

## Guidance for using Aotearoa's Coastal Change Dataset for tangata whenua

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### 1.0 Background and purpose

The University of Auckland (UoA) has released a nationally consistent, open-source set of coastal change data for open coast beaches at a national scale, called '**Aotearoa's Coastal Change Dataset**', funded by the Resilience to Nature's Challenges (RNC) National Science Challenge. This document provides some high-level guidance for tangata whenua on how these data may be useful, and shares case studies of how some whānau have used the data. This information is envisaged to be used alongside the broader guidance and frequently asked questions, which can both be found on the Coastal Change website (<https://coastalchange.nz/>).

### 2.0 How is this dataset relevant to tangata whenua?

As a nation, 75% of our people live, and have livelihoods, close to the coast. Many Māori-owned lands are located in low lying coastal areas<sup>1</sup>, as are many marae and associated wāhi tapu<sup>2,3</sup>. About 14 per cent of Māori households are in areas highly susceptible to coastal inundation with projected sea-level rise<sup>4</sup>. Māori are also heavily invested in climate sensitive sectors that intersect with the coast, such as agriculture, forestry, fishing, tourism and renewable energy<sup>5,6</sup>. Many marae, wāhi tapu and coastal infrastructure are already vulnerable to damage from riverine and coastal flooding and erosion, with around 191 marae located within 1km of the coast, with their associated wāhi tapu including urupā (burial grounds), mahinga kai (food gathering areas) and other places of importance<sup>7</sup>. As such, coastal hazards including erosion and flooding are an important consideration for tangata whenua, and many whānau, hapū and iwi are already grappling with these issues, especially after recent storm events such as Cyclone Gabrielle in 2023.

#### **Titiro whakamuri kia anga whakamua —Look to the past in order to move forward**

This whakataukī reflects that it is important to understand the history of how our coasts have changed in the past. Such an understanding can help us to envisage what things might look like in the future, understand the hazards, and help make plans. There are many knowledge and data sources to understand coastal changes including kōrero tuku iho (history and oral traditions). Aotearoa's Coastal Change dataset is one tool that allows us to look to past changes on our coastline to help us plan forward to a thriving future. Different types of knowledge and data can work together (where appropriate) to obtain a broader understanding of our coastal dynamics. The Coastal Change dataset provides one piece of the puzzle, helping to understand and visualise historical coastal erosion and accretion patterns at many open-coast locations around Aotearoa.

### 3.0 How are these data useful for climate change?

Coastal hazards (such as coastal erosion, coastal flooding and rising groundwater) have a historic, and ongoing impact around Aotearoa New Zealand, and climate change may exacerbate these hazards in some areas. Sea-level rise, combined with potentially more frequent extreme events (such as storms), means that it is important to understand coastal hazards now and into the future, and to enable planning for the future, despite uncertainties such as exact rates and timing of sea-level rise. Estimated sea level is approximately 0.2 to 0.3 m by 2050, and over the coming century could be up to 0.4 to 1.2 m, although there is uncertainty about the rate, timing and magnitude<sup>8</sup> of increases. While this range of possible sea-level rise futures is seemingly large, even a small 0.2 or 0.4 m rise in sea level will exacerbate the impacts of coastal flooding and erosion.

Unpacking how climate change will impact coastal hazards such as erosion is complex, because the coast changes in response to human actions (such as land use changes in catchments, dredging and coastal

protection structures) that can mask the impacts of sea-level rise<sup>8</sup>. Moreover, coasts also respond to natural processes, like earthquakes, landslides and river flooding, and they move and change over many time scales such as when a large storm hits, seasonally, annually and beyond. All of these factors mean that teasing out changes driven by sea-level rise is challenging. Using multiple types of data and information can help understand these changes and time scales. Aotearoa's Coastal Change dataset is one source of information that could be used in planning for coastal hazards and sea-level rise impacts, alongside other knowledge, datasets, policies and guidance documents (see the [general guidance](#) for using Aotearoa's Coastal Change data).

#### 4.0 How can tangata whenua use these data?

Coastal Change data can be used in a variety of applications, and can be used to support tangata whenua to:

- Understand potential realistic future rates of erosion to start conversations to plan for papakāinga, marae, urupā and other wāhi tapu.
- Link with mātauranga-a-whānau/hapū/ iwi and your own tohu/ indicators of change.
- Feed into coastal hazard assessments and climate adaptation planning to save costs on data gathering. While not all coastal areas are currently covered in the dataset, the UoA Coastal Change team is open to generating data for new coastal sites or adding to the resolution of data for existing sites. You can find information about this on their website.
- Consider potential impacts on mahinga kai and coastal taonga species.
- A potential resource to assist with Treaty claims or to engage with authorities.

