



Climate Factsheet

Niue

People and Geography

» The island of Niue lies south of the equator in the western south Pacific Ocean, between latitude 19° S and longitude 169° E, with a total land area of 259 sq. km.¹

One of the world's largest coral islands

One of the world's largest coral islands, it formed from an extinct volcano and is a raised coral atoll with fringing coral reefs encircling its steep limestone cliffs.¹

- » Niue is characterised by three terraces; the rim of the lower terrace averages 28 m above sea level, with the upper rim averaging 69 m above sea level.¹
- » The slopes of the terraces are rough, with jagged coral outcrops.¹
- » The island has a rugged, rocky 64 km long coastline, featuring steep cliffs, caves, deep chasms, and blowholes.¹
- » There are 14 villages scattered around the island's coast, one of which Alofi is the capital.¹
- » There is no surface water on Niue, but artesian bores tap a subterranean reservoir of fresh water for domestic, commercial, and agricultural purposes.¹
- » Niue is a parliamentary representative democracy, where the premier is the head of government. The constitution vests executive authority in the Crown, currently Her Majesty Queen Elizabeth II, and specifies that in everyday practice this authority is exercised

by the premier of Niue and a cabinet of three other ministers.¹

» The premier and ministers are members of the Niue Legislative Assembly (Fono Ekepule), the nation's legislature. The assembly consists of 20 democratically elected members, 14 of whom are elected by village constituencies and six by all registered voters in all constituencies.¹



Niue had a population of
1,719

Niue had a population of 1,719 in 2017, with a population density of 6.2 per sq. km.²

- » As of 2019, the natural population growth rate was -1.2%.²
- » 46.2 % of the population was urban as of 2020.²
- » By 2050, the total percentage living in urban areas is expected to rise to 61.6 %.³
- » Between 90% to 95% of Niuean people live in New Zealand, along with about 70% of the speakers of the Niuean language.⁴
- » As of 2011, the life expectancy at birth was 73.1 years for the total population, with the same being 76.3 and 70.1 for females and males respectively.²
- » The total fertility rate in 2016 was 2.7.²
- » Niue is a bilingual country, with 30% of the population speaking both Niuean and English.⁴

» Niue's economy depends on joint ventures, trade, mining, agriculture, tourism, as well as foreign aid, and revenues from offshore banking, the internet, and the sale of stamps to foreign collectors.⁴

» Around 204 sq. km of the country's land is available for agriculture, with commonly grown crops including taro, cassava, yams, kumara, and bananas.⁴

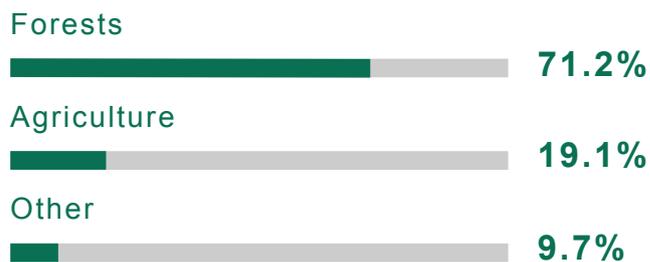
» According to the 2009 Niue Mini Population Census and Agricultural Census, 87% of households were actively involved in the agriculture sector.³⁰

» The 2009 agricultural survey reported that around 60% of the household were engaged in fishing activities.³¹

» Coconut, meat, passionfruit, and limes dominated exports in the 1970s, but in 2008 vanilla, noni and taro were the main export crops.⁴

» Niue's GDP per capita was USD\$ 17,032 as of 2018.²

As of 2011, land use in Niue constitutes ⁵



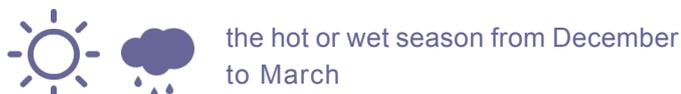
» Niue is known as the world's first "dark sky nation" according to the International Dark Sky Association due to its low levels of light pollution.⁶

» It has four types of fauna (birds, butterflies, mammals, Katuali) and 186 vascular plant species (159 native flowering plant species, 25 ferns, and 2 fern allies).⁷

Climate

» Niue has a tropical maritime climate, with a seasonal range of about 4.5°C between the warmest and coolest months.¹

