

CLIMATE RISK AND RESILIENCE IN CENTRAL OTAGO

▶ A SUMMARY OF CENTRAL OTAGO'S PART
IN THE OTAGO CLIMATE STORY



Otago
Regional
Council

 **Aukaha**



TE AO
MĀRAMA INC.



About this summary

Climate change is already affecting the rivers, lakes, valleys and ranges of Central Otago. Hotter days, heavier rain and longer dry spells put pressure on water, land, our infrastructure and the things communities rely on every day.

Central Otago can continue to thrive in the coming decades if we act now to understand and adapt to these changes. This work will be challenging, but done well, it 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, including Central Otago, may face over the coming decades, and what they could mean for everyday life, local businesses, and the services communities rely on.

This summary describes Central Otago's part in Otago's climate story, including Kāi Tahu mana whenua knowledge and experiences. It explains how the climate across Central Otago is changing; what these changes mean for Central Otago communities, infrastructure, services and natural environments; and what is being done today to build resilience.



Our place

Otago's communities, landscapes, infrastructure and ecosystems are all experiencing the effects of climate change. From the mountains to the sea, climate change is reshaping the systems that support the environment, people, businesses and services communities rely on.

Central Otago's climate change story is shaped by its rivers, lakes, valleys, and ranges. The area is known for its big skies, distinctive seasons and strong connection to the land. Towns such as Alexandra, Cromwell, Clyde, Ranfurly and Roxburgh sit among rocky hills, productive valleys, orchards, vineyards and the Clutha River/Mata-Au, which helps shape life across the district.

From the iconic high country of the Lindis Pass to the productive plains of Ida Valley and Ranfurly, the natural environment supports much of the local economy and way of life. Farming, orchards, vineyards and tourism all depend on reliable water, healthy land, working roads and great places to live and visit. These strengths also mean the area can be exposed to changes in the climate. More frequent and intense droughts, water shortages, flooding, wildfire and storms can disrupt daily life and damage infrastructure important to communities across Central Otago.

Central Otago communities are growing, and visitor numbers add extra pressure at busy times. While growth presents opportunities to carefully plan and build resilience, climate change can also place more strain on the long networks for roads, water and services people count on.

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 tīpuna 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

Central Otago's climate is influenced by its inland location, mountain ranges and dry basins. Places like Alexandra, Cromwell and Ranfurly are known for hot, dry summers and cold winters with frequent frosts, while the surrounding ranges hold snow that feeds important rivers like the Clutha River/Mata-Au.

Looking ahead, Central Otago is expected to become warmer, with many more hot days in places like Alexandra and Cromwell, and far fewer frosts across the area, especially in spring and autumn. Rainfall totals may not change dramatically overall, but when it does rain, it is expected to be heavier, increasing the risk of heavy downpours, flooding and damage to roads, land and communities

Across Central Otago, different areas will continue to experience climate change in different ways. The river valleys and low-lying areas around the Clutha and Manuharekia rivers can be affected by flooding during heavy rain or periods of rapid snowmelt, while hillside and high-country areas like the Old Man Range are more prone to erosion and slips. The dry inland areas, such as Maniototo and the Upper Clutha, are particularly sensitive to drought, water shortages and increasing wildfire conditions, especially during long, hot summers.

The mountains surrounding Central Otago are likely to receive more variable snowfall. Snow may fall less often, melt earlier and be replaced more often by rain. This means less natural water storage for spring and summer, putting more pressure on rivers, irrigation and water supply during dry periods.

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)

▶ Key climate change risks in Central Otago*

Risks to rivers, lakes, wetlands, water supplies, farming, horticulture, and viticulture from less snow, reduced water availability, drought and changing rainfall.

Risks to native plants, animals, productive land, and biosecurity from pests and weeds becoming more widespread due to warmer temperatures and drought stress.

Risks to the local economy, primary production, tourism, infrastructure, and community wellbeing from rising operating costs, disrupted supply chains, and climate-related damage to natural and built assets.



Risks to the reliability of electricity networks, transport routes, businesses, and essential services from flooding, storms, landslips, drought and changing rainfall patterns.

Risks to homes, buildings, roads, bridges, and supply chains from more intense rainfall, inland flooding, landslips and storm events.

Risks to rural communities, farms, vineyards, orchards, buildings, water supply, and energy infrastructure from increased fire weather, heat, drought and extreme weather events.

