Interim Statement of Core Purpose for the New Zealand Institute for Earth Science

Purpose

To drive New Zealand's economic growth and wellbeing through increasing returns from the use of New Zealand's natural resources and environments, enhancing energy security, building resilience to natural hazards and increasing prosperity in a changing climate.

The CRI will aggressively pursue opportunities to lift innovation, commercial outcomes, and use of advanced technology to grow the national economy.

Outcomes

The CRI will fulfil its purpose through leadership in global science and innovation, the provision of research that benefits the economy, and the transfer of data, technology and knowledge in partnership with industry, government, Māori and Pacific partners to:

Support future energy growth, sustainability and security through increased production, effective storage, and resilient distribution through geothermal, hydro, wind, solar, mineral and marine resources.

Increase economic benefit from the development and diversification of aquatic and geologic resources, including aquaculture, fisheries, and minerals.

Support the economy through increased preparedness and resilience to natural hazards such as geological, space weather, and extreme weather and climate hazards.

Develop new materials and technologies that improve energy efficiency and advance zero or low carbon energy use to contribute to economic growth.

Increase social and economic benefits within environmental boundaries through improved management and stewardship of freshwater and marine resources and ecosystems and enhanced biosecurity.

Adapt to and realise the economic opportunities of climate variability and change, and mitigation of the drivers of climate change.

Accelerate earth science and its application through the development and use of advanced technologies, such as space, environmental observation and analysis, biotechnology, engineering, nanotechnology, AI and supercomputing.

Ensure key parts of the economy and society meets quality assurance, accreditation processes and regulatory compliance by providing measurement standards for New Zealand domestically and internationally.

Build a more dynamic, effective and efficient Science, Innovation and Technology system for New Zealand by working collaboratively with other research organisations, including other CRIs and universities, and through enduring partnerships with international science organisations.

Scope of Operations

To achieve these outcomes, the New Zealand Institute for Earth Science will integrate physical, biological, and social scientific approaches to study New Zealand, Antarctica and the Southern Ocean, and the South West Pacific region in the following core research areas:

Earth System Observations and Processes

- Understanding geological, atmospheric, cryospheric, freshwater and oceanic processes, and their role in the climate system and hydrological cycle across temporal and spatial scales.

Natural Hazards

- Monitoring, risk management, forecasting and emergency response for geological, weather, climate and space hazards.
- Multi-hazard risk and impact-based approaches across sectors to inform warnings and short to long term risk-based decision making.

Landscape Evolution and Mineral Resources

- Understanding and modelling of processes that shape New Zealand's landscape and influence land use.
- Determining the distribution, scale, formation processes and nature of New Zealand's minerals and evaluating the impacts of extraction.

Energy

- Determining the distribution, scale and nature of energy resources (e.g., geothermal, hydrogen, minerals, hydro, wind, solar and marine generation), the impacts of their use and energy storage options.

Materials and Technologies for Energy Efficiency and security of supply

- Development of materials and technologies for efficient renewable energy production (e.g., hydrogen, geothermal, solar, and wind), reduced emissions, and improved carbon capture and storage.

Freshwater Resources and Environments

- Increased returns from the optimal and sustainable use of water resources from streams, rivers, lakes and groundwater.
- Support freshwater environmental resilience, including in a variable and changing climate, through geological, physical and biological freshwater research.

Ocean Resources and Environments

- Support ocean resource use and environmental resilience, including in a variable and changing climate, through geological, chemical, physical, and biological oceanographic research.

- Operation of the national deepwater and coastal research vessel fleet.

Climate and Weather Science, Monitoring, Forecasting and Risk

- Modelling and operational delivery of weather and climate forecasts and non-hazard impacts, based on land, ocean and space observations, for key sectors, including aviation and transport, primary production, tourism, infrastructure and energy, conservation and emergency response within New Zealand and the Pacific.
- Development of decadal scale climate system forecasts, projections, key thresholds and tipping points to inform adaptation to climate change.

Carbon cycle and atmospheric change

- Support the management of atmospheric change through the measurement and monitoring of atmospheric constituents, quantifying the sources and sinks of greenhouse gases, and measurement of terrestrial and oceanic carbon cycling, including ocean acidification.
- Development and verification of carbon sequestration technologies and carbon emission mitigation approaches.

Fisheries and Aquaculture

- Support fisheries management through the surveying, monitoring, modelling, assessment and differentiation of stocks, from the tropics to Antarctica. Mitigate impacts of fishing and and advance ecosystem-based management approaches.
- Development of sustainable sea-based aquaculture production, commercial scale land-based culture technologies and production, broodstock development and genetics, hatchery techniques and animal husbandry, with a focus on high value species.

Environmental Observations

- Maintain national environmental monitoring networks and development and engineering of sensor technologies and the collection, analysis and application of remote sensing data.

Supercomputing

- Operation of national advanced supercomputing capability, data storage, AI and cloud services, collaborating with REANNZ to provide the wider Science, Innovation and Technology system access to supercomputing.

Measurement Standards

- Ensure that New Zealand's units of measurement meet the international System of Units, enabling business to comply with regulations and maintain consumer confidence and trust.

The New Zealand Institute for Earth Science will collaborate with the other CRIs in the following areas:

Food Safety and Health

- Interfaces between food safety and human health, including foodborne disease and risk management, contaminants in drinking water, groundwater and freshwater systems, One Health approaches and cross-domain threats.

Natural Hazards and Risks

- Hazard impacts, multi-hazard approaches and adverse events across sectors and emergency management.

Aquaculture, Seafood and Fisheries

- Integrated aquatic ecosystems and sustainability and environmental aspects of production.

Climate & Weather

- Interfaces between environmental modelling, climate change, weather and climate forecasting and land-use impacts.

Biosecurity

- Cross domain and integrated approaches to biosecurity threats and biosystematics across environments, including pathogen detection, antimicrobial resistance monitoring, and biosafety through integrated One Health approaches.

Climate Change

- National mitigation, adaptation and resilience, including greenhouse gas emissions and the carbon cycle, impacts on biodiversity across domains, climate-health research environmental surveillance, and community resilience strategies.

Conservation, Biodiversity and Ecosystem Services

- Development of national biodiversity and conservation approaches and environmental management.

Soil, Freshwater, and Nutrient Modelling

- Catchment management, water quality and environmental health, particularly in relation to rural and urban development.

Environmental Health and Risk Science

- Monitoring and risk assessment, as well as environmental reporting, across terrestrial, freshwater and marine environments, including chemical, biological, radiological and explosive threat detection, preparedness and response to protect population health and national security.

Technologies for Energy Efficiency and Security of Supply

- Collaboration on energy options, materials and infrastructure

Social Science

- Integrated approaches to social science, community engagement and policy development, bridging biophysical and social science.

Collections and Databases

- Biosystematics, data curation, data sharing, and infrastructure.

Supercomputing and Advanced Technologies

- Digital infrastructure and data analytics including AI.
- A system-wide approach to development and use of advanced technologies, including via an Advanced Technology PRO.

Vision Mātauranga

- Enabling the innovation potential of Māori knowledge, resources and people.

Building an effective SI&T System

- Approaches to knowledge transfer, commercialisation capability and infrastructure development.