October 2025

GeoNet Annual Report

Financial Year 2024/25

Earth Sciences
New Zealand

GNS Science Business Unit

earthsciences.nz

Earth Sciences New Zealand

On 1 July 2025, GNS Science and the National Institute of Water & Atmospheric Research (NIWA) were merged to form Earth Sciences New Zealand.

Recognising Our Partners

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HIKINA WHAKATUTUKI

Natural Hazards Commission
Toka Tū Ake

Toitū Te Whenua
Land Information New Zealand

National Emergency Management Agency
Te Rākau Whakamarumaru

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Introduction

The GeoNet Programme is a collaboration between the New Zealand Institute for Earth Science Limited (Earth Sciences New Zealand), the Ministry of Business, Innovation & Employment Hīkina Whakatutuki (MBIE), the Natural Hazards Commission Toka Tū Ake (NHC), Land Information New Zealand Toitū Te Whenua (LINZ) and the National Emergency Management Agency Te Rākau Whakamarumaru (NEMA).

Twenty-four years ago, GeoNet launched with 102 land-based sensors, gathering data to help Aotearoa New Zealand monitor and manage geohazards. Fast forward to 2025 and we've become known as a public good service that has captured the hearts and minds of New Zealanders. Through major geohazard events such as the Christchurch and Kaikōura earthquakes and the Whakaari / White Island eruption, as well as in quieter times, GeoNet has supported New Zealanders by sharing data, information and advice, and offering people reassurance. GeoNet has developed into a complex but resilient data pipeline with a suite of products and services that support a vast range of ongoing scientific research, helping us to better understand our changing whenua.

This year's work programme was delivered by GNS Science, in collaboration with partner organisations highlighted above. On 1 July 2025, GNS Science and the National Institute of Water & Atmospheric Research (NIWA) were merged to form Earth Sciences New Zealand.

GeoNet Delivery – Key Theme for the Year

The 2024/25 year was one of transition and future readiness. We invested in resilience and development initiatives. Our key focus for the year was the delivery of the annual integrated workplan, which includes our full capital investment plan. Significant work was focused on improving our network of sensors, migration of our data collection into the cloud, modernising our data processing and developing new products to support science and geohazard advice across the motu. GeoNet also adjusted to allow for delivery against a multi-year funding allocation.

Key Events in 2024/25

Infrastructure and Network Maintenance

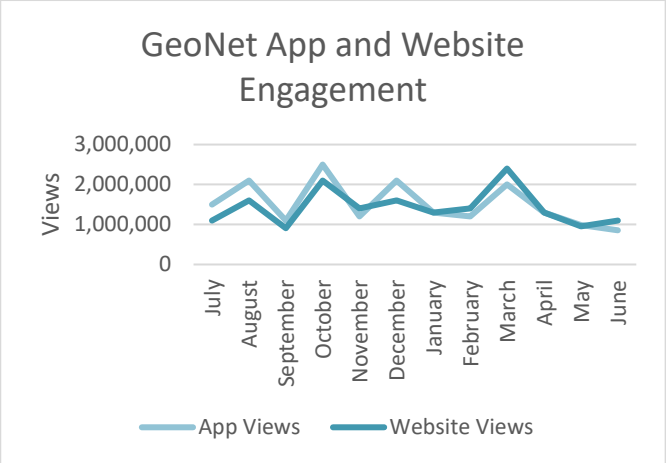
Our technicians carried out 112 field trips to 347 stations, completing new installations, upgrades, repairs, satellite repointing and routine maintenance, ensuring the reliability and resilience of our monitoring network. This is part of ongoing investment in managing our assets.

Infrastructure and Platform Evolution

Key multi-year development initiatives advanced this year. These included the start of our Earthquake Location System re-architecture, the overhaul of the DART (Deep-ocean Assessment and Reporting of Tsunami) Communications Data Display System and the migration of data collections directly into the cloud. These projects strengthen GeoNet's adaptability, security and future-readiness.

Public Engagement and Data Accessibility

GeoNet's public engagement and free and open data continue to play a crucial role in how New Zealanders interact with geohazard information.



- GeoNet datasets are aligned with global data-management principles. These align with the international FAIR (findable, accessible, inter-operable and re-usable) framework. We have worked to make our data more FAIR than ever, with a 14% average improvement in FAIR scores since 2021.
- The outdated FITS (Field Integrated Time-Series) mechanism was fully retired, with data successfully migrated into the Tilde (Time Lapse Data Entries) API (Application Programming Interface).
- The GeoNet app is installed on over 264,000 devices, approximately 3200 more installations than the previous year. We are seeing slow but steady growth, which is to be expected in a period between major geohazard events. Our websites continue to see strong public engagement.
- We hosted 20 formal tours and many impromptu visits to the National Geohazards Monitoring Centre (NGMC).
- Communications around Whakaari / White Island included new FAQs and a social media campaign centred on the integration of our webcam at Te Kaha for monitoring of the island.

Geohazards Activations

Over the course of 2024/25, GeoNet supported 62 geohazard incident-management activations. Of these, 23 required the mobilisation of a Peril Duty Officer. The Scientist in Charge was directly involved in 24 activations, the majority of which were managed at Level 1.

One significant event, a magnitude 7.3 earthquake in Vanuatu, required escalation to a Level 2 activation and the formation of a full Incident Management Team. This response drew on the depth of the GNS Science incident management framework and demonstrated our ability to mobilise quickly and coordinate through the GNS Science Incident Management Framework.

