Climate

Taranaki is one of the sunniest and windiest regions in Aotearoa. Crowned the sunshine capital of New Zealand in 2021, New Plymouth often enjoys more than 2,500 sunshine hours a year.

Taranaki climate is largely influenced by its location and exposure to weather systems migrating across the Tasman Sea. Consistent rainfall, a moderate climate and fertile, free-draining soils mean the region is well-suited to productive land uses such as sheep, beef and dairy farming.

Science tells us the climate is changing at a rapid pace. The Intergovernmental Panel on Climate Change (IPCC) reports New Zealand warmed by around 1.1°C between 1910 and 2020, and annual temperature changes have exceeded natural variability across the country. The National Institute of Water and Atmospheric Research (NIWA) in the report *Climate change projections and impacts for Taranaki* (2022) predicts increases of 0.5 to 1.0°C by 2040 and 1.25-3.0°C by 2090.

Understanding climate change and its local effects requires good quality, long-term data and the latest science to support decision-making. In Taranaki, our network of observation stations collects climate data from across the region. This includes information on air temperature and wind, rainfall, soil temperature, soil moisture and river flows.

This section presents a summary of climate conditions based on climate data and other information we have collected, as well as climate projections for the coming decades based on up-to-date information from NIWA. The report indicates the conditions we could expect to see in Taranaki in the coming years and how these changes might affect the way we live, work and play. This will inform how we plan, prepare and adapt to a changing climate in Taranaki.

2,556 hrs
Average sunshine hours

1,620 mm
Average rainfall
non-mountain

14 °C
Average air temperature

126 km/hr
Strongest wind gust
Hāwera - 2018

What we know

In considering weather and climate we are mainly interested in sunshine, rain, wind and temperature data. This helps guide decision-making around growing seasons, flood management, fishing, swimming and surf conditions. River flows are influenced by rainfall and temperature and tell us how dry or wet a summer is. River flow measurements can help us ensure water use is managed in a way that protects freshwater ecosystem health. Find more information on river flows in the Water chapter.

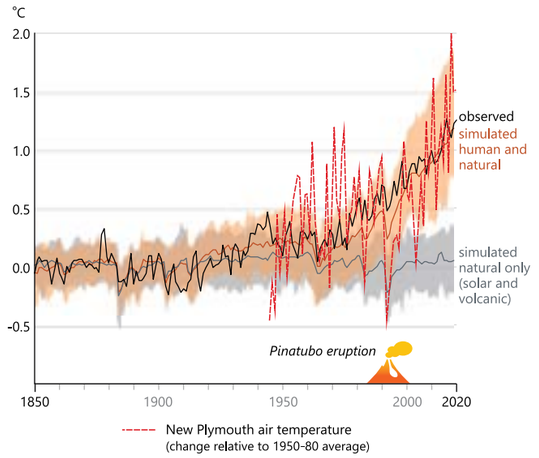
Air temperature

Annual mean air temperatures in the region's main urban areas are around 13-14°C, while temperatures at Taranaki Maunga Dawson Falls and North Egmont Visitor Centre average slightly over 9°C. Winter temperatures average between 7 and 8°C, with a fresher 3°C at our mountain sites. Summer daily averages are from 19 to 20°C, and 16°C on Taranaki Maunga. Although summer days can feel hot, the temperate climate, and our proximity to the ocean mean that, in summer, the mercury rarely climbs above 30°C.

Averages °C	New Plymouth	Hāwera and Stratford	North Egmont and Dawson Falls
Year	14	13	9
Winter	8	7	3
Summer	20	19	16

Annual mean air temperatures for Hāwera, Stratford, New Plymouth and mountain sites, with summer high (95th percentile of daily averages) and winter low (5th percentile of daily averages) for the period 2015 to 2020. These are not the hottest and coldest temperatures, but show the range of values that can normally be expected.

