NEW ZEALAND COUNTRY REPORT

Reporting on activities supporting the National Priority Actions of the Pacific Islands Meteorological Strategy (PIMS) 2012-2021

This Report is presented to the Fourth Pacific Meteorological Council (PMC-4) Meeting held in Honiara from 14-18 August 2017

NEW ZEALAND
FOREIGN AFFAIRS & TRADE

MetService

NIWA
Taihoro Nukurangi

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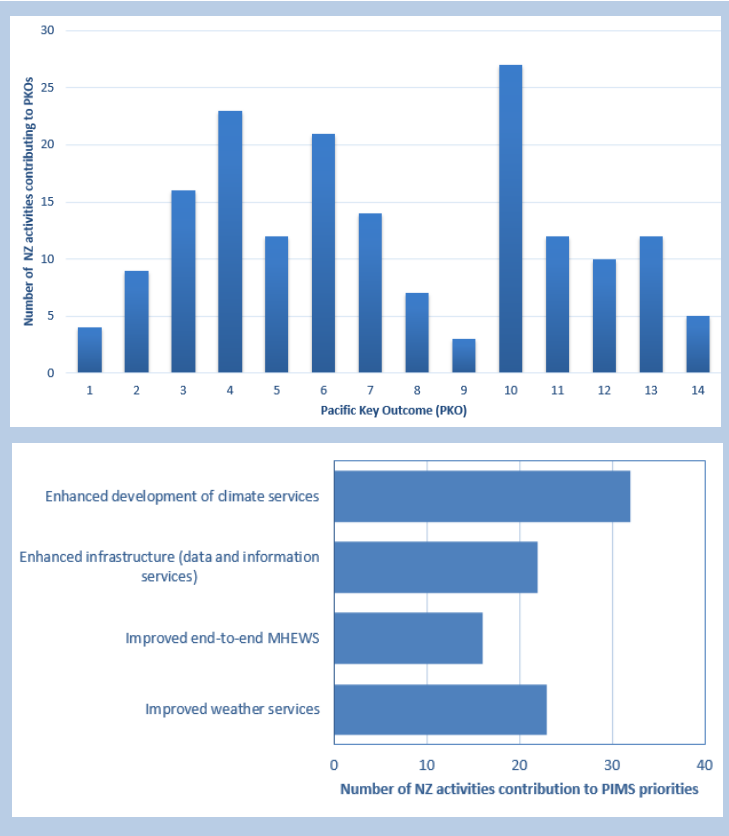
1 Summary

This paper outlines activities contributing to the National Priority Actions of the Pacific Islands Meteorological Strategy 2012-2021 being funded, supported or conducted by the following:

- Activities funded by the New Zealand Ministry of Foreign Affairs and Trade (MFAT) as part of the aid programme.
- Activities being supported by the Meteorological Service of New Zealand Ltd (MetService).
- Activities being supported by the National Institute of Water and Atmospheric Research Ltd (NIWA).

New Zealand's support to Pacific Island Meteorology and Hydrology Services continues to cover all 4 priority action areas of the Pacific Island Meteorological Strategy 2012-2021, supporting both national and regional priority actions and contributing to all fourteen key outcome areas.



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2 Activities funded by NZ Ministry of Foreign Affairs and Trade

2.1 New Zealand Pacific Partnership on Ocean acidification (OA)

New Zealand has partnered with SPREP (working with SPC and USP) to deliver an initiative on building the resilience of ecosystems and communities to OA in the Pacific region over four years (*NZ$2.1m over 2015-2019*). The "New Zealand Pacific Partnership on Ocean Acidification" aims to build resilience through practical adaptation actions, capacity building and awareness raising, along with a small component on research and monitoring. As part of this programme, a regional vulnerability analysis has been carried out and pilot sites in Tokelau, Kiribati, Vanuatu and Fiji are being identified through discussions with relevant government departments.

Ocean acidification was highlighted at the Pacific regional preparatory meeting for the UN Oceans conference, Suva 15-17 March and the New Zealand Pacific Partnership on Ocean Acidification was included in discussions at the UN Oceans SDG 14 Conference, New York, June 2017. The US National Oceanic and Atmospheric Administration (NOAA) and New Zealand's National Institute of Water and Atmospheric Research (NIWA) provide technical input to this programme. SPREP in collaboration with the IUCN are now developing a regional funding proposal to the "Green Climate Fund" with the view to scaling up this initiative.

