

Pacific Climate Change Science Program



Addressing climate change in the Pacific



Climate change poses serious challenges to the sustainable development of Pacific island countries and East Timor. It also threatens progress towards the Millennium Development Goals.

Recognising the seriousness of climate change issues, Pacific island countries and territories are implementing the Pacific Islands Framework for Action on Climate Change 2006-2015.

In 2008, the Australian Government launched the International Climate Change Adaptation Initiative to meet high-priority adaptation needs of vulnerable countries in the Asia-Pacific region, especially the Pacific island countries and East Timor.

The Pacific Climate Change Science Program (PCCSP) is a key activity of the Initiative. The PCCSP is assisting the region address two of the key principles of the Pacific Islands Framework for Action on Climate Change 2006-2015; firstly, improving the understanding of climate change and secondly, the provision of education, training and awareness.

Overview of the Pacific Climate Change Science Program

Retrieving, managing and analysing climate data, and understanding major climate features such as the El Niño-Southern Oscillation.

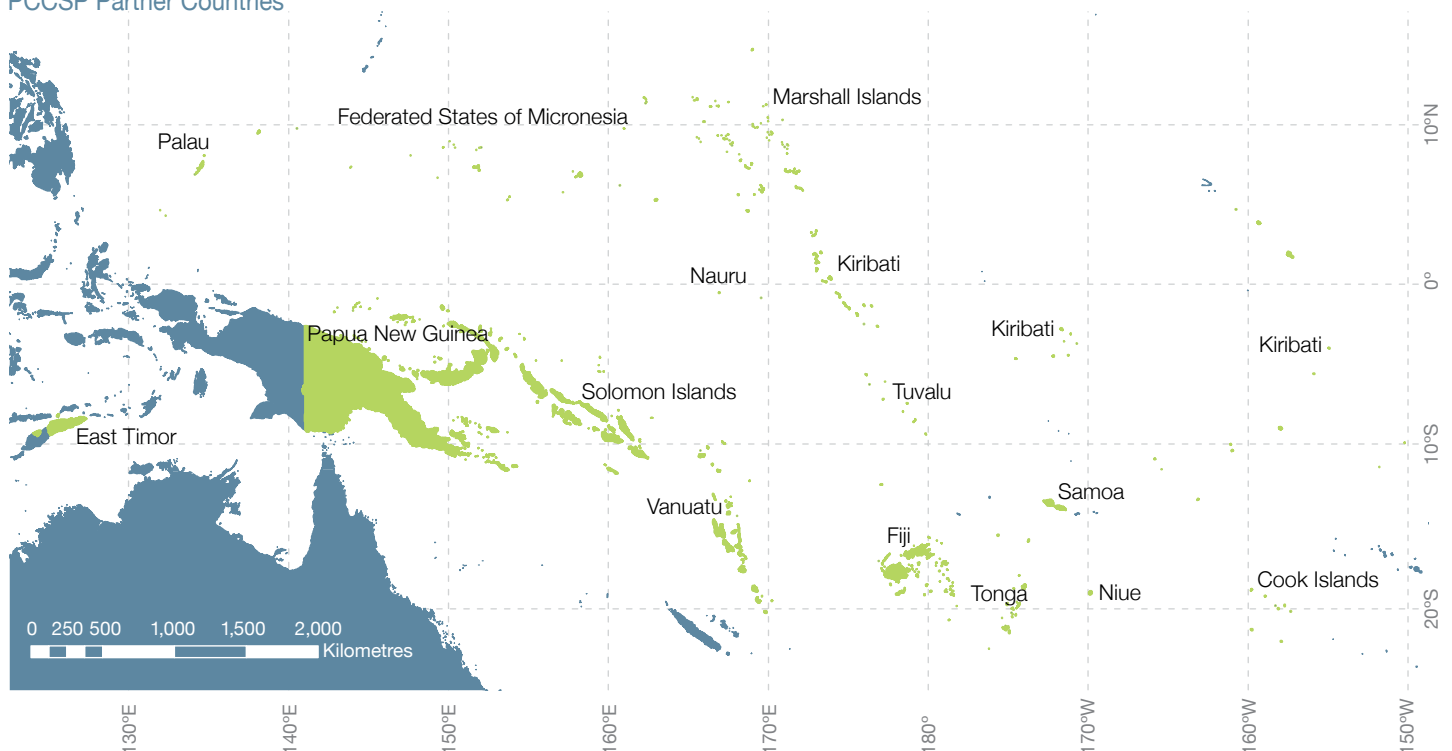


Assessing and downscaling global climate models to prepare projections of how the climate and oceans may change in 2030, 2055 and 2090.



