

Update June 2024

Tahuri mai o kamo ki ngaa Paanui o tew aa o Future Coasts Aotearoa

Good day and welcome to the third Future Coasts Aotearoa (FCA) update. The Future Coasts Aotearoa Endeavour research programme team want to ensure our stakeholders are up to date with our progress and achievements. In this newsletter, we present significant reports completed, individual highlights from our Research Aims and the release of some FCA-produced tools and datasets to the public. Among these is our first StoryMap, summarising freely available datasets for coastal lowlands, along with the highly anticipated reports for the Systems Diagrams of the Lower Waikato Case Study. We have exciting developments on the horizon, including new groundwater guidance tools, an initial evaluation of elevation capital in New Zealand coastal lowland systems, and the unveiling of our first multi-hazard serious game. We trust you'll find these resources both valuable and enlightening.

Best regards,
Dr Christo Rautenbach.
Programme Leader

Future Coasts Aotearoa Video



Future Coasts Aotearoa is a five-year (2021-2026) collaborative research programme led by NIWA that aims to transform coastal lowland systems threatened by relative sea-level-rise into prosperous communities.

[Check out our video to find out more.](#)

CONSEQUENCES

Research Aim 2

Build fit-for-purpose, multi-wellbeing evaluation tools

Lower Waikato Case Study investigates best ways for communities to respond to sea-level-rise



Photo Credit: Stu McKay/ NIWA

Te Puuaha o Waikato pictured above is an area traditionally demarcated by tangata whenua as starting near the town of Te Paina (Mercer) and following the flow of the Waikato River westward to the sea at Port Waikato.

The results of our case study in Te Puuaha o Waikato investigated a gamut of options for assisting our communities, using the best available information, to respond effectively to future sea-level rise. Our primary focus is on marae and hapuu, but with additional outcomes to support wider community decision-making. The latest causal maps, systems updates and reports are now available. Case studies are happening around Aotearoa-New Zealand as part of the Future Coasts Aotearoa Endeavour Research programme.

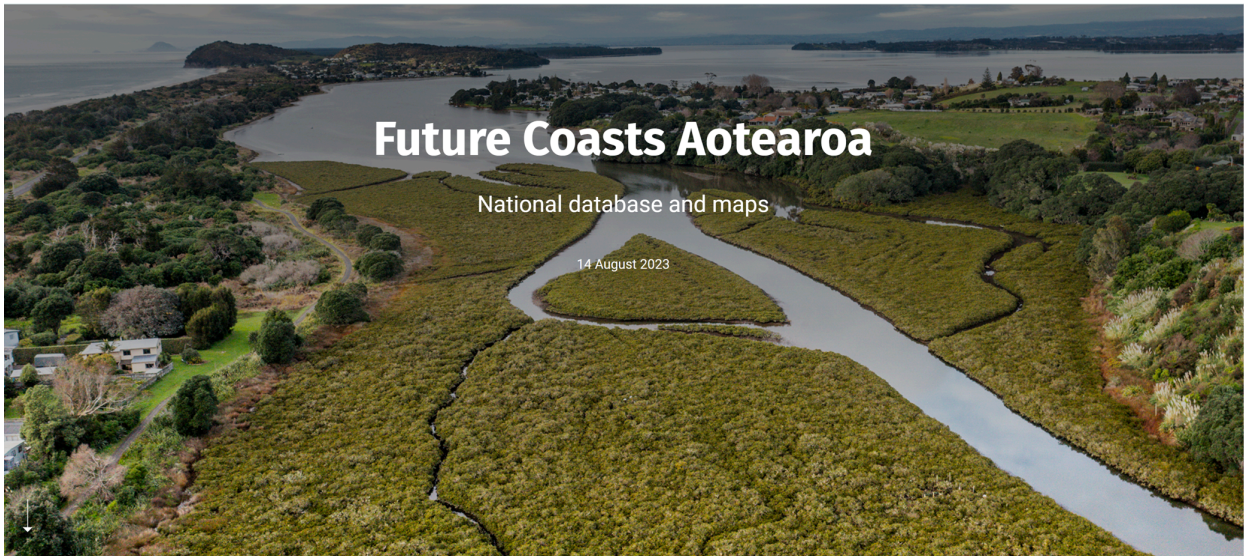
[Read more](#)