There are two distinct seasons in Niue:¹



Rainfall

The average annual rainfall is approximately 2,180 mm, but it can vary from 810 mm to 3,300 mm.¹

» The bulk of rainfall is concentrated in the hot season and is often delivered in torrential downpours; it accounts for 68% of the total annual rainfall.¹

» The cool season is characterised by warm, sunny days and cool nights, with temperature averaging 24°C.¹

» The annual average temperature does not vary greatly throughout the year due to the influence of the sea on a small low-lying island.¹

» The annual rainfall pattern is erratic, with very dry or very wet months possible at any time of the year.¹

» Year-to-year variability in Niue's climate is strongly associated with the El Niño-Southern Oscillation (ENSO), which makes annual rainfall in the wettest years almost four times that in the driest years.⁸

» Warming trends are evident in both annual and seasonal mean air temperatures for the period 1950–2009.⁸

» Temperatures are typically warmer during El Niño events and cooler during La Niña Events.⁸

» El Niño events are associated with drier conditions and occasional droughts while La Niña events are associated with wetter conditions and an increase in the number of tropical storms.⁸

» Droughts occur from time to time, particularly affecting agriculture due to lack of irrigation.¹

» There are two operational observation meteorological stations in Niue. Meteorological data for Niue is available from the mid-1950s.⁸

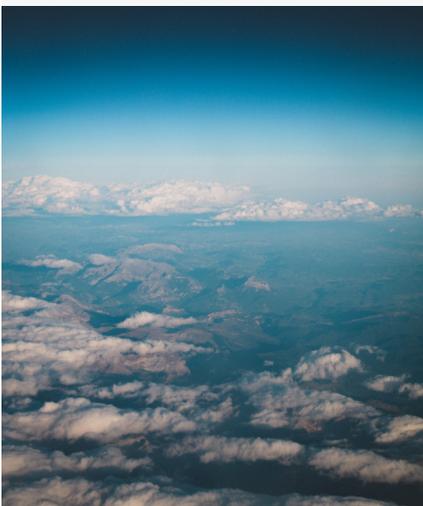
» The primary station, where multiple observations are conducted daily, is located at Hanan Airport, south of Alofi, and a single daily observation rainfall station is located at Liku.⁸

Global Climate Change



Sea Level Rise

- » The rate of sea-level rise has doubled since 1993 compared to the 20th-century average.⁹
 - » In 2019, the sea level continued to rise with the global mean sea level reaching its highest value since the beginning of the high-precision altimetry record (January 1993).¹⁰
 - » The average rate of rising is estimated at 3.24 ± 0.3 mm per year over 27 years, but the rate has increased over that time.¹⁰
 - » Global mean sea level rise since 1880 has been about 21–24 centimeters (8–9 inches), with about a third of that coming in just the last two and a half decades.²⁸
 - » The rising water level is mostly due to a combination of meltwater from glaciers and ice sheets and thermal expansion of seawater as it warms.²⁸
- » In 2019, the global mean sea level was 87.61 mm centimeters (3.4 inches) above the 1993 average—the highest annual average in the satellite record (1993-present).²⁸
 - » From 2018 to 2019, the global sea level rose 0.24 inches (6.1 millimeters).²⁸
 - » The rate of sea-level rise has doubled since 1993 compared to the 20th-century average.²⁸



Atmospheric Temperature

- » As of 2019, the year 2019 was the second warmest year in the 140-year record, with a global land and ocean surface temperature 0.95°C above the 20th-century average. This value is only 0.04°C less than the record high value of $+0.99^{\circ}\text{C}$ set in 2016. The third highest value recorded in 2015.¹¹
- » The five warmest years in the 1880–2019 record have all occurred since 2015, while nine of the 10 warmest years have occurred since 2005.¹¹
- » As of 2019, Africa and Asia had their third warmest year, Hong Kong, Australia, and Oceania had their warmest year in 2019.¹¹

Extreme Precipitation and Drought

- » In 2019, extreme precipitation and drought were recorded across the world. Hurricane Dorian affected the U.S. and the Bahamas. Summer 2019 was particularly dry across parts of western and central Europe. A tropical cyclone induced heavy rainfall over parts of Argentina, and eastern Africa.¹¹
- » Rainfall during India's summer monsoon season for 2019 was 10% above the 1961–2010 average.¹¹
- » Typhoon Wutip produced significant rainfall over parts of Micronesia in 2019.¹¹



