

New Zealand Population Review, 51, 151–152.
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POSTER:
**A Data-Driven Look at Population Flooding
Vulnerability in Aotearoa**

**He Tirohanga ā-Raraunga ki te Noho Whakaraerae
ā-Taupori ki te Waipuke**

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Editors' Note

The PANZ Newell Award is awarded by the Population Association of New Zealand (PANZ) for the best poster on any population topic. The 2025 winner of the award for best student poster was Morgan Harris.

Ka whakawhiwhia te Tohu PANZ Newell e Te Roopu Waihanga Iwi o Aotearoa (PANZ) mō te pānui whakaahua tino pai mō tētahi kaupapa taupori. Ko Morgan Harris te whakaihuwaka mō te pānui whakaahua ākongā tino pai rawa i te 2025.

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A Data-Driven Look at Population Flooding Vulnerability in Aotearoa

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Introduction

Planning effectively for the impacts of climate change requires an understanding of both physical hazards and the socioeconomic capacity of communities to cope with them.

This research combines socioeconomic deprivation and precipitation intensification data to identify the regions in Aotearoa most at risk of flooding in a warming world.

A warmer atmosphere can hold more water vapor, leading to larger amounts of rain being released during extreme events. Climate change-driven precipitation intensification has a larger effect on short-duration rainfall events, with smaller effects on long-duration events (Table 1).

Island	3 hours	6 hours	12 hours	24 hours	36 hours	48 hours	72 hours	84 hours	96 hours	120 hours	168 hours
North	18%	15.7%	11.5%	8.9%	8.2%	7.6%	7.2%	6.7%	6.6%	6.3%	5.9%
South	16.3%	15.2%	9.9%	7.4%	6.4%	5.7%	4.9%	4.7%	4.5%	4.1%	3.7%

Table 1 – Precipitation intensification rates (% per °C of warming) for rainfall durations of 3 to 168 hours with a return period of 100 years. Calculated from climate model analysis [1].

Methods

- Hydrological models [2] were used to estimate the cumulative time required for water to travel the length of each river catchment nationwide (known as time of concentration or ToC).
- Catchment-specific ToC data was used to infer climate change driven precipitation intensification rates of greatest relevance for different regions around the country.
- These precipitation intensification rates were combined with information about socioeconomic deprivation (NZ Deprivation Index sourced from 2023 census data [3]) to identify at risk regions around the country.

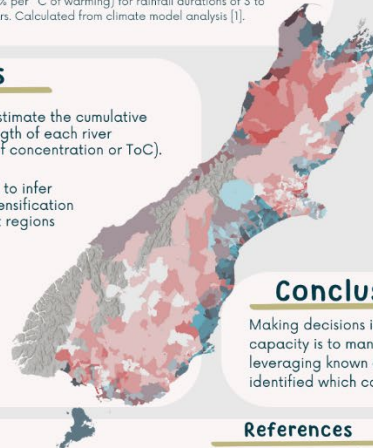


Figure 1 – Map of NZ Deprivation Index 2023 and precipitation intensification under climate change, color-coded by the bivariate scheme in Figure 2.

Results

- Aotearoa’s population is concentrated in high precipitation intensification areas, which make up just 14.8% of the land surface but include 53.8% of the population. In contrast, low-intensification areas cover 35.3% of the land but only 8.0% of the population.
- Aotearoa’s most vulnerable populations are concentrated in areas with the highest precipitation intensification. People in high-deprivation regions are more likely to live in areas with high precipitation intensification, while those in less-deprived regions are more likely to reside in low-intensification areas (Figure 2).
- There is significant variability in precipitation intensification and deprivation across the country (Figure 1), with notable differences between regional councils.

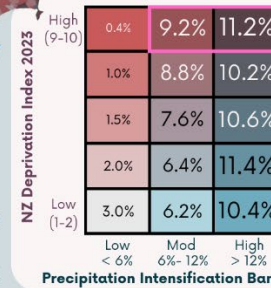


Figure 2 – Heat map showing the percentage of Aotearoa’s population living within precipitation intensification and deprivation classes.

- The proportion of people at high risk can differ between regions by a factor of ten.
- Considerable variability also exists within the boundaries of individual regional councils, particularly in regions with diverse river catchment sizes.

Conclusion

Making decisions in warming climate requires an understanding of who lives in harms way, what their capacity is to manage the changes they face, and what flood related risks are most relevant to them. By leveraging known differences in how climate change effects short and long duration rainfall we have identified which communities are most at risk in our flood prone future.

References

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[3] University of Otago. (2024). Socioeconomic deprivation indexes: NZDep and NZDep. Department of Public Health. <https://www.otago.ac.nz/whaiora/research/growth/research-growth-in-the-department-of-public-health/http://socioeconomic-deprivation-indexes-nzdep-and-nzdep-department-of-public-health>

Further Findings →

