

Research finds dramatic changes in New Zealand river flows

March 24 2023



Credit: Victoria University of Wellington

River flows in New Zealand have changed dramatically over the past 50 to 90 years as the climate has varied, a new study has found.

Marked changes in average summer and winter river flows were identified in the study, carried out by researchers at Te Herenga Waka—Victoria University of Wellington and NIWA. Results of the

research are published in the paper "Spatiotemporal Trends in Near-natural New Zealand River Flow" in the *Journal of Hydrometeorology*.

While parts of the North Island have seen [extreme rainfall](#) this summer, long-term trends show that, on average, summer river flows are decreasing in these areas and they're likely to be getting drier.

"Typical summer river flows have significantly decreased for much of the North Island, with the exception of Manawatu and Wellington," says lead author Laura Queen, a Ph.D. candidate at Victoria University of Wellington who is based at NIWA.

"In winter, average river flows have also decreased in the upper North Island but significantly increased on the West Coast of the South Island and in Fiordland and Southland," she says.

"The trends we found are the result of variations in the climate, whether it's natural climate cycles such as the El Niño and La Niña oscillation, or human-caused climate change. Our next task is to identify the extent to which each is contributing to these trends."

Queen says human-induced climate change is causing temperatures and atmospheric moisture to rise and wind circulation patterns to shift across New Zealand, with potentially major knock-on effects for river flow.

"Even in places where average river flows are decreasing, such as the upper North Island in summer, scientists expect we will still see increases in extreme rainfall and shorter duration flash flooding—just as we've seen this summer.

"In the South Island, changes to the strength of the southern storm track have increased rainfall on the West Coast and that affects river flow in the region.

"We've also seen increasing winter river flows in the snow-fed catchments in the South Island. This could be caused by changing wind circulation patterns that are delivering more rain, as well as by rising temperatures turning snowfall into rainfall."

The study Queen led was based on long-term data (at least 50 years) from 53 sites around the country, from the Awanui catchment in Northland to the Pomahaka in south Otago.

The research looked at rivers in wilderness areas where [water flows](#) were not affected by irrigation, [hydroelectric dams](#) or land use changes such as deforestation. Focusing on these remote rivers meant the researchers could isolate the impacts of climate on river flow, Queen says.

"Instead of looking at rivers individually, we grouped them and analyzed how they'd changed over time. Trends that are hard to see in a single river become clear when you look at data for a group of rivers over a period of at least 50 years."

Regional trends identified in the study will have implications for the management of water resources, she says.

"Increasing winter [river flow](#) in the west South Island may affect hydroelectric dam management. Meanwhile, decreasing winter and summer flow in the upper North Island has potential impacts for water availability in New Zealand's most densely populated area."

More information: Laura E. Queen et al, Spatiotemporal Trends in Near-Natural New Zealand River Flow, *Journal of Hydrometeorology* (2022). [DOI: 10.1175/JHM-D-22-0037.1](https://doi.org/10.1175/JHM-D-22-0037.1)

Provided by Victoria University of Wellington

Citation: Research finds dramatic changes in New Zealand river flows (2023, March 24)
retrieved 24 May 2024 from <https://phys.org/news/2023-03-zealand-river.html>

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