CLIMATE RISK AND RESILIENCE IN QUEENSTOWN LAKES

A SUMMARY OF QUEENSTOWN LAKES' PART IN THE OTAGO CLIMATE STORY

Otago Regional Council

Aukaha

TE AO MĀRAMA INC.

Kingston

About this summary

Climate change is already affecting the mountains, headwaters, lakes and rivers across the Queenstown Lakes area. Heavier rainfall, hotter days, longer dry spells and less reliable snow are placing more pressure on our ecosystems, infrastructure and way of life.

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

Explore the interactive
Otago Climate Story
to learn more about
climate change in Otago:
orc.govt.nz/climatestory

Cover image: Queenstown–Glenorchy Road

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 the services communities rely on.

Queenstown Lakes' climate change story is shaped by its mountains, lakes, rivers and spectacular natural landscapes. With broad glacial valleys, iconic lakes and rivers, and distinctive alpine environments, Queenstown Lakes supports native species and ecosystems that are rare or unique to the area. Queenstown and Wānaka, along with smaller communities like Glenorchy, Kingston and Hāwea, are inherently shaped by their connection to the land and water, and by the visitors who come to experience them. The natural environment supports much of the local economy and way of life.

Communities across Queenstown Lakes rely on a strong nature-based and adventure tourism sector, including snow sports. Activities such as viticulture and livestock farming also contribute significantly to the economy and community. The area also depends on a few key road corridors, like State Highway 6, and a constrained electricity network. These strengths and dependencies can make the Queenstown Lakes area vulnerable to increasing flooding, wildfire, changes in snow cover, and growing pressure on essential services.

The Queenstown Lakes area is growing quickly, and visitor numbers add extra pressure at busy times, particularly during peak winter and summer seasons. While growing communities and infrastructure present opportunities to carefully plan and build resilience, climate change can also place more strain on housing, roads, water services and emergency response.

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 ī 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

From the high alpine areas of Tititea / Mount Aspiring National Park to the lakeside towns of Queenstown and Wānaka, the local climate shapes many of the things communities rely on, including drinking water, transport networks, tourism and valued natural places.

Different parts of Queenstown Lakes will experience climate change differently depending on their elevation, exposure, and proximity to lakes, rivers and mountains. Higher places are more affected by changes in snow and ice, while valley floors, lake edges and river corridors are more exposed to flooding, slips, wildfire and pressure on infrastructure.

Some places are more exposed than others. Low-lying lake and river areas, including parts of Queenstown, Wānaka, Kingston and Glenorchy, face increasing risk from heavier rainfall events that elevate lake and river levels and overwhelm local stormwater systems. Steeper hill and mountain areas are more prone to slips, debris flows and road disruption, especially during heavy rainfall. Forested and dry inland areas near settlements are also likely to face greater wildfire risk as conditions become warmer and drier at times.

Over time, Queenstown Lakes is expected to continue to become warmer, with fewer frosts, more hot days and more variable snow. Snowlines are expected to rise, and snowmelt is expected to happen earlier in the season. This means less water being stored naturally as snow through winter and released slowly in spring and summer. Total annual rainfall may not change greatly in some places, but heavy rainfall events are expected to become more frequent and intense.

Hokia ki tō mauka kia purea ai koe e kā hau o Tāwhirimātea | Return to the mountains to be cleansed by the winds of Tāwhirimātea

Mountains (mauka) play a significant role in the spiritual and cultural connections of Kāi Tahu; they are intrinsically linked in whakapapa to kā atua (gods) and considered one of the most sacred places in our landscape.

Specific seasonal times indicate key periods of growth and prosperity. Spring waters and rainfall moving through the system during Mahuru (start of spring) into the lower catchment are integral to the cleansing and replenishing of the system. These flows are intrinsically linked to seasonal shifts and maramataka, guiding when whānau gather specific mahika kai. Climate-driven changes such as earlier snowmelt are altering the timing and volume of these seasonal flows, affecting lake levels, groundwater recharge, and the reliability of these culturally significant cycles. Reduced snowpack and glacier retreat across the catchments further threaten the long-term availability of fresh water that underpins these practices.