2.2 Cyclone relief support to Fiji Meteorological Service

Working via the Meteorological Service of New Zealand Ltd (MetService), the New Zealand Aid Programme provided $600,000 for the repair and replacement of meteorological equipment destroyed as a result of Tropical Cyclone Winston. Replacement equipment was installed across 16 weather stations in Fiji by Fijian Met Service personnel, with technical support from MetService.

2.3 Strengthening water security in vulnerable island states

In partnership with SPC, New Zealand is supporting a five year (2014 to 2019), NZD 5 million project to strengthen water security in five low-lying Pacific islands and atolls that are subject to drought and water shortages (Tuvalu, Tokelau, Kiribati, Cook Islands and the Republic of the Marshall Islands). This partnership is working to improve awareness and understanding of water security issues, develop drought management plans, and improve water management practices.

2.4 Technical Assistance for Pacific Access to climate finance

In early 2016 New Zealand launched a *Technical Assistance for Pacific Access* ('TAPA') programme to support Pacific island countries to access climate finance, including from the Green Climate Fund (GCF). The TAPA programme is providing rapid deployment of technical support to develop project proposals from the Pacific. For example, TAPA provided engineering assistance in support of Samoa's USD 57.7 million flood

management project that was approved by the GCF Board in December 2016. New Zealand has also funded national GCF workshops in Kiribati, Tuvalu, Tonga and Niue, aimed at bolstering national capacities and understanding of the GCF.

3 Support provided by the Meteorological Service of New Zealand Ltd

3.1. Wellington Regional Specialised Meteorological Centre

MetService operates the Wellington Regional Specialised Meteorological Centre (RSMC Wellington), as part of New Zealand's contribution to the World Meteorological Organization Global Data-processing and Forecasting System (GDPFS).

RSMC Wellington maintains a weather watch over the southwest Pacific all year round and publishes routine weather analysis products daily. During the tropical cyclone season, RSMC Wellington publishes a daily tropical cyclone potential bulletin.

During the tropical cyclone season, RSMC Wellington provides routine and at-request information to the New Zealand Ministry of Foreign Affairs on the forecast onset and path of cyclones in the southwest Pacific region.

At the 69th session of the WMO Executive Council (Geneva, May 2017), WMO decided to adopt the revised Manual on the Global Data-processing and Forecasting System. RSMC Wellington's current designation is as a centre with geographic specialisation. New Zealand has demonstrated RSMC Wellington's capabilities against the criteria/functions for Regional Severe Weather Forecasting as described in CBS-16/Doc. 3.6(2) Annex 4 to draft Recommendation 3.6(2)/1. Along with similar applications from other WMO Members operating RSMCs specialising in regional severe weather forecasting, New Zealand's application will be considered at the 70th session of the WMO Executive Council.

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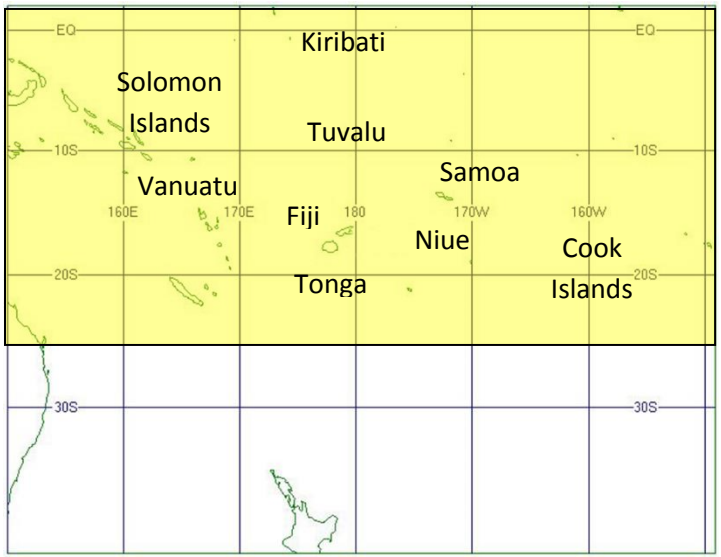
3.2. Severe Weather Forecasting and Disaster Risk Reduction Demonstration Project (SWFDDP)

Twice daily, RSMC Wellington issues severe weather forecasting guidance, to nine Pacific countries, over the yellow area shown on the right, for the likelihood of heavy rain, strong winds and damaging waves out to five days ahead.



