



Climate Change in the Mid-Pacific

Background & Description: Global climate change is a natural phenomenon; that is, there are natural long-term climate cycles that lead to changes in climate. However, human-induced global climate change is expected to include much more rapid rates of change in weather or climate patterns than have been experienced for millennia. Marine and coastal, and in particular, small island ecosystems, are considered to be especially vulnerable to rapid climate change. This is because landmass is very limited and that other stressors, such as changes in land use (increased urbanization) and introductions of alien species, already put these ecosystems at risk.

Climate variability and change that will affect the PACN region includes increased sea surface temperatures and UV radiation which will affect coral reefs and other marine resources. In addition, the effects of sea level rise on shoreline and coastal communities, and the spread of avian malaria and other vector borne diseases will intensify due to changes in temperature and rainfall patterns. Changes to the height and frequency of the trade wind inversion are also predicted, and could lead to changes in rainfall patterns and cloud immersion time for wet forests. Moreover, the effects of extreme events such as prolonged, El Niño Southern Oscillation (ENSO)-related droughts and a possible increase in frequency and intensity of tropical cyclones and associated flooding are concerning.

Sea Level: There is little doubt in the scientific community that global sea levels are increasing and will continue to rise due to human-induced climate change. This is due to increased temperatures which lead to melting of sea ice and glaciers, as well as thermal expansion of ocean water. Sea levels are also influenced by several other factors. The actual water level that occurs at a coastal site is determined by the seasonal sea level, the astronomical tides, and the shorter-period responses to weather forcing, especially winter storms.

Generally, comparisons of sea levels are made for mean levels midway between mean high

and low water level. Because of varying factors, sea level trends in the PACN region are not uniform and the contribution of climate change to increased sea levels is difficult to determine. Low islands and atolls are considered to be especially at risk. In addition, many islands, including the Hawaiian Islands, are sinking (and sea level is rising). In some cases this is due to increased weight as active volcanoes spew out lava and add more mass.

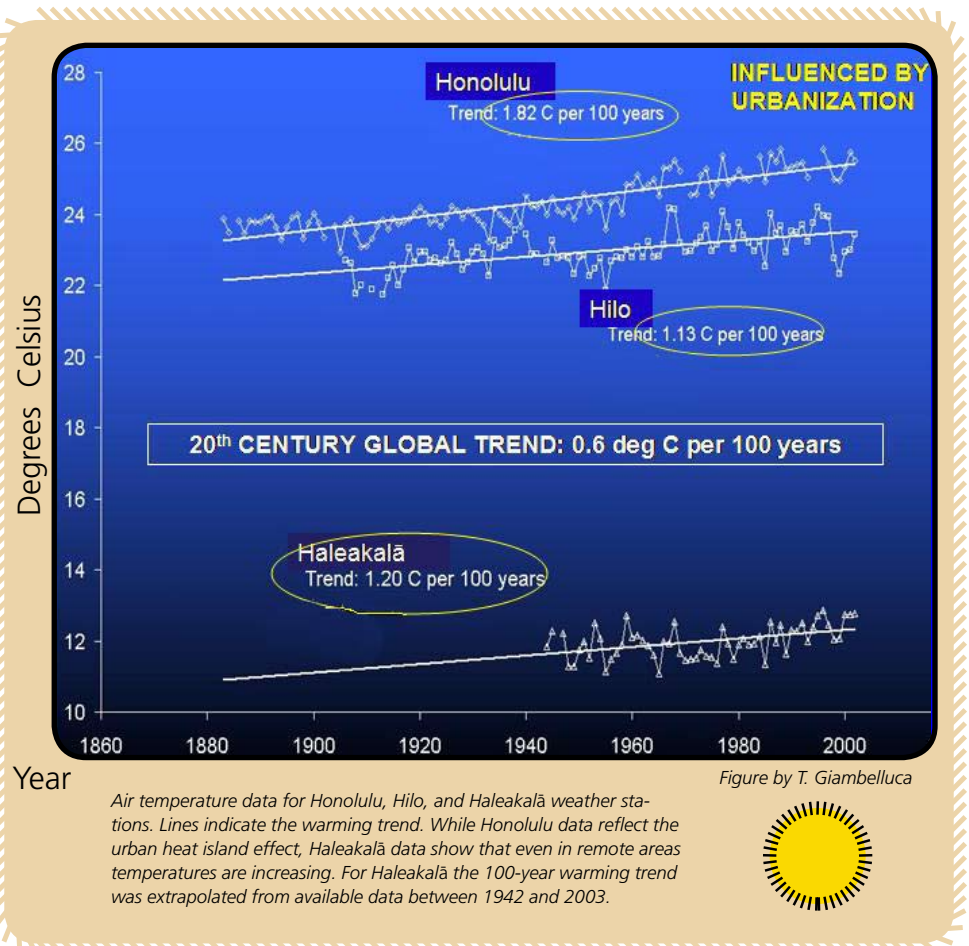
Data and information about sea levels can be found at the University of Hawaii Sea Level Center (<http://ilikai.soest.hawaii.edu/uhslc>) and on several National Oceanic and Atmospheric Administration websites. In addition, the Pacific ENSO Applications Center provides short term (up to a year) forecasts for sea levels in the Pacific region that are immensely valuable for anyone involved in civil defense or natural resources management ([\[soest.hawaii.edu/MET/Enso/peu/2006_4th/Sea_Level.htm\]\(http://soest.hawaii.edu/MET/Enso/peu/2006_4th/Sea_Level.htm\)\).](http://ww</p></div><div data-bbox=)

Temperature and Precipitation:

Climate change predictions are based on models with spatial resolutions too low to predict changes on the tiny specks of land in the Pacific Ocean. Thus, there are no predictions indicating how temperature and precipitation will change for individual Pacific islands. However, predictions for the Pacific region as a whole include temperature increases. Rainfall is predicted to increase as well, but not uniformly throughout the year. Rainy seasons are predicted to experience higher rainfall while dry seasons will be dryer than in the past. Data (below) provided by Dr. Tom Giambelluca (University of Hawaii) indicate that a warming trend may already be taking place in Hawaii.

For more information contact:

Karin_Schlappa@contractor.nps.gov



Air temperature data for Honolulu, Hilo, and Haleakalā weather stations. Lines indicate the warming trend. While Honolulu data reflect the urban heat island effect, Haleakalā data show that even in remote areas temperatures are increasing. For Haleakalā the 100-year warming trend was extrapolated from available data between 1942 and 2003.

Figure by T. Giambelluca