Climate change significantly impacts Kāi Tahu cultural and spiritual connection to mauka. Mauka are seen as images of kā atua; hukawai (melt waters) coming down from the mauka are known to hold the highest level of purity, used for spiritual connection and highly valued for amenity value. Changes in snowmelt patterns may affect mahika kai practices and spiritual use of hukawai (melt waters). Changing snow and rainfall patterns may increase erosion and the amount of sedimentation moving down the system, degrading water quality and impacting the mauri of and connection to these outstanding landscapes. Reduced snow cover and warmer conditions may also result in an upward shift of the natural treeline, altering alpine ecosystems and leading to changes in indigenous biodiversity. This shift can enable the spread of invasive pest species into previously inhospitable alpine areas, further disrupting ecological balance and threatening culturally significant species.

Dean Whaanga (Kaupapa Taiao Kaiwhakahaere Te Ao Mārama Inc.)

Key climate change risks in Queenstown Lakes*

Risks to alpine wetlands, lakes, freshwater species, water supplies, winter tourism, and community wellbeing from warmer temperatures, variable snowfall and changing rainfall patterns.

Risks to transport routes, supply chains, telecommunications, businesses, buildings, and open spaces from more frequent and intense flooding, landslides, and extreme weather events.

Risks to freshwater ecosystems, water supplies, stormwater and wastewater networks, and recreational values from drought, flooding, extreme temperatures, reduced snowpack, and declining water quantity and quality.

Risks to Queenstown Lakes' tourism economy, particularly winter sports and nature-based tourism, from warmer temperatures, variable snowfall, flooding, landslips and increasing operating costs.

Risks to households, businesses, infrastructure providers, tourism operators, and primary industries from more frequent damage, disruption, and increasing costs associated with climate-related hazards.

Risks to farming, viticulture, horticulture, and productive land from drought, higher temperatures, pests, diseases, and increased fire weather.

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

Heavier rainfall and flooding

Heavier rainfall events are expected to become more intense across Queenstown Lakes over time. When large amounts of rain fall in a short time, it can raise lake and river levels, overwhelm stormwater systems, and cause flooding around streets, homes, businesses, roads and low-lying lakefront areas, including places around Queenstown, Wānaka and Glenorchy.

Heavy rain can also put pressure on the gorges, hillsides and mountain areas that important roads like State Highway 6 intersect. In places like Kawarau Gorge and Kingston Road, where slopes, river terraces or alluvial fans are already unstable, very wet ground can trigger slips. This can damage roads, bridges, water pipes and other important services, and may cut off more isolated communities during extreme weather.

Reduced snow cover and earlier snowmelt

A warmer climate is expected to make snow and ice cover more variable across Queenstown Lakes alpine areas over time. More winter rain and varying snowfall mean the snow season may become shorter and snow that does fall, likely to melt earlier, particularly in lower elevation areas like Coronet Peak.

This matters well beyond the ski fields. Snow acts like natural water storage, releasing water slowly as it melts. With less snow, more water is likely to flow through rivers in winter and less may be available in summer. This can reduce water supply in important waterways, like the Clutha River/Mata-Au, affect river health and ecosystems, and increase the risk of higher flooding in winter.

