

Shared Situational Awareness for Emergency Management

National Lifelines Utilities Forum, 16 October 2018



Ministry of Civil Defence
& Emergency Management

Te Rākau Whakamarumaru



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Ministry of Civil Defence & Emergency Management (MCDDEM)

- Provide leadership in reducing risk, being ready for, responding to, and recovering from emergencies.
- Manage central government's response and recovery functions for national emergencies, and support the management of local and regional emergencies.

Improved situational awareness is required across the emergency management sector

- 30 August 2018, the Civil Defence Minister Kris Faafoi released the Government's response to a Technical Advisory Group's report into how New Zealand responds to natural disasters and emergencies
- The response included funding development of a business case for a Common Operating Picture (COP), with the purpose of improving situational awareness across the emergency management sector to enable informed decision-making
- The Ministry of Civil Defence & Emergency Management (MCDEM) is establishing a programme to progress this work
- The programme will be sponsored by the Director, MCDEM and governed by a multi-agency steering committee. Multi-agency Project Advisory Groups will also be established to inform streams of work.



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Key elements of the COP

Baseline and Event Data

- Essential baseline and event data is discoverable, available and accessible to relevant stakeholders
- Agencies are using authoritative sources
- Data hosting platforms are robust and scalable for use in a large-scale emergencies

Geospatial Systems

- Agencies utilise geospatial systems in a way that decision-makers can quickly gain an overview of the situation
- A centralised solution is not necessarily required; however agency-owned solutions need to share and use the same authoritative data sources
- Embedding use of geospatial systems and shared data into the CIMS intelligence cycle



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Key elements of the COP, *continued*

People Capability and Capacity

- People capability and capacity to support shared situational awareness in emergency management
- Guidance, procedures, training, exercises etc

Mandate

- Standards are set and mandated to enable information sharing across the emergency management sector

Other Information Needs

- Improved sector-wide solutions for document sharing, event logs, task and request management etc



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Scope of the initial phase COP programme

The scope of the initial phase of the programme is to:

- Develop a **shared understanding** of where the emergency management sector wants to get to and how best to get there. This will inform work being progressed across the sector and help ensure all organisations are heading in the same direction.
- Develop a **Business Case** based on the above to seek further funding.
- **Progress key elements of the COP**



Progress key elements of the COP

Progress key elements of the COP in the interim with the objective of providing immediate benefits to stakeholders as well as learnings for inclusion in the business case. In this financial year we will:

- Develop a geospatial proof-of-concept for MCDEM-led responses
- Fast-track work to make key data available across the sector. This includes ensuring relevant standards are finalised as soon as possible. This work is currently being progressed at both a central and local government level without an overarching plan. The programme will coordinate this from a national level and seek to accelerate this work.
- Implement a sector-wide solution for document sharing, event logs, task and request management. This will replace the CDEM Emergency Management Information System (EMIS).



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Existing work

There is significant existing related work in this area including:

- Needs and Damage Assessment Dataset and Data Dictionary (NDA DSD) – MCDEM
- GEOCONOPS, Minimum Essential Datasets (MED), Information Requirements (SIN/EEI/IR), Data Schemas – MCDEM led with NZGIS4EM
- Symbology Working Group – FENZ led with NZGIS4EM
- National Information Infrastructure Framework (NIIF) – StratSim
- Work to make data available
 - DIA, Stat NZ, LINZ, LUC, CDEMG's and others



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Geospatial Capability

- MCDEM have an existing programme of work to enhance geospatial capabilities within emergency management; from community resilience planning and readiness to providing situational awareness during emergencies.
- We encourage and support CDEM Groups to investigate GIS solutions as this benefits the entire emergency management sector and strengthens use in daily operations and across all the four R's – risk reduction, readiness, response and recovery
- We encourage application of information management principles, information flows (information architecture), integration, interoperability and standardisation to ensure information can be shared between agencies in the future.

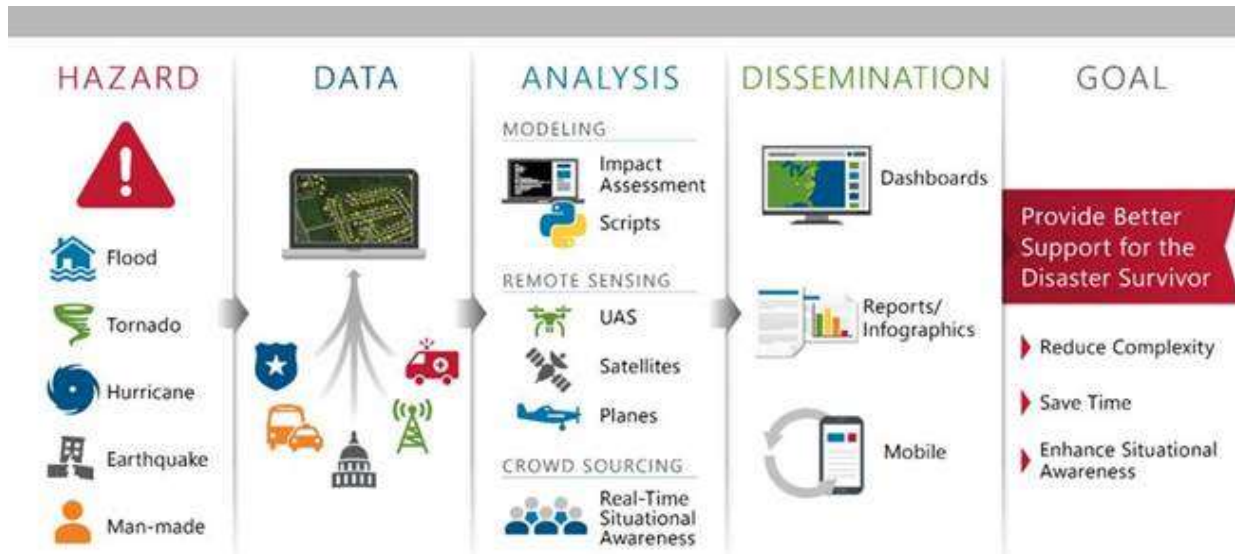


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International Best Practice

Examples: FEMA, EMSINA, UNOCHA, UNGGIM, and others



Source: FEMA (2018)



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NZGIS4EM – New Zealand GIS for Emergency Management



After the Kaikoura Earthquake in 2016, a group of Geospatial Specialists in New Zealand met in Wellington to discuss best practices for using GIS for Emergency Management. This led to...

- Paul Doherty, Eagle Technology, led workshops around the country
- A professional network with 350+ members - independent
- March 2018: Terms of Reference. August 2018: Committee



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Community – NZGIS4EM

- MCDEM are working collectively with NZGIS4EM, a community with shared interest in emergency management and GIS.
- The community provide technical advice and contribute to projects for the emergency management sector.
- Organisations generously contribute time and expertise of employees.

If you are interested in joining contact:

nzgis4em@gmail.com



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Lifeline Utilities Community

Identify the information needs from the LUC collaboratively

- Information needs, rather than data needs
- Define simple questions, terminology and symbology eg agreed levels of service degradation
- Work with MCDEM and other CDEM stakeholders to define the minimum essential datasets to enable enhanced information sharing

What information does your organisation need from the EM sector?

- Where are the information gaps?

Workshops, 17 October 2018

- NZGIS4EM for Lifelines Utilities
- ArcGIS for Lifelines Utilities



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National Disaster Resilience Strategy

Rautaki Manawaroa
Aituā ā-Motu

We all have a role in a disaster resilient nation

He wāhanga tō tātau katoa i roto i te iwi manawaroa aituā

DRAFT FOR
CONSULTATION

Vision

New Zealand is a disaster resilient nation that acts proactively to manage risks and build resilience in a way that contributes to the wellbeing and prosperity of all New Zealanders

Public consultation finishes at 5pm on Friday 7 December

Have your say about New Zealand's vision and goals for civil defence emergency management over the next 10 years

- Strategy for all New Zealanders, and all sectors of New Zealand society
- Important for individuals, community organisations, and other groups to make their views known
- Significant emphasis to the importance of community and provides clearer priorities about what needs to be done
- Developed after widespread stakeholder input and informed by international research on resilience
- Builds on recent Government decisions made on the Technical Advisory Group's report on better responses to natural disasters and other emergencies in New Zealand

Taranaki Lifeline Utilities GIS Viewer

National Lifelines Utilities Forum

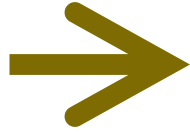
Tuesday 16 October 2018



Task

Develop a regional lifelines GIS viewer for the Taranaki Regional Lifelines Vulnerability Assessment....

With next to no budget!



Our kete has started small but we have big ambitions....

**We needed to
understand, in a
spatial manner:**



Bringing together data

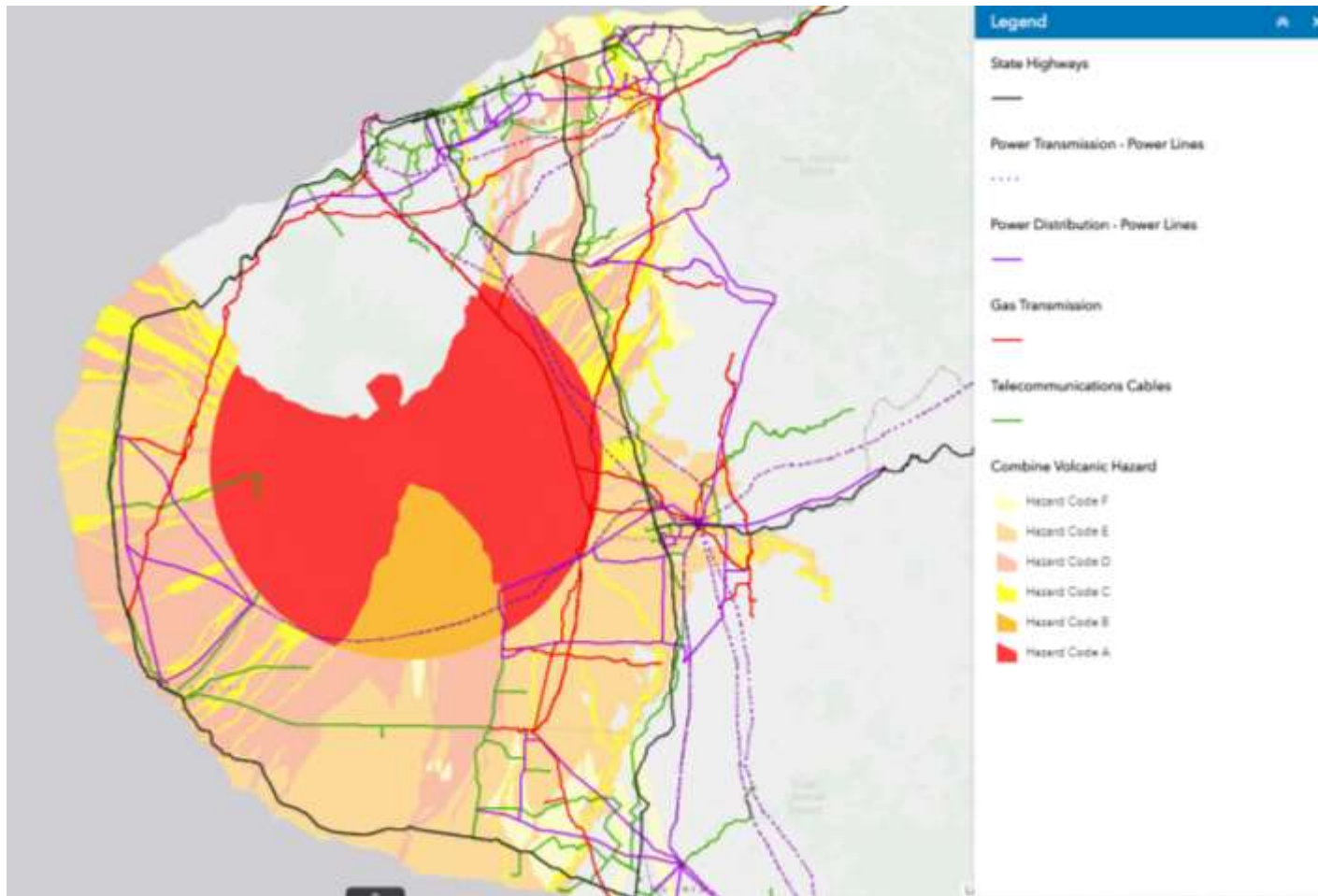
Asking nicely!