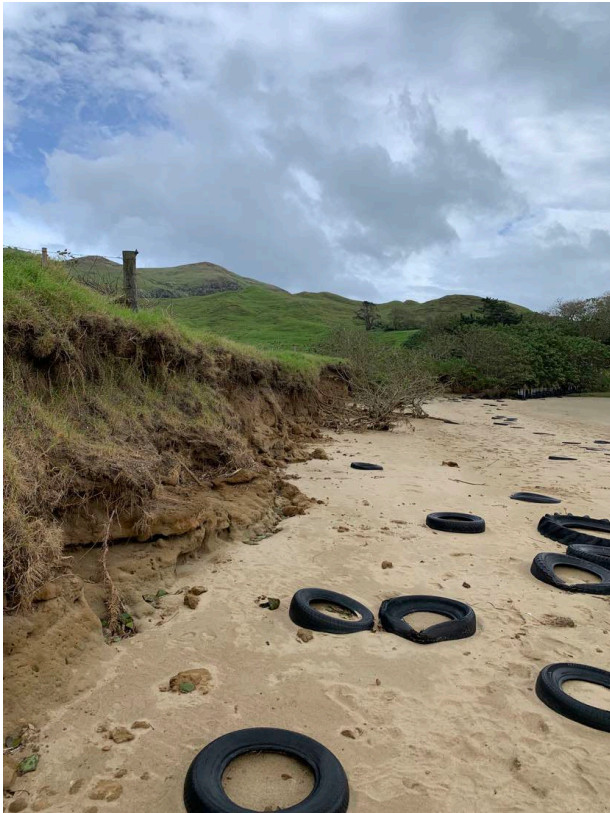
Here we present some examples of how whānau have already used these data.

#### 4.1 Another tool in the kit to understand coastal erosion

During a wānanga with a whānau from a marae situated on a low-lying sandspit in Te Tai Tokerau, Coastal Change data was presented. This whānau has long standing, intergenerational concerns about coastal erosion near their marae. They often spoke of how the land used to extend further out, but over the years, they observed their whenua being lost to the sea (Figure 1). By using the Coastal Change dataset, whānau were able quantify their observations, in a sense translating their experiences in to "Pākehā terminology". The data revealed that since 1941, the greatest extent of land lost to erosion was 54.5 meters, aligning with their observations. Additionally, it showed that the rate of coastal erosion had been relatively consistent over the years, enabling us to predict that this trend will likely continue into the future. Having access to the Coastal Change data empowered and reaffirmed whānau's observations.

The whānau already have their own mātauranga, but this dataset provided more insights to understand their whenua, how it has changed and to consider future changes. By putting it into terminologies that are understood by institutions so, whānau can apply this information within these frameworks, such as to support treaty claims or to engage with authorities, for environmental impact assessments, and to use for personal documentation.

Moreover, when the whānau were shown a range of old aerial photographs of their whenua from 1941 to the present, these images triggered memories of their childhood, and times spent on the land. The historical photos offered a chance to reflect on when their parents and grandparents lived there, prompting reminiscences and the sharing of stories about the whenua. Access to such data is often challenging for whānau, but it provides a valuable link to their past and supports their ongoing connection to their whenua.



**Figure 1. Example of the current coastal erosion on the low lying sandspit in Te Tai Tokerau (Photo credit: Milly Grant-Mackie).**

#### **4.2 Kaitiakitanga and coastal archaeology: Patuharakeke**

In Aotearoa New Zealand, our archaeological sites such as middens (a deposit that may include shells, kōiwi, animal bones, taonga and charcoal etc) and earthworks (such as old pā sites) are located largely at the coast due to our history of reliance on coastal resources and Māori history of transportation by waka<sup>9</sup>. Coastal erosion is a major threat to our coastal archaeology and cultural heritage, and the risk is increasing with sea-level rise. This impact case study focuses on retrieving and caring for the information contained in archaeological sites before they are taken by Tangaroa.

This project was a collaboration between Patuharakeke (mana whenua of the Te Akau/Bream Bay area) and the University of Auckland. Patuharakeke monitor coastal areas in their rohe and identified a site on Te Akau as the focus. Te Akau is a sandy beach with a vegetated dune system that faces east into the Pacific Ocean (Figure 2). Recent storm events including tropical cyclones Hale and Gabrielle (January and February 2023) caused significant dune erosion that exposed middens.

