

CLIMATE RISK AND RESILIENCE ACROSS OTAGO

▶ A SUMMARY OF OTAGO'S CLIMATE STORY

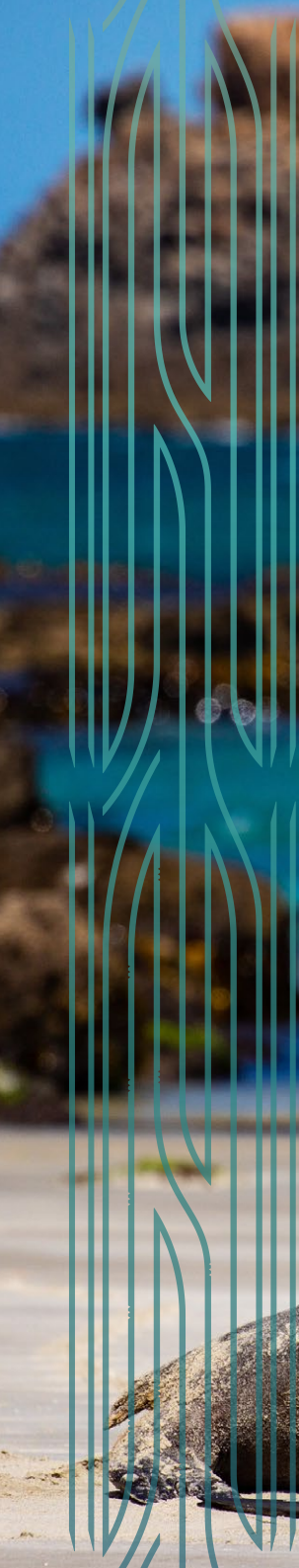


Otago
Regional
Council

 **Aukaha**



TE AO
MĀRAMA INC.



About this summary

Climate change is already affecting Otago's mountains, rivers, lakes, plains, coast and communities. Hotter days, heavier rainfall, longer dry spells, less reliable snow, sea level rise and coastal erosion are placing increasing pressure on the land, water, infrastructure, businesses, ecosystems and communities that support life across the region.

Otago can continue to thrive in the decades ahead if action is taken now to understand and adapt to these risks. This will not be simple, but careful planning and practical action can help build climate-ready communities where people, nature, culture and the economy are resilient.

The Otago Climate Change Risk Assessment (2021) describes the main risks that the Otago region is likely to face over the coming decades, and what they could mean for everyday life, local businesses and the services communities rely on.

This summary tells the story of what climate change will mean for our region, including Kāi Tahu mana whenua knowledge and experiences. Together, this summary explains how the climate across Otago is changing, the most important risks the area may face in the coming decades, and what is being done today to build resilience.



Our place

Ranging from the alpine headwaters, lakes and inland valleys of Queenstown Lakes and Central Otago to the productive plains, estuaries, harbours and wild coastline of Clutha, Dunedin, and Waitaki; Otago's climate story is shaped by its diverse landscape. That diversity is one of Otago's great strengths, but it also means climate change risks show up in different ways from place to place.

Across the region, our growing communities and economy depend on healthy rivers, reliable water, working roads, electricity, communications and thriving natural systems. Otago's growth in some urban areas, combined with dispersed rural settlements in others, adds to the challenge of planning ahead and keeping people connected when natural hazard events occur.

Otago's environment, communities and way of life are connected, from the mountains to the sea — ki uta ki tai. What happens in one part of the region can affect another. Changes in the mountains influence rivers, lakes, water supply and energy generation downstream. Damage to roads, rail or other lifelines can affect households, businesses, visitors, and essential services well beyond the place where the disruption begins.

Ki uta ki tai | From the mountains to the sea

Kāi Tahu mana whenua hold traditional customary authority and maintain contemporary relationships within this area, determined by whakapapa (genealogical ties), resource use and ahikāroa (the long-burning fires of occupation).

Wai (water) and waka (canoes) feature prominently in Kāi Tahu oral histories. Storms described in oral histories battered and capsized ancestral waka such as Te Waka o Aoraki, Araiteuru and Tākitimu. Neither atua nor tipuna were exempt from the turbulence of a changeable environment, and the pūrākau (stories) remain to remind us of the consequences.

According to Kāi Tahu cosmology, atua shape the balance between land, water, climate and people. A changing climate reflects a shift in the balance between these atua and their domains, which has wide-ranging and severe impacts on us living in Te Waipounamu.

