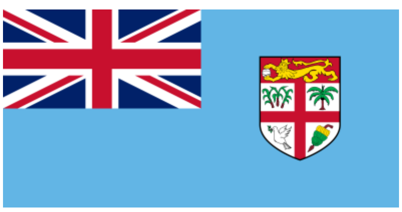
Summary: Climate Change in Fiji 2022

Historical and Recent Variability, Extremes and Change



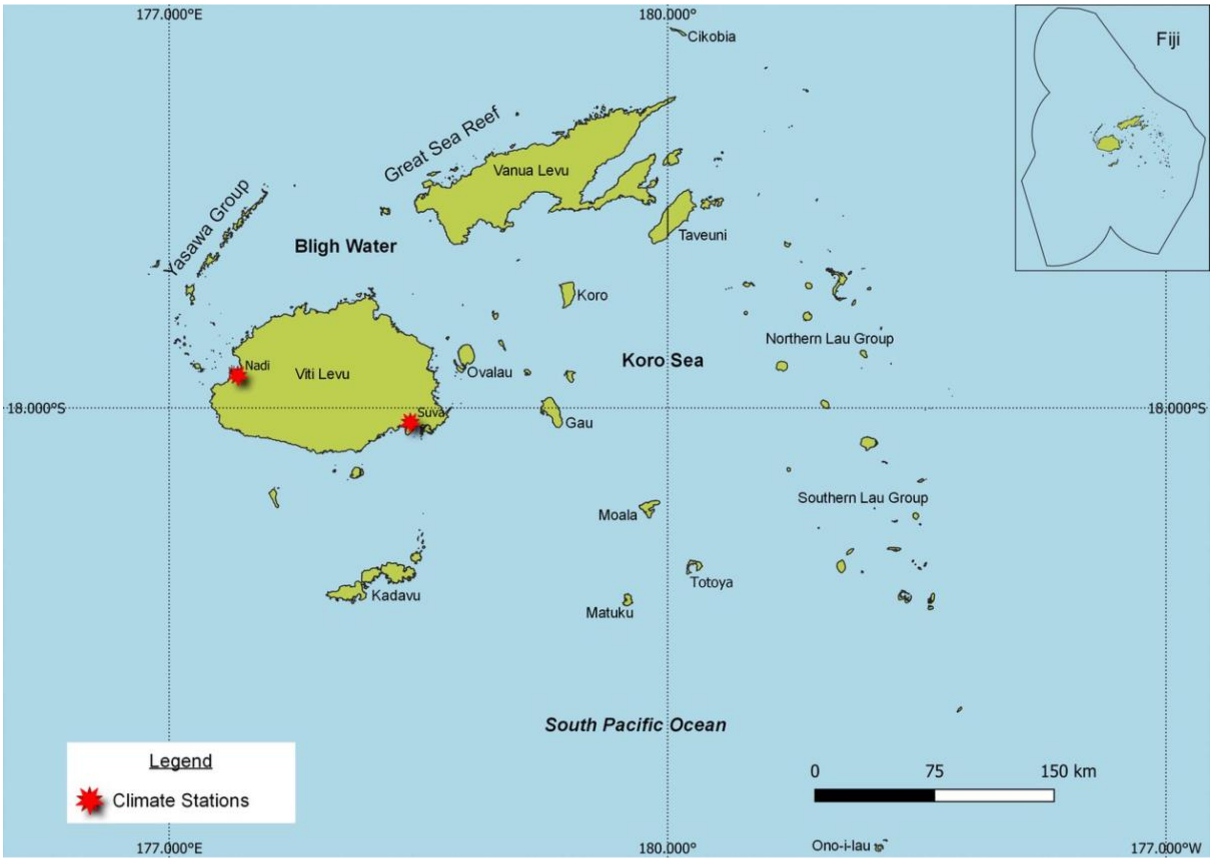
COSPPac
Climate and Oceans Support Program in the Pacific

This brochure provides a snapshot of key long-term changes in climate and ocean variables in Fiji. Long-term changes were determined by analysing trends in historical climate and ocean data. Trends provide information about climate change in Fiji ‘to date’.

