



Climate, climate variability and change of Kiribati

Introduction

The Republic of Kiribati is made up of 33 scattered low-lying islands, dispersed over 3.5 million km² in the central Pacific Ocean (Figure 1). There are four main groups - Banaba, Gilbert, Phoenix and the Line Islands. Banaba, a raised coral island with a highest point of 81m, was once a rich source of phosphate. The rest of Kiribati consists of sand and reef rock islets of atolls or coral islands which rise to no more than a few metres above sea level.



Extreme water temperatures cause coral bleaching. Near and off-shore fisheries are an important part of Kiribati livelihood and important source of national income



A majority of the Kiribati population depend on small vulnerable groundwater supplies as their main source of freshwater. Regular rainfall is essential



Storm surges and high sea levels associated with low pressure systems and distant tropical cyclones have severely damaged coastal homes in the past

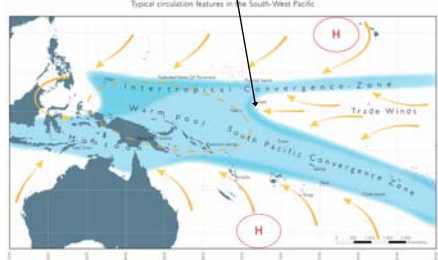


Figure 1. Map of Kiribati (<http://www.climate.gov.ki/images/photos/map.kiribati.gif>). Figure 2. Typical circulation features of the South-west Pacific (bottom)

The country's population is approximately 92,500 (2005) of which 40,300 live on the main island Tarawa.

Data availability and homogeneity

Tarawa the main observation site is located on the southern part of Tarawa Atoll in the Gilbert Islands. Homogeneous rainfall and temperature data are available from 1948. Raw rainfall data is available from 1926.



Figure 3. Locations of key Kiribati Meteorological Stations

Climate Drivers

The climate of Kiribati is governed mainly by the movement of the Intertropical Convergence Zone (ITCZ) and the equatorial doldrum belt (EDB) which is present throughout the year in the western Pacific within 5° of the equator. The EDB is defined

as an area of relatively light winds, high rainfall and great seasonal variability. The South Pacific Convergence Zone (SPCZ) has an effect on the climate of the southernmost islands but to a lesser extent.

Seasonal Cycles

Overall, Kiribati has a hot, humid tropical climate. In the case of Tarawa, annual maximum and minimum temperatures are highly consistent throughout the year with a range of less than 1°C (Figure 4).

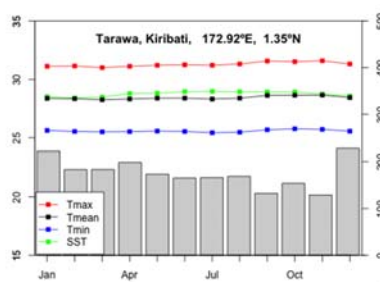


Figure 4. Tarawa mean annual cycle, 1971-2000

There is a large variation in mean annual rainfall across Kiribati. A notable zone of lower rainfall, less than 1500mm per year exists near the equator and extends eastwards from 170°E. Tarawa receives just under 2100mm, while the islands of Butaritari only 350km to the north receive in the vicinity of 3000mm.

Driest and wettest periods in the year vary from location to location. At Tarawa the six-month period with lowest mean annual rainfall (dry season = Aumaiaki) begins in June, with the month of September having the lowest mean rainfall (~125mm). The peak of the wet season is January with a mean value of almost 240mm (wet season = Aumeang). The marked change in mean monthly rainfall towards the end of the year is common across Kiribati. December's rainfall is often more than 100% greater than that of November. Some islands have a slight secondary maxima in July.

Monthly mean SST is very similar to monthly mean air temperature except in the middle of the year when SST is higher than mean temperature.

Observed inter-annual variability and trends

There is a strong relationship between the El Niño-Southern Oscillation (ENSO) and Kiribati climate.

El Niño is generally associated with above normal rainfall and strong westerly winds while La Niña is associated below normal rainfall.

The trend in Tarawa maximum, minimum and mean annual temperature since 1947 is +0.18, +0.20 and 0.19 °C/decade respectively. For rainfall, the mean annual trend from 1947 is +41.92 mm/decade (Figure 5) with the rainfall trend since 1960 and 1980 +57.99 and -72.27 mm/decade respectively.

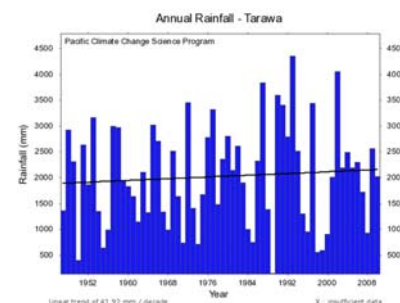


Figure 5. Homogeneous Tarawa annual rainfall, 1947-2010 (<http://www.bom.gov.au/climate/pccsp/>)

Impacts and Extremes

The impact of droughts, usually associated with La Niña, can be very severe in Kiribati. For example 1971, 1985, 1998 and 1999 annual rainfall was less than 750mm.

The recent drought from April 2007 to early 2009 severely affected the southern Kiribati islands and Banaba. During this period ground water turned brackish and the leaves of most plants turned yellow. Copra production, the main income source for people in the outer islands, declined. During the 1970-71 drought the complete loss of coconut trees was reported at Kenna village on Abemama in central Kiribati.

Other important extremes include storm surge and extreme sea levels.