is settled or the asset realised.

Under Section OB1(2)(d) of the Income Tax Act (2007), the Company is not required to maintain an imputation credit account.

Employee entitlements

Liabilities for wages and salaries, annual leave, long service leave and retirement leave are recognised when it is probable that settlement will be required and they are capable of being reliably measured. Employee benefits to be settled within twelve months are reported at the amount expected to be paid and are classified as current liabilities. Employee benefits not expected to be settled within twelve months are reported at the present value of the estimated future cash outflows. Provisions for long service leave and retirement leave depend on a number of assumptions such as the expected employment period of employees, salary levels and the timing of employees taking leave. When measuring employee benefit liabilities risk-free discount rates provided by The Treasury are used as the appropriate discount rates, the salary increase factor is based on forecast information and employee pattern of leave has been determined after considering historical data.

Financial instruments

CAPITAL MANAGEMENT

The Group manages its capital to ensure that entities in the Group will be able to continue as going concerns while maximising the return to shareholders through the optimisation of the debt and equity balance. The capital structure of the Group consists of cash and cash equivalents, and equity attributable to equity holders of the parent, comprising issued capital and retained earnings. The Group is not subject to any externally imposed capital requirements.

CURRENCY RISK

The Group undertakes certain transactions denominated in foreign currencies. Exchange rate exposures are managed within approved policy limits using forward foreign exchange contracts. These derivative financial instruments are initially recognised at fair value on the date the derivative contract is entered into and are subsequently remeasured to their fair value at the end of each reporting period. Derivatives are carried as assets when the fair value is positive and as liabilities when the fair value is negative. The resulting profit or loss is recognised in profit and loss immediately, unless the derivative is designated effective as a hedging instrument, in which event the timing of the recognition in profit or loss depends on the nature of the hedging relationship. The effective portion of changes in the fair value of cash flow hedges is recognised in other comprehensive income and accumulated in a cash flow hedge reserve. The gain or loss relating to any ineffective portion is recognised immediately in profit or loss.

INTEREST RATE RISK

The Group operates a call account and has short-term deposits on which interest is earned. Where possible the Group manages exposures to interest rate fluctuations through prudent management of its treasury operations. In managing interest rate risks the Group aims to reduce the impact of short-term fluctuations on earnings. Over the longer term, however, permanent changes in interest rates will have an impact on profit.

CREDIT RISK MANAGEMENT

The financial instruments which expose the Group to credit risk are principally bank balances, short-term investments and accounts receivable. The Group monitors credit risk on an ongoing basis. Bank balances and short-term investments are held with New Zealand registered banks in accordance with the Group's treasury policy. No collateral is held by the Group in respect of bank balances, short-term investments or accounts receivable. The maximum exposure to credit risk is represented by the carrying value of each financial asset in the Balance Sheet.

LIQUIDITY RISKS

The Group manages liquidity risk by maintaining adequate reserves, cash deposits and reserve borrowing facilities, by monitoring forecast and actual cash flows and by matching the maturity profiles of financial assets and liabilities, all of which are of a short-term nature. The Group continues to generate sufficient cash flows from operations to meet financial liabilities.

Trade and other payables

Trade and other payables are non-interest bearing and are normally settled on the 20th of the month following receipt of invoice. The carrying value of creditors and other payables approximates their fair value.

Related party transactions

The Crown is the ultimate shareholder of the Company. No other transactions with New Zealand government owned entities are considered as related party transactions in terms of NZ IAS 24.

Commitments

NON-CANCELLABLE OPERATING LEASE COMMITMENTS

Operating lease payments are recognised on a systematic basis representing the pattern in which economic benefits from the leased asset are consumed over the lease term.

Leases are classified as finance leases whenever the terms of the lease transfer a significant portion of all of the risks and rewards of ownership to the lessee. All other leases are classified as operating leases.

The Group has no leases which would be classified as finance leases.

Preparation disclosures

STATEMENT OF COMPLIANCE

The financial statements have been prepared in accordance with New Zealand Generally Accepted Accounting Practice. They comply with New Zealand equivalents to International Financial Reporting Standards and other applicable Financial Reporting Standards, as appropriate for profit oriented entities. The financial statements also comply with International Financial Reporting Standards. Accounting policies have been applied consistently to all periods presented in the financial statements.

MEASUREMENT BASIS

The financial statements of the Group have been prepared on an historical cost basis, except that derivative financial instruments are measured at their fair value. Transactions in foreign currencies are converted at the New Zealand rate of exchange ruling on the date of the transaction. Monetary assets and liabilities at year end are converted to New Zealand dollars at the exchange rate ruling at balance date. The financial statements are presented in New Zealand dollars which is the Group's functional currency. All values are rounded to the nearest thousand dollars.