Climate variability strongly influences extreme events in Fiji. The brochure also provides up-to-date scientific information on climate variability and its influence on extreme events.

Figure 1:

Fiji and the location of the climate stations used in Climate Change in the Pacific 2022 report.

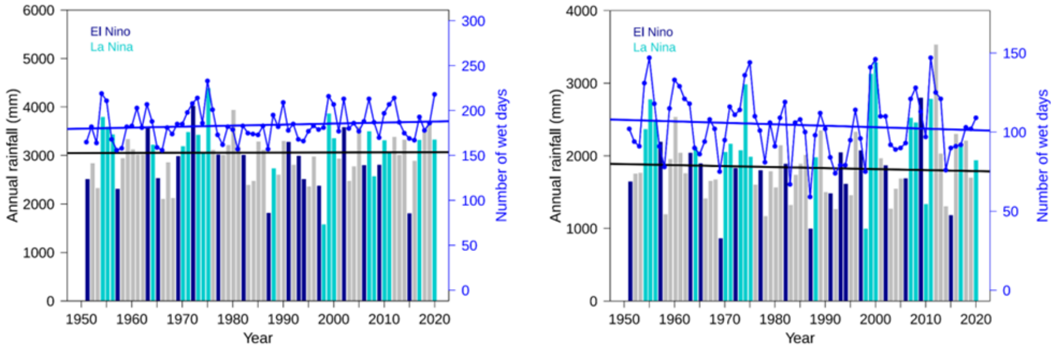


Little change in rainfall

Natural modes of climate variability drive differences in total annual and seasonal rainfall from year to year in Fiji. Year to year variability is especially notable at Nadi Airport, where higher rainfall typically occurs during La Niña years compared to El Niño years (Figure 2). Mountains influence distinct regional differences in rainfall. Regions exposed to the trade winds – such as Suva – can receive annual rainfall in excess of 4000 mm, while leeward regions in the northwest receive on average less than 2000 mm annually.

Figure 2:

Annual rainfall (bar graph) and number of wet days (where rainfall is at least 1 mm; line graph) at Suva (left) and Nadi Airport (right). Straight lines indicate linear trends for annual rainfall (in black) and number of wet days (in blue).



Despite considerable year to year variability associated with natural climate variability, there has been little long-term change in annual and seasonal average rainfall in Fiji since 1951.

There has been little change in the magnitude or frequency of very wet days, nor the contribution of extreme rainfall to annual rainfall totals. During the wet season (November–April) naturally occurring weather features such as the Madden–Julian Oscillation (MJO) are associated with heavy rainfall for several days.

Little change in meteorological drought is evident during both the wet and dry seasons in Fiji since 1951. Further, there has been little change over time in consecutive dry days per decade. Nadi Airport typically experiences longer dry spells than Suva.

Air Temperature has increased

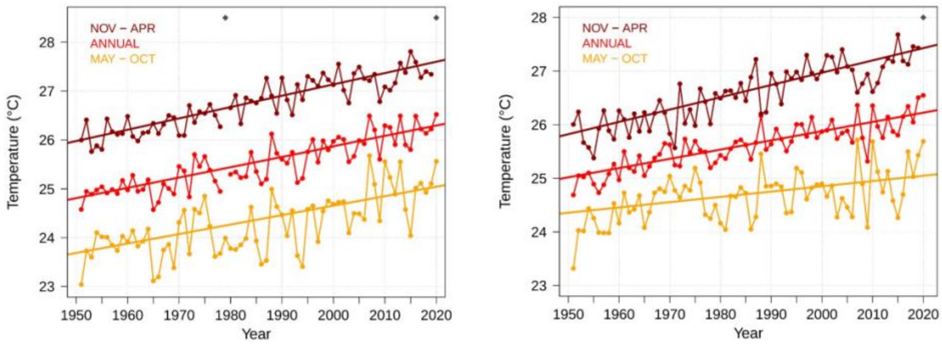
Average annual temperatures have increased significantly at Suva and Nadi Airport since 1951 by an average of 0.21 °C per decade and 0.17 °C respectively (Figure 3). Increases in seasonal temperatures are generally consistent with these trends although at Nadi Airport, temperatures during the warm/wet season (November–April) increased faster than temperatures during the cool/drier season (May–October) (Figure 3).

