Summary: Climate Change in Palau 2022

Historical and Recent Variability, Extremes and Change

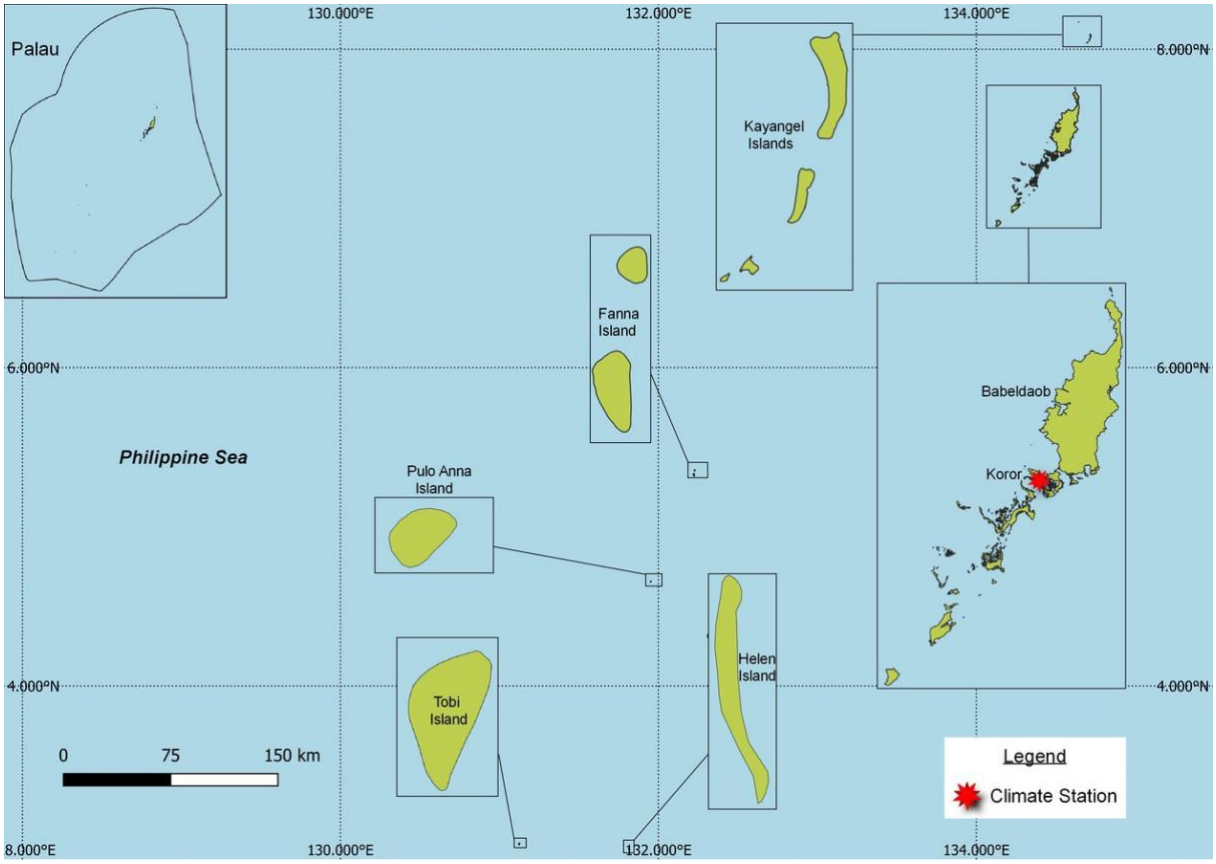
COSPPac
Climate and Oceans Support Program in the Pacific

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

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

Figure 1:

Palau and the location of the Koror climate station used in Climate Change in the Pacific 2022 report.



Cover image: Seventy Islands, Palau, November 2016. Photo: Pablo Marx

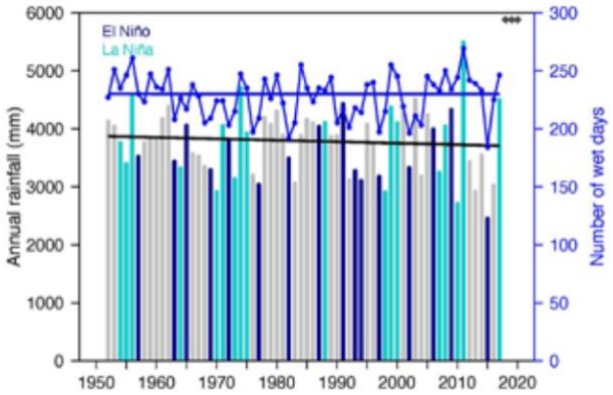
Little change in annual and seasonal rainfall

There has been no significant change in annual and seasonal rainfall at Koror since 1952 (Figure 2). Annual rainfall has varied from approximately 2500 to 5500 mm (98.4 to 216.5 in).

Palau's location on the edge of the Pacific Warm Pool and the year-long influence of the ITCZ lead to a relatively high monthly rainfall. In Koror, the wet season is from May to October, which averages over 2100 mm (82.7 in). During this time, the West Pacific Monsoon is usually most active and can bring heavy rainfall.