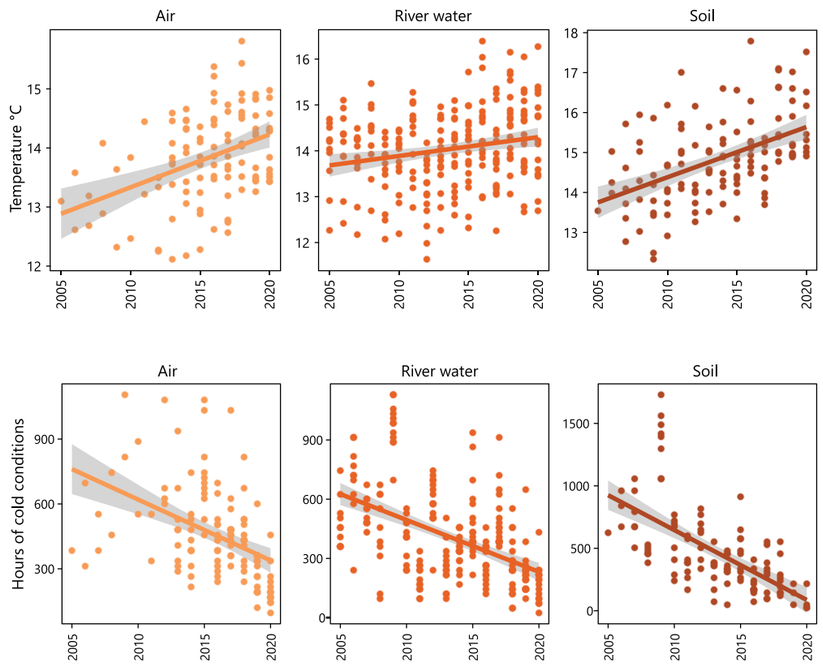
Air temperature observations have been taken at MetService's New Plymouth Airport climate station since 1944. The data is highly variable but shows patterns similar to the rising global trend of 0.1°C per decade for much of the last century. From the 1970s, this trend increased to around 0.18°C per decade. There was a large temperature drop in 1992 due to ash from the Mount Pinatubo eruption, however since that time the temperature has rebounded. In the last 20 years, we have experienced an unprecedented increase in temperature of 0.5°C per decade.



Air temperature data collected at the New Plymouth climate station since 1944 is shown by the red dotted line as a three-year running average. Base diagram source: IPCC.

Temperatures measured at climate stations across the region show marked increases in air, water and soil temperature, particularly over the past decade. Changes in river water temperature are more subtle, while air and soil temperatures have risen sharply, with soil temperature increasing at a rate of around 1.4°C per decade. Changes over 10 to 15 year periods are affected by long-term climate trends as well as changes due to shorter climatic cycles, such as the El Niño-Southern Oscillation. An assessment of cold temperature trends for air, soil and river water suggests that in coming years we can expect to see fewer cold hours and milder winters in the region.

Taranaki is one of the sunniest and windiest regions in New Zealand, due to its location and exposure to weather systems that migrate across the Tasman Sea.



Trends in air, river water and soil temperature (top) and trends in low temperature hours (bottom) for the period 2005 to 2020.

NIWA reports that by 2040 we can expect to see an increase in annual and seasonal mean temperatures of 0.5 to 1.0°C, and between 1.25 and 3°C by 2090 when compared to the period 1985 to 2022. We can also expect to see increases in maximum and minimum temperatures and an increasing fluctuation of temperatures (diurnal temperature range) across the day.

Frost days are projected to decrease by 2-10 days by 2040. By 2090, frost days could decrease by up to 23 days per year, with frosts becoming an uncommon occurrence across much of Taranaki. Growing degree days, with temperatures that support plant growth, are projected to increase by the year 2040 and more considerably by 2090 in particular coastal areas north of Taranaki Maunga. In the long term, this may influence the types of crops that can be grown and result in earlier harvesting times for current crops.