Earthquake Monitoring

This year, GeoNet recorded 23,080 earthquakes in and around Aotearoa New Zealand. The largest domestic event, a magnitude 6.8 earthquake in Fiordland, triggered a small local tsunami. A ten-centimetre rise was recorded at the Puysegur tsunami gauge, with models suggesting larger amplitudes elsewhere in Fiordland. This prompted a multi-peril escalation involving seismic, tsunami, landslide and communications experts.

Beyond major events, our Earthquake Monitoring Group closely tracked smaller but scientifically important activity. This included earthquake swarms, a significant event near Te Whanganui-a-Tara (Wellington), slow-slip earthquake episodes and multiple offshore earthquakes near Fiordland and Tokoroa. Alongside real-time monitoring, the team contributed to readiness activities such as the Earthquake Expert Panel tabletop exercise, reviews of 24/7 monitoring operations and the development of regional tectonic summaries. Enhancements to the Seismology Scientist in Charge role were also introduced.

Volcano Monitoring

At Whakaari / White Island, periods of unrest and ash emissions led to the Volcanic Alert Level being raised to Level 3, twice between August and October 2024 and again from April to June 2025. During these times, the Aviation Colour Code was raised to orange, reflecting potential risks to aviation. With no on-island monitoring, our Volcano Monitoring Group relied on a combination of mainland-based webcams, regular airborne gas and observation flights, and satellite imagery. A new webcam at Te Kaha was established to provide a different angle on the island, improving long-distance monitoring capability, and upgrades to camera imagery live-streaming have strengthened internal monitoring operations.

At Ruapehu, we made major advances in volcanic gas monitoring by installing several automated instruments capable of continuously measuring sulphur dioxide emissions using Differential Optical Absorption Spectroscopy (DOAS). Data is now available several times a day during daylight hours, compared to once every few weeks in the past. This higher-frequency data enables a deeper understanding of volcanic processes and improves our ability to identify early signs of unrest at the maunga. Plans are underway to further automate the system and extend similar technology to other volcanoes across Aotearoa New Zealand.

Tsunami and Landslide Hazard Monitoring

Two significant offshore earthquakes during the year required Tsunami Expert Panel activations: the magnitude 7.3 Vanuatu earthquake and the magnitude 6.8 earthquake on the Puysegur Subduction Zone near Fiordland. On both occasions, the panel provided accurate, timely advice to NEMA, supported by data from GeoNet and international partners. The Vanuatu earthquake also led to a formal request for assistance from the Government of Vanuatu. Through the GeoNet-funded GNS Science Incident Management System, our team worked alongside the Ministry of Foreign Affairs & Trade and the Vanuatu Meteorology and Geohazards Department to provide science advice for response and recovery efforts.

The Landslide Monitoring Group also supported our response to the magnitude 5.3 earthquake near Eketāhuna in January 2025. Strong ground-motion recordings met the threshold for using our new earthquake-induced landslide forecasting tool, marking its first operational deployment. Although no significant landslides were detected, the event provided an important demonstration of the system's readiness.

Organisational Milestones

The year also marked a period of major transition for the wider science sector. On 1 July 2025, GNS Science and NIWA merged to form Earth Sciences New Zealand. In time, MetService will also join Earth Sciences New Zealand. This consolidation is part of the Government's science system reforms. The Interim Statement of Core Purpose (2025) for Earth Sciences New Zealand emphasises strengthening national resilience to natural hazards, including geological, space weather and climate-driven risks. GeoNet is well positioned to contribute to this mission, building on its role as a trusted source of geohazard monitoring, data delivery and science advice.

Looking Ahead

We conducted a comprehensive consultation process with stakeholders in late Financial Year (FY) 2024/25 to refresh the GeoNet Five-Year Rolling Business Plan (FY2026–2030). This plan captures our collective priorities, identifies multi-year initiatives and provides a flexible framework that will be updated annually to reflect delivered impact and sector changes. Once published in FY2025/26, it will serve as a guiding framework as we continue to deliver on our mission in an evolving science landscape.

Our Reporting Approach

This annual report will follow the same structure as the previous iteration. In this structure, the programme is divided into five cross-functional delivery areas:

- Programme Operations
- Network – Acquisition and Transportation of Data
- Core Platform, Infrastructure and Data Products
- Data Custodianship
- Emerging Products, Hazard and Peril Data Use

Programme Operations

The GeoNet Programme Operations delivery area covers the activities that maintain a science-led, user-focused, sustainably funded programme. It provides the structures and processes that ensure our priorities are transparent, risks are managed and our decisions are well-founded. This delivery area also ensures that the value of our work is clearly communicated to our people, our users and our stakeholders. This work helps maintain trust in GeoNet and Earth Sciences New Zealand brands, while supporting impact across the wider science system.

Highlights and Outcomes

Funding

In Budget 2024, GeoNet was fortunate enough to secure a sustained, multi-year funding allocation. This was an excellent outcome overall. The allocation triggered an intensive process to adapt and prioritise our workplan to align it with the Budget 2024 funding envelope, which has a profile that decreases over time.

Integrated Workplan for 2025/26

A major focus for programme operations this year was the proactive development of our annual Integrated Workplan 2025/26 in line with the Budget 2024 funding profile. Through internal workshops and engagement with funding stakeholders, we built a plan that balances essential business-as-usual functions with multi-year initiatives and secondary developments. As part of this work, we understand that trade-offs mean increased risk in some areas. These risks have been assessed and agreed together with the GeoNet Steering Group and GeoNet Advisory Panel, subsequently endorsed by the Advisory Panel and approved by the GNS Science board in June 2025. The Integrated Workplan gives us a clear and realistic view of our work for FY2025/26.