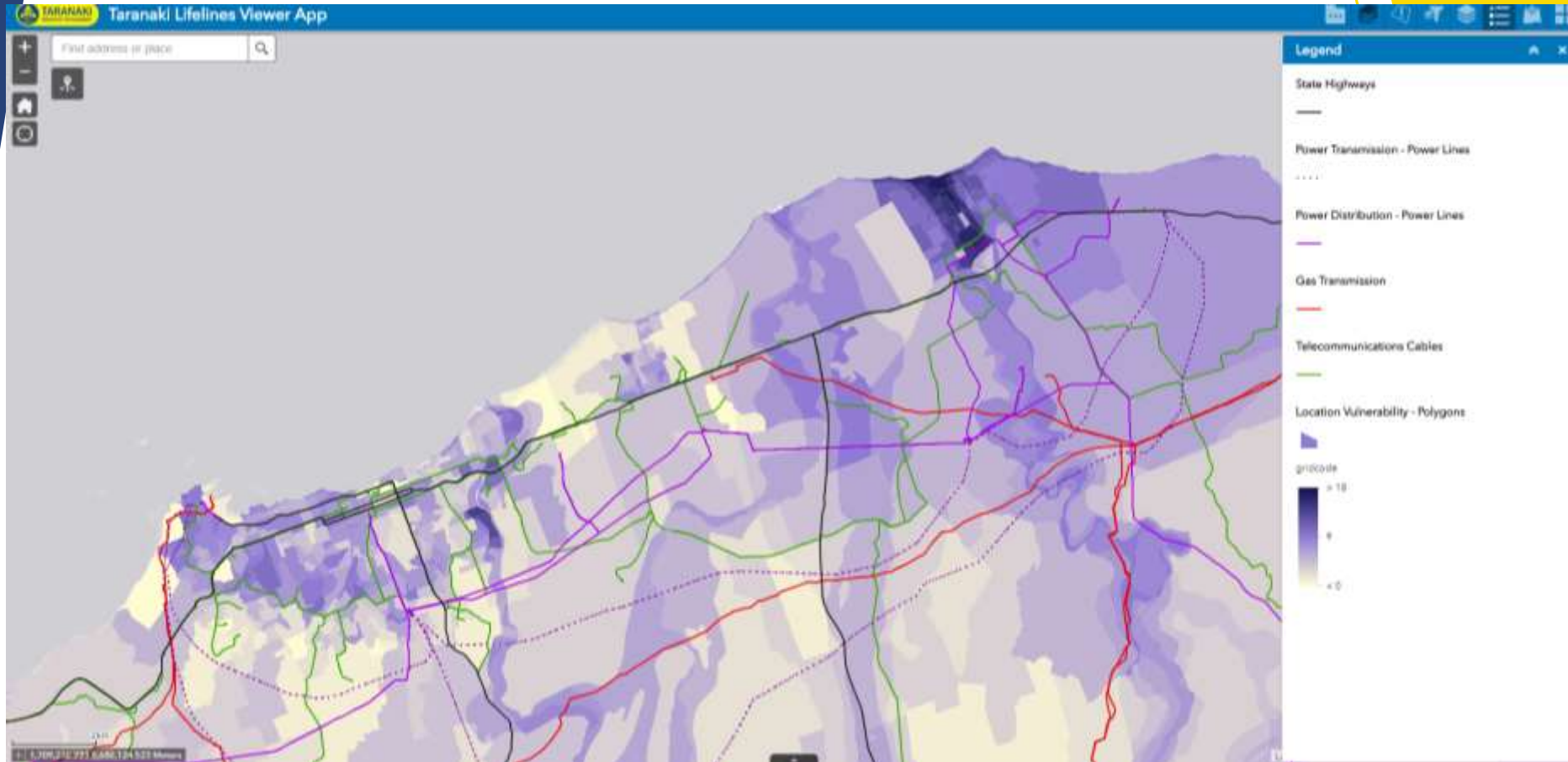
User agreements

The diagram consists of two horizontal rectangular boxes. The top box is yellow with rounded corners and contains the text 'User agreements'. The bottom box is blue-grey with rounded corners and contains the text 'Not all data is the same!'. From the left side of the yellow box, a yellow line extends to the left, then turns down and then right to connect to the left side of the blue-grey box. Similarly, from the right side of the yellow box, a yellow line extends to the right, then turns down and then left to connect to the right side of the blue-grey box. This creates a rectangular frame around the space between the two boxes, with the top and bottom lines being the same color as the boxes they connect.

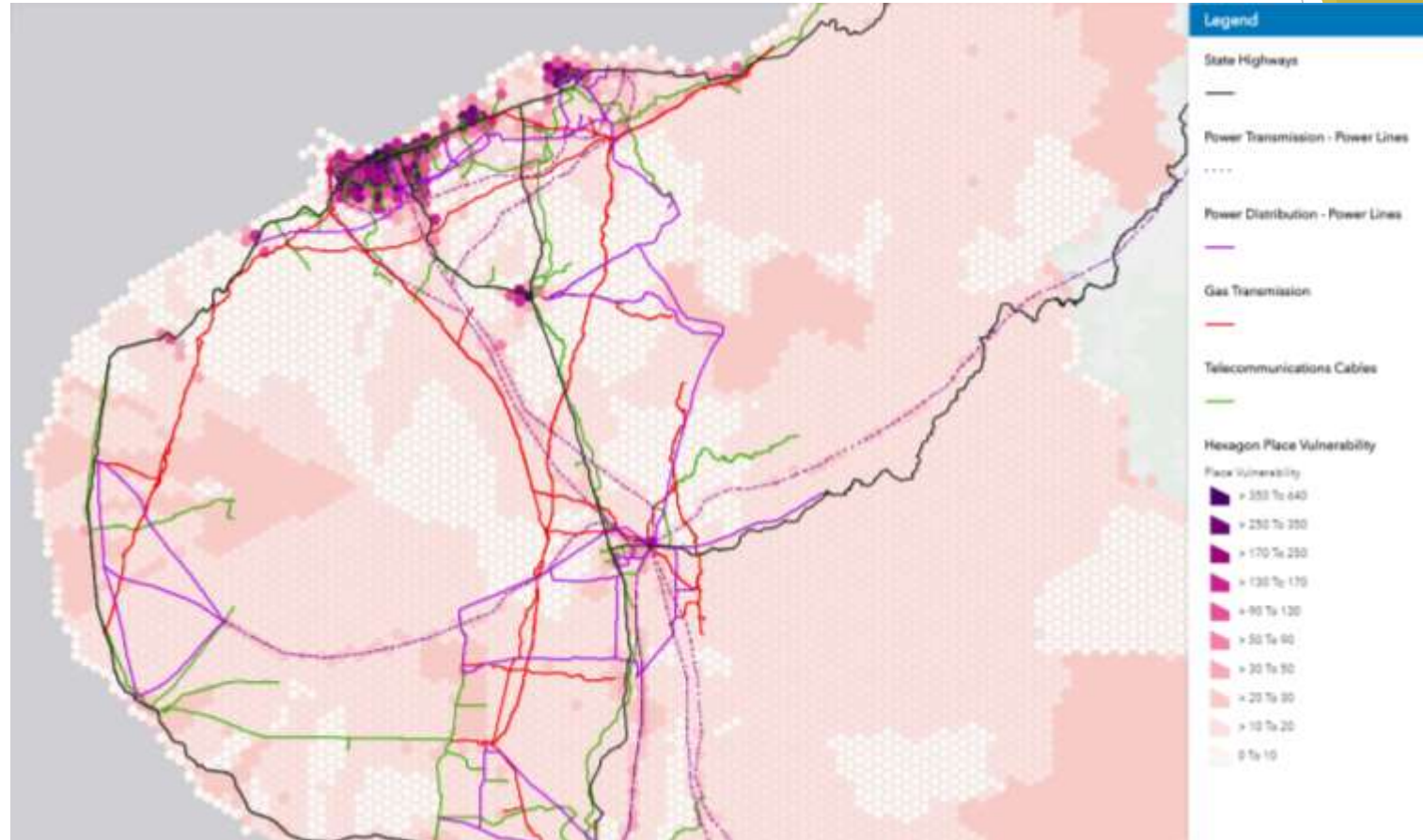
Not all data is the same!



Social Vulnerability



Lifelines Vulnerability



Key Strengths

First time bringing together the lifeline utility asset data against multiple assets

Very simple to operate

Helps the Lifelines Advisory Group to focus on geographical areas of vulnerability

Looks cool!

Key Weaknesses

It is static information - out of date already

No live update arrangements

Haven't got all the data yet

Inability to map some important hazards accurately



Conclusion

Move towards a common operating picture - national database of critical lifeline utility shapefiles with regular updates and the ability to access lifeline status information

GeoNet Update, New Zealand National Lifelines 2018

Ken Gledhill

**Technical Adviser GeoNet 2.0 (on secondment from
GeoNet Director role)**

GNS Science, New Zealand



**MINISTRY OF BUSINESS,
INNOVATION & EMPLOYMENT**
HĪKINA WHAKATUTUKI



Outline

New Zealand GeoNet: Lifelines update 2018

Introduction

- Why GeoNet 2.0?....
- In the beginning - GeoNet 0.0

GeoNet Continues....

- GeoNet 1.0
- Technical dept

Data, data, data....

- Data produced
- Processing
- International links

Future – GeoNet 2.0

- The move to full 24/7
- Future directions

Engagement

- GeoNet App, felt reporting, etc.
- Facebook, twitter, etc.