The number of hot days and warm nights has increased, and the number of cool days and cold nights has decreased at Suva and Nadi Airport. Since 1951, the number of hot days has increased by about 8 days per decade. Hot days have a maximum temperature above 29.6–33.3 °C, depending on the time of year.

The number of days where air conditioning is required to cool a building down to 25 °C has increased by around 54 days per decade at Nadi Airport and around 50 days per decade at Suva, indicating that energy demand for cooling has increased significantly since 1951.

Figure 3:

Average annual, November–April and May–October temperatures for Suva (left) and Nadi Airport (right). Straight lines indicate linear trends. The magnitudes of the trends are presented in Table 4.2. Diamonds indicate years with insufficient data for one or more variables.



Long-term increases in both average temperature and temperature extremes in the Pacific are likely driven by human-associated climate change due to the rate of the observed changes and consistency with global trends that have been attributed to climate change (PCCM, 2021).

Tropical cyclone severity has decreased

In the greater Southwest Pacific, the total number of **severe** tropical cyclones[1] has decreased over the last 40 seasons. There has been little change in the total number of tropical cyclones of any category in the southwest Pacific. The number of tropical cyclones that became severe has marginally declined.

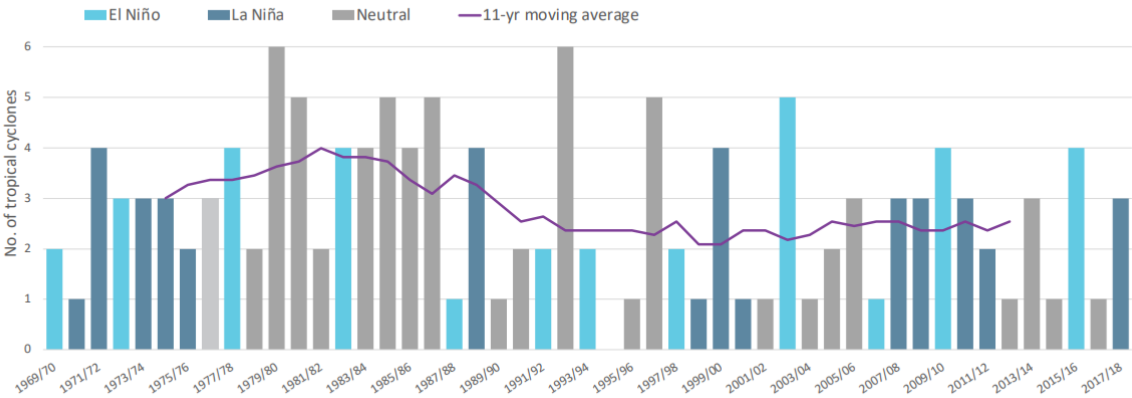
Tropical cyclones usually affect Fiji during the southern hemisphere tropical cyclone season, which is from November to April, but also occasionally occur outside the tropical cyclone season.

The number of tropical cyclones occurring in Fiji's Exclusive Economic Zone (EEZ) varies considerably from one year to the next, ranging from zero in the 1994/95 season to six in 1979/80 and 1992/93 (Figure 4). Tropical cyclones are most frequent in neutral years (29 cyclones per decade), and then equally likely during El Niño and La Niña years (26 cyclones per decade).

[1] A 'severe' tropical cyclone is defined as having a minimal central pressure of <970 hectopascals (hPa). Pressure is often used when comparing intensity of tropical cyclones.

Figure 4:

Number of tropical cyclones passing within the Fiji EEZ per season. Each season is defined by the ENSO status, with light blue being an El Niño year, dark blue a La Niña year and grey showing a neutral ENSO year. The 11-year moving average is presented as a purple line and considers all years.