Five-Year Rolling Business Plan (2026–2030)

We developed the GeoNet Five-Year Rolling Business Plan through collaborative workshops with stakeholders. This process refined our function-based roadmaps, incorporated sector shifts and new opportunities and clarified the assumptions that shape our planning environment. The resulting plan will serve as a guiding framework and identify risks. It will be refreshed annually to remain responsive to funding and sector change.

Case Study: Budget 2024 Construct

In Budget 2024, GeoNet and the National Seismic Hazard Model secured a sustained, multi-year funding allocation. This triggered an intensive process to adapt and prioritise our workplan to align it with the Budget 2024 funding envelope and agreed scope outcomes.

Through a series of workshops, primarily with our funding stakeholders, we refined our principles and set a prioritisation framework to guide us through planning over the coming years.

In creating the prioritisation framework, we explored the implications of the funding decision. We asked stakeholders to prioritise and articulate to us how changes (specifically degradation) in different aspects of GeoNet would impact them and the groups they represent. This resulted in concise priority statements from each of the funding stakeholders, which have since been used to support targeted, balanced decision-making around initiatives in annual and five-year planning.

Key outcomes of note from the budget construct process were that:

- The ambitions of the GeoNet Ten-Year Strategy would be unachievable but that the strategic vision and direction underpinning it were still valid.
- Transformation in 24/7 geohazards advice delivery services was necessary.
- Additional measures would need to be taken in the longer term in response to further inflationary pressures and science-system change.
- There would be increased risk that needed to be escalated.

The principles and prioritisation framework were formally endorsed by the GeoNet Advisory Panel in July 2024 and are now a fundamental tool in planning and prioritisation.

Looking forward, we will continue to identify and realise budget efficiencies where possible, particularly as we move through our annual and five-year planning processes.

Looking Ahead

In the next financial year, we will continue to improve our programme operations through an independent review of reporting and assurance, further development and streamlining of our planning processes, refreshment of the Products & Services Catalogue and development of a benefits framework to better connect our activities with impact and support stakeholder decision-making and advocacy.

Network – Acquisition and Transportation of Data

This delivery area focuses on acquiring data through our nationwide sensor networks and ensuring secure and reliable transport to data centres. Delivering the initiatives outlined in this section is a part of allowing GeoNet to keep up with advancements in science and technology while ensuring that the data collection and transport systems are built on strong, resilient and secure foundations with adequate coverage across Aotearoa New Zealand. A resilient network ensures that our data continues to serve science, emergency management and the public well.

Highlights and Outcomes

Network Investment

In 2024/25, our technicians completed 112 trips to 347 stations across the motu, carrying out installations, upgrades, maintenance and repairs. This year we:

- Commissioned three National Network (Tier 1) stations (Marlborough, Southern Alps, Taranaki) and upgraded stations in Wellington, Fiordland and Rakiura.
- Commissioned Global Navigation Satellite System (GNSS) stations (nine of these co-located with tide gauges, in partnership with LINZ).
- Installed 24 weak-motion seismic sensors.
- Installed 34 strong-motion seismic sensors, including four following a review of our strong-motion network coverage in Canterbury.
- Commissioned two downhole multi-sensor arrays in Wellington, providing three-dimensional data on seismic shaking and improving modelling for urban areas at risk of liquefaction.
- Commissioned tsunami gauges on the West Coast and Lake Taupō.
- Upgraded three building arrays.
- Upgraded eleven infrasound stations in Tongariro National Park.
- Commissioned two landslide monitoring stations in Tairāwhiti in partnership with Gisborne District Council, tracking displacement on a coastal landslide.

Ngāti Rangi Memorandum of Understanding

In April 2025, a Memorandum of Understanding was signed between GNS Science and Ngā Waihua o Paerangi Trust (Ngāti Rangi). This agreement formalised the relationship between the two parties and established an ongoing co-operative relationship regarding shared areas of interest such as sustainable environmental management and natural hazards monitoring.

The time spent with Ngāti Rangi was important to us and enabled our staff to undergo a cultural training session with Ngāti Rangi. This way we understand their cultural values, history and pūrākau about Ruapehu.

Connectivity Upgrades

This year, we made significant investments into improving the connectivity and resilience of our network. These improvements included:

- Moving the collection and processing of data from tsunami and seismic networks directly to the Amazon Web Services (AWS) Sydney cloud region, simplifying data pathways and providing back-up support in a major geohazard event that could impact our on-premises data centres.
- Multiple data-centre endpoints were added for cellular providers, reducing vulnerability to single-channel failures.
- Remaining cellular data transport connections were upgraded to 4G/LTE to prepare for the 2025 3G shutdown.

Case Study: Southern Alps Network Coverage

This year we completed a large project to expand our network coverage in the Southern Alps, which began during FY2023/24. This project was driven by the outcomes of a Strategic Science Investment Fund (SSIF) Strategic Development Project Science-case for GeoNet Expansion. This project was a collaborative effort to develop a documented, prioritised set of science-backed recommendations for how GeoNet seismic and geodetic sensor networks could be expanded.

The South Island Plate Boundary zone was identified as a priority target for GeoNet geodetic and seismic expansion. This is due to the high conditional probability (75%) of an earthquake greater than magnitude eight along the Alpine Fault in the next 50 years, as well as the large earthquakes that have occurred in these regions over the last fifteen years. Last year we identified potential locations and deployed temporary equipment to assess which sites would be the best in terms of data, ease of install and other requirements, such as sky view and data transport service availability.