New Zealand Events During the Last Few Years

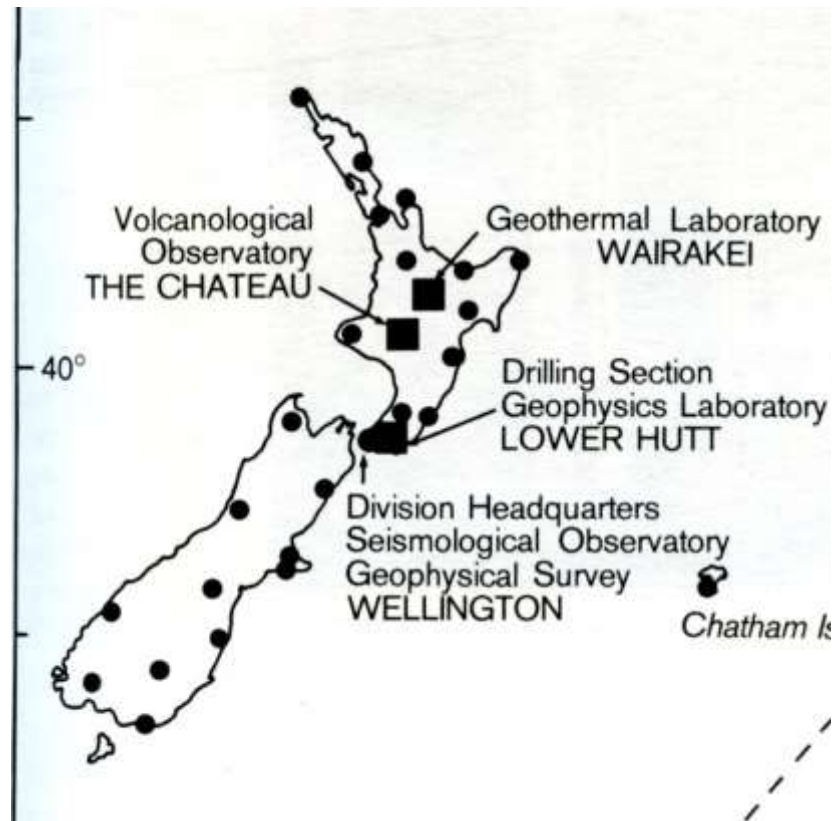
- **2009 July: Dusky Sound Earthquake (M7.8) – local tsunami**
- **2009 September: Samoan Islands Tsunami**
- **2010 February: Chile Tsunami**
- **2010 September: Darfield Earthquake (M7.1)**
- **2011 February: Christchurch Earthquake (M6.2)**
- **2011 March: Japan Tsunami**
- **2011 June and December: Canterbury Earthquakes (M6.0, 5.8, 5.9)**
- **2012 August, November: Tongariro Eruptions**
- **2013 July, August: Cook Strait Earthquakes (M6.5, 6.6)**
- **2014 January: Eketahuna Earthquake (M6.2)**
- **2015 January: Wilberforce (M6.2); April: M6.2; May: M5.8**
- **2015 September: Chile Tsunami**
- **2016 February: Christchurch Valentines Day earthquake (M5.7)**
- **2016 September: East Cape earthquake and tsunami (M7.1)**
- **2016 November: Kairoura Earthquake (M7.8) and Tsunami**

Why GeoNet 2.0: Enhanced Geohazards Monitoring?

- The Operations Centre, at the heart of GeoNet is a big and important step for GNS Science and New Zealand – adding full 24/7 response capability for the first time!
- The public perception is that GeoNet IS 24/7 - a tribute to the amazing work by on-call staff
- On day one, consistent service for 24 hours, every day; then enhancements over the next three years
- The enhancements are future focused, funded by MBIE with MCDEM as principle client and GNS as delivery partner and host
- It is a cross-government collaboration for the benefit of New Zealanders and a very important step forward for GNS Science and GeoNet

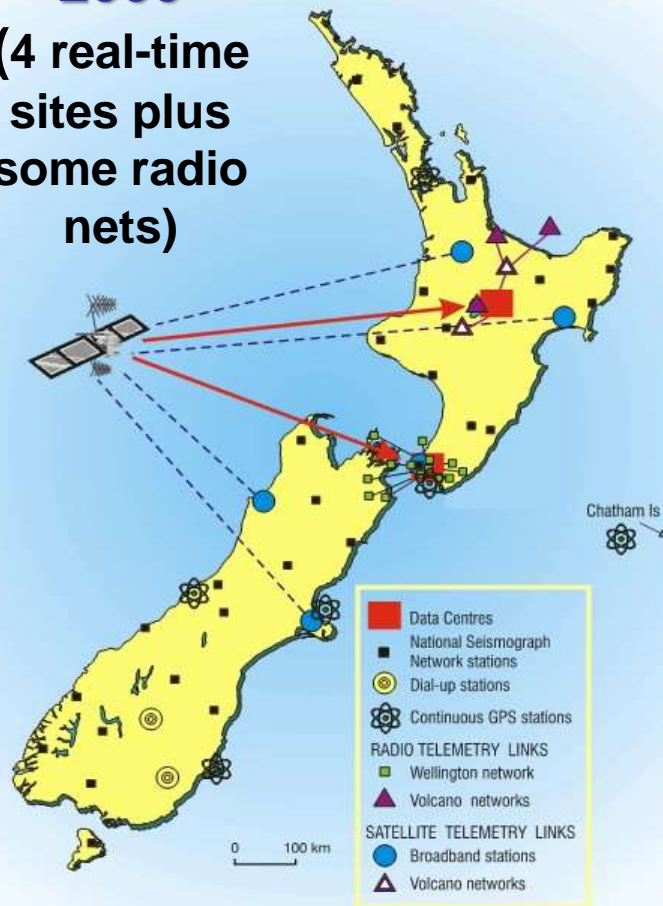
The Electric Telegraph and Earthquakes

THE use of the electric telegraph for recording earthquakes is not so new as the *Echo* (quoted in your last number, p. 35) supposes. Dr. Hector, Director of the Geological Survey, has, ever since the last great convulsion, systematically used the telegraph for this purpose in New Zealand, where indeed it forms an important element in the admirable system he has inaugurated for recording shocks throughout the islands. In his last letter he writes as follows:—"Not long ago, one operator asked another 200 miles distant 'Did you feel that?' and got the answer, 'No. What? Yes; there it is,' all in a breath, so to speak!"

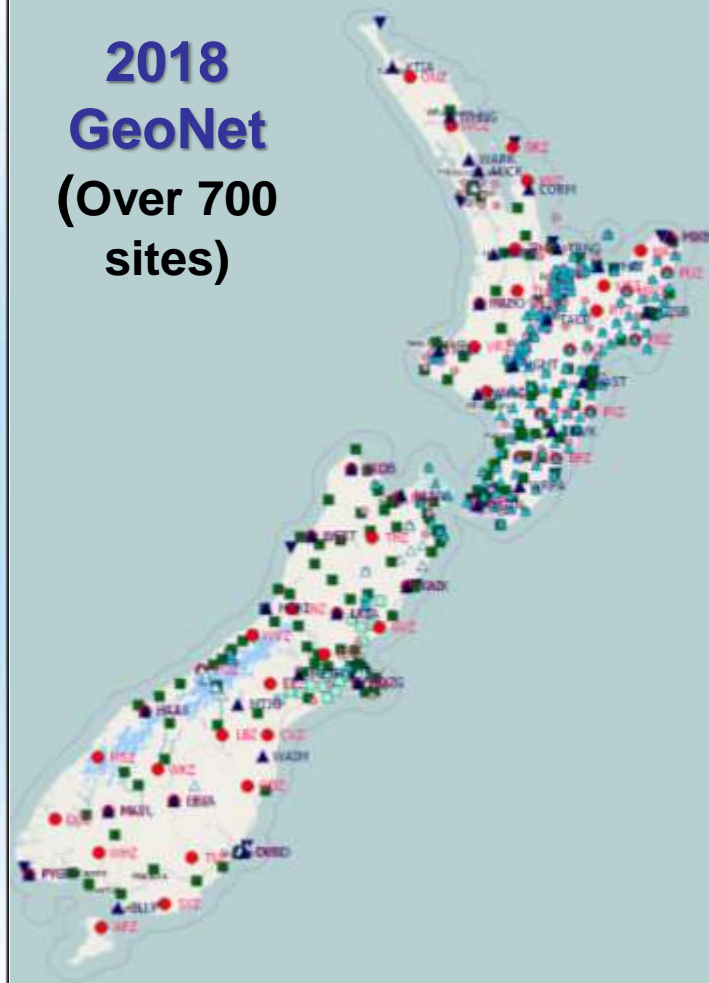


Seismograph network in 1980

2000
(4 real-time
sites plus
some radio
nets)



2018
GeoNet
(Over 700
sites)



Technical Debt and GeoNet

- After operating for over 17 years, GeoNet undergoing renewal
- Geohazards events since 2009 allowed less resources for maintenance
- EQC increased funding to ~\$12M/year from 2016 to address this
- Technical renewal is continuing
- Enhancements to geohazards monitoring (e.g. 24/7 operation) is built on the proven GeoNet infrastructure and capability

GeoNet and Technology - Currently Producing, Analysing and Making Available:

- Data from 52 broadband and 146 regional seismograph stations
- Data from 200 GNSS deformation stations; 50 streaming
- Data from >300 strong ground motion stations and 20 strong motion building and borehole arrays
- Data from 18 tsunami (sea level) gauges
- A number of medium to low data-rate data streams (chemistry, landslide monitoring)
- A total of ~10 Gigabytes of data a day
- **Total archive currently 50+ Terabytes**
- **ALL DATA freely available**

GeoNet Web Traffic 2001 to 2016

- Early years (Dino the dinosaur) 10 hits/s
- 2005 Upper Hutt earthquakes 300 hits/s
- 2010 Darfield Earthquake 5,000 hits/s
- 2012 Deep North Island Earthquake 16,000 hits/s
- 2016 Kaikoura Earthquake 35,000 hits/s