He taura whiri kotahi mai anō te kōpunga tai nō i te pū au. From the source to the mouth of the sea, all things are joined together as one.

Ki uta ki tai is a philosophy that has become synonymous with the way Kāi Tahu think about te taiao (the natural world). While commonly interpreted as 'from the mountains to the sea', ki uta ki tai is about standing on the land and knowing the effects, both positive and negative, in every direction. This ethos reflects the mātauraka (knowledge) that all environmental elements are interconnected and must be managed as such. It is a way of understanding the natural environment, including how it functions, how climate changes may impact it, how people relate to it and how te taiao can be looked after appropriately.



Our climate, now and in the future

Different parts of Otago will continue to experience climate change differently depending on their elevation; proximity to the coast, rivers and lakes; and how exposed they are to changing weather patterns.

High country and alpine areas, such as the Humboldt Mountains and the Rock and Pillar Range, are especially sensitive to changes in snow and ice. Inland basins and plains, like parts of Central Otago, are more exposed to drought, heat and water stress. Low-lying floodplains, harbours and coastal settlements across Waitaki, Dunedin and Clutha are more exposed to flooding, rising groundwater, erosion and sea-level rise.

Looking ahead, Otago is expected to become warmer overall, with more hot days and fewer frosts. Heavy rainfall events are expected to become more intense across the region, even in places where the amount of rain over a year is not expected to change. Dry periods are likely to become longer and more severe, especially in inland areas. In the mountains, less snow is expected to fall, snowlines are likely to rise, and snowmelt is expected to happen earlier in the year. Along the coast, sea-level rise will continue to increase the reach of storm tides and the effects of coastal flooding and erosion on Otago communities, coastal habitats and infrastructure.

These changes are connected. For example, less snow means less natural water storage through winter, which can increase winter runoff and reduce water availability later in spring and summer. Heavy rain falling on steep, unstable slopes can lead to flooding, slips and debris flows. Coastal hazards can be made worse when high tides, storm surge, intense rain and overwhelmed drainage systems happen together.

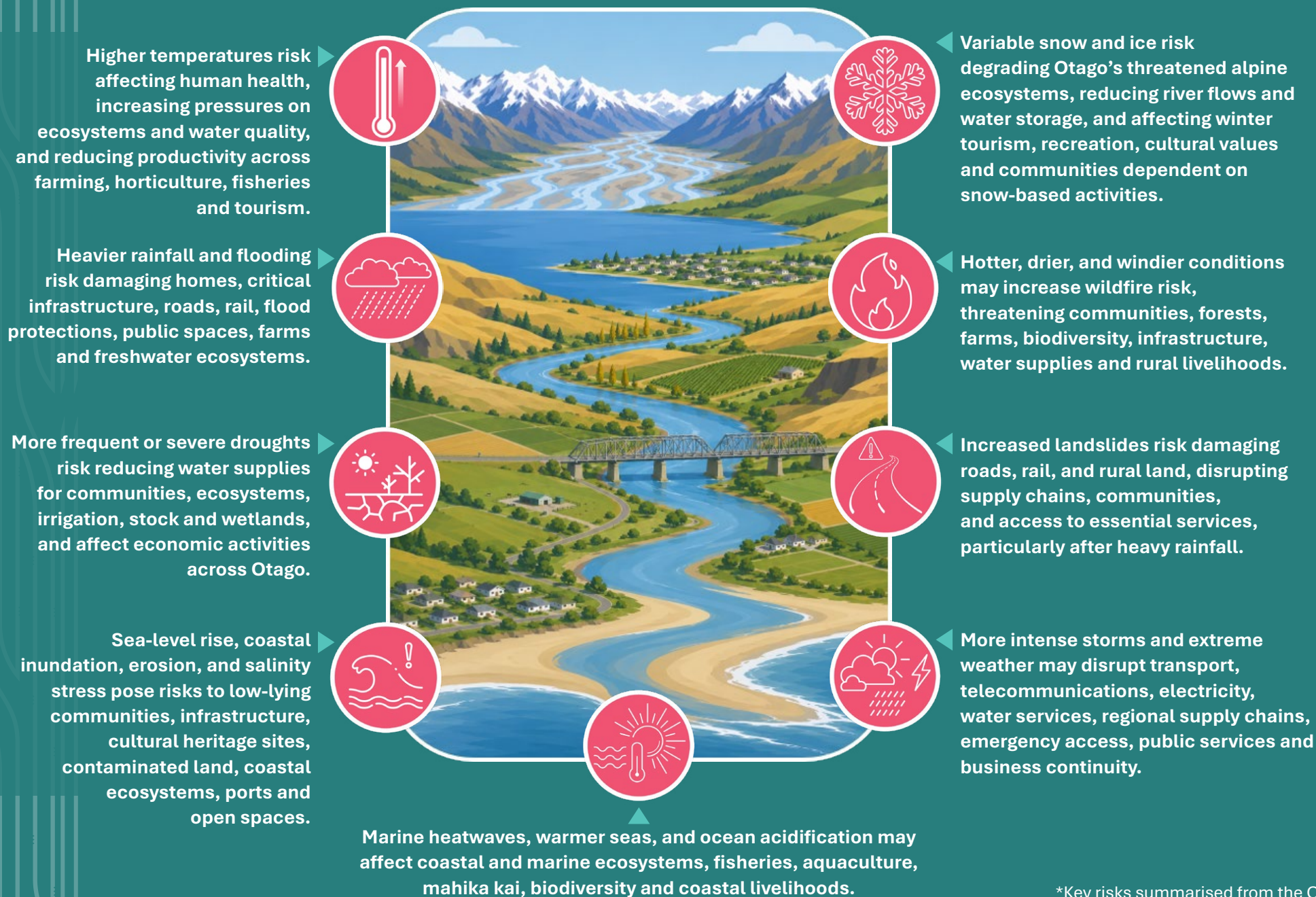
He waka eke noa | We are all in this waka together