This year, we commissioned nine stations with weak- and strong-motion seismic capability across the Southern Alps stretching from Haupiri to Haast. Six of these stations also have GNSS sensors. In addition, we upgraded one GNSS station with weak- and strong-motion seismic capabilities. These new stations have significantly improved our network density and monitoring capability across this nationally important fault.

Looking Ahead

In FY2025/26, our network development will focus on upgrading volcano monitoring webcams for improved image quality, completing infrasound array renewals, commissioning new tsunami and seismic monitoring stations in Taranaki and near Fox Glacier, trialling innovative seismic detection using seabed fibre optic cables in Cook Strait and developing a business case to strengthen landslide monitoring based on the Gisborne pilot.

Core Platform, Infrastructure and Data Products

This delivery area covers the GeoNet systems for collecting, processing, storing and sharing data. Maintaining and improving this infrastructure ensures that GeoNet data remains fit-for-purpose, useful, usable and used. It also enables us to integrate new technologies, strengthen resilience and deliver trusted data and products to researchers, emergency managers and the public.

Highlights and Outcomes

Cloud Collections in AWS

In FY2024/25 we stood up a new ingestion and collections infrastructure in the AWS Sydney region, alongside existing data centres at Avalon and Kapua. This ensures that, even if domestic centres are disrupted by a major event, critical GeoNet data remains safely collected, stored and disseminated. This shift marks a step-change in resilience for GeoNet.

Field Integrated Time-Series Migration

All Field Integrated Time-Series (FITS) datasets have now been migrated into the Tilde API and GUI (Graphical User Interface), with supporting documentation for users. Tilde now houses GNSS time series, ScanDOAS (data on gas levels at volcanoes) and manually collected monitoring data, all also available through the AWS Open Data programme. The FITS API has been fully decommissioned, with lessons learned from this coordinated migration informing future cross-functional delivery work.

GNSS Processing Improvements

A multi-year project modernising our GNSS processing pipeline was completed this year. Enhancements included:

- Adoption of the new industry standard file format (RINEX3) format for GNSS data.
- Re-development of one-second GNSS RINEX generation, including richer station-specific metadata.
- Expanded data-quality metrics across the full GNSS spectrum.
- Re-configuration of field equipment to capture additional satellite constellations and signals.

These upgrades maximise the value of investments made in hardware since 2020 and significantly improve the accuracy and usability of GNSS data for stakeholders.

Case Study: DART Communications Data Display System

This year saw the bulk of the remediation work for the Deep Ocean Assessment and Reporting of Tsunamis (DART) Communications Data Display System (CDDS). This comprised a full assessment of the hardware, operational processes and security systems in preparation for a migration of the collections and processing functions of the system to our AWS cloud environment.

While the DART services currently sit outside of the GeoNet programme, the future includes incorporation of these into GeoNet, and the work to migrate the system to the cloud has utilised key GeoNet expertise and resource this year. It is a crucial piece of work toward integrating DART into our systems, particularly as DART delivers vital tsunami data into our monitoring and response function.

Prior to migration, the system had not been re-booted for five years since it was deployed in 2020. The servers were degrading to a point where these would begin to pose a risk to international tsunami monitoring capabilities. We believe our team are the first of the worldwide DART system users to re-deploy the CDDS system.

In preparation for the migration, the team created copies of the system to use as a back-up in case of any critical failures during remediation work. These copies were then used as a baseline for the team to replicate the system (code, network and configuration) from the ground up to make it cloud compatible and more resilient in a major event.

The next phase involved creating staging and production environments for end-to-end testing, which again needed to be engineered from the ground up. We have also implemented regular patching and updating processes to allow us to make changes and maintain resilience of the system. The bulk of remediation work was completed in FY2024/25, allowing the team to focus on the upcoming switchover to the cloud hosted environment near the beginning of FY2025/26.

Looking Ahead

Cloud Migration

We are preparing to migrate all remaining GeoNet systems hosted at Avalon and Kapua data centres into AWS Sydney and Auckland. This will expand resilience across six data centres (over our original two), modernise our infrastructure and shift us from capital and maintenance heavy data-centre investment to a flexible cloud operational model.

Earthquake Location System Re-Architecture

Planning and early development began this year for a multi-year re-architecture of our Earthquake Location System. The re-architecture will:

- Split the system into ‘Rapid’ and ‘Review’ instances in FY2025/26.
- Modernise architecture to align with international best practice.
- Improve adaptability, monitoring and integration with SeisComP.
- Enhance outcomes for research and response.

Once complete, GeoNet will have a state-of-the-art, industry-leading earthquake location system.

GeoNet Data Dissemination

Recognising the need to modernise our data-delivery platform, we initiated development of GLOBE (GeoNet Linked Open data & Browser Endpoint) to replace *data.geonet.org.nz*. GLOBE will ensure permanent, reliable access to raw and basic data products while aligning with user needs and usage patterns. Prototyping with stakeholders, including LINZ, NASA-CDDIS and EarthScope, informed the design and provided insight into user behaviour and download volumes.

Data Custodianship

Data is at the heart of GeoNet delivery. How well it can be used depends on strong data-management practices. The goal of this delivery area is to make GeoNet data FAIR (Findable, Accessible, Inter-operable and Re-usable) for all users.

By being good custodians, we ensure that GeoNet data is trusted and reliable; stays aligned with new technologies; and remains open and useful for science, emergency management and decision-making. Ultimately, this improves our understanding of Aotearoa New Zealand's land and geohazards, supporting both real-time response and long-term research.