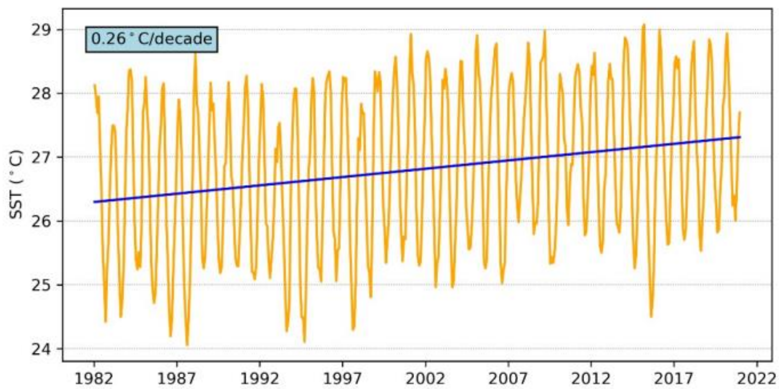
Due to this high interannual variability and the relatively small number of tropical cyclones passing through any country's EEZ since reliable records began, individual country analysis of long-term trends in frequency and intensity is not possible.

Sea surface temperature has increased

Sea surface temperatures averaged across Fiji's EEZ increased by 0.26°C per decade since 1981 (Figure 5). This trend is consistent with broad-scale change in the southwest Pacific region. Prior to this period, water temperatures remained relatively constant from the 1950s to late 1980s.

Figure 5:

Sea surface temperature from satellite observations averaged across the Fiji EEZ, shown as the orange line. The blue line shows the linear regression trend.



Globally, sea surface temperature is one of the most widely used indicators used to monitor human-associated climate change. Modes of climate variability influence sea surface temperatures on an interannual and decadal/multi-decadal basis, however, climate change is a driver of the long-term positive trend (PCCM, 2021).

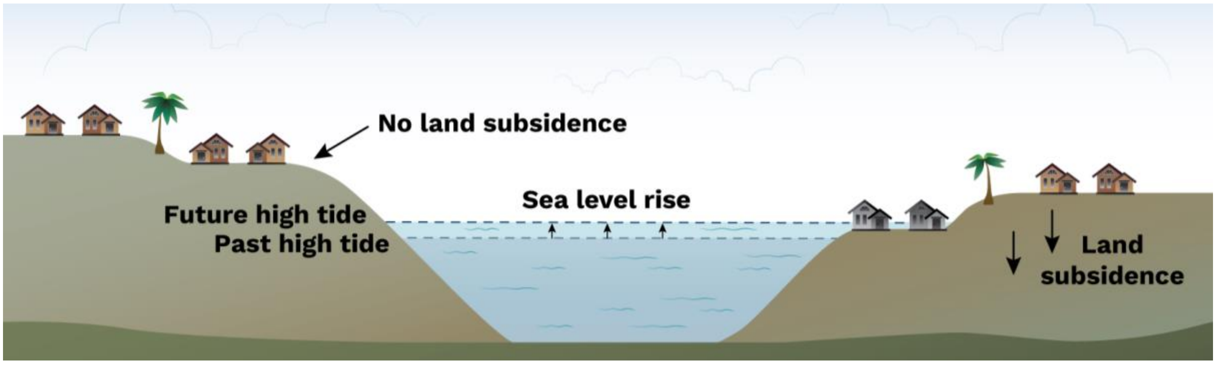
Sea surface temperatures in Fiji tend to be warmest between December and March. At Lautoka, ocean temperatures reach on average a maximum of 30 °C during these months, with minimum average temperatures reaching a low of 26.4 °C in August.

Sea level has increased

Sea level as observed from satellite altimetry has risen between 4 mm and 5 mm per year across Fiji's EEZ since 1993, a rate higher than the global average. At the Lautoka tide gauge, the number of hours per month that sea level has exceeded 2.39 m (the 99th percentile of historical maximum sea level) has increased steadily since 2009 and this is due to a combination of sea level rise and land subsidence occurring in Fiji (Figure 6).

