

Pacific Climate Change Science

PACCSAP climate change science, tools and outreach

Kevin Hennessy & Geoff Gooley

.....on behalf of PACCSAP Science Program (CSIRO, Bureau of Meteorology and collaborative partners in Australia & the Pacific)



Activities and outputs

- **Science** www.pacificclimatechangescience.org
 - Climate data rescue, digitisation & archival
 - Seasonal predictions based on dynamic modelling
 - Understanding large-scale climate features & variability
 - Climate projections for 14 Pacific countries
- **Tools**
 - CliDE data management system
 - Pacific Climate Futures
 - Climate Change Data Portal
 - Cyclone Data Portal
- **Communication products**
 - Technical report & country brochures
 - Summary report
 - Journal papers, animations, fact sheets & training materials
- **Capacity development**
 - Mentoring & attachments
 - Technical training
 - Workshops, conferences, symposia
 - Networking & collaboration
 - Science outreach/support



What worked well – partner country collaboration and brochures

- Collaboration with Met Services to enhance capacity development outcomes
- Country-specific brochures first released in 2011 (English and local languages), aligned with Technical Report (2011)
- Updated brochures in 2015 based on new science in Technical Report (2014) which had detailed country chapters
- Summary Report (2015) just released!

Samoa's current climate

Temperature
Temperatures in Samoa are generally consistent throughout the year, with only very small seasonal differences. Average temperatures are coolest in July, when the cool, dry south-east trade winds are strongest. The warmest month is March. The country has two distinct seasons – a wet season from November to April and a dry season from May to October. On average 75% of Samoa's total annual rainfall occurs in the wet season.

Rainfall
Samoa's rainfall is greatly influenced by the position and strength of the South Pacific Convergence Zone. This band of heavy rainfall is caused by air rising over warm water where winds converge, resulting in thunderstorm activity. It extends across the South Pacific Ocean from the Solomon Islands to the Cook Islands and lies between Samoa and Fiji during the wet season (Figure 2). Samoa's mountains have a significant effect on rainfall distribution. Wetter areas are located in the north-west and relatively drier, drier areas in the north-west.

Year-to-year variability
Samoa's climate varies considerably from year to year due to the El Niño-Southern Oscillation. This is a natural climate pattern that occurs across the tropical Pacific. Ocean and effects weather around the world. There are two extreme phases of the El Niño-Southern Oscillation: El Niño and La Niña. There is also a neutral phase. In Samoa, El Niño events tend to bring wet seasons that are greater than normal, while La Niña events usually bring wetter and cooler than normal conditions.

Samoa's future climate

Climate impacts almost all aspects of life. Climate of Samoa is important so people.

At a glance

- El Niño and La Niña events will continue to occur in the future, but there is little consensus on whether these events will change in intensity or frequency.
- Annual mean temperatures and extremely high daily temperatures will continue to rise.
- Little change in mean annual rainfall is projected, with more extreme rain events.
- Incidence of drought is projected to decline or stay approximately the same.
- Sea level will continue to rise.
- Ocean acidification is expected to continue.
- The risk of coral bleaching is expected to increase.
- A reduction of wave period in December–March is projected with no change in wave height, while no change is projected in June–September.
- Tropical cyclones are projected to be less frequent but more intense.

Sea level will continue to rise
Sea level is expected to continue to rise in Samoa (Table 2 and Figure 6). By 2050, under a very high emissions scenario, this rise in sea level is projected to be in the range of 7–17 cm. The sea-level rise combined with future year-to-year changes will increase the impact of storm surges and coastal flooding. As there is still much to learn, particularly how large ice sheets such as Antarctica and Greenland contribute to sea level rise, scientists warn larger rises than currently predicted could be possible.

Ocean acidification will continue
Under all four emissions scenarios the acidity level of sea waters in the Samoa region will continue to increase over the 21st century, with the greatest change under the very high emissions scenario. The impact of increased acidification on the health of reef ecosystems is likely to be compounded by other stressors including coral bleaching, storm damage and fishing pressure.

Wave climate will change
Wave period in December to March is projected to decrease, with no change in wave height. No change is projected in June to September.

How do scientists develop models?
Global climate models are the best tools for understanding future climate change. Climate models are mathematical representations of the climate system that require very powerful computers. They are based on the laws of physics and include information about the atmosphere, ocean, land and ice. There are many different global climate models and they all represent the climate slightly differently. Scientists from the Pacific Climate Change Science and Adaptation Planning Program have evaluated 24 models from around the world and found that 24 best represent the climate of the Samoa region of the western tropical Pacific. These 24 models have been used to develop climate projections for Samoa. The future climate will be determined by a combination of natural and human factors. As we do not know what the future holds, we need to consider a range of possible future conditions, or scenarios, in climate models. Greenhouse gas and aerosol concentrations (parts per million, ppm) associated with the very low (RCP2.6), low (RCP4.5), medium (RCP6.0) and very high (RCP8.5) emissions scenarios for 20-year time periods (bracketed) contrast on 1995 (the reference period), 2030, 2050, 2070 and 2090. By 2100 an estimate range also averages.