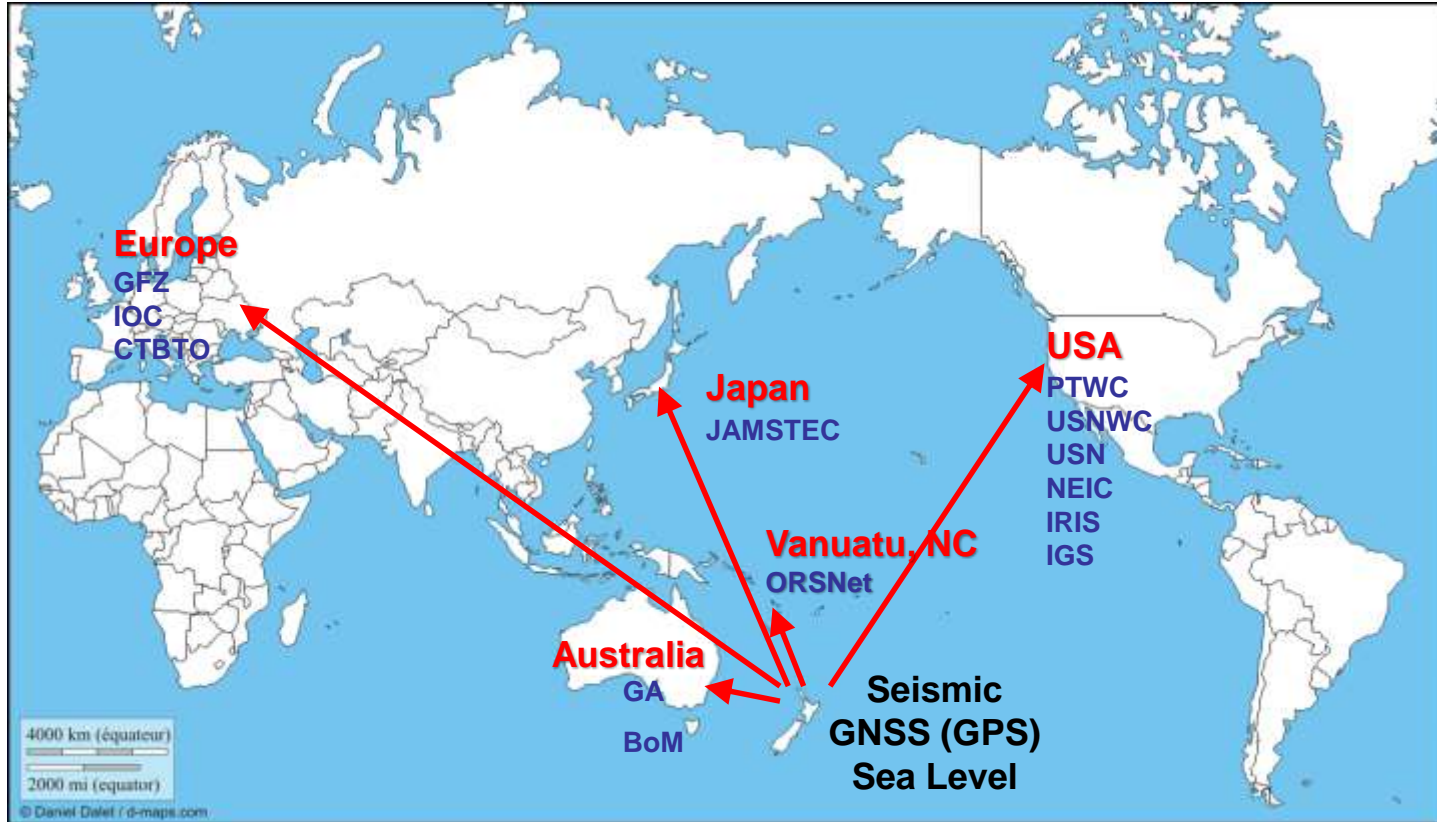


Hit rates are now running at > 1 billion per year

M7.8 Kaikoura Earthquake reached 250 million hits in the first day

Hits/s = requests received by the website per second

Real-time data sharing (seelink + FDSN webservice)



The Future of GeoNet

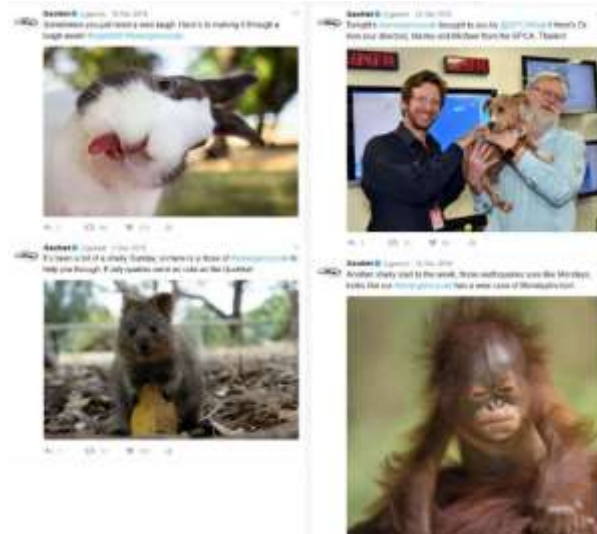
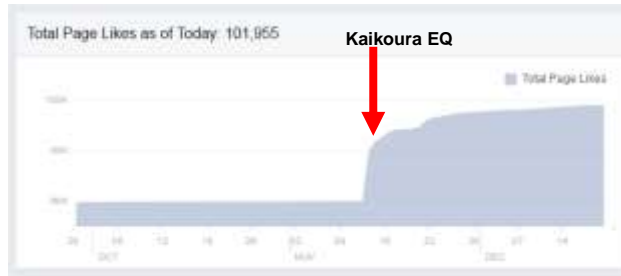
- **More active funders (EQC, LINZ, MBIE); Total funding ~\$NZ20M per year**
- **Increasing scope (and complexity) with the introduction of full and active 24/7 monitoring**
- **GeoNet governance – A new governance and contracting structure being finalised**
- **24/7 Operations Implementation Timeframe:**
 - 15 Geohazard Analysts currently nearing end of training
 - 24/7 operations centre nearing completion
 - “Soft” launch in October – day shifts only
 - “Hard” launch in November – full shifts
 - Official launch in December 2018.

GeoNet Mobile App ~400,000 active users



Social Media

- **Building trust before an event**
 - GeoNet was top of Google NZ in 2016
- **Gives GeoNet a authentic, personalised voice**
- **Fast way to talk directly to the public (and media)**



Questions?

Also see:



www.geonet.org.nz; www.gns.cri.nz



www.facebook.com/geonetnz



twitter.com/geonet



www.youtube.com/user/GeoNetNZ



Land Information
New Zealand
Te Kaitiaki

Resilient New Zealand Based on Integrated Land, Coast and Marine Data Sources

Graeme Blick
Group Manager Positioning and Resilience

National Lifeline Utilities Forum 16 October 2018

Focusing on key challenges

Challenge



Water



Resilience and climate change



Urban areas

Description

Contribute to better management of fresh water, including quality and allocation (3-waters are in 'urban areas').

Support efforts to prepare for, mitigate and adapt to the impacts on land and sea of climate change and one-off events (natural and man-made).

Contribute to managing and responding to pressures on urban areas from population growth.

LINZ's key activities:

- Identify key datasets and implement an improvement plan
- Provide authoritative national datasets that are openly available and can be relied on – reduction, readiness, response, and recovery
- Formalise the support role offered by LINZ during an emergency event

To support more effective risk management and response to and recovery from an emergency event.

Key datasets



Address
Buildings
Property
Population



Road Network
Rail Network



Aerial Photography
Topographic Map
Elevation

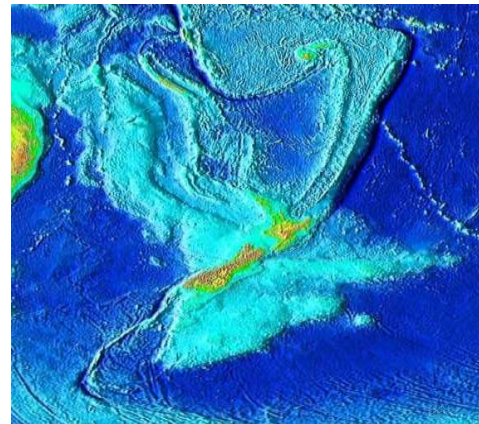


River Network
Water Catchments
Coastline

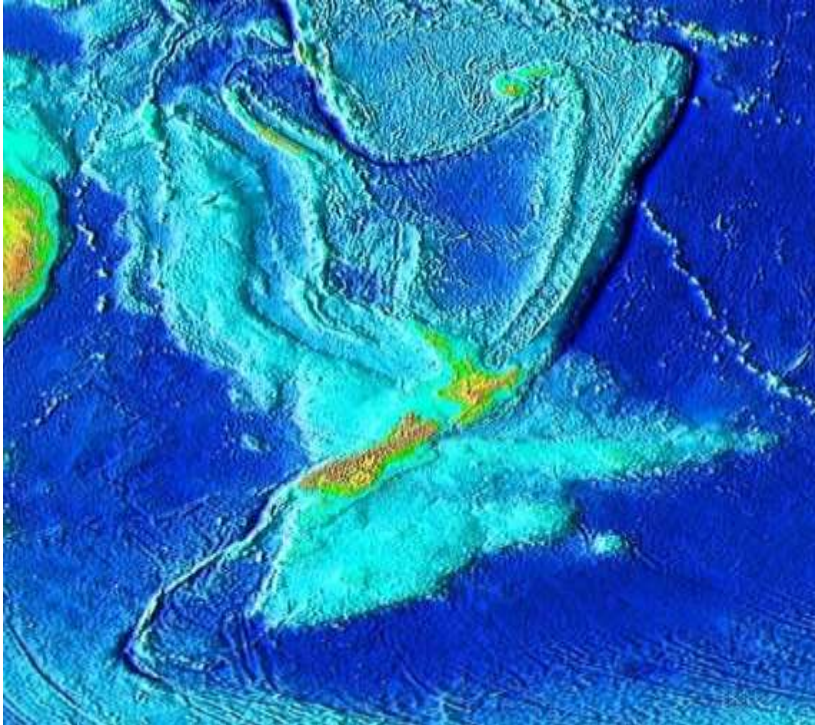
Mapping NZ 2025

Mapping NZ 2025 is a 10-year programme of leadership and coordination by LINZ.

It aims to ensure seamless, integrated mapping and provision of national datasets that help answer the most critical 'Where' questions.