Besides the specialised guidance described above, as part of its contribution to SWFDDP, RSMC Wellington also makes available, to the same nine Pacific countries, relevant deterministic and ensemble numerical weather prediction and remote sensing-based guidance products.

While well established and having operated successfully since November 2009, this project remains in "full demonstration" phase and has not yet transitioned to "continuing development" phase. Transition would require some different governance and funding arrangements from those currently in place.

Besides the nine Pacific countries and New Zealand, the SWFDDP partnership includes the United Kingdom Met Office, the National Weather Service operated by the United States National Oceanographic and Atmospheric Administration, the Japan Meteorological Agency, the European Centre for Medium-Range Weather Forecasting and the Australian Bureau of Meteorology.

Contribution to Pacific Key Outcomes													
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3.3. GCOS, GUAN and GSN network improvements

MetService helps to ensure the continuity of GCOS ECVs observation programmes in a number of Pacific Island Countries and Territories (the Cook Islands, Fiji, Kiribati, Niue, Samoa, Tuvalu, Tokelau and Tonga) by providing in-kind advice and technical assistance. This is done in cooperation with the Pacific Islands-Global Climate Observing System (PI-GCOS) programme.

As part of a New Zealand–US National Oceanic and Atmospheric Administration (NOAA) PI-GCOS Technical Support Project (TSP) which is sustained by the New Zealand – US Climate Change Partnership, MetService provides preventive, routine and emergency site inspections,

maintenance and technical support to Global Upper Air Network (GUAN) stations in the Cook Islands (Rarotonga), Fiji (Nadi), the Solomon Islands (Honiara), Papua New Guinea (Port Moresby) and Vanuatu (Bauerfield). These PI GUAN stations are part of the GCOS GUAN programme.

Under a joint Secretariat of the Pacific Regional Environment Programme (SPREP) - Met Office UK Pacific Trust Fund partnership, MetService also assists in the management and operation of the GUAN stations in Tuvalu (Funafuti) and Kiribati (Tarawa). Targeted technical training and maintenance activities are routinely carried out in-country.

Since late 2015, work undertaken includes:

- Upper air observing system maintenance visits to Cook Islands, Tuvalu and Kiribati
- Provision of upper air observing equipment spares to Cook Islands, Tuvalu, Kiribati and Vanuatu
- Provision of surface observing equipment spares to Cook Islands, Tuvalu, Kiribati, Vanuatu, Niue and Pitcairn Island
- Service and calibration of observing equipment for Samoa
- Provision of advice on observing system equipment maintenance to Tuvalu, Kiribati and Vanuatu.

At the Wellington Regional Telecommunication Hub (RTH) of the WMO Global Telecommunication System (GTS), MetService facilitates the transfer of observations from a number of Pacific National Meteorological Centres (NMCs) to the GTS. Wellington RTH also relays forecasts, analyses and other products from the GTS to these NMCs.

MetService administers funding provided by the US National Oceanic and Atmospheric Administration (NOAA) GCOS office in support of Bodeker Scientific's services to the Global Climate Observing System.

Funding from the US National Oceanic and Atmospheric Administration (NOAA) GCOS office for maintenance and technical support of GUAN stations and for support of Bodeker Scientific's services to the Global Climate Observing System will cease in August 2017.

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4 Support provided by the National Institute of Water and Atmospheric Research Ltd

4.1. Regional seasonal climate forecasting

The Island Climate Update has been providing operational one to three month seasonal outlooks for the Pacific region since 1999. The regional and country level forecasts are based on a consensus forecast for each country from eight dynamical global climate models. The ICU has been funded since 2000 by NZ MFAT, in recent years via New Zealand's multi-year funding package to SPREP with technical support provided by NIWA. In July 2016, operational funding for the ICU was discontinued by SPREP.