Changes in Samoa's climate

- > Temperatures show no clear trend but are projected to warm with more very hot days in the future.
- > Rainfall has increased since 1890 at Apia. Projections show little change in annual or seasonal rainfall, with more extreme rainfall events. Drought frequency is projected to decrease by the end of the century.
- > Sea level near Samoa has risen and will continue to rise throughout this century.
- > Ocean acidification has been increasing in Samoa's waters. It will continue to increase and threaten coral reef ecosystems.
- > Wave period in December to March is projected to decrease by the end of the century.

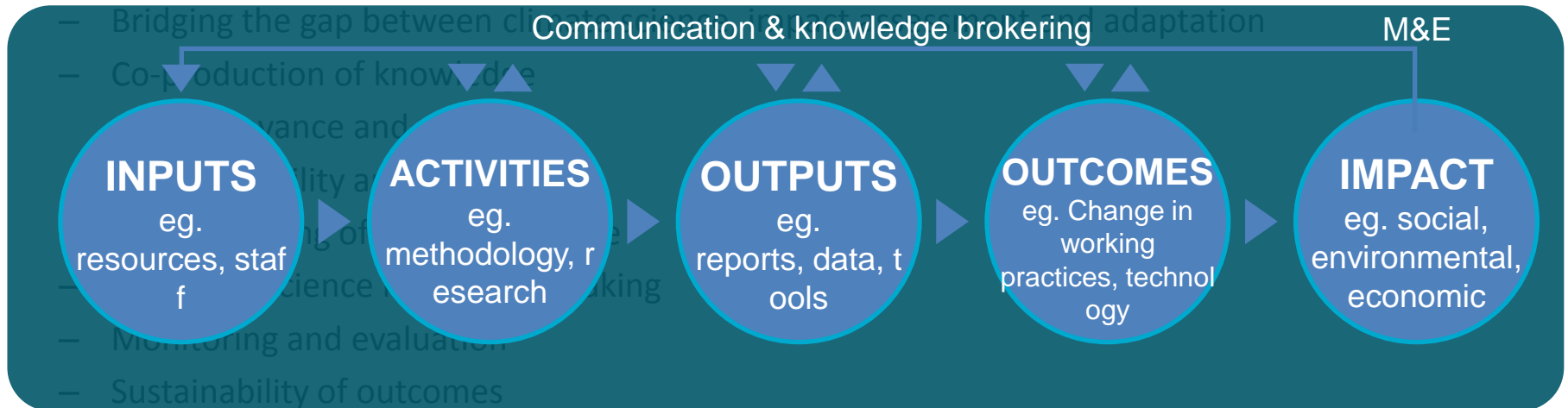
Contact the Samoa Meteorology Division, Ministry of Natural Resources and Environment:
 web: www.mns.gov.fj/meteorology
 email: climateservices@mns.gov.fj
 phone: +685 20855 or +685 20856

www.pacificclimatechangescience.org

Australian Aid, **Australian Government Bureau of Meteorology**, **Australian Government Department of the Environment**, **CSIRO**

Key challenge – the path to impact

- Great science, tools, communication products and capacity-building activities don't guarantee outcomes and impact
- Knowledge brokering is needed to facilitate:



The future – what could be done differently

- PACCSAP Science Program has finished
- A future science program could:

- Leverage what has been done for t
 - See www.climatechangeinaustralia.gov.au
- Place greater emphasis on user-en to turn outputs into outcomes and
- Focus on sustainable resilient deve

- Integrated information for early-w climate projections
- Targeted research on extreme eve
- Tailored/application-ready climate
- Support services (guidance material, training, advice, Help Desk) to inform/facilitate evidence-based decision-making

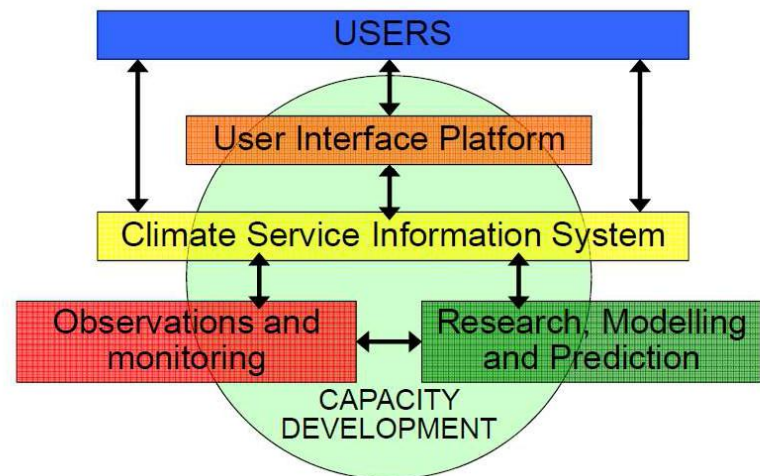
– *Global Framework for Climate Services (GFCS) innovation pathway: Today's climate science is tomorrow's climate service!*

- In-country capacity development

- *Coordination, collaboration, partnerships – deeper relationships*
- *Skills-based training for next users, e.g. Met Services*

GFCS Guidelines for developing a climate service

Framework is based around **five components (or pillars)** identified as being necessary for producing and delivering effective climate services:



Thank you

For further information

Dr Geoff Gooley

PACCSAP Science Program

Email: geoff.gooley@csiro.au

Phone: +61 3 9239 4462



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