Wind

A measure of windiness is the average daily maximum wind gust in km/hr. The Ministry for the Environment (MfE) reported in *Our Atmosphere and Climate* 2020 that Wellington is New Zealand's 'windy city' with average daily maximum wind gusts of 65km/hr recorded from 2010–2019. Invercargill, at 47km/hr, came in second place, with New Plymouth following closely in third place with gusts up to 46.3km/hr.

Our coastal Taranaki climate stations measure some of the strongest winds with peak gusts of around 120km/hr. Hāwera and Cape Egmont are similarly windy to New Plymouth, with predominant southerly and westerly winds in New Plymouth and northerly and westerly winds in Hāwera. Southeasterlies, southwesterlies, and northeasterly winds are all prevalent at Cape Egmont.

Our data indicate a rising trend in wind gust speed, more time with gale-force gusts, and less time with calm conditions. NIWA climate projections for New Zealand suggest winds will strengthen as we progress through the 21st century. Projections for Taranaki suggest small changes in wind speed by 2040, with stronger patterns and seasonal changes evident by 2090.

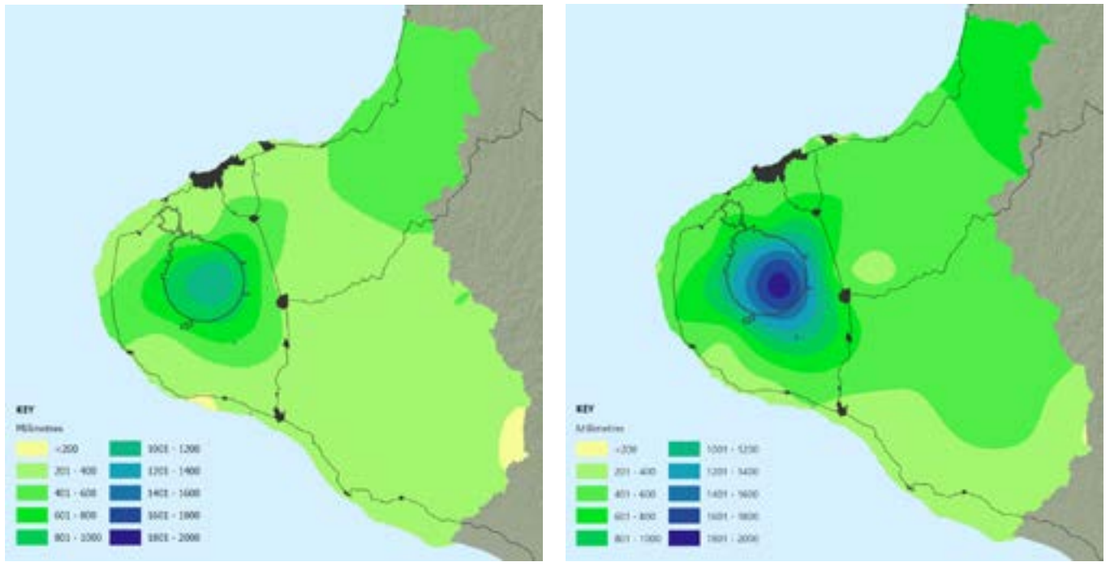
Rainfall

Taranaki enjoys regular rainfall throughout the year, with New Plymouth receiving 1,300 to 1,500mm of rainfall annually. Taranaki Maunga receives a deluge of 7,000mm of rainfall annually at the summit, intercepting cloud tracking in from the west, dropping sharply with distance from the peak to 3,000mm. When we report on rainfall, we're generally referring to precipitation, which includes snow, hail and sleet.

The rainfall total in summer (December–February) is typically 60-75% of that in winter (June–August), although long hot summer days accompanied by windy conditions result in rapid drying conditions compared to winter. The lower eastern hill country receives around 2,000mm of rain, while coastal areas around and south of Manaia are drier, receiving 1,000 to 1,300mm a year.