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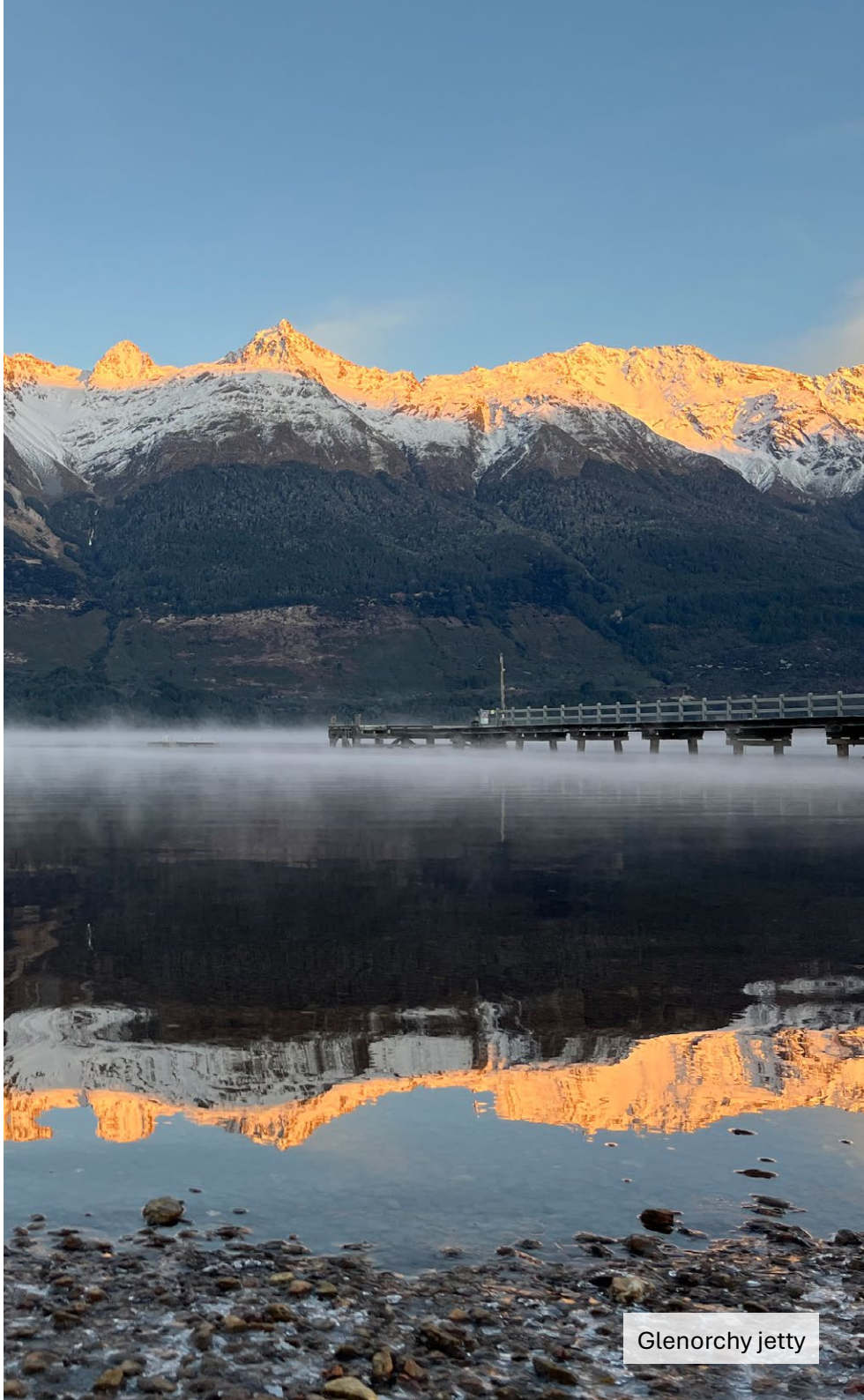

Glenorchy jetty

Hotter and drier conditions

Hotter and drier conditions across Queenstown Lakes will mean warmer winters, hotter summers and quicker drying of soils, with more frequent and severe droughts. Less snowmelt may reduce river flows through spring and summer, while higher temperatures are likely to increase demand for drinking water and irrigation.

Drier landscapes also increase the risk of wildfire and place stress on ecosystems. Fires can start and spread more easily, and low river flows can affect water quality and habitat. Over time, these conditions can shift plant and animal habitats, allow pests and weeds to spread, and reduce the overall health of rivers, wetlands and soils.

Managing fire risk in Wānaka

Climate change is expected to increase wildfire risk around northern Wānaka and Albert Town, near Mt Iron. Hotter temperatures, longer dry spells and more frequent extreme fire weather will make it easier for fires to start, spread faster and burn more intensely.

As the Wānaka community grows, more people, houses and visitors are located in places where a wildfire could move quickly and be harder to control. While some residents are already taking steps to prepare, greater awareness is needed across the wider community and visitors to reduce the risk.