Highlights and Outcomes

International Partnerships

- We established collaboration with the European Plate Observing System (EPOS), including participation in the inaugural EPOS Summer School on Data Management.
- Staff attended several international seismic and volcanic conferences and workshops in Italy, the United States, Germany and Spain, learning about developments in the industry and exploring collaboration opportunities.
- We made contributions to the United Nations Global Geodetic Centre of Excellence, by the organisation (through GeoNet) signing the Multilateral Memorandum of Understanding on Strengthening the Global Geodesy Supply Chain.
- We supported the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) through operation of dual-use seismic sites, now part of the International Monitoring System. Staff also visited CTBTO headquarters in Austria.

National Seismic Hazard Model

A new local magnitude scale targeted to Aotearoa New Zealand was developed by the National Seismic Hazard Model team and is now delivered operationally via GeoNet. Monthly catalogues with updated station corrections now feed into aftershock forecasting tools, with full integration into the Earthquake Location System planned.

Data Digitisation

This year over 15,000 historic seismograms from Ruapehu (1952–1953, 1969–1975) and Taupō (1964–1965, 1983–1986) were digitised. Future projects with university partners will analyse this data and make it available via the Earthquake Information Database.

Case Study: GeoNet Data FAIRness

FAIR principles are globally recognised as guidelines to improve findability and usability of data products. Improving our FAIR score will always be a key part of our work and will yield improvements across all of our products and services. We evaluated our FAIR compliance using the Australian Research Data Commons (ARDC) FAIR data self-assessment tool, modified for our use (Mavroeidi and Rattenbury 2022[1]). We first scored our data in 2021 and repeated that process in 2024. The following graph shows our 2021 fair scores represented in grey, with the 2024 scores in orange.

1 Mavroeidi M, Rattenbury MS. 2022. FAIR Principles applied to high-value geoscience datasets. Lower Hutt (NZ): GNS Science. 39 p. (GNS Science report; 2021/62). https://doi.org/10.21420/88HQ-9792

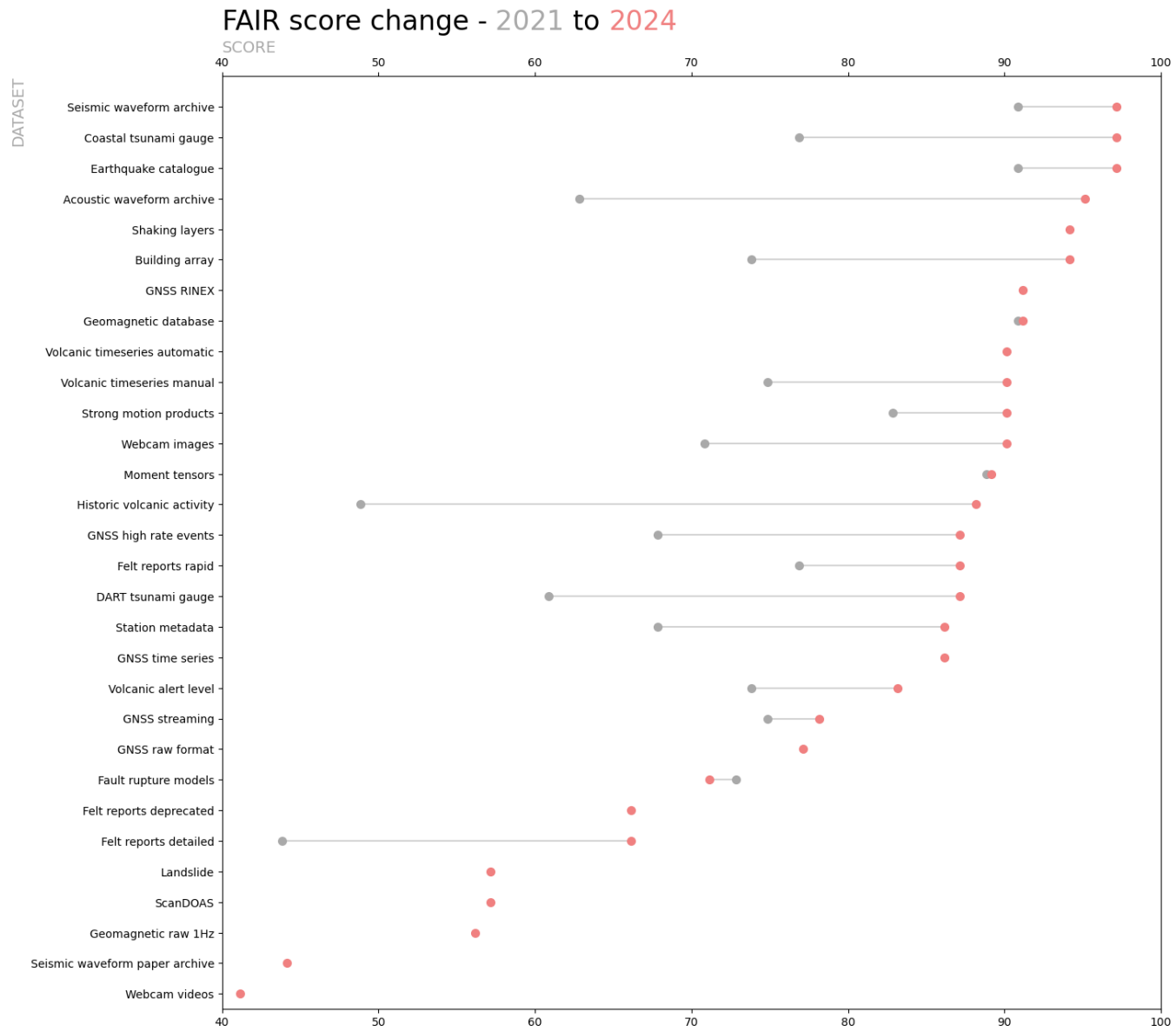


Figure shows FAIR scores in 2021 and 2024 for GeoNet and related Nationally Significant Collections Database datasets (figure re-purposed from a Geoscience Society of New Zealand 2024 conference poster entitled Making and Keeping GeoNet Data FAIR: Re-scoring GeoNet Data in 2024, Lessons Learnt and Progress made since 2021 (and how to cite GeoNet data).