Figure 2:

Annual rainfall (bar graph) and number of wet days (where rainfall is at least 1 mm; line graph) at Koror. Straight lines indicate linear trends for annual rainfall (in black) and number of wet days (in blue). Diamonds indicate years with insufficient data for one or both variables.



Air Temperature has increased

Average annual temperatures at Koror have increased by 0.13 °C (0.23 °F) per decade since 1952. Average November–April (dry season) temperatures are warmed faster than May–October (wet season) temperatures.

The number of hot days and warm nights has increased, and the number of cool days and cold nights has decreased. Since 1952, the number of hot days has increased by 14 days per decade. Hot days have a maximum temperature above 31.7–32.8 °C (89.1–91.0 °F), depending on the time of year.

The number of days where air conditioning is required to cool a building down to 25 °C (77 °F) has increased by 46 days per decade, indicating that energy demand for cooling has increased significantly since 1952.

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).

Little change in tropical cyclone frequency and severity

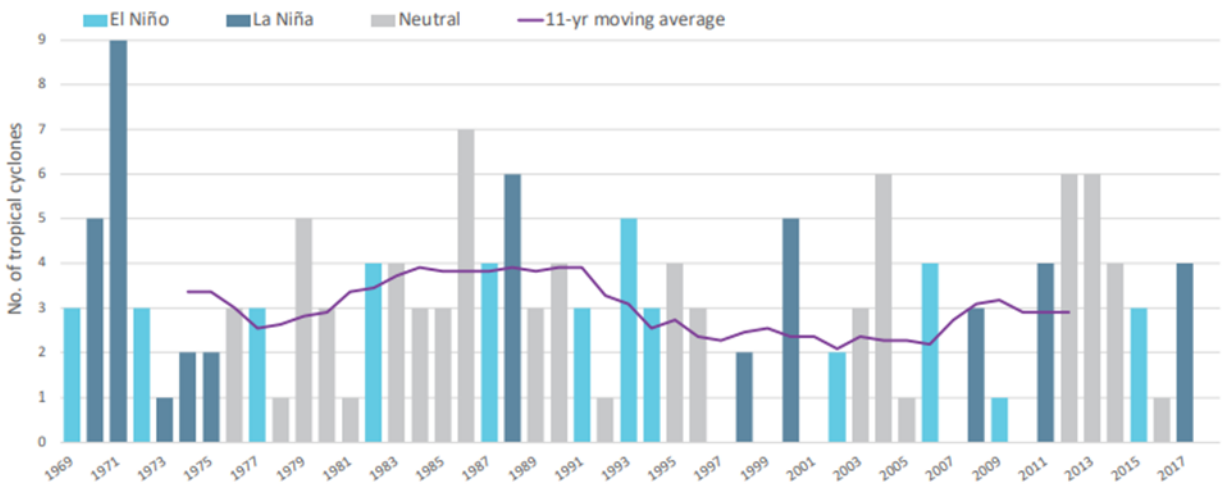
In the western North Pacific, there has been little change in the total number of tropical cyclones or the number of **severe** tropical cyclones[1] over the last 41 seasons.

Tropical cyclones usually affect Palau year-round. Year to year, there is large variability in the number of tropical cyclones in Palau's Exclusive Economic Zone (EEZ). For example, there are no tropical cyclones in some years and there were 9 tropical cyclones in 1971 (Figure 3).

The number of tropical cyclones occurring in Palau's EEZ varies considerably from one year to the next (Figure 3). Tropical cyclones were most frequent in neutral years (33 cyclones per decade), followed by La Niña years (31 cyclones per decade) and least frequent in El Niño years (29 cyclones per decade).

Figure 3:

Number of tropical cyclones passing within the Palau 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.

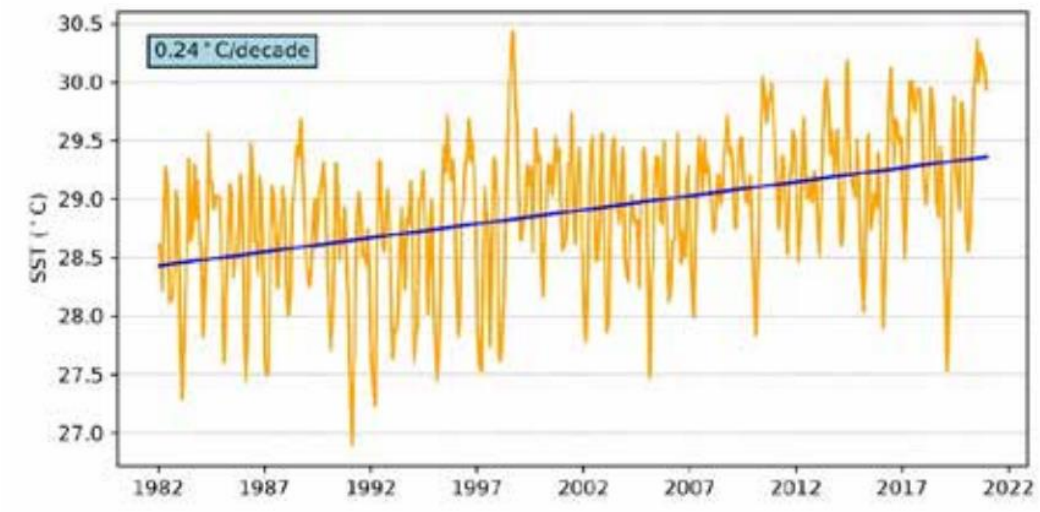
[1] A 'severe' tropical cyclone is defined as having a minimal central pressure of <970 hectopascals (hPa). Pressure is often used when comparing intensity of tropical cyclones.