The project included looking at the dune stratigraphy (layers) to identify the midden contents (such as shells, charcoal, bones and artefacts) combined with kōrero shared by Patuharakeke. Coastal erosion and accretion trends were analysed from the Coastal Change data using 17 images and coastal positions from 1942 to 2023. Coastal position was defined as the edge of vegetation (i.e., the seaward edge of the sand dune in this case). Since these data show only the horizontal coastline changes, other data was used in conjunction, including the elevation of the dune from LiDAR (Light Detection and Ranging) available from the Northland Regional Council and Land Information New Zealand (LINZ).

Coastal Change data show that some areas the coastline are accreting (building out seaward), such as near the entrance to Whangārei Harbour, but there are also extensive areas of erosion, including where the midden was exposed, where erosion is occurring at 0.45 m/year. The presence of the (now exposed) 200 year-old midden in the dune indicates that coastal erosion has not reached back that far since at least

200 years, showing us that the current erosion rates are relatively high compared to at least the past 200 years. Coastal change data shows that this section of the coast has retreated by about 20 m between 1942 and 2023, with about half of this erosion (10 m) occurring during Cyclone Gabrielle in 2023.

This work was only possible as it was built on whanaungatanga between mana whenua and researchers, and great care was taken in the approach to braid methods of archaeology, geomorphology and mātauranga. To find out more, check out this short video to hear from Ari Carrington from Patuharakeke: [Ari Carrington - Climate Change, Mātauranga Māori and Archaeology NZAA 2022 Specialist Video Series. - YouTube](#)



**Figure 2. Drone photo of the beach at Te Akau at the archeological study site where there are erosion concerns showing researchers and whānau working together (Photo credit: Aaron Apfel).**

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## 6.0 References

1. Hardy, D. et al. Planning for Climate Change Impacts on Māori Coastal Ecosystems and Economies: A Case 28 Study of 5 Māori-Owned Land Blocks in the Horowhenua Coastal Zone. (2019).



2. Bailey-Winiata, A., Gallop, S. L., Hikuroa, D. & White, I. The role of coastal marae in natural hazard response and climate change adaptation. *N. Z. Coast. Soc. Spec. Publ. 5 Coast. Adapt. Adapt. Coast. Change Hazard Risk Aotearoa N. Z.* 41–44 (2022).
3. Bailey-Winiata, A. P. et al. Looking backwards to move forwards: insights for climate change adaptation from historical Māori relocation due to natural hazards in Aotearoa New Zealand. *Reg. Environ. Change* **24**, 80 (2024).
4. Te Puni Kōkiri. Understanding Climate Hazards for Hapori Māori – Insights for Policy Makers. [www.tpk.govt.nz/en/o-matou-mohiotanga/te-taiao/understanding-climate-hazards-forhapori-maori-ins](http://www.tpk.govt.nz/en/o-matou-mohiotanga/te-taiao/understanding-climate-hazards-forhapori-maori-ins). (2023).
5. Awatere, S. et al. He Huringa Āhuarangi, He Huringa Ao: A Changing Climate, a Changing World. <http://www.maramatanga.ac.nz/te-arotahi-07> (2021).
6. Te Puni Kōkiri. Understanding the Exposure of Climate Hazards on Māori-Owned Businesses. <https://www.tpk.govt.nz/en/o-matou-mohiotanga/climate/understanding-the-exposure-of-climate-hazards-to-m> (2024).
7. Bailey-Winiata, A. P. Understanding the potential exposure of coastal marae and urupā in Aotearoa New Zealand to sea level rise. (University of Waikato, Tauranga, New Zealand, 2021).
8. Ministry for the Environment. Ngā Pūmake Takutai Me Te Ārahitanga Huringa Āhuarangi: Coastal Hazards and Climate Change Guidance. <https://environment.govt.nz/assets/publications/Coastal-hazards-and-climate-change-guidance-2024-ME-1805.pdf> (2024).
9. Jones, B. D., Dickson, M. E., Ford, M., Hikuroa, D. & Ryan, E. J. Aotearoa New Zealand’s coastal archaeological heritage: A geostatistical overview of threatened sites. *J. Isl. Coast. Archaeol.* 1–21 (2023) doi:10.1080/15564894.2023.2207493.