Mapping NZ 2025



*** Address**

*** Aerial Photography**

*** Building Outlines**

*** Coastline**

*** Elevation**

Population Data

*** Property Boundaries**

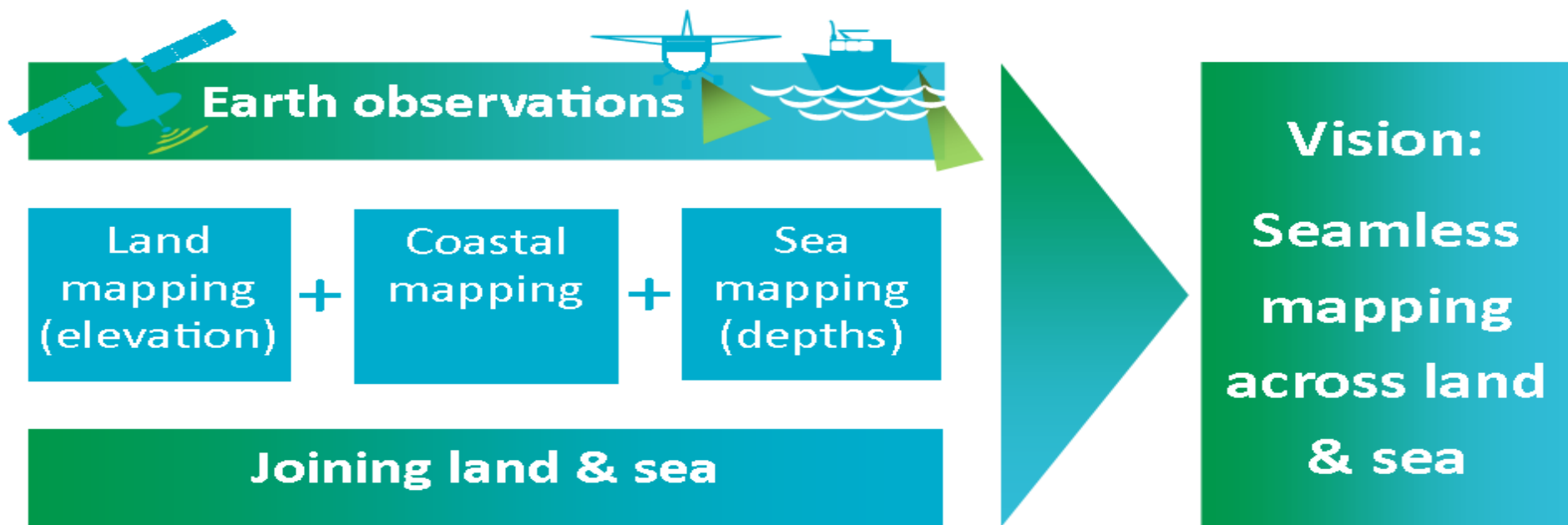
Rail Transport Network

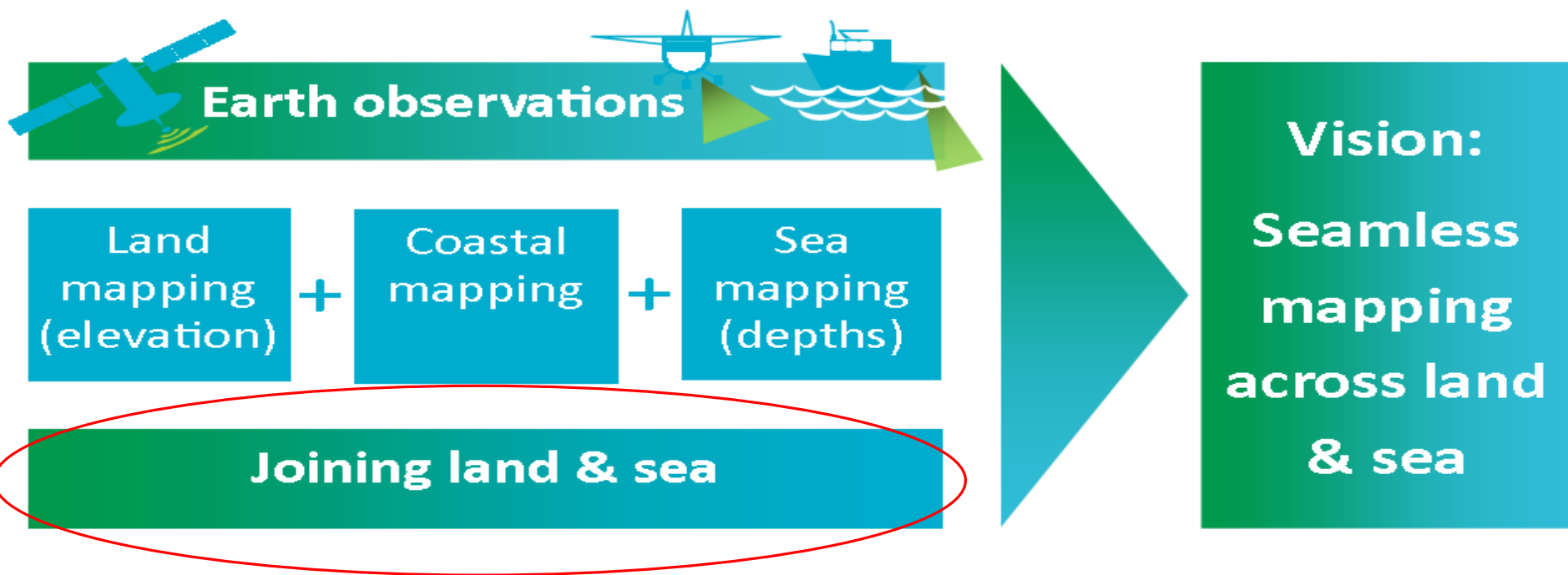
*** River Network**

*** Road Transport Network**

*** Topo Basemap**

Water Catchment Boundaries



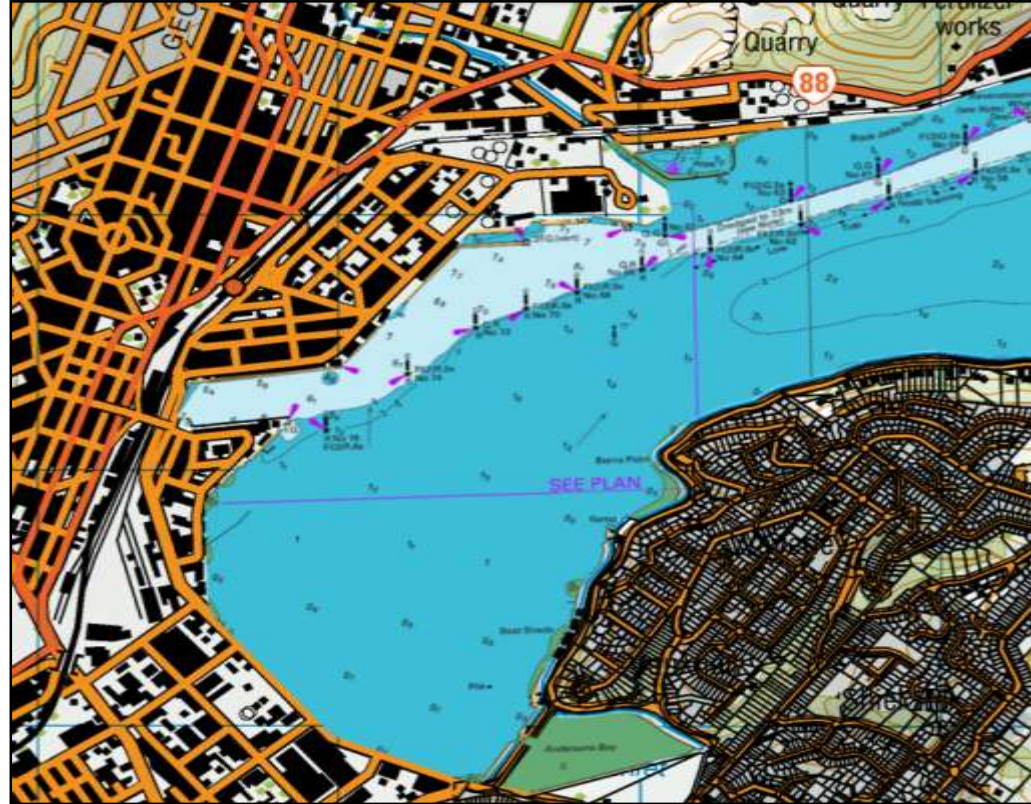


Joining Land and Sea datasets

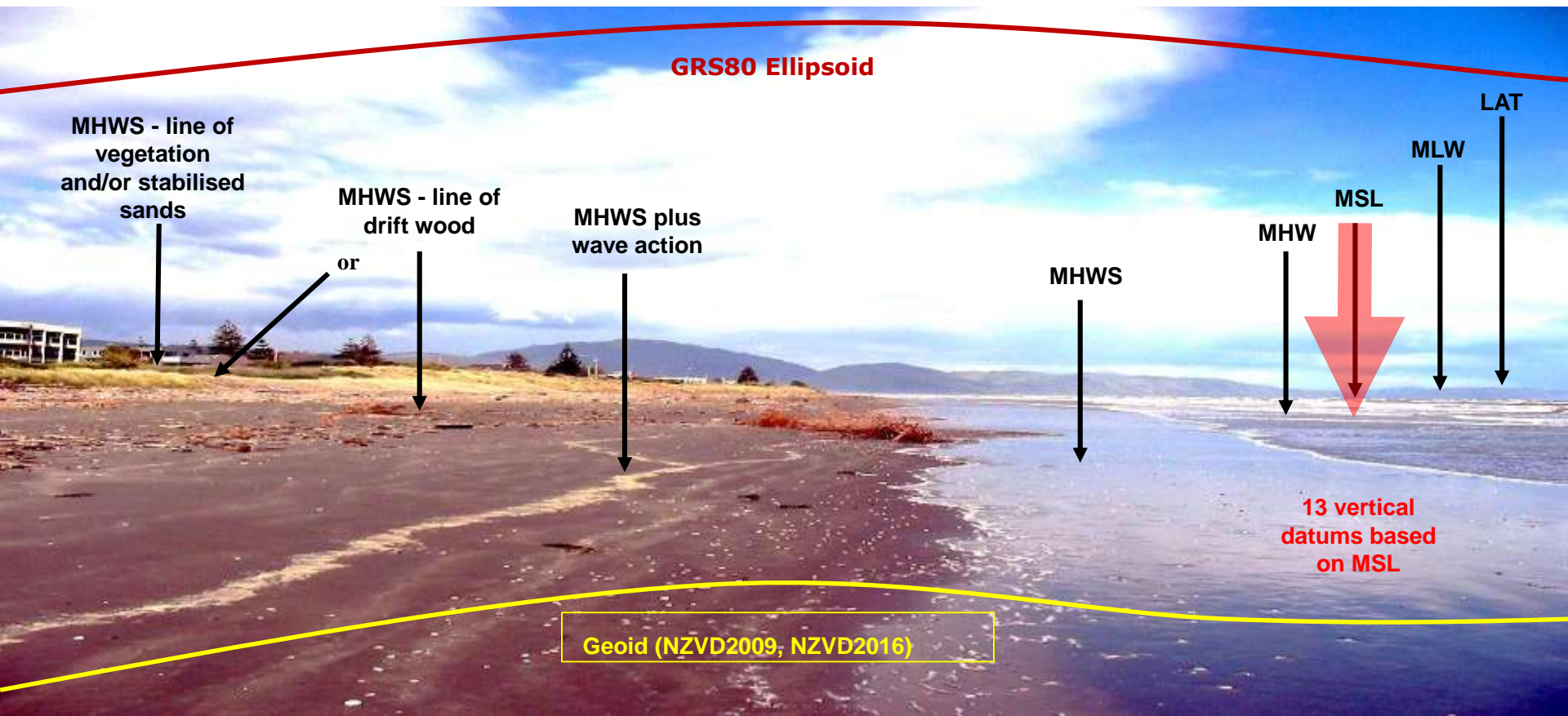
Datasets usually defined in terms of different vertical datums and reference surfaces:

- Topography – MSL
- Hydro – LAT/CD
- Cadastral – MHWS
- Geodesy – MSL & ellipsoid

The challenge is to combine different datasets



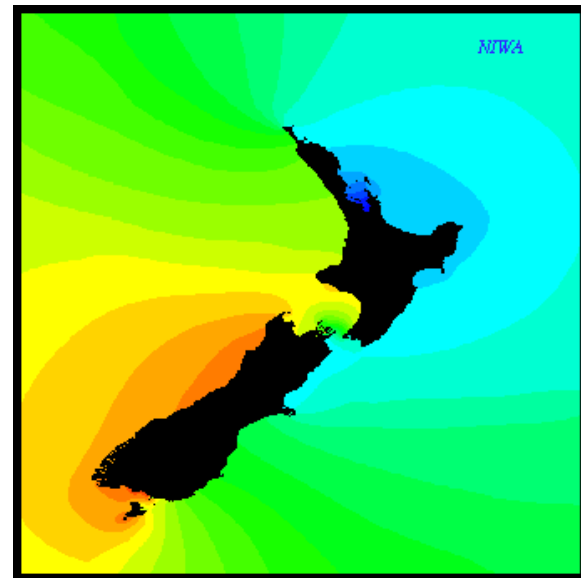
Reference frames/datums



Joining Land and Sea (JLAS)

Aim: To provide the transformations between physical and geometric vertical datums to enable datasets to be collected in terms of a consistent vertical datum across the land and sea and to compute sea level boundaries and heights away from tide gauges.