EXPOSURE

Research Aim 1

Advance understanding of the physical impacts of sea-level rise

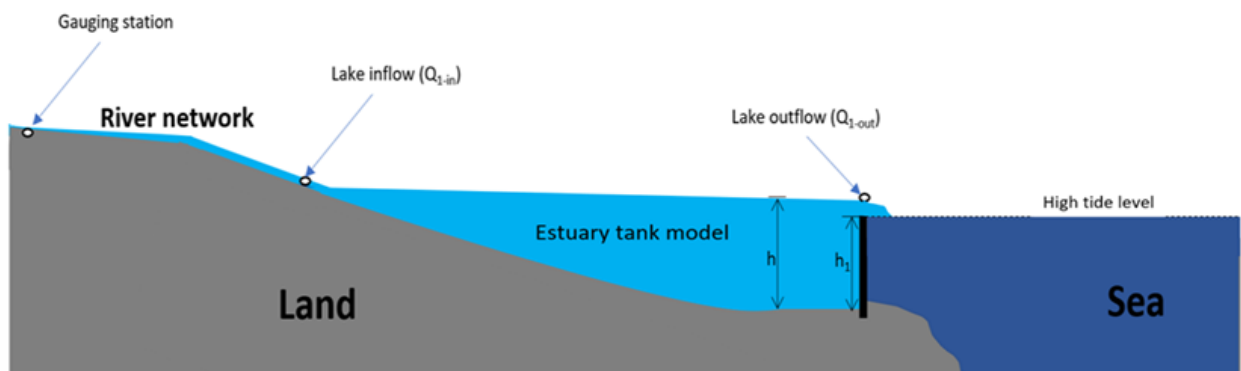
New one-stop-shop for wetland data



The FCA National database and maps is the programme's first collection of spatial information freely available. Everything you need to know about wetlands we've put in one place for you to view and bookmark.