INTEREST IN JOINT ARRANGEMENTS

A joint arrangement is an arrangement whereby the Company or its subsidiaries have joint control over an entity. Joint control is the contractually agreed sharing of control of an arrangement, which exists only when decisions about the relevant activities of that entity require the unanimous consent of the parties sharing control. A joint arrangement is either a joint operation or a joint venture. For a joint operation the Group recognises its share of assets, liabilities, revenues and expenses on a line-by-line basis using the proportionate method. For a joint venture the Group recognises its interest in a joint venture as an investment and accounts for that investment using the equity method.

CLASSIFICATION OF FINANCIAL ASSETS AND LIABILITIES

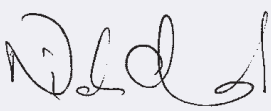
The Group holds loans and receivables. These are measured at cost less impairment, or in the case of trade receivables, reduced by an allowance for doubtful debts. Financial liabilities, excluding derivative financial instruments, are classified as 'other financial liabilities'. Other financial liabilities are initially measured at fair value, net of transaction costs. Other financial liabilities are subsequently measured at amortised cost, with interest expense recognised on an effective interest basis.

CRITICAL ACCOUNTING ESTIMATES AND JUDGEMENTS

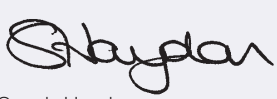
In applying the accounting policies, there is the requirement for judgements, estimates and assumptions to be made about the carrying amounts of some assets and liabilities. The estimates and assumptions are based on historical experience and other relevant factors. Actual results may differ from these estimates. Accounting policies where critical estimates have been made include property, plant and equipment, intangible assets, impairment of assets and liabilities and employee benefits. Judgement has been applied in determining not to value heritage assets for financial reporting purposes.

NEW STANDARDS AND INTERPRETATIONS NOT YET ADOPTED

New accounting standard NZ IFRS 15 Revenue from Contracts with Customers is effective in the current period and has been adopted.



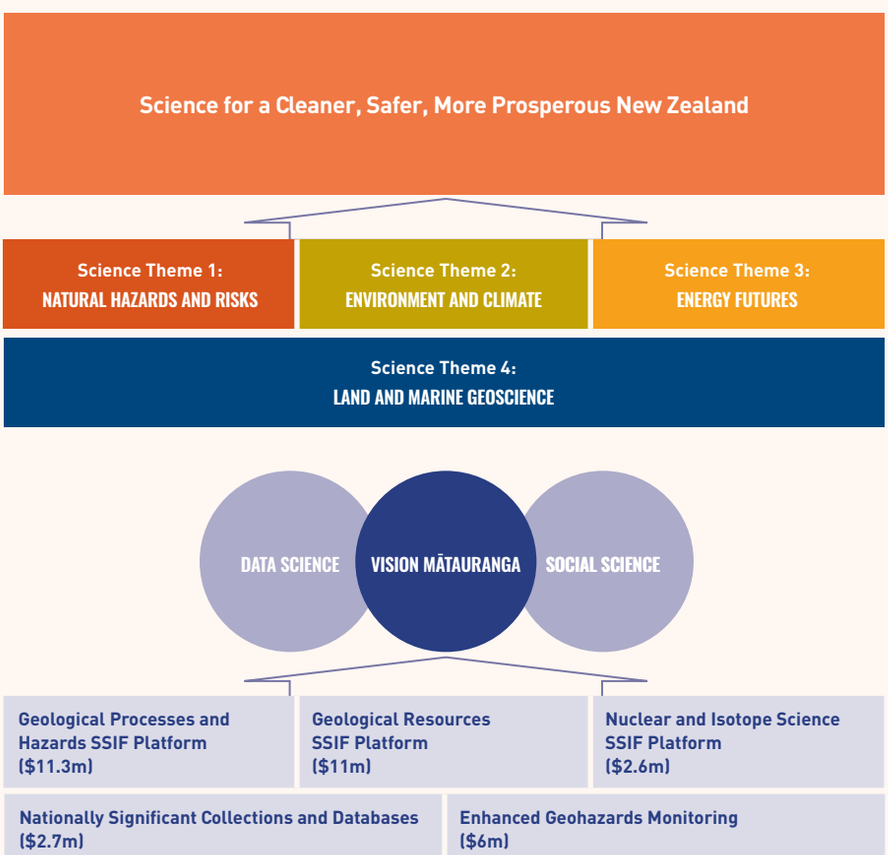
Dr Nicola Crauford
Chairman



Sarah Haydon
Deputy Chairman

APPENDIX 1

ALIGNMENT OF SSIF INVESTMENT TO OUR SCIENCE THEMES AND VISION



Note: Variations to the SSIF contract may result in changes to these investment numbers.