1. Consulting with peers – NIWA, GNS, industry ✓
2. Reviewing international solutions ✓
3. Assessing our current tidal and geodetic data
4. Implementing a solution for NZ

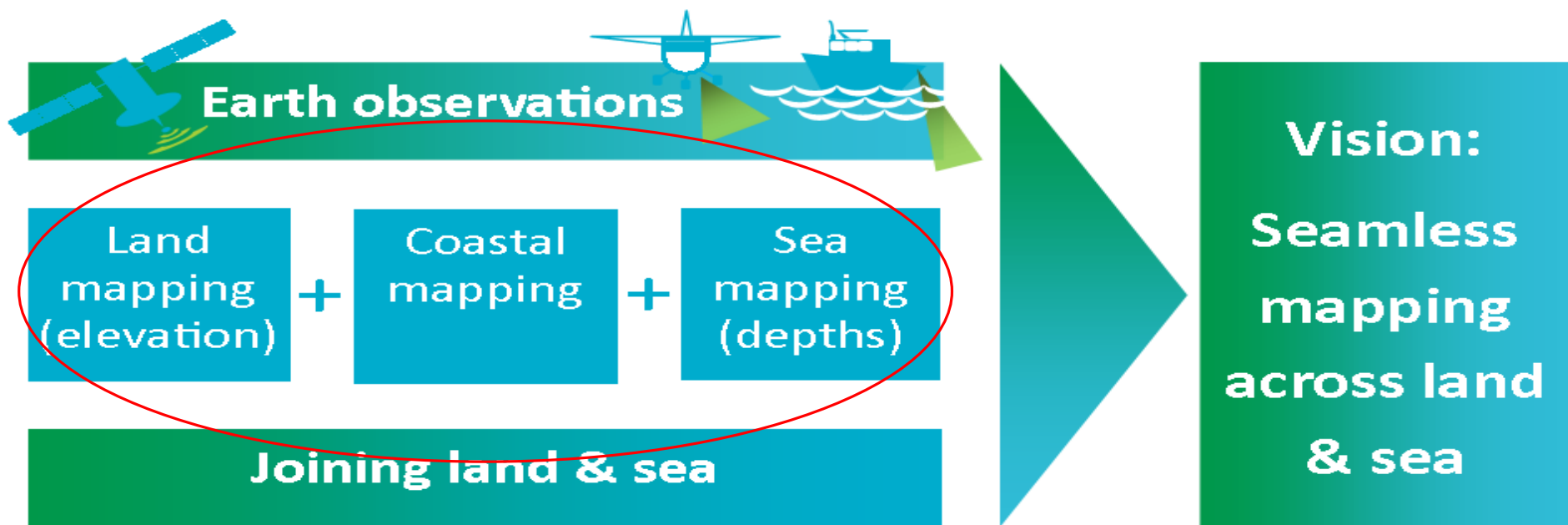


The Result



With better coastal elevation data coastal boundaries will be able to be better mapped and monitored and heights in terms of these boundaries determined

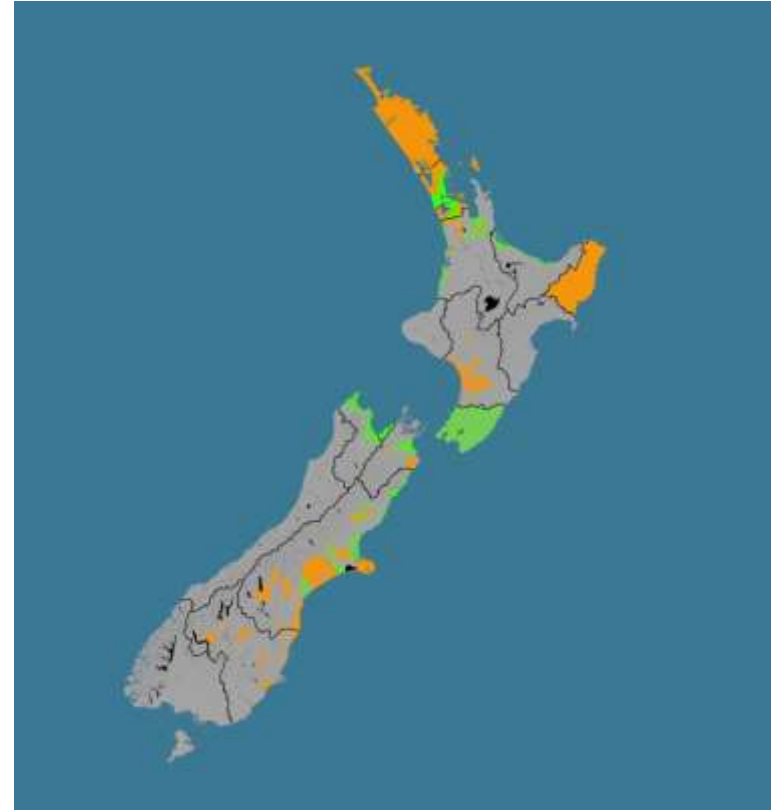
Integrating Land and Sea



LiDAR coverage

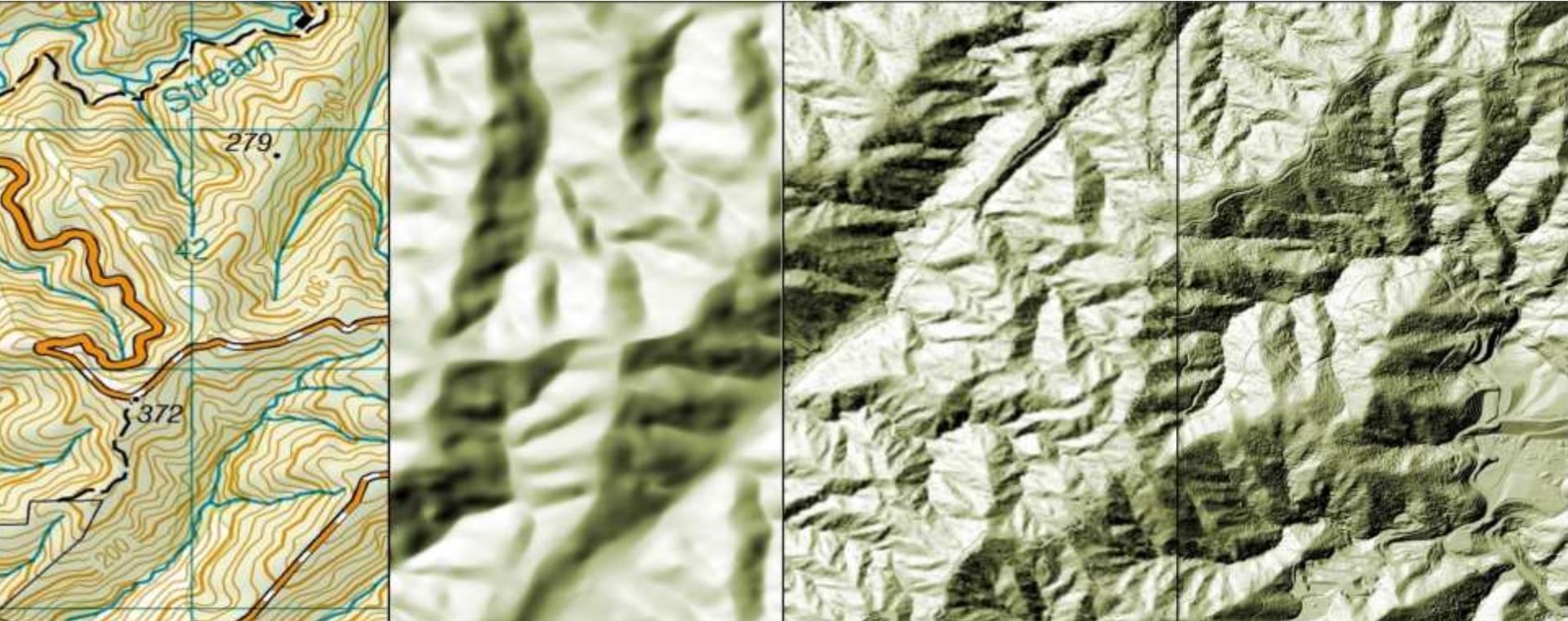
LDS now - 18,000 km²

In progress - 33,000 km²



National Elevation Improvement

“Changing the source elevation data from mapping contours to LiDAR provides the DEMs required for better interpretation of remote sensing data.”