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

▼ KEY CLIMATE CHANGE RISKS CONTINUED

Heavier rainfall and flooding

Heavy rainfall events are expected to become more frequent and intense across Central Otago, which may cause riverbanks to overtop and stormwater systems to be overwhelmed. This increases the risk of flooding in low-lying areas along rivers like the Clutha River/ Mata-Au, affecting towns such as Alexandra and Ōmakau as well as nearby farms and orchards.

Heavier rainfall can also put pressure on key roads, bridges and drainage networks that keep Central Otago communities functioning, leading to flooded streets, damaged infrastructure and disrupted travel. In hill and high-country areas like the Roxburgh Gorge and Cromwell Gorge, very wet ground can trigger slips and debris flows, block transport routes and isolating rural communities.

Hotter and drier conditions

Hotter, drier conditions are expected to become more common across Central Otago, with communities experiencing more hot days and longer dry periods. This will increase pressure on water supplies for towns like Clyde, Cromwell and Ranfurly, as well as for irrigation across orchards, vineyards and farms in areas such as the Manuharekia and Ida valleys.

Prolonged dry conditions can also raise the risk of drought and wildfire, particularly in high-country and forested areas like Naseby, Queensberry, and the Ida Valley. Hotter conditions put more stress on people, livestock, and crops, while heat and water shortages may disrupt daily life and economic activity across the area.

▼ CONTINUED ON NEXT PAGE



Luggate Creek

▼ KEY CLIMATE CHANGE RISKS CONTINUED

Less snow and fewer frosts

Varying snowfall and fewer frosts are expected across Central Otago as temperatures rise. This means winter snow that once built up on places like the Old Man Range, Hawkdun Range, Dunstan Range and Pisa Range will be reduced, and what does fall will melt earlier in the year. As a result, less water may be stored in the mountains and released slowly into catchments like the Manuherekia and Clutha when it is needed most.

Frost patterns are also likely to change, with some areas becoming nearly frost-free. Fewer frosts may change growing conditions across the area, allowing earlier planting and new crop types, but potentially increasing pests and disease.

The role of snow in the Clutha River/Mata-Au

Climate change is expected to make snowfall far more variable and cause snow to melt earlier across Central Otago. This matters because snow works like a natural water store, holding water in winter and releasing it more slowly through spring and summer.

For rivers and streams, including the Clutha River/Mata-Au, less snow and earlier melt can mean lower and less reliable summer flows, affecting irrigation, drinking water, river health and how communities manage water during dry periods.

In the Clutha River/Mata-Au, winter snow provides up to 20% of the water storage needed for irrigation. With less snow, more water is likely to run off earlier in the year, and less may be available later when rivers, farms, power generation, ecosystems and communities need it most. This could mean more pressure on water supplies, changes to river flows, and impacts on recreation and tourism that depend on snow and ice.

Put simply, a warmer climate is likely to mean more variable snowfall, less predictable water and new challenges for everyday life in Central Otago.



Roxburgh Gorge trail

What matters most?

Water security and productive landscapes

Central Otago's water security is highly sensitive to hotter, drier summers and reducing snowmelt. As temperatures continue to rise, rainfall becomes less predictable and winter snowfall varies. Less water is likely to be available during the warmer months when Central Otago rivers, wetlands, orchards, vineyards, farms and towns need it most.

At the same time, demand for water is expected to increase as hotter days dry out soils and put more pressure on drinking water supplies. Longer dry periods and lower summer flows can also reduce water quality by making rivers and lakes warmer and prone to algal growth, while heavy rainfall events can wash sediment and contaminants into waterways. In catchments such as the Manuherekia, Taieri headwaters and Clutha River/Mata-Au tributaries, these pressures could make water supply less reliable and harder to manage, particularly during dry periods and droughts.

Our natural environment

Central Otago's native ecosystems are highly sensitive to hotter, drier conditions and changes in snow. As temperatures rise, the seasonal snowpack in areas such as the Dunstan, Old Man, and Hawkdun ranges are expected to shrink and melt earlier, meaning less water is slowly released into rivers, wetlands and dryland habitats through spring and summer. This puts pressure on places that rely on limited water, including the Manuherekia, Maniototo and Clutha River/Mata-Au catchments, where longer dry periods can stress native plants, wetlands and freshwater habitats.

Warmer conditions will also change which species can survive across Central Otago. Alpine plants and animals may lose habitat as snowlines rise, while dryland ecosystems around Alexandra, the Maniototo and Manuherekia valleys are likely to face more drought, wildfire risk and competition from pests. Warmer winters can allow pests such as wilding pines, broom and rabbits to spread or breed for longer, reducing the health and resilience of natural environments.