Figure 6:

The effect of sea level rise and land subsidence on local sea level.



Peak sea levels typically occur over October to March. La Niña years typically bring higher sea levels during March/April and September/October.

Yasawa Islands, Fiji

The rise in Pacific mean sea level since 1993 is primarily attributable to global warming. Naturally-occurring modes of climate variability in the Pacific region - for example, the El Niño–Southern Oscillation (ENSO) on interannual time scales, and the IPO (Interdecadal Pacific Oscillation)/PDO (Pacific Decadal Oscillation) on decadal to multi-decadal time scales - influence sea level and can amplify or dampen the underlying trends arising from global warming (PCCM, 2021).

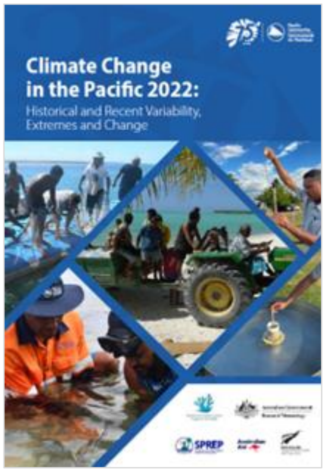
Waves

Waves at Suva come from the southeast to southwest. On average, Suva experiences 2.7 extreme wave events – defined as reaching or exceeding wave height of 1.97 m per year.

There has been no long-term change in average annual wave height at Suva since 1979. Wave height, wave period (the time interval between two waves) and wave direction changes from month to month with the seasons and, to a lesser degree, year to year with climate variability modes. Seasonal wave activity peaks over June–August in terms of both wave height and period. Wave period reduces significantly over December–February.

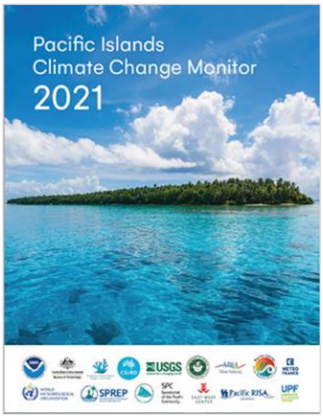
Further reading

For more information, refer to Climate Change in the Pacific 2022: Historical and Recent Variability, Extremes and Change. Climate and Oceans Support Program in the Pacific. Fifteen country chapters are available at https://purl.org/spc/digilib/doc/kskiv



For more information on Pacific-wide observed and future trends in climate indicators see the Pacific Islands Climate Change Monitor 2021 available at https://www.pacificmet.net/sites/default/files/inline-files/documents/PICC%20Monitor_2021_FINALpp_0.pdf

Historical climate trends and basic climate information from observation sites across the Pacific Islands are available through the web-based Pacific Climate Change Data Portal at www.bom.gov.au/climate/pccsp



Information about future climate change can be found in the 'NextGen' Projections for the Western Tropical Pacific country reports https://www.csiro.au/en/research/environmental-impacts/climate-change/pacific-climate-change-info

Pacific community staff member surveying the Lautoka harbour. Surveying is an important part of sea level change assessment

The content of this brochure is an outcome of the high degree of cooperation and collaboration that exists between the implementing partners of the Australian Aid funded Climate and Oceans Support Program in the Pacific (COSPPac), specifically the Bureau of Meteorology (the Bureau), the Pacific Community (SPC) and Pacific Regional Environmental Programme (SPREP), together with the valuable ongoing support from the national meteorological services in the 15 partner countries and territories. Publication support has been provided through New Zealand Aid Programme.

Australian Aid

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For more detailed information on the climate of Fiji and the Pacific, see: *McGree, S., G. Smith, E. Chandler, N. Herold, Z. Begg, Y. Kuleshov, P. Malsale and M. Ritman. 2022. Climate Change in the Pacific 2022: Historical and Recent Variability, Extremes and Change. Climate and Oceans Support Program in the Pacific. Pacific Community, Suva, Fiji.*

Contact the Fiji Meteorological Service:

web: https://www.met.gov.fj/

phone: +679 672 4888