Since this time NIWA has provided interim funding to ensure the ICU, in a revised format, continues to be produced and disseminated. During 2016/17 this and other supported associated activities have included:

- Production of monthly Pacific ENSO outlook, rainfall outlook and water stress outlook bulletin and disseminated via email, web and facebook distribution.
- Production of a short monthly ENSO/Rainfall/Water Stress forecast video via facebook (The latest video reached 3,500 people and has been viewed over 850 times).
- Coordination of the Pacific seasonal cyclone outlook including bulletin and cyclone outlook video.
- Support to a number of Pacific Islands to add local language subtitles to the cyclone outlook and ICU videos
- Production of a Tokelauan version of the cyclone outlook video.
- Continued involvement in development of multi-model Ensemble Sea Level Forecasts for Tropical Pacific Islands product developed in partnership with the University of Hawaii Sea Level Centre, NOAA's NCEI (Pacific Region) and Pacific ENSO Applications Climate Center, and BoM (http://uhslc.soest.hawaii.edu/sea-level-forecasts/).
- Continued support to Kosrae to produce monthly enhanced tide charts incorporating sea level forecasts.
- Technical support, input and workshop facilitation of the second Pacific Island Climate Outlook Forum. This included leading sessions on the 2015-2016 ENSO event; typical impacts of La Nina across the Pacific and variations inter-events; rainfall outlooks for the 2016-17 season, tropical cyclone outlook, research plans to develop sub-seasonal (15 days – 1 month) outlooks; and the Island Climate Update.

Contribution to Pacific Key Outcomes													
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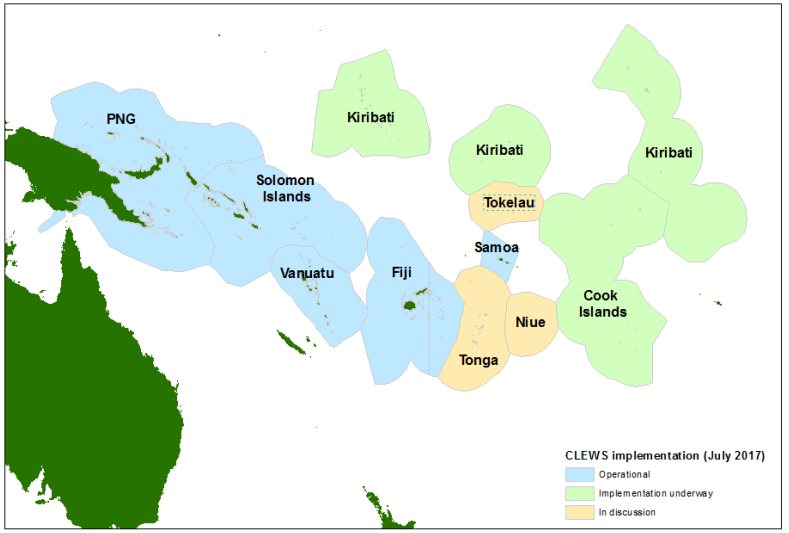
4.2. Drought prediction, climate services and climate early warning

The Climate Early Warning System (CLEWS) was initiated by the Samoa Meteorological Division with technical support for its development provided by NIWA through funding from the Global Environment Facility administered by UNDP. Developing CLEWS was an overarching component of Samoa's National Adaptation Programme of Action and has been developed in a way to provide a system for Pacific Island Meteorological Services to fully deliver on the Global Framework for Climate Services.



This has included the installation of close to 200 rain gauges, automatic weather stations, hydrology stations and one sea level gauge, all of which are telemetered to enable real-time access to monitored data. CLEWS has also included the development of the CliDEsc (Climate Data for the Environment Services Application Client) open-source software platform that links to the Bureau of Meteorology CLIDE (Climate Date for the Environment) database operational in all Pacific Islands, to enable real time generation of sector focussed climate products and services, including drought and Fire Weather Warning Systems.

Since this time operational CLEWS systems have been developed in Fiji, Solomon Islands, Vanuatu, PNG and are being implemented in Kiribati and Cook Islands. During 2016/17, supported activities have included:

- Continued technical support, training and capacity development to Solomon Island Meteorological Service to develop their CLEWS system including additional weather, climate, hydrology and groundwater monitoring installations and telemetry, sector climate service product development and training (Supported by UNDP/Solomon Islands Government as part of the implementation activities associated with the *Solomon Islands Water Sector Adaptation Project* and *Strongem Waka lo Community fo Kaikai (SWoCK): Resilience in Agriculture and Food Security in the Solomon Islands project*.
- Working with the Vanuatu Meteorology and Geoscience Department to develop their CLEWS system under the UNDP-led *Vanuatu Coastal Adaptation Project*. This has included installation of 6 AWS, telemetry, integration with CliDE, installation of CliDEsc and development of a series of sector-based climate service bulletins, training and capacity development of VMGD staff. A further 3 AWS, funded by GIZ, will be installed and incorporated in to the CLEWS system.