In 2020 MfE reported evidence of a decreasing trend in total rainfall in New Plymouth during the period 1960 to 2019.

Climate change projections for the wider region, however, suggest increasing precipitation and more extreme rainfall events in the coming decades, with longer and more frequent dry spells. NIWA reports Taranaki can expect a mixture of changes in rainfall, with an increase in rainfall of up to 8-12% in winter, with decreases in inland and northern areas in autumn and spring under different climate change scenarios. An increase in the number of dry days, particularly from spring through to autumn, can be expected with little change in winter projected by 2090. For all future climate scenarios, we anticipate seeing an increase in drought conditions, particularly by 2090.



Average total annual rainfall 2015–2020 for summer (left) and winter (right) based on measurements collected at rainfall stations across Taranaki.

River flows

River flows are a product of rainfall and temperature. Higher temperatures generally increase rates of drying due to evaporation and transpiration and, if there are longer rain-free spells, lower river flows will occur. An overall declining trend in flows is indicated with a general tendency for rivers to experience extended periods at low flow, when compared to 20 or 30 years ago. Measures of high storm flows indicate there will be more hours at high flows at some sites and fewer at others. Investigating rainfall and river flow patterns in detail is beyond the scope of this report, but we intend to explore and report on this soon.

In the future, we can expect to see similar overall river flows (in terms of annual discharge) but a decrease in annual low flows. NIWA recently assessed hydrological changes in the region's rivers between the baseline period (1986–2005) and two future periods: mid-century (2036–2056) and late-century (2086–2099). They report that average annual discharge remains stable or will increase slightly by mid-century across some coastal and northern parts of Taranaki. By late-century, mean annual discharge remains stable for much of the region, with increases in coastal parts of Taranaki. It is expected mean annual low flows will decrease across the region by mid-century. This pattern is similar by late-century, with decreases of up to 50% for most of the river systems in the region.

Sea level

NIWA also reports that rising sea levels in past decades have affected human activities and infrastructure in coastal areas of New Zealand, contributing to increased vulnerability to storms and tsunami. In the coming years, a further sea level rise will have increasing implications for development in coastal infrastructure such as transport networks (roads, ports and airports), wastewater treatment plants and potable water supplies, as well as creating capacity and performance issues with stormwater and overland drainage systems.

In 2017, MfE reported a doubling in the rate of sea level rise along the New Zealand coastline over the past five to six decades, from an average of about 1mm/year earlier last century to nearly 2mm/year from 1961 to 2015. There was a New Zealand-wide average relative sea level rise of nearly 1.81 (±0.05) mm/year up to 2015. Relative sea level rise along the Taranaki coast also incorporates a component of vertical land movement, reflecting the land movements that accompany our active tectonic environment. In New Plymouth, average relative sea level rise is 1.37 (±0.16) mm/year.

What we're doing

Climate affects rainfall, river flows and wind speed, so any changes to the climate will have environmental and social impacts. Changes in frequency and intensity of rainfall, river flows and wind events may lead to natural hazards such as floods or cause damage to buildings, crops and forests. Extended dry or still periods will impact on river flows and water temperature, creating stress on the life in the river, loss of grassland productivity and heat stress on livestock and crops.

We are working to better understand the range of impacts we can expect in coming years. The Council recently commissioned the NIWA report *Climate change projections and impacts for Taranaki* (2022), which outlines possible changes in climate and how these may affect us.

The Council's draft Climate Strategy will be further refined as we take stock of the recent NIWA findings. As a Council, we are investigating options to improve public transport and reduce carbon emissions from our public transport fleet and other road-based emissions. Our scientists and data analysts are studying climate issues in greater detail and our policymakers are considering the impacts of a future climate on the environment, including water availability and ecosystem health.

We are working in partnership with local district councils, building our collective understanding of climate change impacts, risks and opportunities. Along with local councils, iwi and hapū, and research partners such as Massey University and GNS Science we are looking at ways to support those in vulnerable areas of our region to adapt to climate changes and to advance our knowledge as to how we can best respond as a region.

