

OUR LAND
AND WATER

Toitū te Whenua,
Toiora te Wai

What is Our Land and Water?

Our Land and Water is a National Science Challenge. National Science Challenges are dedicated and designed to break new ground in areas of science that are crucial to New Zealand's future. In our case, this means, tackling the biggest science-based issues and opportunities facing our country in the area of primary production, and the complex relationship it has with our precious land and water resources.

Enhancing New Zealand's primary sector production and productivity while maintaining or improving land and water quality is our aim. The vision for Our Land and Water is that New Zealand is world-renowned for integrated and successful land based primary production systems, supported by healthy land and water and capable people. We already have research programmes underway including **Sources and Flows** that specifically target our aim and are working towards our future vision.

Research Timeline

July 2016: Sources and Flows funding approved

October 2016: Sources and Flows research underway

June 2019: Sources and Flows research complete

What is the background to the Sources and Flows research?

We already know that on average 55% of nutrients lost from productive land uses in New Zealand are transferred as they make their way through catchments to the sea. But the proportions of these nutrients reducing vary widely across and between landscapes. Different soils, landscapes and water pathways vary at a range of scales in their ability to produce, transfer and reduce contaminants. This in turn, affects the lands suitability for different types and intensities of land uses.

Limits being set on land uses by regulators to safeguard the life-supporting capacity of freshwaters and the associated health of people and communities need to take into account these differences in attenuation between contaminant sources and sites where water quality attributes are set. With appropriate knowledge, productive enterprises will have the opportunity to adapt and tailor their land use and management practices to work within the natural and built attenuation capacity of their landscape.

The full title of this research is **Sources and Flows: Managing Contaminant Pathways and Attenuation to Create Headroom for Productive Land use** and the programme will quantify at a range of scales the complex and spatially variable connections between contaminant sources, soil, vadose zone (the layer between the root zone and the aquifer), ground- and surface-waters and associated offsetting capacities.

How will the research achieve its aims?

An integrated understanding in space and time of critical source areas, pathways and fluctuations of water and contaminants through the landscape along with natural and engineered attenuation capacity, will allow dominant pathways to be identified and key risks and mitigation opportunities to be recognised. Linking hydrological and chemical signatures will provide powerful tools which we will exploit to deduce landscape-specific contaminant transport pathways from existing national databases of soils, geology, climate and flow and water quality.

Using this new knowledge, together with targeted case studies, and quantitative modelling of flows and contaminants, we will evaluate a range of tactical and strategic mitigation measures to reduce mobilisation and transport and/or increase attenuation efficiency. Working alongside another Challenge programme, we will map these landscape risk factors to the receiving water risks, to manage investment risk relative to desired catchment values and dynamic sensitivities.

How will we be able to use the research?

- This programme will support more informed decision-making on investment in land use activities. Land managers and regulators will be able to identify the inherent risks of generating unacceptable environment pressures from particular land uses in a range of landscapes.
- Land Managers and regulators will be able to identify the critical contaminants that will result in environmental impact from specific land uses and locations, as well as acceptable limits of discharge to enable the most cost-effective and appropriate level of mitigation for their enterprise.
- At a larger catchment scale, we will be able to identify which contaminants have potential headroom to allow for increased production within environmental constraints, or where catchment re-design utilising low environmental footprint land use options are required.