- Supply of 14 Automatic Weather Stations to Cook Island Meteorological Service to form the basis of the Cook islands CLEWS system and technician training to install, calibrate and maintain equipment as part of the UNDP-led *Strengthening the Resilience of our Islands and our Communities to Climate Change* (SRIC – CC) project.
- Supply of 3 AWS stations to Kiribati and upcoming technical support, training and capacity development to Kiribati Meteorological Service to develop their CLEWS system included support to KMS to install the AWS in 3 outer islands, telemetry, integration with CliDE, installation of CliDEsc and development of a series of sector-based climate service bulletins, training and capacity development of KMS staff. The project is a component of the UNDP-led *Enhancing National Food Security in the Context of Climate Change* project.
- Development of drought risk visualisation tools (DRVT) integrated in to CliDEsc for Samoa, Fiji and Solomon Islands with funding from the Department for International Development (DFID) and the Global Facility for Disaster Reduction and Recovery (GFDRR), as part of a Challenge Fund to *deliver an innovative demand-led toolkit of new open data and tools to support risk identification and decision-making to build resilience to natural hazards*. Phase II of the project has expanded the deployment of the DRVT suite to NMS's in three new countries - Kiribati, Papua New Guinea and Vanuatu as part of their CLEWS development.
- Continued support to PNG and Solomon Islands to provide country-wide one to three-month rainfall accumulation monitoring from satellite rainfall data (funded by NIWA) and integration of satellite rain data in to CLEWS.
- Development of version 2 of CliDEsc to provide an effective user-interface to deliver climate services and early warning information to enable web-delivery of data-driven products from multiple sources to multiple users (funded by NIWA).
- Functionality development of CLEWS including:
    - Integration of JICA AWS data into the CliDE data management system and calculation of daily data from JICA AWS data (not available previously).
    - Development of dashboard for viewing real time data for all AWS.
    - Development of automated pre-coding of synop and METARs for manual observers to integrate AWS and manual obs into coded format for GTS - replacing data delivery by lengthy phone calls and multiple key entry, and improved QA system.
    - Scheduling of web products for drought early warning - unique feature is concatenation (sequential integration) of new AWS stations with existing historical record at synoptic sites, to enable climatological drought risk to be determined at short record AWS sites.

Contribution to Pacific Key Outcomes													
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4.3. Hydrology and flood early warning systems

NIWA has continued to support the development of flood warning and forecasting systems in the Pacific region. This has been predominantly in the development of instrumentation-based flood warning systems in Fiji in collaboration with Fiji Meteorological Service.

During 2016/17 supported activities have included:

- Supporting Fiji Meteorological Service to upgrade and expand their hydrological monitoring network with 5 new sites installed on Vitu Levu, including real-time telemetry and integration with Fiji's hydrological database, Tideda. Training and capacity development of FMS hydrology staff (funded by the Fiji Government).
- Assisting the PNG Conservation and Environment Protection Agency and National Weather Service develop a flood warning system for the Bumbu catchment in Lae as part of the UNDP-led *Enhancing Adaptive Capacity of Communities to Climate Change-related Floods in the North Coast and Islands Region of PNG project*. The project includes supply and support to install 5 AWS, 3 automatic water level recorders and five automatic rain gauges, all with real-time telemetry, management system for weather, climate and hydrology data (which integration with CliDE, installation of CliDEsc and development of PNG's CLEWS system), development of flood warning thresholds, standard operational procedures and warning dissemination procedures and ongoing maintenance support.
- Supply of replacement equipment to Fiji Meteorological Service for 10 hydro-meteorological stations damaged or destroyed by Cyclone Winston (funded by NZ MFAT via NZ Met Service).
- Supply and installation of surface and groundwater hydro meteorological stations, rain gauges, telemetry and other environmental monitoring equipment to Solomon Island Meteorological Service/ Water Resources Division, Ministry of Mines & Energy. Training and capacity development in equipment installation, calibration, operation and maintenance. Integration with SI Met Service climate data management and reporting systems (UNDP/Solomon Islands Government).
- Support to Samoa to install telemetry on 29 Rain/hydrology/groundwater stations with a further telemetry upgrade of 20 Rain/hydrology station to implemented shortly under the Pacific Resilience Program (PREP). This will contribute to the development of flood early warning systems in catchments in Samoa. Provision of training and capacity development of Water Resource Division staff.
- Hydrology and flood warning technical assistance to UNDP and PMG's Climate Change and Development Authority (CCDA) to develop proposal to the GCF focusing on climate information and flood early warning systems for critical watersheds across PNG (funding support provided by NZ MFAT).
- Steering group member of the Coastal Inundation Forecasting Demonstration Project Fiji (CIFDP-F).