Action is already underway through coordinated efforts by Queenstown Lakes District Council, Fire and Emergency New Zealand, and other local partners. Measures include prohibited fire zones, reserve closure protocols, public education resources, environmental monitoring systems and joint planning for wildfire response.

Wānaka

What matters most?

Our natural environment

Queenstown Lakes ecosystems and wildlife are highly sensitive to warmer and drier conditions. As temperatures rise and snow levels lift and melt each spring, this reduces the steady flow of cold, clean water that rivers, wetlands and lake edges rely on, particularly through late spring and summer. In places like the Upper Clutha and Cardrona catchments, longer dry periods can dry out soils and wetlands, putting pressure on native vegetation and freshwater habitats.

Hotter, drier conditions will also change which species can survive in different parts of the district. Alpine and high-country ecosystems around areas like the Pisa Range, Makarora and Tititea / Mount Aspiring National Park are especially vulnerable, as they continue to lose alpine habitat. At the same time, warmer conditions allow pests, weeds and plant diseases to spread into new areas, competing with native species. These pressures are expected to gradually reduce the health, diversity and resilience of native ecosystems across the district.

Growth in a changing environment

Rapidly growing populations, particularly across Queenstown, Wānaka, Hāwea and Kingston, along with high visitor numbers, are already putting pressure on infrastructure, housing and services. Climate change is expected to add to these pressures, including by increasing demand for water during hotter and drier conditions.

As the population grows, more people, homes and businesses could be exposed to climate change hazards, such as flooding, landslides and wildfires. Queenstown and Wānaka already have residential and commercial areas near high fire danger areas, which also rely on volunteer fire brigades. Visitors may be especially vulnerable because they are less familiar with local risks and may be less prepared when floods, fires or other disruptive events occur.

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Gibbston Valley

Our people and economy

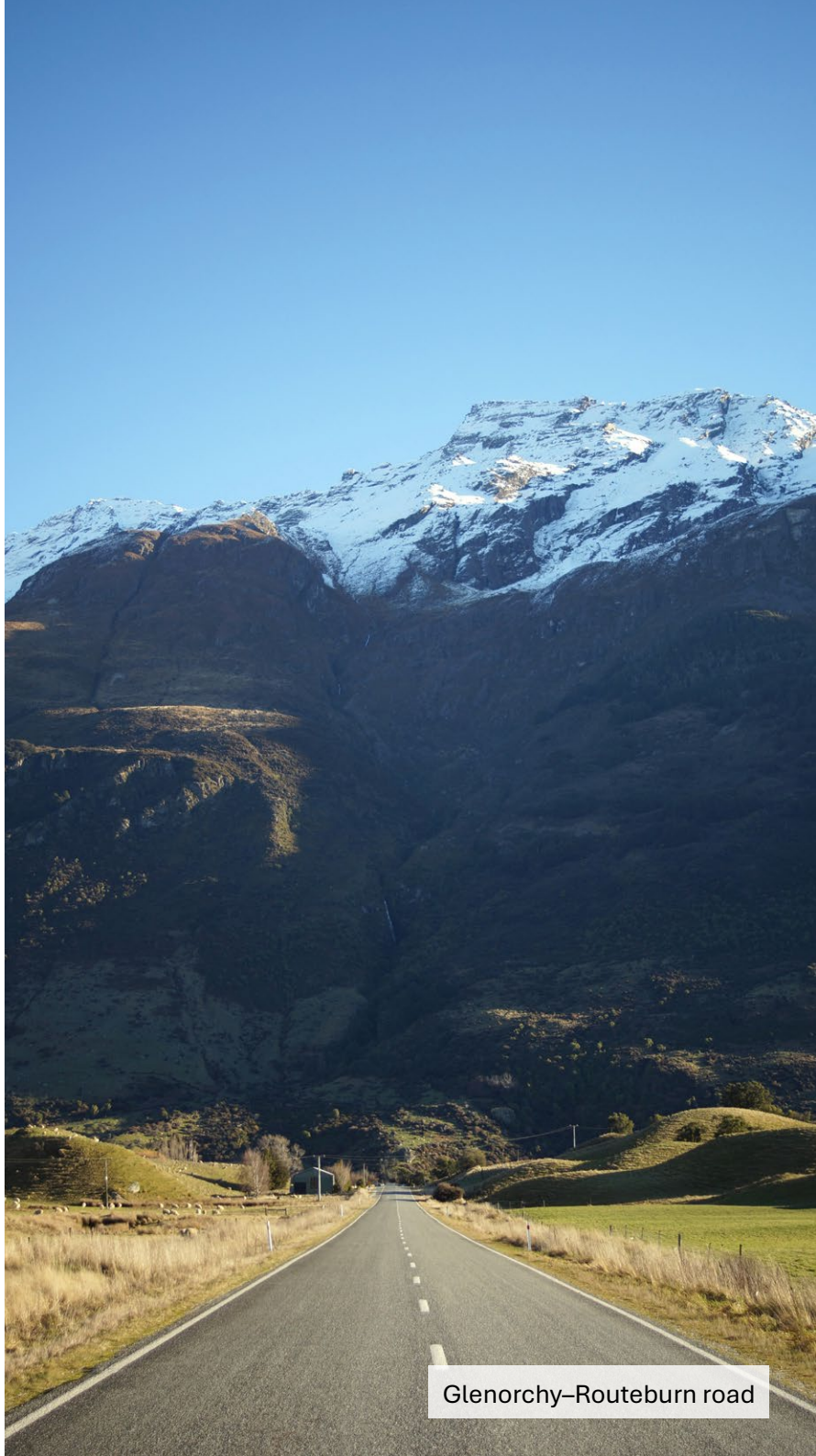
Queenstown Lakes' economy is closely connected to its mountains, lakes, landscapes and seasonal patterns, making local businesses and communities increasingly exposed to the effects of climate change. Warmer winters, more variable snowfall, and earlier snowmelt are creating growing challenges for ski areas, as well as the accommodation, hospitality, retail and tourism businesses and seasonal workers that depend on winter visitors. At the same time, heavier downpours, flooding, slips and wildfire risk can cause disruptions and closures at important visitor destinations and recreation areas, like the Routeburn Track.