Future Coasts national database and maps

Parsimonious estuary model to simulate the impact of sea-level rise

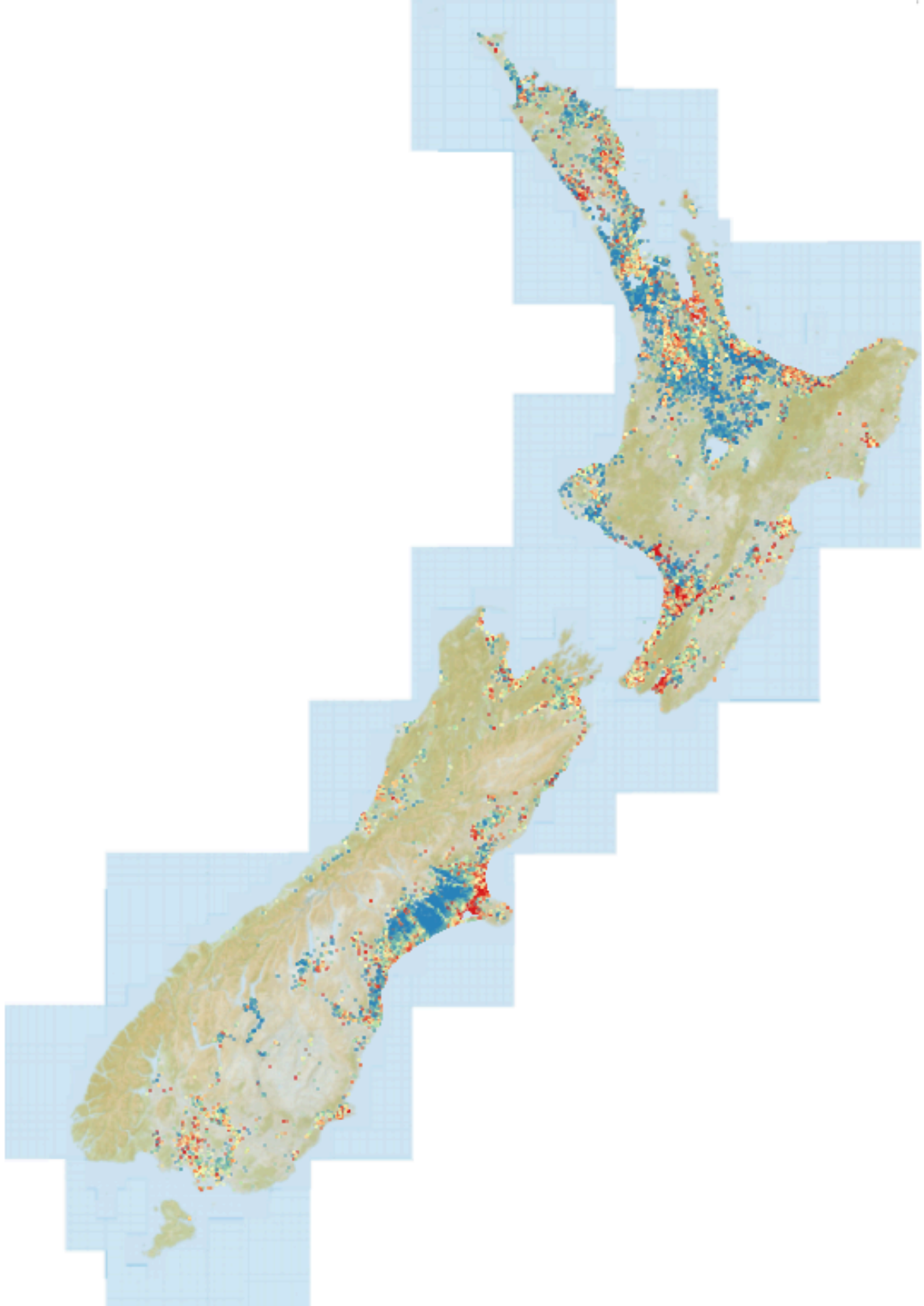




The New Zealand Water Model (NZWaM), which currently models river flows across New Zealand, is being used to simulate the impact of tidal inundation on estuary water levels during high flow events. This is achieved by using a parsimonious ‘tank model’ to represent an estuary at high tide (Figure 1). The model is currently being validated for the Ashley River in Canterbury (Figure 2) and will then be used to assess the impact of higher tidal inundation associated with future sea-level rise scenarios. The model will be trialled at two other locations in New Zealand with a view to extending the model at a national scale.

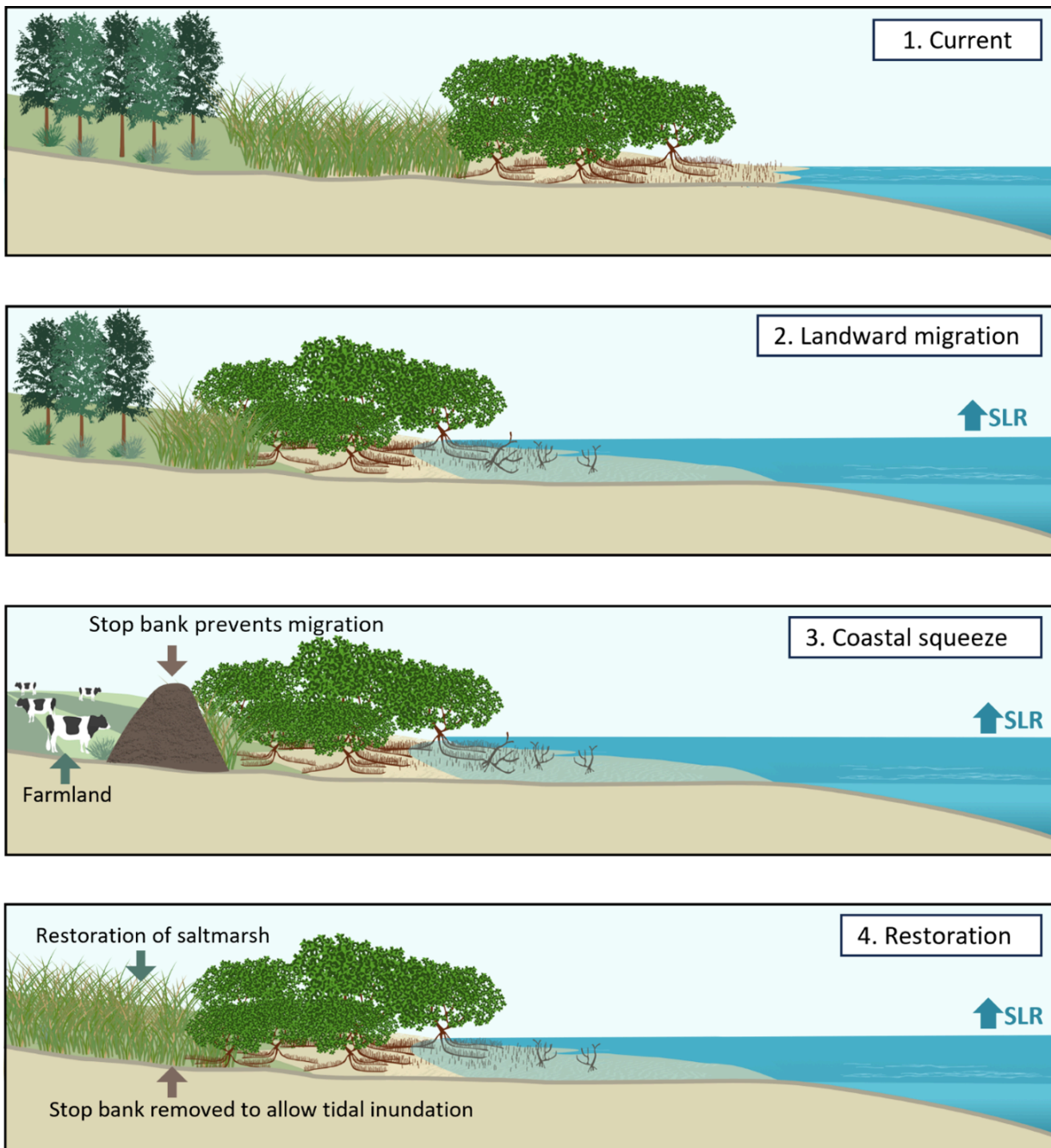
[Read more](#)