Overall, we saw a mean improvement in the FAIR score of GeoNet data of 14% between 2021 and 2024. The largest improvements are for the historic volcanic activity dataset (39%), the acoustic waveform archive (32%) and the DART tsunami gauge data (26%). This was mainly due to work done to add datasets to the GNS Science Dataset Catalogue and generate a Digital Object Identifier (DOI) for each dataset. We have advanced our score in leaps and gains and now twelve of our datasets have a FAIR score of 90% or above. In 2021, of all assessed datasets, only three were scored above 90% and two more above 80%. By 2024, we had twelve with a score of 90% or above.

Looking Ahead

In FY2025/26, we plan to re-process GNSS time series data using the latest reference frame to align with global best practice, release the GeoNet Seismic Benchmark Dataset to support AI-driven research in earthquake detection and hazard assessment, and develop cloud-based tools to make seismic waveform data more accessible and scalable for research.

Emerging Products, Hazard and Peril Data Use

GeoNet is continually developing products and services to make our data easier to use and more impactful. This delivery area enables us to partner with researchers, agencies and communities to co-develop tools that strengthen Aotearoa New Zealand's resilience to geohazards. The products described below expand how GeoNet data can be applied in research, long-term advice, real-time operations and decision-making.

Highlights and Outcomes

Geomagnetic Data Delivery and Streaming

Supporting the Solar Tsunamis Endeavour programme, we developed a new AWS-based streaming service to deliver geomagnetic data in near real-time. This strengthens the ability for partners to manage risks from space weather.

- One-minute and one-second magnetic field data for the Eyrewell Geomagnetic Observatory are now available via a GeoNet dashboard, Tilde API and AWS Simple Notification Service (SNS).
- Users include Transpower, NOAA's Space Weather Prediction Centre, the Australian Bureau of Meteorology, Dunedin Aurora Alert, GFZ Potsdam, and others.

Earthquake-Induced Landslide Forecasting Tool

Building on last year's Shaking Layers tool, the GeoNet Landslide Forecast System automates earthquake-induced landslide forecasts in AWS. The tool:

- Provides GIS-ready outputs in near real-time for Landslide Duty Officers, emergency managers and scientists.
- Integrates seamlessly with ArcGIS Online, enabling direct use in incident management systems across the country.
- Uses scalable, cloud-based architecture that ensures resilience and sets the foundation for future hazard-forecasting products.

Felt Reports in Te Reo Māori

This year we conducted work to improve our Felt Reports service on the GeoNet website. Felt Reports are one of our highest-profile public resources and are a valuable resource in our earthquake location and response toolkit. A major highlight of the improvement work was launching a Te Reo Māori user journey in Felt Reports. When users access the Felt Reports page, they are now able to select the Te Reo journey, and the page will be displayed in Te Reo.

This is an important step in honouring our commitment to our partnerships with iwi and hapū and is a significant accessibility improvement for the website. Our partnerships with Māori are invaluable across a broad range of our operations, from field work to response and more, so providing our Felt Reports service in Te Reo is a step toward strengthening these relationships.

GeoNet eScience Solutions Platform (GeSSP)

The GeSSP platform has grown significantly, connecting GeoNet data with science-development tools:

- Seven tools are now operational in production on the platform, including Moment Tensor Earthquake solutions (MTS), Probabilistic Volcano Decision-Making (PyVolPob) and Finite Fault Rupture Detector (FinDer).
- 36 mature science tools in sandbox environment and 66 more in development.
- Investment in GeSSP is now evolving into the Science Development Platform, with expanded AWS-based capabilities.

Incident Management System Hub

Launched as a central platform for response readiness, the Incident Management System Hub consolidates:

- Duty rosters, contact details and response templates.
- A reference library of Coordinated Incident Management System (CIMS) functions and roles.
- After-action review findings and event-training resources.