Kāi Tahu mana whenua often perceive climate risk and climate change through a lens informed by te ao Māori values and perspectives.

An example of a Kāi Tahu-led approach to climate risk assessment is provided by the South Dunedin Future Mana Whenua Risk Assessment Report, which used core values of mana, mauri, whakapapa and tapu/noa to frame a range of specific risks. While framed as risks to mana whenua values, these also encompassed a broad understanding of risks to South Dunedin, including wider environmental, social and economic risks.

Tying this back to the ki uta ki tai philosophy, climate change is viewed by Kāi Tahu as a disruptor to interconnected systems. Only by bringing a holistic approach in responding to all types of climate risk will our society achieve a fair and lasting transition to a climate-safe future that keeps our collective waka upright and afloat.

Key climate change risks across Otago*



*Key risks summarised from the Otago Climate Change Risk Assessment (2021).

▼ KEY CLIMATE CHANGE RISKS CONTINUED

Heavier rainfall and flooding

Heavier rainfall is one of the clearest risks shared across Otago. It is already our most frequent, disruptive and costly hazard, and climate change is expected to make it worse. In urban and rural areas alike, more intense downpours can overwhelm stormwater systems, flood roads and properties, erode riverbanks, and damage bridges, rail, water pipes and other essential infrastructure. In more built-up places, such as South Dunedin, central Queenstown or low-lying parts of Ōamaru and Balclutha, even short-duration storms can create widespread disruption when the capacity of drains, pumps or flood protection systems is exceeded.

Flooding risks are not limited to our cities and towns. River valleys, lake edges, floodplains and farmland across the Clutha, Taieri, Waitaki, Manuherekia, Upper Clutha and other catchments are also exposed. In hilly and mountainous areas, very wet ground can trigger slips, landslides and debris flows that block roads and isolate communities. This matters especially in places such as the Kawarau Gorge, Kingston Road and Otago Peninsula, where communities rely on a small number of transport links and long infrastructure networks.

Reduced snow cover and earlier snowmelt

Changes in snow are especially important for Otago because mountain snow acts like a natural water store. In Queenstown Lakes and Central Otago, and for catchments that support communities further downstream, less snow and earlier snowmelt mean more winter runoff and less-reliable water supplies later in spring and summer. This can affect irrigation, drinking water, river health, wetland condition, hydro generation and recreation.

Reduced snow cover also has wider impacts on alpine landscapes, biodiversity and tourism. Winter sports and tourism in the Queenstown Lakes area are especially exposed to warmer temperatures, shorter snow seasons and less-reliable conditions at lower elevations. Earlier snowmelt may also alter seasonal river flows that have cultural significance for mana whenua and that help maintain the mauri of high-country lakes, rivers and wetlands.