Sumner flood risk example



National DEM – 10m accuracy



0-2 m

2-4 m

4-6 m

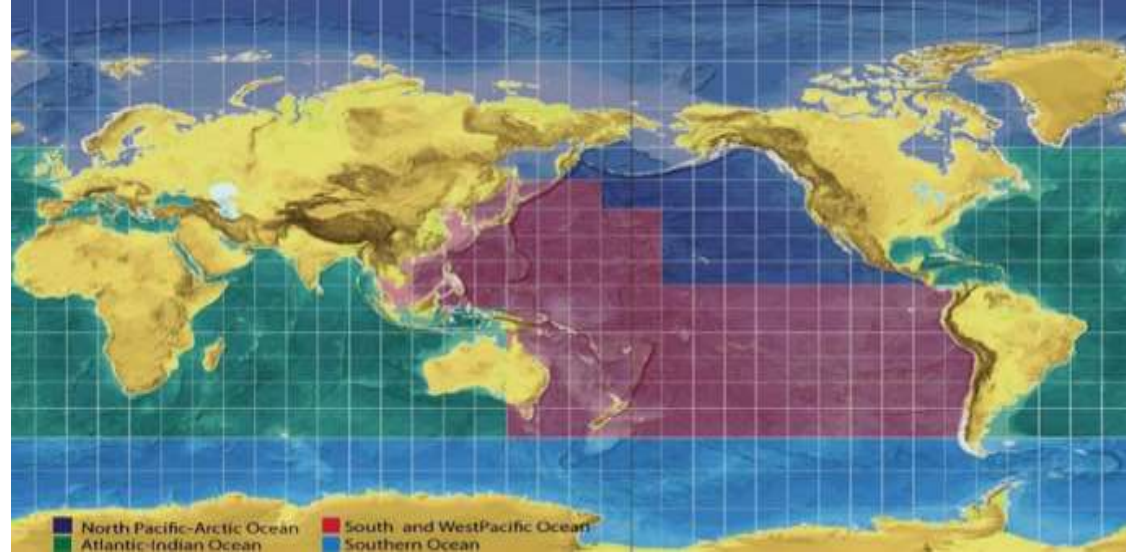
6-20 m

LiDAR provides sub-m accuracy

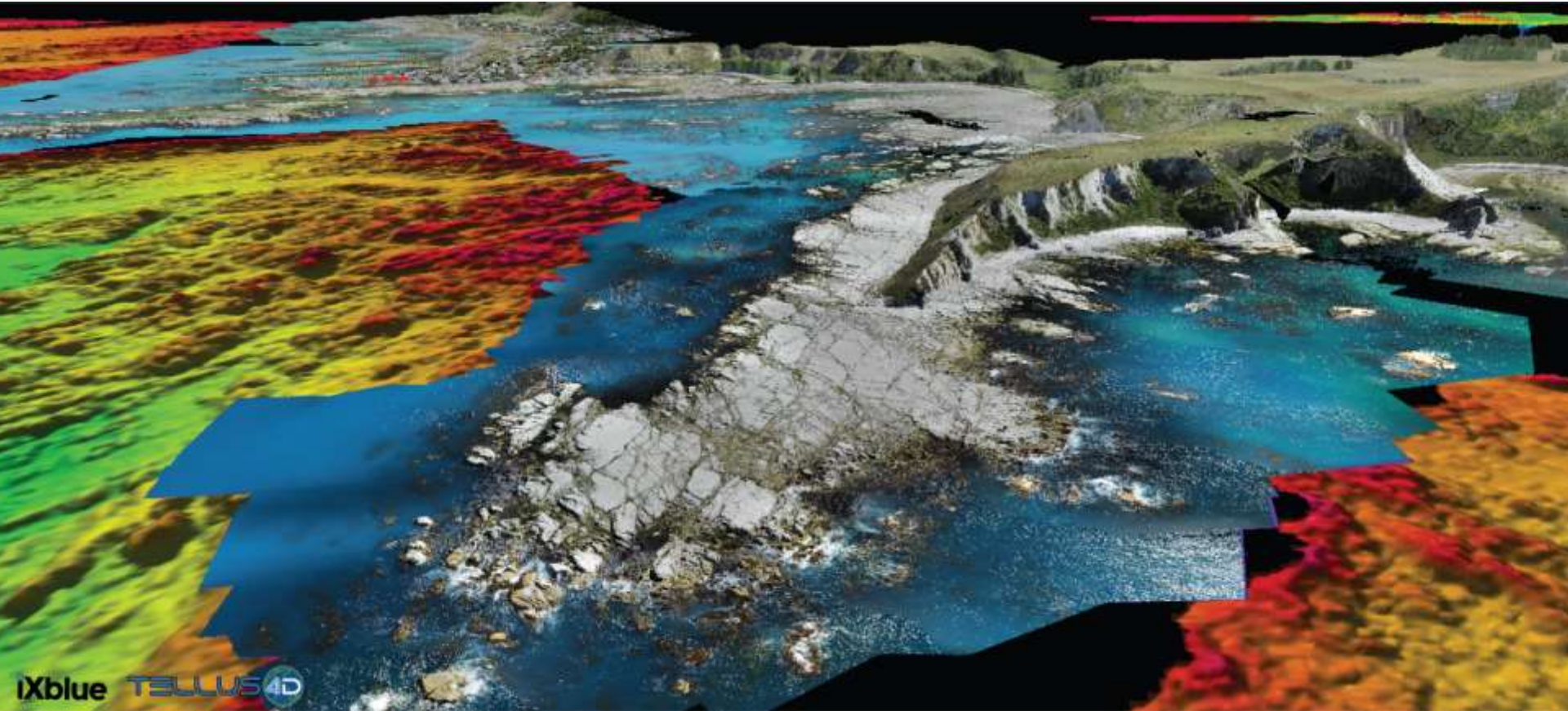


Improving national bathymetry

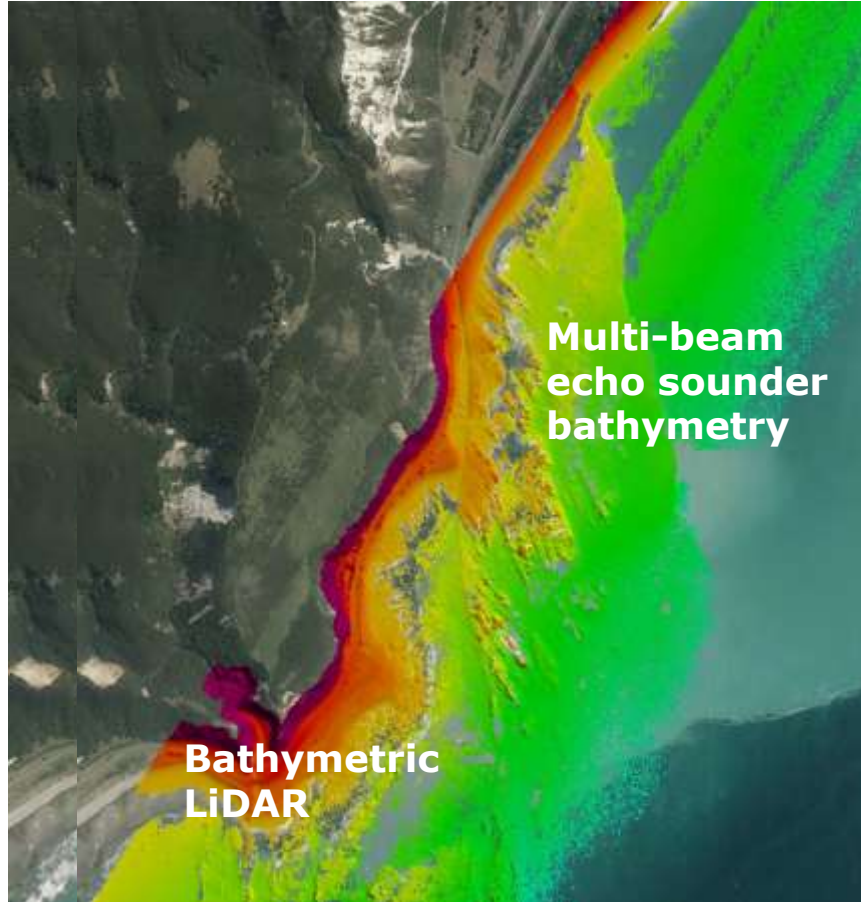
- Operating survey programme and partnerships.
- Joint agency work on international initiatives (Seabed 2030).
- Gathering bathymetric data from research vessels.
- Focus on near shore mapping