Contribution to Pacific Key Outcomes													
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4.4. Atmospheric Chemistry monitoring

NIWA's work includes research on the physical and chemical processes affecting the atmosphere and climate, including global effects, stratospheric research, air quality and interactions with the surface and oceans. In the Pacific region in 2016-17 this has included:

- Assistance with technical aspects and site selection for the establishment of a GHG observation station and analytical laboratory in Fiji, through discussion with Fiji Meteorological Service and University of the South Pacific of a potential pilot project for the island under the Global Atmosphere Watch (GAW) programme with strong interest / support of the WMO secretariat.
- Ship-based GHG observations in the Pacific region from voyages of the Transfuture-5 vessel in a previous regional NOAA/NIES collaboration have now ceased. The Pacific region dataset has recently been used in the assessment of the regional background CO_2 to determine New Zealand national emissions from atmospheric measurements and modelling.
- Ongoing discussions with Pacific Meteorological Services with interest in developing Pacific island air quality monitoring in Fiji, Samoa, and Tonga.

The following observations, forecasts and tools are available to a number of Pacific Island countries:

- UV index monitoring continues at Rarotonga, with Cook Islands Met Service and the previous days data are available on-line https://www.niwa.co.nz/our-services/online-services/uv-and-ozone/yesterdays-uv-index
- UV index forecast is provided for Nadi, Suva, Noumea and Rarotonga on-line at https://www.niwa.co.nz/our-services/online-services/uv-and-ozone/forecasts.
- Support is being provided for site-specific prediction of solar energy resource, through the Solarview tool https://solarview.niwa.co.nz/ which can be used in Fiji, Kiribati and the Cook Islands.

Contribution to Pacific Key Outcomes													
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4.5. Training, capacity development and mentoring support

NIWA provides significant training, capacity development and mentoring support to PI National Meteorological and Hydrological services. During 2016/17 this has included:

- Continuation of our buddy system where PI climate and hydrology technician staff are supported by a country-specific NIWA mentor who can assist with ad hoc queries and technical issues.
- AWS, rain gauge, water level gauge and telemetry instrumentation training at NIWA's instrumentation facility in Christchurch. 2-4 week training has been provided to 3 technical staff from Water Resource Division in Samoa; 4 technical staff from Solomon Islands Meteorological Service / Water Resources Division, Ministry of Mines & Energy; and 4 staff from Vanuatu Meteorology and Geohazards Division.
- In-country on the job training on AWS, rain gauge and hydrology station site selection, installation, calibration, telemetry, and maintenance for meteorology and hydrology staff in PNG, Solomon Islands, Vanuatu, Fiji, Samoa and Cook Islands.
- As part of the CLEWS development a series of six training modules have been developed:
    - Module 1 Climate services: strategic overview
    - Module 2 Instruments and measurements
    - Module 3 Data transfer, telemetry and integration
    - Module 4 Data storage and quality management
    - Module 5 Climate monitoring, products and client services
    - Module 6 Sector engagement, decision support and risk management
- The following training modules have been conducted in the following countries for meteorology staff and associated stakeholders: Vanuatu (M1 (x2), M2(x3), M3(x3), M4(x3), M5, M6); Solomon Islands (M1, M2(x3), M3(x3), M4(x3)
- Development with WMO UCAR's COMET Program a distance learning WMO Field Hydrology Technicians Course for the Small Island Developing State countries of WMO RA V. This was offered for the first time in 2017 with participants from Cook Islands, Fiji, Kiribati, Niue, PNG, Samoa, Solomon Islands, Tonga, Vanuatu.
- Facilitated a 2-day workshop for 15 students on the use of the programming language Python for climate data analysis and visualization at the University of the South Pacific / Pacific Centre for Environment and Sustainable Development (PACE-SD) in Suva, Fiji,

Contribution to Pacific Key Outcomes													
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