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Kāi Tahu relationship with wai māori

Water is the lifeblood of the environment, and of the many life forms that depend on it. As a result, water is of high significance for our people, both for its practical applications and for the spiritual meaning it embodies. Rivers are a symbol of permanence and a source of spiritual meaning to mana whenua.

Key aspects of the Kāi Tahu relationship with wai māori (freshwater) include:

- Wai māori as an enduring and recognisable part of our wāhi tūpuna (ancestral landscapes).
- The gathering of mahika kai as part of our cultural identity, and as a means of passing on knowledge and cultural traditions from one generation to the next.

Climate change has the potential to cause major disruption to this enduring wai māori relationship. Both long-term trends (such as higher temperatures and water scarcity) and short-term extreme events (such as high-intensity rain events and flooding) can cause loss of mahika kai and degrade our wāhi tūpuna. In areas of increasing water scarcity, existing land uses may need to adapt to more dryland systems to mitigate climate impacts on waterways.

Climate change will exacerbate the impacts of unsuitable practices already affecting te mana o te wai; for example, the location of wastewater treatment infrastructure beside waterways and the coast.

Edward Ellison
(Te Rūnanga o Ōtākou)

Sea-level rise and coastal change

Sea-level rise and coastal change are major issues for coastal Otago communities, ecosystems and infrastructure, especially in Dunedin, Clutha and Waitaki. Low-lying settlements, estuaries, harbours, wetlands, roads, rail, waters infrastructure and farms are increasingly exposed to more frequent flooding, storm surge, erosion, rising groundwater and saltwater intrusion. In some areas, even small increases in sea level will change how water moves through drainage systems and flood protection networks.

This is already a pressing issue in places such as South Dunedin, the Clutha Delta, Kākā Point, Kaitangata, Ōamaru, Moeraki and the Otago Peninsula. Coastal hazards can also threaten old landfill sites, pump stations, recreation areas, urupā, wāhi tapu, and other places of deep community and cultural value. In some areas, like Ōamaru North, coastal subsidence in some locations adds to the urgency of planning ahead. Sea-level rise across Otago is not only an infrastructure issue. It is reshaping beaches, estuaries, dunes, saltmarshes and nearshore habitats that support wildlife, tourism, mahika kai and coastal identity.

Hotter and drier conditions

Hotter days and longer dry spells are expected to become more common across much of Otago, particularly inland areas such as Central Otago, Queenstown Lakes, and parts of Waitaki and Clutha. These changes will increase pressure on drinking and irrigation water supply and quality, pasture growth, stock health, crop production and freshwater ecosystems. For some places, warmer conditions may create opportunities such as longer growing seasons or new crop options, but those opportunities may be accompanied by higher costs and greater uncertainty.

Dry conditions can also increase wildfire risk in Otago. This is already a major concern in dry grassland, high-country and forest-edge environments, including parts of Wānaka, Queenstown, Central Otago and inland Waitaki. Hot, dry and windy conditions can make fires easier to start, spread faster and become harder to control. In summary, longer dry periods will affect more than water quantity.



Bannockburn, Central Otago



What matters most?

Healthy environments and cultural connections

Across Otago, healthy rivers, wetlands, lakes, coastlines and alpine areas are central to resilience. They help store and filter water, reduce erosion, buffer floods, and underpin Otago's tourism, recreation and regional identity. When these natural systems are healthy, they make it easier for communities to cope with climate stress. When they are degraded, the effects of climate change are often felt more quickly and more severely.

Otago's natural environment is under growing pressure from climate change. Warmer temperatures, heavier rainfall, drought, wildfire, coastal change, and habitat loss can all reduce the health and resilience of native ecosystems. Alpine species may lose habitat as snowlines rise. Dryland, wetland, river and coastal ecosystems may all be squeezed by changing temperatures, water availability and more frequent disturbance. These changes also affect cultural values. Mahika kai, wai māori, ara tawhito, wāhi tapu and the seasonal rhythms that guide the use of these places all depend on functioning ecosystems and reliable water.

People, homes and everyday life

Climate change is increasingly shaping everyday life across Otago. More frequent flooding, rising groundwater, coastal erosion, hotter days, drought and wildfire can all affect where people live, how safe homes are and how easy it is to access the services people rely on every day. Everyday life can be affected in many ways, such as disruptions from flooded streets and properties, cancelled travel, damaged community facilities, interruptions to drinking water or wastewater services, pressure on health and emergency support, and increased household costs.