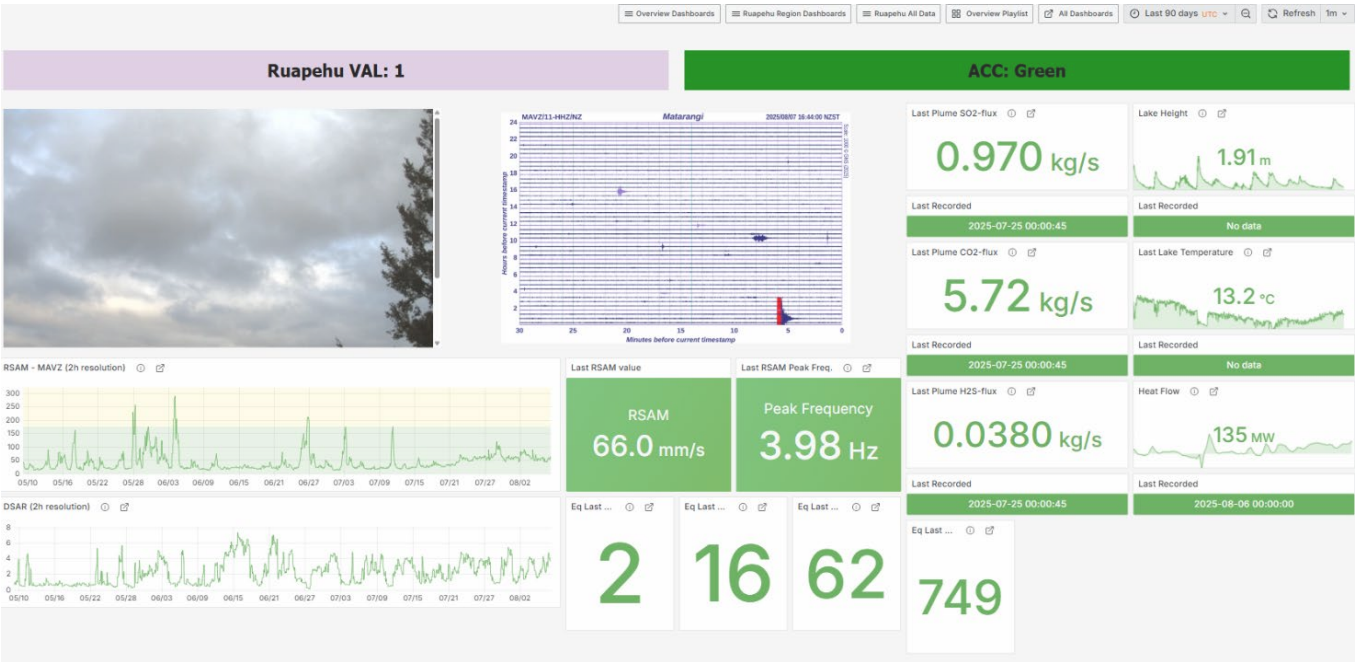
This hub enhances coordination, consistency, and decision-making during emergency responses.

Case Study: Peril-Monitoring Dashboards

At the end of last year and through the beginning of this year, we trialled and launched a Volcano Dashboard, for use by our Volcano Monitoring Expert team, on a GeoNet-supported cloud platform. This was used to display data in an easily accessible and consolidated format. Data presented in the dashboard included webcam imagery, seismometer readouts, sulphur dioxide readings and crater-lake water levels and temperatures, as well as a range of other data.

The system is built using Grafana, a third-party tool that enables the visualisation of data from multiple sources and supports custom layouts. Grafana is particularly well-suited for scientific users due to its simplicity and flexibility in dashboard creation.

Figure below shows an example of a volcano dashboard.



We have developed a new pipeline that empowers specialist users to make editorial changes directly. The Volcano Monitoring Group now manages dashboard updates and configurations, with support from

GeoNet technical teams to maintain consistency and efficiency. We also introduced automated software tools to ensure that changes are robust and standardised.

Because Grafana supports API-based data integration, we can now enhance our dashboards with external data sources, such as the United States Geological Survey website readouts. Incorporating data from multiple providers strengthens our resilience and improves flexibility in monitoring and analysis.

The learnings from this work are being used to develop a range of dashboards, with user input from science teams, for other geohazards that we collect data on.

Looking Ahead

In FY2025/26, we plan to deliver a re-designed website with faster, event-focused and user-specific pages; to co-develop a Tsunami Dashboard with national and international partners; to begin developing an automated tool to forecast rainfall-induced landside probabilities; and to trial a centralised hazard dashboard to streamline information flows and support event response.