▼ CONTINUED ON NEXT PAGE



Community and wellbeing

Central Otago's economy is closely tied to the land, water and climate, so hotter, drier conditions create risks for farming, orchards, vineyards, tourism and local businesses. In places like Alexandra, Cromwell and Roxburgh, increasing pressures on water supplies can affect pasture growth, stock health and crops. While warmer conditions may create opportunities, such as longer growing seasons or new crops, these benefits may come with higher costs from water shortages, heat stress, and more damage from floods and extreme weather.

Climate change also creates risks for community wellbeing. Heatwaves can put more pressure on older people and outdoor workers, while droughts, floods and fires can disrupt businesses, access to services and daily life in communities such as Ranfurly and Naseby. As insurance, infrastructure, food, water and business costs rise, the impacts will be felt most by households and businesses that have fewer resources to adapt.

Connectivity and accessibility

Central Otago's transport, electricity, communications and water networks are exposed to increasing climate risks, particularly because many services depend on long routes across dry, open and sometimes mountainous landscapes. Roads and bridges around places like Roxburgh, Ranfurly, Naseby and the Manuharekia and Ida valleys are vulnerable to flooding and slips, causing damage to river crossings.

More frequent extreme weather could make it harder for people, goods and emergency services to move reliably around Central Otago. Floods, landslides and wildfire can close roads, damage power or telecommunications lines, and disrupt access to farms, small communities, and key services. Many communities rely on important regional links such as Stage Highway 8, with some rural areas having few alternative routes if roads close. These disruptions can delay supplies, isolate communities, affect businesses and make recovery more difficult, especially during extreme events or widespread outages.



Alexandra Bridge



Mahika kai and ara tawhito

“Kāi Tahu describe mahika kai as the gathering of foods and other resources and management of the places where they are gathered. The concept of mahika kai also embodies the traditions, customs and collection methods involved with harvesting and processing the resources. Over many generations, Kāi Tahu developed food gathering patterns throughout Otago, based on the seasons and lifecycles of various birds, animals, and plants. The coasts, rivers and lakes and their associated reefs, valleys and tributaries were a fundamental component of these systematic seasonal food gathering patterns.

Kāi Tahu used an ancient and complex series of trails (ara tawhito) throughout Te Waipounamu that connected settlements with one another, and settlements to resource gathering areas. Trails followed food resources so foods could be gathered and consumed to sustain people on their journeys. People never travelled inland and back to the coast by the same route, they would always travel back a different way so that there would be enough food to sustain the next party who would travel along the trails.

Ara tawhito, mahika kai sites and contemporary connections to them are at increased risk due to the impacts of climate change, increased temperatures, sea-level rise and more frequent extreme weather events. Climate change, now and into the future, is a significant concern for whānau. It threatens connections to place, including the loss of mātauranga embedded within the landscape and habitat loss and disruption impacting taonga species and mahinga kai.



David Higgins (Te Rūnanga o Moeraki)

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.

What is being done?

Kāi Tahu, councils, businesses and community groups are taking actions today to respond to and prepare for climate change across Central Otago.

Work is underway to strengthen resilience through initiatives such as native planting projects, community resilience programmes and combined efforts to strengthen local energy resilience.



Improving catchments

The Thomsons Creek Catchment Project is a great example of local people taking action against declining water quality. This has created a five-hectare wetland area, reducing sediment runoff, slowing water movement through the river system and restoring native habitat. Local farmers, community members, rūnaka, government agencies, councils and schools work with a number of catchment groups across Central Otago to improve water and environmental quality in their drainage basins.

Preparing communities for emergencies

In places like Roxburgh, councils and emergency management agencies are helping communities prepare for natural hazards such as debris flows and flooding, and isolation during major events. Community Response Groups and Emergency Hubs are being developed so people can support each other and stay connected when roads and power are disrupted.

Controlling wilding conifers

The Central Otago Wilding Conifer Control Group is helping protect the district from one of its biggest environmental threats. Controlling wilding pines helps reduce wildfire risk, protect water supply in dry catchments, safeguard biodiversity, and prevent long-term damage to Central Otago's iconic landscapes and productive land.

Strengthening vital roads and bridges

Central Otago District Council is investing in bridge renewals and transport planning to keep key routes open and safe across Central Otago as extreme weather becomes more frequent. This work is aimed at making sure rural communities, businesses, emergency services and visitors can still access the places they need during and after severe events.

Planning for long-term resilience

Long-term planning supports Central Otago to prepare for climate change. As resources allow, council can upgrade critical infrastructure, protecting essential services, reducing flood risks and building community resilience for future extreme weather events.



Cromwell