

## **Platform 2 – Geological Processes & Hazards**

### **When will the impacts of sea level rise be felt around New Zealand?**

Sea level rise will impact New Zealand significantly over the next century: 240,000 New Zealanders live within 2 m of the mean high tide line; and up to \$14B of publicly owned infrastructure is at risk. A key part of planning for these impacts is understanding when critical thresholds will be crossed. The Endeavour-funded NZ SeaRise programme has made a significant contribution to this effort. By providing projections of future sea level rise at local scale, the timing of threshold exceedance for coastal inundation is now better constrained. The results show that in some areas, impacts will be delayed – but in others, impacts will occur several decades sooner than previously thought.

NZ SeaRise (Victoria University of Wellington, GNS Science, NIWA and the University of Otago) has recently published local scale (2 km resolution) sea rise projections for the entire New Zealand coast (<https://www.searise.nz/maps-2>). This product aims to help the New Zealand public and the planning community understand how local land movement (uplift and subsidence) will interact with global changes in ocean volume to produce variable rates of sea level rise around New Zealand over the coming decades. An update to the Coastal Hazards Guidance for Local Government on how to use the new projections for planning is in preparation by the Ministry for the Environment. As a demonstration of global reach, these research outputs have also been incorporated into new sea level projections presented in the recent IPCC AR6 report.

In line with the strategic intent of this platform to deliver research aimed at reducing risks and strengthening resilience to natural hazards and climate change, our SSIF programmes have contributed substantially to the underpinning knowledge required for both threads of the NZ SeaRise project: the remote sensing techniques used to understand ground movement; and the observations and models used to understand and project Antarctica's contribution to global sea level. Over the last 10 years, the SSIF-funded Hazards & Risk Management (HRM) and Te Riu-a-Māui/Zealandia (TRM) programmes have invested in research and capability development in remote sensing ground deformation studies using interferometric synthetic aperture radar (InSAR) satellite data. By adapting understandings and methods from local ground deformation studies to a national scale, 10 years of ground movement around the entire coastline of New Zealand were calculated to estimate the average rates of non-earthquake land movement at the present day.

Analysis of ice cores from the Ross Sea area collected by GNS researchers, combined with results from international partners, has provided the observational data that record the response of the Antarctic Ice Sheet to past climate change. This research is the focus of the SSIF-funded New Zealand Ice Core Facility, supported by the Global Change through Time (GCT) programme. We have developed computer models to make sense of these observations of ice sheet change, and to allow projections of future ice sheet and sea level change using further SSIF funding from the Antarctic Research Platform. These models use the existing Global Climate Model to 'force' ice-sheet simulations for the Antarctic Continent for a range of spatial and time scales. By validating these models against the observational data from past ice sheet change, we increase our confidence in the models' performance. One example of this approach was a study of the ice sheet retreat during the last interglacial period (125,000 years ago) when temperatures were similar to a Paris Agreement World. These simulations show that during this period, Antarctic ice sheets contributed 4 m to global sea level rise.

The NZ SeaRise project is a \$7.1M programme over five years (2018–2023). We estimate that, to date, this programme has been underpinned by approximately \$3.6M of SSIF-funded research (i.e.,

~60% as at 30 June 2022) within the HRM, TRM and GCT programmes and Antarctic Science Platform.