Ocean Acidification

- » Oceans are absorbing about 25% of the carbon dioxide emitted to the atmosphere annually and as a result, are becoming more acidic.¹²
- » In recent decades, ocean acidification has been occurring 100 times faster than during natural events over the past 55 million years.¹³
- » Ocean pH has decreased from 8.88 in 2001 to 8.6 in 2016.¹³

Ocean Warming

- » Higher ocean temperatures cause the oceans to have a larger volume.⁸
- » The world's oceans have absorbed about 93% of the excess heat caused by greenhouse gas warming since the mid 20th century.¹¹
- » Ocean heat content has increased at all depths since the 1960s.¹¹

Regional Climate Change

Sea Level Rise

- » Between 1993 and 2017, there has been a rise in sea level of 3–6 mm/year for the Pacific islands.¹⁵
- » Mean sea level increase in Niue and average increase annually is 5 mm, larger than the global average of 3.2 ± 0.4 mm per year.⁸
- » Seasonal sea levels are significantly lower during El Niño conditions and higher during La Niña conditions.⁸
- » No analysis about extreme sea level rising, due to no tide gauge in Niue.⁸

Atmospheric Temperature

- » Averaged as a whole as of 2019, the same year in Oceania was the 1st warmest year in the 140-year record.²⁹
- » In the Pacific region, land-surface temperatures have been rising at the rate of $+0.17^{\circ}\text{C}$ per decade since the 1980s, slightly ahead of the global trend. Since 2005, nearly all surface stations have seen annual temperature anomalies above the long-term average.¹⁵
- » Maximum temperatures have increased at a rate of 0.15°C per decade.⁸

Extreme Precipitation and Drought

- » Annual and seasonal rainfall trends for the period 1950-2009 are not statistically significant.⁸
- » Niue experienced drought in 1983, 1991 and 1998.⁸
- » The tropical cyclone season in the Niue region is between November and April and extreme cyclones occurred in 1969 and 2006.⁸
- » In the 41-years between 1969 and 2010, 63 tropical cyclones passed within 400 km of Niue per season.⁸
- » The last severe cyclone hit the country in 2004, with high winds, storm surge, and intense rainfall and the storm caused over NZ\$37.7 million damage, three times Niue's GDP.⁸

Ocean Warming

- » In Niue, heat stress has already reached levels that cause coral bleaching.¹⁶
- » Niue shows considerable decadal variability of sea surface temperature from the 1950s to the present.⁸
- » Severe bleaching was reported in Niue in February and March 2017. This bleaching was much more extensive on the outer reefs than in 2015.¹⁷

Future Climate Projections

» Beyond 2035 the projected warming diverges depending on the greenhouse gas emissions pathway that humanity follows (Table 1). Climate projections have been derived for Niue by the Australian Bureau of Meteorology using the CMIP3 database for up to three greenhouse gas emission scenarios: B1 (low emissions), A1B (medium emissions), and A2 (high emissions).⁸

Table1: Projected change in surface air temperature (°C) for 2030 (2020–2039), 2055 (2046–2065), and 2090 (2080–2099), relative to the 1990 (1980–1999) base period for the three emission scenarios are shown below.⁸

Emission Scenario	2030 (°C)	2055 (°C)	2090 (°C)
Low: B1	+0.2 ± 1.0	+0.5 ± 1.5	+0.7 ± 1.9
Medium: A1B	+0.2 ± 1.2	+0.7 ± 1.9	+1.2 ± 2.8
High: A2	+0.3 ± 1.1	+0.9 ± 1.7	+1.8 ± 3.2

The CMIP3 scenarios are considered equivalent to the more recent CMIP5 scenarios. Regarding, air temperature CMIP3 and CMIP5 have been shown to produce similar results and ranges of uncertainty by the end of the century.⁸



According to the table, by 2030, under a high emissions (HE) scenario, this increase in temperature is projected to be in the range of **0.3–1.1°C**.⁸