Where we're heading

The IPCC's Sixth Assessment Report *Climate Change 2022: Impacts, Adaptation and Vulnerability* (2022), along with updated projections for a range of climate change measures, tells us New Zealand warmed by around 1.1°C between 1910 and 2020 and annual temperature changes have exceeded natural variability across the country. The report concludes human-induced climate change is affecting many weather and climate extremes across the globe, including in New Zealand. Evidence of observed changes in extreme weather events and their attribution to human influence has strengthened since the Fifth Assessment Report in 2014.

Locally, much of Taranaki will experience an increase in rainfall intensity, with an increasing risk of erosion and landslides (NIWA, 2020). We are also likely to experience more frequent and severe drought conditions, impacting the productivity of primary industries. Changes in rainfall can have positive and negative effects, with different plants and crops responding in different ways. Pest species may increase in number and in distribution, migrating to areas where conditions permit their spread. Reductions in cold conditions may enable people to diversify their crops, however warmer temperatures may also increase the risk of plant and animal pests and diseases.

Understanding climate change and its local effects requires good quality, long-term data, robust science and collective efforts to support good decision-making. This includes understanding natural climate variation, such as the effects of El Niño and La Niña, and the effects of human-induced climate change. Working in partnership with iwi, hapū, district councils, emergency management staff and experts from research institutes such as NIWA and Massey University ensures we provide the best information possible and co-ordinate our responses.

As we build our understanding of the drivers and impacts of climate change through our science and monitoring, we will investigate and report on a range of climate-related themes – from water availability and land management to flood management and biosecurity. We will look for ways to adapt to a rapidly changing climate – the opportunities as well as risks.

Potential impacts of climate change are likely to include reduced low flows in our region's rivers, increased risk of erosion and landslides.

Gap bridged with flood barrier

A multi-year upgrade of the Council's flood defences for Waitara township was completed in 2021 with the installation and testing of a temporary flood barrier for the Town Bridge.

The barrier is stored nearby in lightweight kitset form, ready to be quickly deployed if, and when, floodwaters threaten to overtop the bridge deck.

How can it keep so much water back when it looks almost low enough to step over?

Looks are deceiving. The barrier may not look high but it matches the height of the flood walls either side. As a result of the upgrade, those flood walls and stopbanks are significantly higher than when they were first built in the 1990s. Without the new barrier, the bridge would be a weak link in the boosted flood defences.

If floodwaters were ever high enough to flow over the bridge deck, the river would be flowing fast and wide. So, without the barrier, a considerable amount of water would quickly pour into the CBD.

Is there a barrier at both ends of the bridge?

A barrier is needed only on the town side of the bridge, as the eastern side is higher and floodwaters would not overtop at that end.

What other improvements have been made to the town's flood defences? How watertight is the town now?

Floodwalls and stopbanks were raised, rock linings and rock groynes were upgraded, and floodgates installed to prevent floodwater getting into stormwater pipes. Waitara now has protection from floodwaters up to 3,840 cumecs (cubic metres a second).

Why was an upgrade needed?

More hydrology data and more modelling capacity is available now than in the 1990s when the scheme was originally designed. And there is also more understanding of the potential effects of climate change.

So is the town protected from a 'one-in-100-year' flood? How come we hear about these so often these days?

That's an old definition, and it's misleading. Of course, nature doesn't take any notice of our calendars – she operates to her own timetable. It's more accurate to say there's a 1% chance of a flood that big in any given year, regardless of when the last big one was.

Waitara's 3,840 cumecs protection is more than enough to meet the 1% exceedance standard. In other words, there's less than1% chance that such a flood will occur in any given year.

What other flood protections schemes are there?

There's a Council scheme similar to Waitara's for the Lower Waiwhakaiho River on the northern edge of New Plymouth, and smaller-scale schemes at Ōkato, Ōpunake and Waitōtara.