Sea surface temperature has increased

Sea surface temperatures averaged across Palau's EEZ increased by 0.24 °C (0.43 °F) per decade since 1982 (Figure 4).

Figure 4:

Sea surface temperature from satellite observations averaged across the Samoa 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).

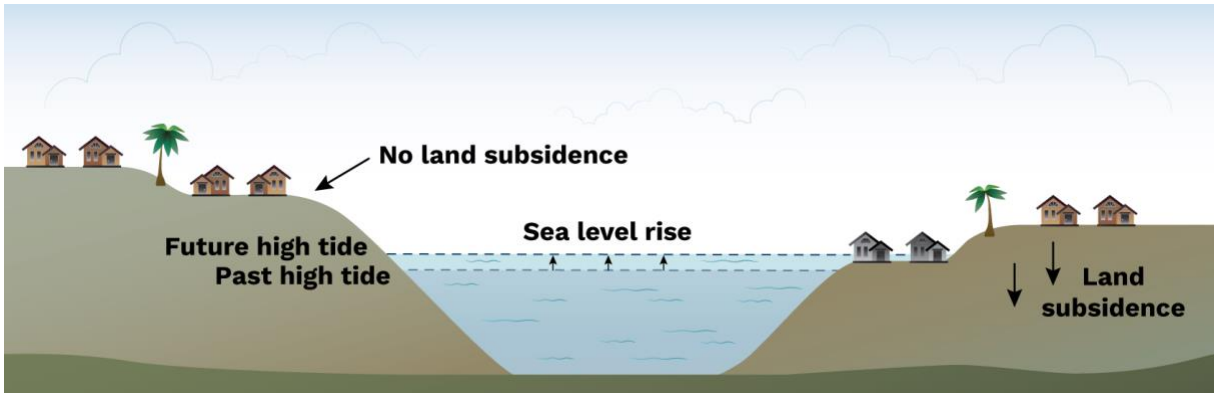
Sea surface temperatures at Koror tend to be warmest in June and November, reaching, on average, maximums of 29.4 °C (84.9 °F) and 29.3 °C (84.7 °F), respectively. Sea surface temperatures are coolest in February, reaching, on average, a minimum of 28 °C (82.4 °F). Daily temperatures can be up to 2 °C (3.6 °F) higher or lower than these averages at Koror and may differ at other locations in Palau.

Sea level has increased

A combination of sea level rise and land subsidence has increased sea level at the Malakal Island tide gauge by 4.89 mm (0.19 in) per year since 1993 (Figure 4). Peak sea levels typically occur between July and September.

Figure 5:

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



The long-term trend in sea level across Palau's EEZ is 2–3.5 mm (0.08–0.14 in) per year since 1993. This rate is close to the global average trend (3.1 ±0.4 mm per year, or 0.12 ± 0.02 in).

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).

Seascape, Palau, February 2012. Photo: Erin Magee / DFAT

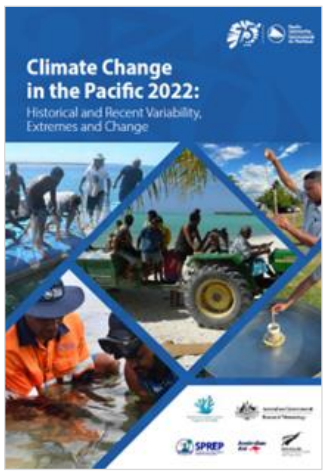
Waves

Waves at Koror come from the east. On average, Koror experiences approximately four extreme wave events – defined as reaching or exceeding a wave height of 1.61 m (5.28 ft) per year.

There has been no long-term change in average annual wave height since 1979. Wave height, wave period (the time interval between two waves) and wave direction changes from month to month with the seasons and (peaking from December to March), to a lesser degree, year to year with climate variability modes.

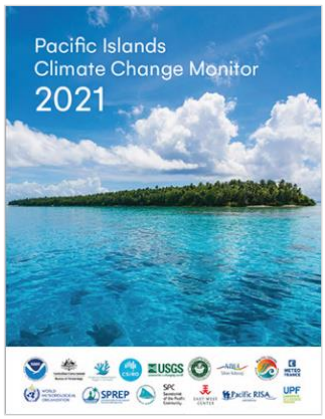
Further reading

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

Damage from Typhoon Bopha, which impacted Palau in December 2012. Photo: Alan Willmore / Royal Australian Navy

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.

For more detailed information on the climate of Palau 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.*

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