For farmers and growers in the area, the outlook is mixed but increasingly uncertain. Warmer temperatures and fewer frosts may open up opportunities for new crops, earlier planting and expanded horticulture or viticulture in some areas, but farmers and growers are also likely to face more heat stress for stock, greater irrigation demand, changing pests and diseases, and less dependable water as mountain snowpack shrinks.

Connectivity and accessibility

Queenstown Lakes' electricity, transport and water networks are exposed to climate risks because they depend on a relatively small number of constrained infrastructure corridors. The district's mountainous terrain, lakes and rivers limit opportunities for alternative routes and network redundancy.

More frequent and intense extreme weather events, such as heavy rainfall, flooding, landslides and wildfire, pose increasing risks of important services being disrupted. Road transport is particularly vulnerable. Queenstown Lakes depends on a small number of strategic road corridors, like Kawarau Gorge, Kingston Road and the Glenorchy–Queenstown Road, some with limited alternative routes. Climate change is expected to increase the frequency and severity of disruptions, reducing reliable access. Road closures and infrastructure damage can isolate communities, strand visitors, interrupt deliveries of essential supplies such as food and fuel, and hinder emergency response and recovery.



Glenorchy–Routeburn road

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.

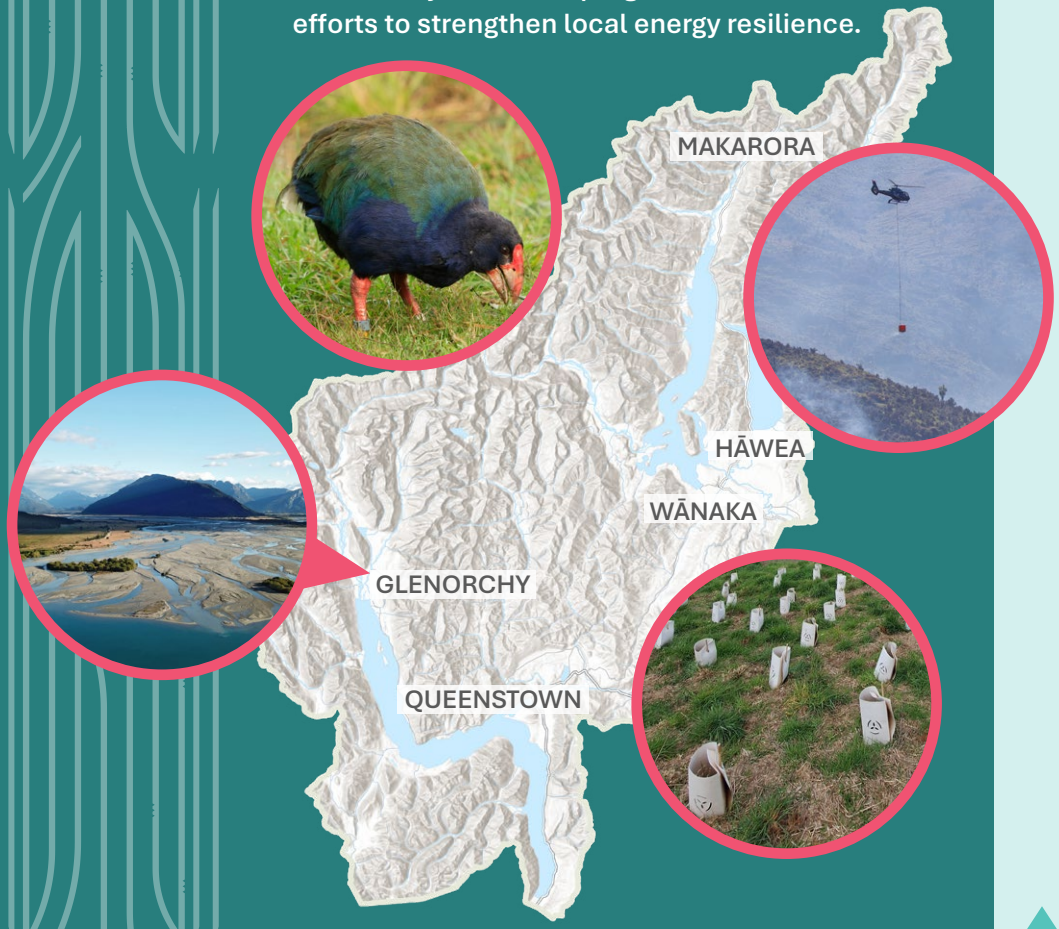
An example of a Kāi Tahu-led approach to climate risk assessment is provided by the South Dunedin Future Mana Whenua Risk Assessment Report, which used core values of mana, mauri, whakapapa and tapu/noa to frame a range of specific risks. While framed as risks to mana whenua values, these also encompassed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

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



Recloaking the slopes of Queenstown Lakes

Project Tohu is one of New Zealand's largest native revegetation programmes, transitioning an ex-pine plantation into native vegetation across the slopes of Coronet Peak. Queenstown Lakes District Council, in partnership with Kāi Tahu, Te Tapu o Tāne, Citycare Property, and local community conservation organisations, will plant over half a million native trees, shrubs and grasses to restore and protect native ecosystems, improve water quality across the catchment and remove carbon.