APPENDIX 2

GNS SCIENCE KEY PERFORMANCE INDICATORS (KPIS)

INDICATOR	MEASURE YEAR ENDING 30 JUNE	FORECAST 2018-19	TARGET 2019-20	TARGET 2020-21	TARGET 2021-22
STRATEGIC INTENT					
Priority setting	Surveyed end users* have confidence that GNS Science considers their sector's priorities when setting their research priorities	>70%*	New indicators and measures to be developed through establishment of a GNS Stakeholder Survey.		
Team selection	Surveyed end users* have confidence that GNS Science has assembled 'best' teams for research delivery	>85%*	New indicators and measures to be developed through establishment of a GNS Stakeholder Survey.		
SCIENCE IMPACT					
Research delivery	Research milestones (critical steps) on track or completed	>85%	>85%	>87%	>87%
Impact case studies	Impact case studies published	3	3	3	3
Knowledge exchange	Surveyed end users* have adopted knowledge from GNS Science in the past three years	>90%*	New indicators and measures to be developed through establishment of a GNS Stakeholder Survey.		
SCIENCE EXCELLENCE					
Peer-review	Programme reviews carried out	5	5	5	5
Science quality	Impact of scientific publications (weighted citation index)**	3.0	3.0	3.2	3.2
Research collaboration	Papers co-authored	90%	91%	92%	93%
SCIENCE RELEVANCE					
End-user collaboration	Revenue per FTE from commercial sources ($000)	72	78	83	86
Technology and knowledge transfer	Commercial reports per scientist FTE	1	2	3	4
FINANCIAL					
Revenue generation	Revenue per FTE ($000)	232	244	250	256
EMBEDDING VISION MĀTAURANGA					
Māori engagement	Projects with Māori stakeholders embedded in the research	4	5	5	5
PEOPLE AND CULTURE					
Health and Safety	Recordable injuries per 200,000 work hours (rolling 12-month average)	<3	<3	<2.5	<2.5
Staff engagement* **	Percentage of staff engaged in working for GNS Science	60%	65%	>68%	>70%

* Based on a biennial MBIE commissioned Colmar Brunton Survey (>50 respondents). This survey is being discontinued.
** Mean 2-year impact factor for SCImago-assessed journals, weighted by the number of GNS Science publications.
*** Based on the Qualtrics Survey cluster of questions and definition for staff engagement.

APPENDIX 3

OUR NATIONALLY SIGNIFICANT COLLECTIONS AND DATABASES

We are the custodian of eight Nationally Significant Collections and Databases. As well as ensuring that the databases and collections are kept up to date with newly acquired samples and data, we will maintain and improve system functionality and infrastructure to ensure ready access both internally and externally for research, commercial applications and public information.

- **The Regional Geological Map Archive and Data File** is the national repository of geological maps and regional geological information for New Zealand and its territories, generated over the past 150 years by GNS Science and its predecessors. The information is used widely by resource companies, hazard and risk assessors, and land-use planners.
- **The National Petrology Reference Collection and PETLAB Database** is a curated archive of more than 100,000 rock and mineral samples from New Zealand and its territories collected since 1865. The samples and associated petrological data are used by mineral explorers and regional geologists to better understand crustal composition and resource prospectivity.
- **The NZ National Paleontological Collection and Associated Databases** is a collection of fossil samples from New Zealand and its territories dating back to the early 19th century. It includes vertebrate, invertebrate and plant macrofossils, animal and plant microfossils, trace fossils, and fossil-bearing rocks or rocks that have been sampled for microfossils. Together with the NZ Fossil Record File, and a number of other paleontological databases, the collection provides key biostratigraphic data to refine the geological timescale, with broad benefits to the resources industry, evolutionary biologists, paleo-ecologists and climate modellers. It also contains the raw data on past environmental change.
- **The NZ Fossil Record File** is a register of more than 100,000 fossil locations in New Zealand and the Ross Dependency described since 1865. The data provide essential information for biostratigraphic analysis and refinement of the geological timescale, which are used by stakeholders across the resources, geohazards and environment sectors.
- **The National Groundwater Monitoring Programme**, operating since 1998, provides water quality indicators, including major ions, nutrients, metals and arsenic, for groundwater sampled regularly New Zealand wide. The data provide critical information to water regulators, researchers and consultants to effectively manage water resources.
- **The National Earthquake Information Database** contains essential data on all significant earthquakes recorded in New Zealand since 1840. Accessed via the GeoNet website, these data are used extensively by earthquake hazard modellers and risk analysts, as well as insurance companies and CDEM agencies in New Zealand and overseas.
- **The NZ Volcano Database** is a collection of historic photos and discrete datasets that are being assembled under a single accessible portal. The data are used for eruption forecasting (Volcano Alert levels), and research into magmatic and eruptive activity.
- **The NZ Geomagnetic Database** is a vehicle for transferring critical Southern Hemisphere geomagnetic data collected at Scott Base (Antarctica), West Melton (Canterbury) and Apia (Samoa) to the global INTERMAGNET database. The near real-time data play an important role in constructing and testing global reference models of the geomagnetic field. Geomagnetic reference field models are widely used by scientists, by the military, in transport, and by the general public in smartphones and other mobile devices to provide orientation information.

TOITŪ TE MARAE O TANE, TOITŪ TE MARAE O TANGAROA, TOITŪ TE IWI

Protect and strengthen the realms of the Land and Sea, and they will protect and strengthen the People.

Mt Ruapehu, New Zealand | Servicing GeoNet monitoring equipment at Mt Ruapehu's Crater Lake

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