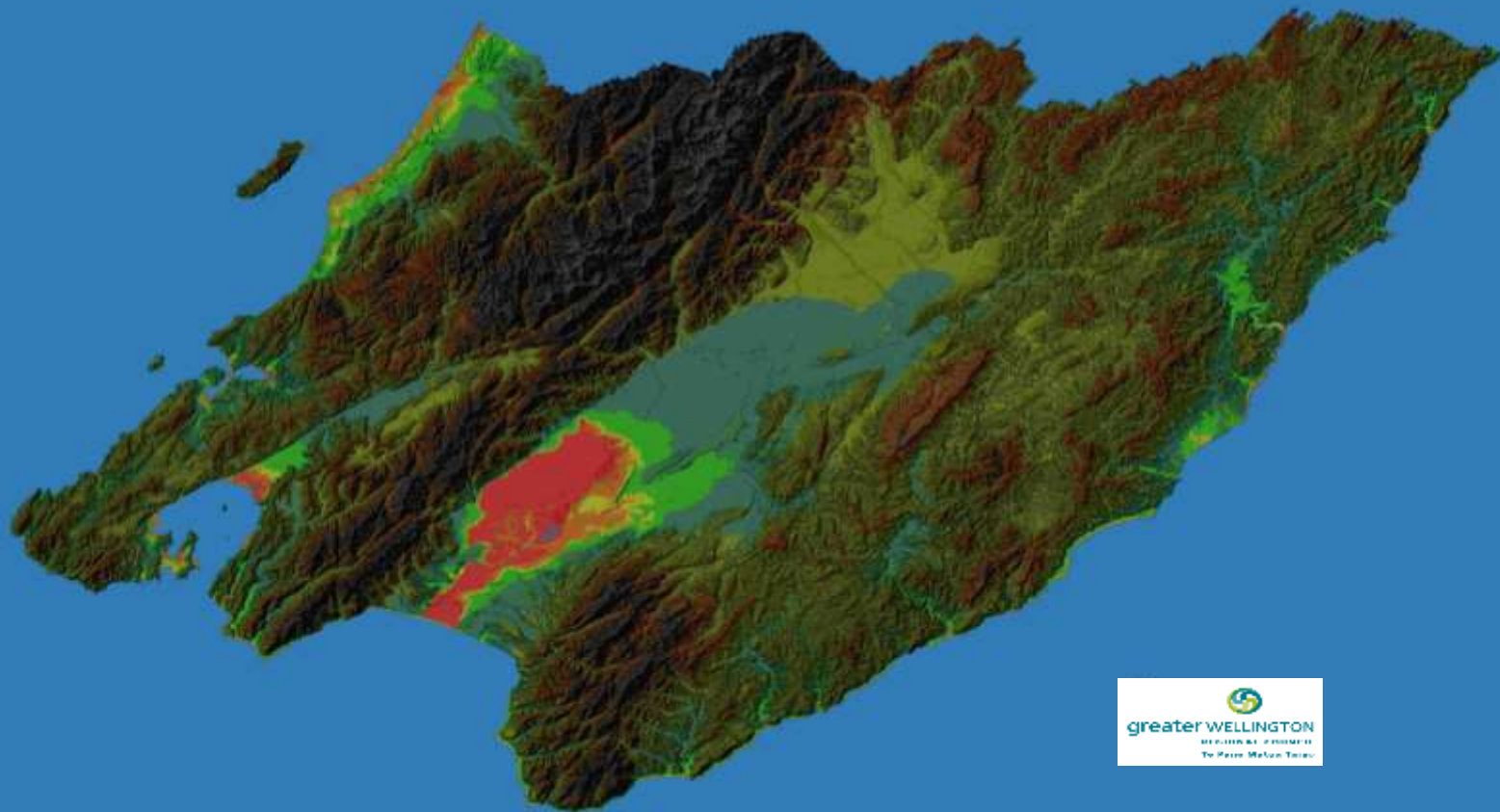
Bathymetry



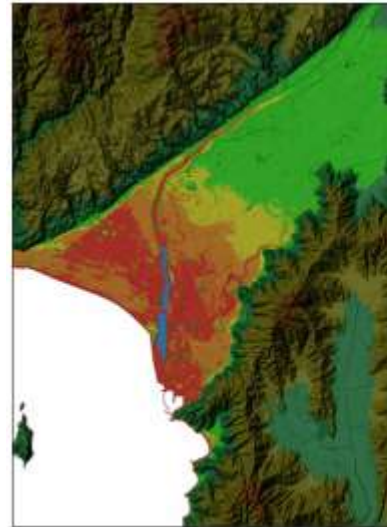
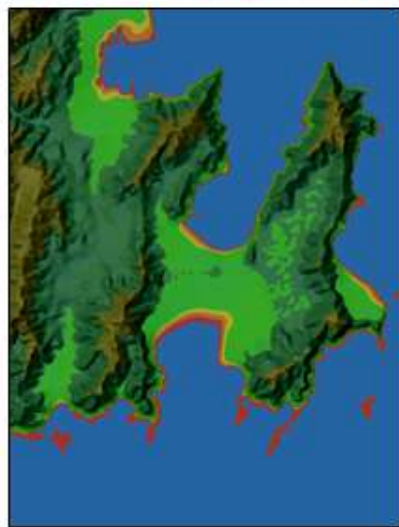
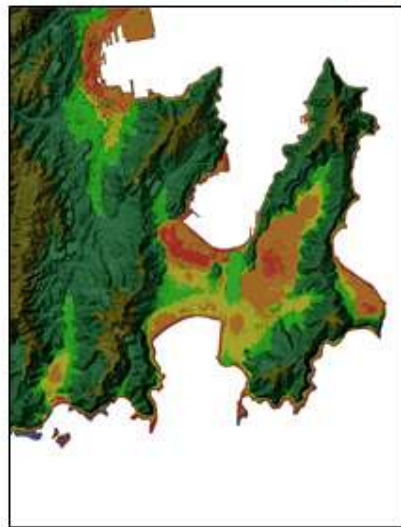
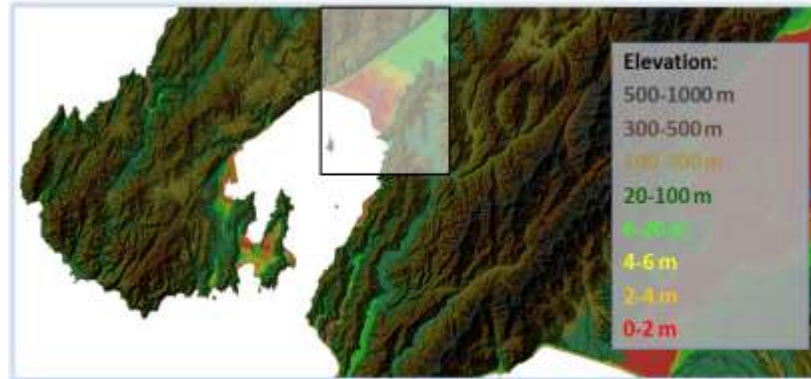
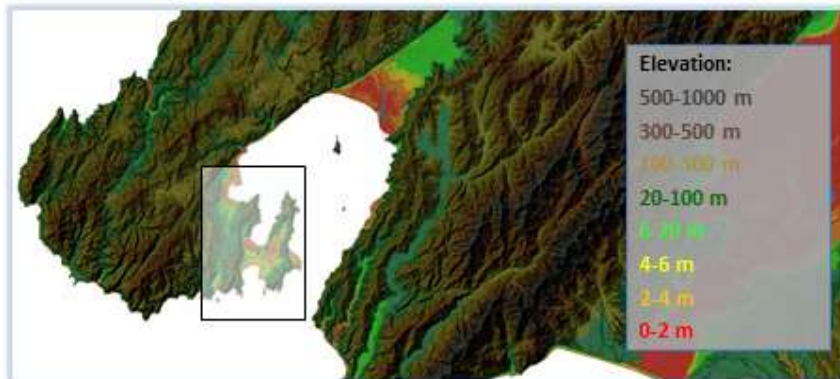
Filling in the missing piece



Wellington region-wide LiDAR



Wellington region-wide LiDAR



Integrating elevation and bathymetry



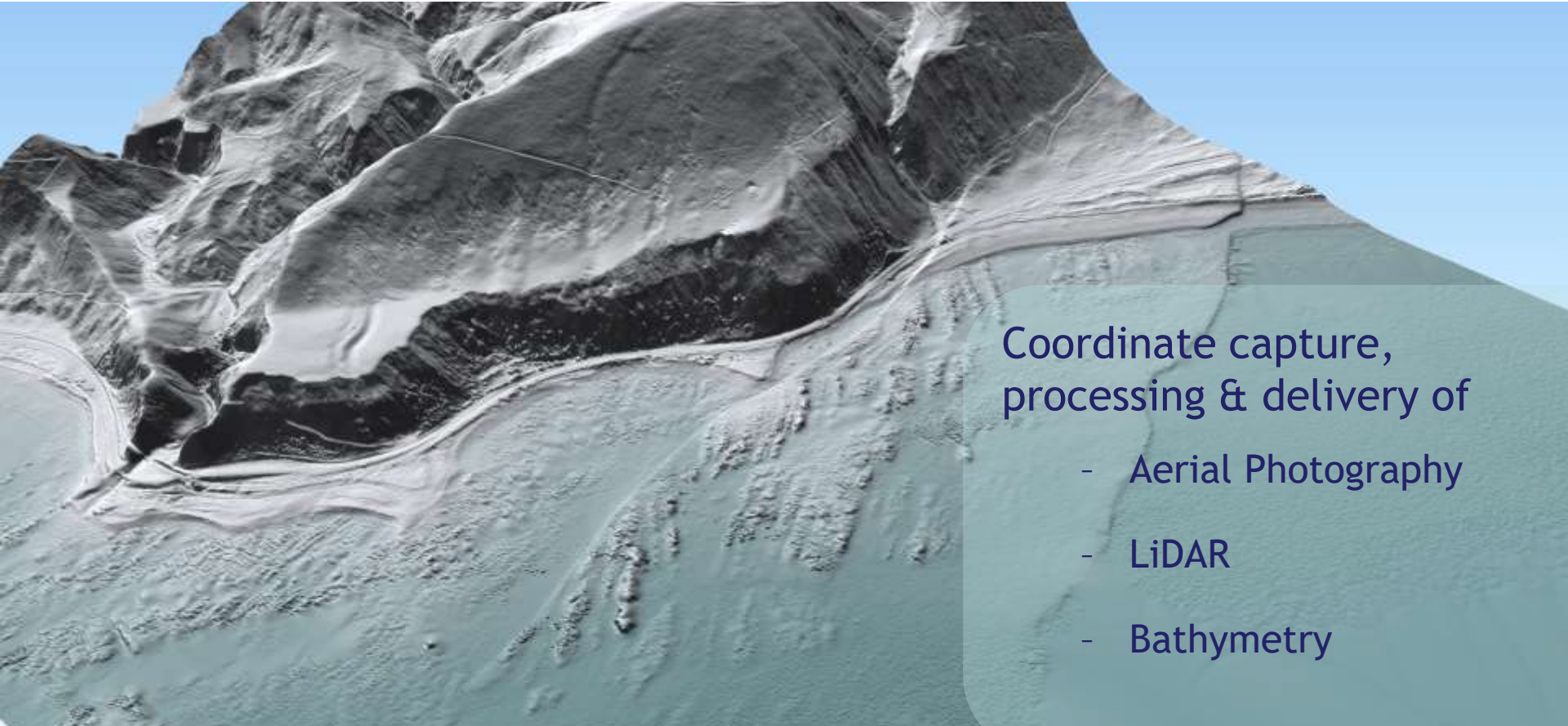
Integrating elevation and bathymetry



Coastal mapping pilot project



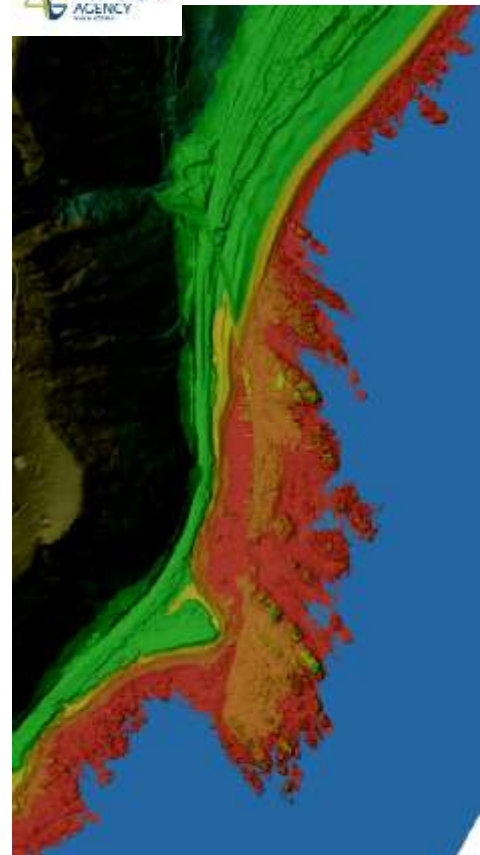
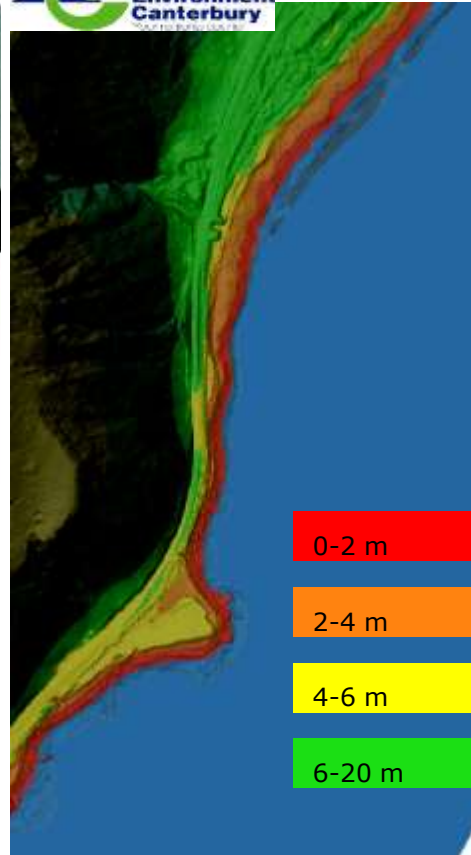
Role of LINZ in emergency response



Coordinate capture,
processing & delivery of

- Aerial Photography
- LiDAR
- Bathymetry

Immediate need for post-event imagery and LiDAR



An aerial photograph showing a coastal landscape. On the left, a river delta flows into a large body of water. The land is a mix of light-colored, possibly sandy or silty, areas and darker, vegetated regions. The water is a deep blue. The word "Questions" is overlaid in white text on the right side of the image.

Questions