Partner country engagement to build local capacity in climate science and climate and ocean projections; and the preparation of a technical report, country summaries, brochures and posters.

PCCSP Partner Countries



The Pacific climate change Science Program

The Pacific Climate Change Science Program will assist decision makers and planners in 14 Pacific island countries and East Timor better understand how their climate has changed and how it may change in the future.



Despite the reported effects of climate change in the Pacific region, scientific information is still limited. The PCCSP is helping address this urgent need for better scientific knowledge so Pacific nations can prepare for the future.

The PCCSP is examining recent climate trends and natural variability, as well as developing regional climate projections.

The research began in 2009 and is being conducted through a partnership between Australian science agencies, principally the Bureau of Meteorology and the Commonwealth Scientific and Industrial Research Organisation. Active engagement with partner countries and regional organisations is building capacity to effectively apply the results of this research.

The climate of the Pacific is changing

The PCCSP is working with partner countries to develop assessments of recent climate trends.

Scientific studies show an increase in average temperatures throughout the region during the second half of the 20th century. This warming has been accompanied by a trend towards more frequent hot days and nights and fewer cool days and nights. Changes in rainfall over recent decades are more varied. Some areas of the Pacific have had increased rainfall and in other areas rainfall has decreased.

Unfortunately little data and few studies exist for other climate variables, such as cloud cover and wind. Many studies are out-of-date and based on incomplete and inconsistent data. Improving historical observational records is critical to understanding climate change.

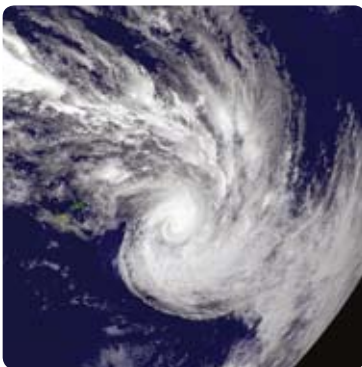
The PCCSP is helping improve climate records by developing a customised climate database management system. This will enable the National Meteorological Services to effectively manage their data and undertake more comprehensive climate research. An interactive web-based climate data portal is also being developed as a tool to help partner countries better identify inconsistencies in records and analyse regional climate data.



Improving our knowledge of tropical cyclones

Tropical cyclones are destructive natural hazards affecting millions of people around the world each year. The 2007 Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) indicates it is likely that future tropical cyclones will become more intense, with larger peak wind speeds and heavier rainfall. With the world's climate changing, it is important to monitor changes in tropical cyclones.

The PCCSP is working with partner countries to improve the understanding of tropical cyclones in the Pacific. This includes further development of a web-based portal to assist National Meteorological Services in analysing tropical cyclone historical data. PCCSP scientists are also investigating the influence of phenomena such as the El Niño-Southern Oscillation on tropical cyclones.



Satellite image originally processed by the Australian Bureau of Meteorology from the geostationary meteorological satellite GOES-9 operated by the National Oceanic and Atmospheric Administration for the Japan Meteorological Agency.

Understanding sea level rise in the Pacific Ocean

Many Pacific island nations are already experiencing sea level rise. Projections for sea level rise from the IPCC Fourth Assessment Report, including an allowance for a dynamic ice sheet response, are about 18 to 80 cm by 2100. However, the IPCC cautioned a larger rise was possible but the likelihood could not yet be assessed. Significant uncertainties are still present in important aspects of sea level science. There is an increasing recognition that sea level rise of up to about one metre or more this century is plausible, and without mitigation of emissions, possibly several metres over the next few centuries.

On shorter timeframes, storm surges cause elevated sea levels, which can result in flooding and coastal erosion. As sea level rises, the impact of extreme sea level events, such as storm surges, will become more severe.

PCCSP scientists are working to develop a better understanding of the regional pattern of sea level rise in the Pacific Ocean and to quantify the likelihood of extreme sea level events. This will provide information needed by partner countries to plan coastal development and safeguard agricultural and water resources.



Photo: courtesy of the Climate Change Office, Ministry of Environment, Conservation and Meteorology, Solomon Islands.

Assessing the impact of ocean acidification

The ocean absorbs about one quarter of the annual emission of carbon dioxide resulting from human activities. Ocean acidification is due to the absorbed carbon dioxide reacting in the seawater and has the potential to severely affect the health and sustainability of tropical reef ecosystems.

The growth of reef building corals and other key species that form strong reef ecosystems is expected to decline due to ocean acidification. Other stresses like coral bleaching events will compound the damage.