Wildfire risk management

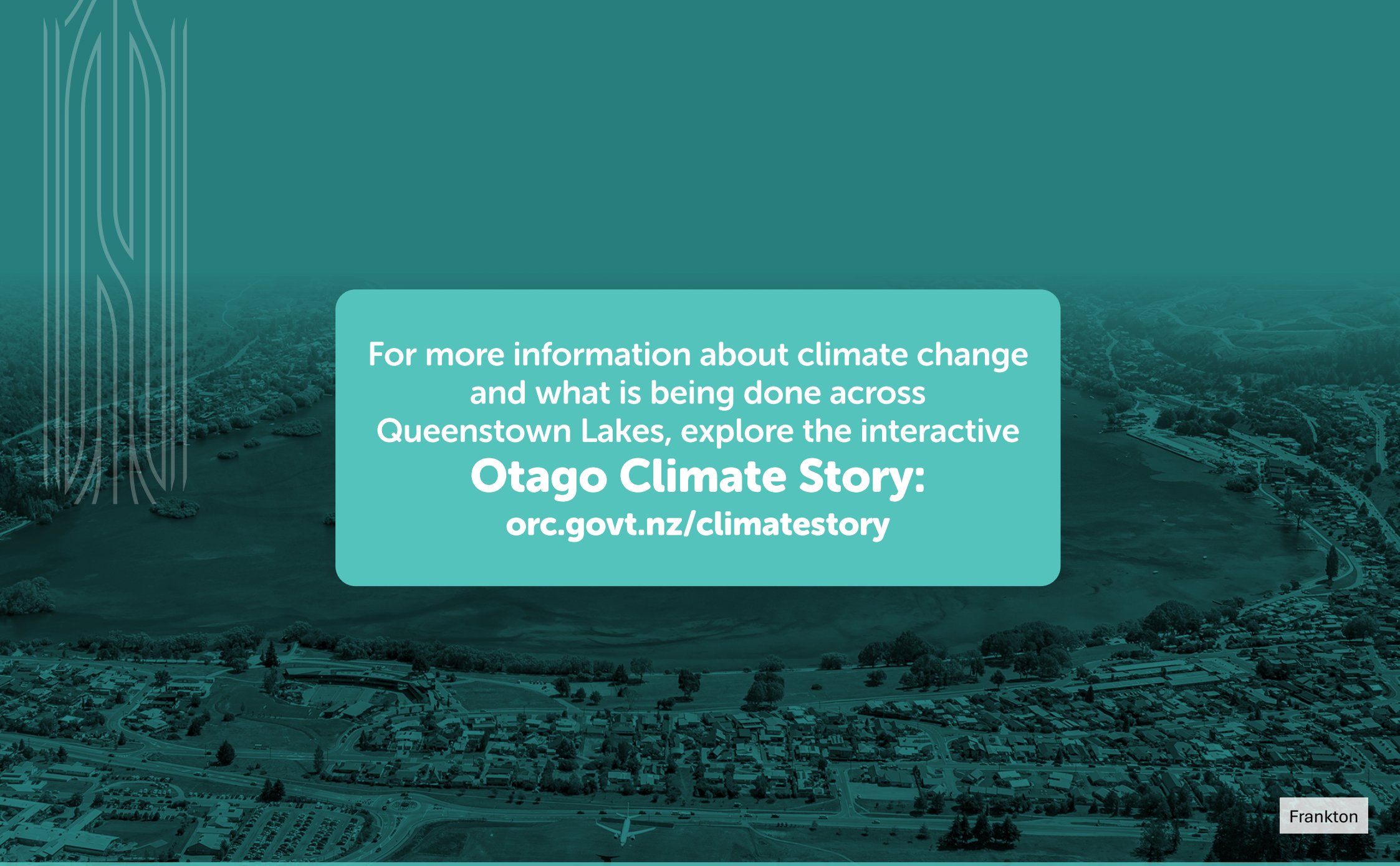
In addition to the year-round fire ban for the Ben Lomond, Queenstown Hill and Mount Iron recreation reserves and trails, weather and environmental conditions in these areas are continuously monitored. Queenstown Lakes District Council has a set of protocols and guidelines to manage these reserves in extreme conditions. This may result in occasional reserve closures to ensure public safety, particularly if hot, dry, windy conditions are forecast.

Communities adapting at the head of the lake

The regional and district councils, together with Emergency Management Otago and the community, have developed the Head of Lake Whakatipu Natural Hazards Adaptation Strategy for the townships of Glenorchy, Kinloch and surrounds. The strategy provides a common direction for natural hazard management and adaptation planning in the face of a changing climate.

Queenstown Lakes Climate and Biodiversity Plan

Since 2019, Queenstown Lakes District Council has worked with communities and key partners to deliver meaningful climate and biodiversity action across the district. The Climate and Biodiversity Plan provides a framework for considering future climate scenarios in long-term planning, risk management and investment decisions. It also supports practical initiatives that strengthen local resilience, including community preparedness programmes, food resilience networks, renewable energy projects and the accelerated rollout of household solar and battery systems.



For more information about climate change and what is being done across Queenstown Lakes, explore the interactive

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Frankton

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