A comprehensive national groundwater data layer for Aotearoa



Groundwater level data is a key input to our understanding of both current and future shallow groundwater hazards in our coastal lowlands and to a broader range of water resource investigation, management and research activities. As part of FCA a team is in the process of publishing this national groundwater data layer in conjunction with the Python code developed for the data processing to facilitate efficient future updates of the data layer as more groundwater level data is collected nationally. We anticipate that the layer will be a valuable resource for water resource researchers, groundwater practitioners and engineers throughout Aotearoa New Zealand.

Mapping Elevation Capital



Graphic illustrating four different sea-level rise scenarios/NIWA

FCA researchers aim to map the migration space or elevation capital for coastal habitats under sea level rise. As sea level rises, coastal land is inundated and can become suitable for colonisation by coastal organisms such as saltmarshes, mangroves, and seagrasses. To determine if there is space for habitats to

a range of sea level rise scenarios. In some cases, urban developments such as sea walls, roads, or settlements inhibit inland migration – this is known as coastal squeeze. In other areas, natural barriers such as hills will block migration. In connected areas, with no barriers (man-made or elevation), there will be greater opportunity for inland migration under sea level rise – this is called elevation capital. We will map these processes at case study sites around Aotearoa New Zealand.

[Read more](#)

The FCA Programme actively involved with the NZ Coastal Society



Two articles have been published recently in Coastal News: Raising Buildings as an adaptation option – not straight forward? by Connon Andrews, Paula Holland, Paula Blackett, Christo Rautenbach (page 5). Plus an update from the Australasian Saltmarsh and Mangrove Conference 2023 by Andrew Swales (page 9).

[Read more](#)

Sea-level rise impacts on groundwater

Dr Leanne Morgan has explored some misconceptions about sea-level rise (SLR) impacts on groundwater with simple analytic solutions. Her study (in press) explains that sea-level rise causes groundwater salinization and water table rise. The impacts these processes can have on water security, agricultural production and infrastructure are becoming widely recognised. However, some misconceptions relating to SLR impacts to groundwater have been observed among students, which may interfere with further learning and the application of science principles to everyday life. These misconceptions are explored with the aid of simple analytic solutions and a Jupyter Notebook. It is expected that the Jupyter Notebook will be useful to educators, science communicators and practitioners. Morgan LK (2024) The paper 'Sea-level rise impacts on groundwater: exploring some misconceptions with simple analytic solutions' is now out and available open source via the [Hydrogeology Journal website](#) or via [SharedIt](#). An accompanying interactive Jupyter Notebook is linked at the end of the paper under 'Open Research'.

Source: [Hydrogeology Journal](#)

Student updates

The FCA programme is supporting students in coastal and physical adaptation research. We have updates from four students in this edition.



Matthew Jones

Data worth analysis to improve modelling of shallow groundwater levels under sea-level rise

Matthew Jones is working on a master's project developing a groundwater model to make predictions of how shallow groundwater levels in the coastal region between the Ashley and Waimakariri Rivers in North Canterbury will respond to sea-level rise.

More student updates

[View this email in your browser](#)



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