These impacts are not evenly shared. Older residents, people with fewer financial resources, isolated rural households and communities already exposed to repeated hazards may have fewer options to prepare, recover or relocate if needed. Visitors to Otago can also be more vulnerable, as they may be unfamiliar with local hazards and unprepared for changing conditions. This means adaptation needs to consider people's different capacities to cope, not just the physical exposure of places and assets.

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Farmland near Maheno

▼ WHAT MATTERS MOST? CONTINUED

Businesses and the regional economy

Otago's economy is closely tied to climate-sensitive sectors. Farming, horticulture, viticulture, forestry, tourism, energy generation, fisheries, freight and service industries all depend on reliable water, functioning infrastructure, healthy ecosystems and safe communities. Climate change can disrupt these foundations through more frequent and intense weather events, damaged roads and infrastructure, water shortages and rising operating costs.

Some sectors may see opportunities in a warmer climate, such as longer growing seasons, fewer frosts in some locations and new crop options. However, those opportunities sit alongside a more uncertain operating environment. Otago businesses may need to deal with more frequent interruptions to supply chains, less predictable water supplies, and increasing costs to protect assets or keep operating during disruptions. For tourism-dependent areas, even temporary closures of roads, ski fields, walking tracks or coastal attractions can have wider flow-on effects across accommodation, hospitality, and retail and transport services.

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Photo: Clutha NZ

Papatowai, The Catlins

Connectivity and essential services

Keeping Otago connected is one of the most important regional resilience challenges. Many of our communities rely on a limited number of strategic roads, bridges, rail links, electricity lines, telecommunications networks, and water services. In some places, like Central Otago and Clutha, there are few backup routes or alternative systems if one link fails. That means a single flood, landslide, wildfire or coastal erosion can quickly affect access to food, healthcare, schools and emergency services.

This vulnerability shows up in different ways across the region. Coastal transport corridors, water infrastructure, and low-lying urban areas face pressure from flooding, rising groundwater, and sea-level rise. Inland routes through gorges, hills and mountain passes are exposed to slips, debris flows and washouts. Long rural networks can be expensive to maintain and slow to restore after major events. In tourist centres, outages or road closures can also strand visitors and place extra pressure on emergency management and local services.

Kāi Tahu whānau build resilience

Severe weather events across the lower plains are already increasing vulnerability to isolation and disruption. Power outages, road damage, and blockages are particularly common in rural areas, heightening the risk of disconnection from critical lifelines, essential services, communication disruptions and key resources.

During previous flood and wind events, access to food has been a significant concern, with road closures disrupting supply chains and limiting the ability of whānau to access and gather natural food resources. Mahika kai areas across the lower plains, including rivers, wetlands, and raupō habitats, can also become unsafe during and after these events due to increased sedimentation and the mobilisation of contaminants. Strengthening the resilience of lifeline infrastructure, protecting and restoring mahika kai, and supporting community-led adaptation approaches will be critical to reducing these risks over time.

Communities across the lower plains do not all have the same ability to prepare for, respond to, and recover from climate-related hazards. Adaptation responses therefore need to recognise the different capacities, resources, and support needs of whānau and sectors across these areas. Some communities will require targeted investment, technical expertise, and sustained support to build resilience and ensure equitable outcomes.

As Mana Whenua Emergency Facilitators working across the takiwā, we believe there is no one solution, no one agency, no one area and the strength remains in our collective Kotahitanga.



Mauriri Kimura-McGlinchey
Mana Whenua Emergency Facilitator | Araiteuru

Angie Hopkinson
Mana Whenua Emergency Facilitator | Murihiku

What is being done?

Otago's climate change story is different in every area, but the region's future is shared. From the mountains to the sea, climate change is reshaping the systems that support the environment, people, businesses and the services communities rely on.

Across Otago, Kāi Tahu, councils, landholders, businesses and community groups are already taking practical steps to build resilience. This includes planning for future flood and coastal risk, restoring wetlands and catchments, strengthening roads and bridges, improving emergency readiness, managing wildfire risk, supporting biodiversity and combining infrastructure investment with nature-based solutions.

More detail about these initiatives is provided in The Otago Climate Story.





Karitāne