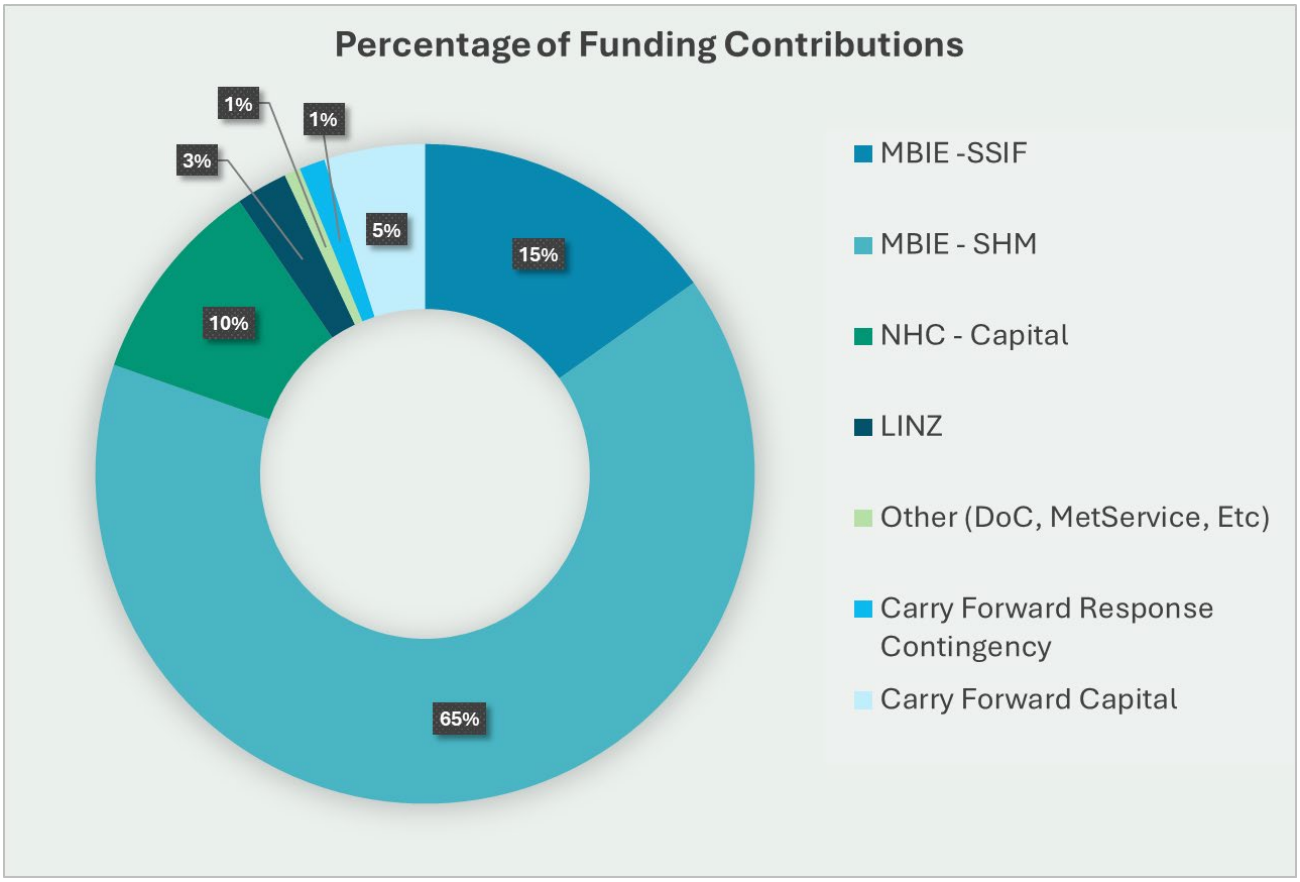
Appendix 1: Risk Management

Risk Management

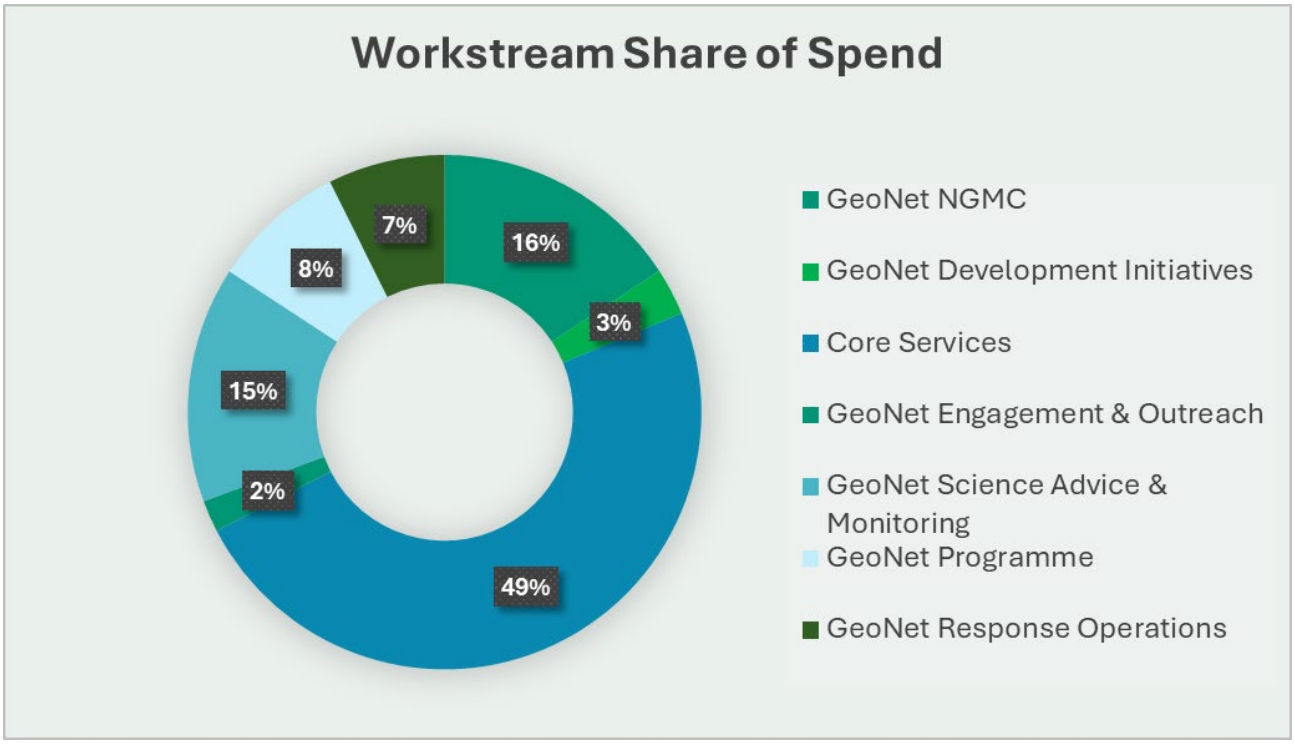
GeoNet programme risks are identified, assessed and treated using the GNS Science (now a business unit of Earth Sciences New Zealand) risk-management framework. The status of risks identified are reported through various internal and external assurance groups throughout the year. Increased risk to delivery of GeoNet products and services arose with Budget 2024, as the funding announced for the programme was not at a level where GeoNet could operate sustainably. A prioritisation framework was developed and agreed with funding stakeholders, guiding programme changes to operate within the budget envelope. This resulted in increasing programme risks, particularly related to the timely provision of accurate science advice. Steps have been taken to manage this risk; however, residual risk remains. These risks have been communicated.

Appendix 2: Finance

Percentage of Funding Contributions



Workstream Share of Spend



GeoNet Annual Report
Financial Year 2024/25

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