The consequences of ocean acidification could seriously affect the large number of Pacific islanders whose livelihoods depend on coastal fisheries and the harvesting of marine resources.

PCCSP scientists are analysing ocean samples and ocean carbon cycle models to determine current acidification, and to project future changes. This research will provide a foundation for assessing the risk of acidification to the many reef systems throughout the region.



Looking to the future

The PCCSP is developing projections for how the climates of partner countries may look around the years 2030, 2055 and 2090.

Limited information is available on climate projections for the Pacific. For example, the Fourth Assessment Report of the IPCC presents annual average temperature and rainfall projections for the entire Pacific Ocean divided into only two regions.

Pacific countries urgently need more detailed information about how their future climates may evolve. This is critical in assessing their vulnerability to climate change and making informed decisions about adaptation and development planning. The PCCSP will produce detailed projections for 14 Pacific countries and East Timor. The projections will include temperature, rainfall, wind, and extreme weather events.

The PCCSP is also investigating climate phenomena such as the El Niño-Southern Oscillation and the South Pacific Convergence Zone. This research is critical to understanding future climate change.

PCCSP scientists will assess and select the most regionally reliable of the 24 Global Climate Models used in the Fourth Assessment Report of the IPCC to develop projections. Due to the small size of many of the Pacific islands, for some areas, the PCCSP will use techniques called dynamical and statistical downscaling. These techniques 'zoom down' to smaller scales providing greater detail.

The projections will show how the climate may look around 2030, 2055 and 2090 under three different greenhouse gas emission scenarios from the Fourth Assessment Report of the IPCC. The three emission scenarios have been selected to show the range of possibilities of low, medium and high. Refer to Figure 1.

Country-specific projection information for decision-making needs will be accessible to partner countries through a specialised web-based tool.

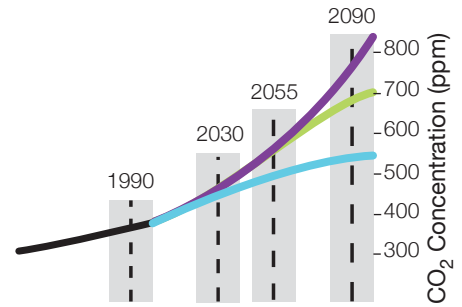


Figure 1: Carbon dioxide (CO₂) concentrations (parts per million, ppm) associated with the three IPCC emission scenarios (B1, A1B and A2). The PCCSP will analyse climate model results for periods centred on 1990, 2030, 2055 and 2090 (shaded).

A2: (High)

- continually increasing population
- regionally oriented economic development and per capita economic growth
- slow technological change

A1B: (Medium)

- global population peaking in mid-century and declining thereafter
- very rapid economic growth
- rapid introduction of new and more efficient technologies

B1: (Low)

- global population peaking in mid-century and declining thereafter
- rapid change in economic structures toward a service and information economy
- introduction of clean and resource efficient technologies

Contributing to the future of the Pacific

The PCCSP will deliver unique benefits to partner countries including:

New, detailed and country-specific science about current and future climates. This research will enable partner country governments to make more informed adaptation and development planning decisions. It will be delivered in a variety of forms including a technical report: 'Climate Change in the Pacific'.

Increasing the capacity of government stakeholders to understand and use climate projections. Building on earlier activities, the PCCSP will conduct in-country visits to deliver national and regional climate projections to a range of stakeholders. The aim is to build an understanding of the information and how it may be used in decision-making and planning.

Ongoing capacity building of National Meteorological Services and other government agencies.

Building the capacity of partner countries to conduct climate science research and improve their climate services is integral to the PCCSP. The tools and software programs being developed will help National Meteorological Services improve the efficiency and level of their services and build research capacity. Regional training workshops with National Meteorological Services have been conducted and the capacity building program will continue with in-country visits.

Increasing awareness of climate change within partner countries and the region.

Concise individual country summaries will provide understandable information about the current and future climate. Partner countries will be able to use these communication tools to enhance climate change awareness among country stakeholders.



For more information please contact:

Dr Gillian Cambers – Program Manager
Pacific Climate Change Science Program
• Phone: +61 3 9239 4400 • Email: gillian.cambers@csiro.au
Private Bag 1, Aspendale VIC 3195 Australia

For communications or media enquiries please contact:

Jill Rischbieth – Communications Officer
Pacific Climate Change Science Program
• Phone: +61 3 9239 4400 • Email: jill.rischbieth@csiro.au
Private Bag 1, Aspendale VIC 3195 Australia



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and Energy Efficiency**