- » There is uncertainty around rainfall projections for Niue as model results are not consistent. A general decrease in dry season rainfall and an increase in wet season rainfall over the 21st century is predicted.⁸
- » Model projections show extreme rainfall days are likely to occur more often.⁸
- » Less frequent but more intense tropical cyclones possibly occur with an increase in the average maximum wind speed of cyclones by between 2% and 11% and an increase in rainfall intensity of about 20% within 100 km of the cyclone centre.⁸
- » Mean sea-level is projected to continue to rise over the 21st century.⁸

Sea level of Niue



**Rise of 4-17 cm
by 2030**

Sea level is expected to continue to rise in Niue and by 2030, under a HE scenario, this rise is projected to be in the range of 4-17 cm.⁸

- » Global Sea Surface Temperature (SST) is projected to continue to increase through the 21st century under all emissions scenarios.¹⁸
- » Devastating impacts on coral reefs between 2030 and 2050 are expected in the region as bleaching level stress is reached annually under all emission scenarios.¹⁸
- » Severe degradation and potential loss of corals from most global locations by 2050 under current warming trajectories.¹⁸

- » Acidity levels of the ocean are expected to increase across Niue.⁸
- » Ocean oxygen levels are projected to decrease by as much as 3.5% by the end of the century under a low mitigation scenario relative to pre industrial levels.¹⁴

Impacts of Climate Change

- » Niue is a small and fragile island, which is subject to extreme climate events such as cyclones and droughts.¹⁹
- » The people and culture of Niue are at risk due to climate change. For example, in 2004, the Heta cyclone destroyed Moota trees which are culturally important for canoe-building.¹⁹
- » Niue has also suffered from significant population decline since 1971, due to immigration to New Zealand.¹⁹
- » An emerging focus on migration as a rational response to the impacts of climate change is a beneficial strategy for spreading risk and migration but is limited to those with threshold levels of economic resources and human capital.¹⁹
- » High resettlement is likely in the future both in response to climate risks and also as a byproduct of energy investments and land-use changes for mitigating climate change.¹⁹
- » Small island communities are at greater risk from sea-level rise in comparison with other geographic areas because most of their population and infrastructure are in the coastal zone.²¹
- » Niue has no surface water and relies upon groundwater and rain. Groundwater is recharged via rainfall infiltration and rainfall currently exceeds the rate of extraction. Thus water scarcity and poor soil are expected to be exacerbated due to climate change.²³
- » Climate change threatens the physical, biological, and human elements necessary for Pacific Island cultures to sustain their way of life.²⁴
- » Climate-driven health risks from the spread of infectious disease, loss of settlements and infrastructure, and decline of ecosystems that affect small island economies and livelihoods, and human well-being are under-researched.²¹



Climate change is expected to lead to severe impacts including **economic** and **social disruption** accompanied by inter-island movement of population and out-migration.²⁰

Mitigation and Adaptation to Climate Change

- » Niue's contribution to climate change has always been marginal (<0.00001% of global emissions).²⁵



80% of its electricity needs from renewable energy

The Niue Strategic Energy Road Map (NiSERM) 2015-2025 outlines Niue's aspiration to meet 80% of its electricity needs from renewable energy sources by 2025.²⁵

- » The national response to mitigate and adapt to climate change is implemented by Niue National Strategic Plan (2014-2019) with the vision of developing the country while building resilience to climate change.²⁵
- » Transport contributes the bulk of energy sector emissions at 57%, and electricity generation the remainder, at 42%. The focus of GHG mitigation efforts for Niue is thus firmly on transport and electricity generation.²⁵
- » Niue faces difficulties in mitigating climate change for two primary reasons such as the lack of environmental base data and the capacity to monitor and evaluate energy supply initiatives.²⁵
- » Niue's economy is heavily dependent on support from New Zealand, (aid accounts for 70% of Niue's GDP) due to low population, scarcity of natural resources, isolation, and high costs of transportation, which in turn affects its ability to invest in climate action.²⁶

» After the Heta cyclone in 2004, Niue's National Disaster Plan (2010), was updated including Disaster Management Plan, Response and Recovery Plan, Contingency Plans (for cyclone and storm, influenza pandemic), and Tsunami Plan.²⁶

» The vision of the Joint National Action Plan of Niue is **"A safer, more resilient Niue"** with 5 main goals to mitigate and adapt to climatic changes impacts.²⁶

» Considering its existing policies, Niue also submitted its first Intended Nationally Determined Contribution to the UNFCCC in 2015.²⁷

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