



**Asia-Pacific  
Economic Cooperation**

---

**2018/EPWG/SDMOF/012**  
Session 4b-i

**Flood and Climate Early Warning Systems  
Development in Papua New Guinea: Towards  
Regionally Consistent Hydroclimatic Monitoring and  
Warning Systems to Support Disaster Resilience in  
the Pacific – Write-up**

Submitted by: National Institute of Water and Atmospheric Research



**12<sup>th</sup> Senior Disaster Management Officials  
Forum  
Kokopo, Papua New Guinea  
25-26 September 2018**

## **Flood and climate early warning systems development in Papua New Guinea: towards regionally consistent hydroclimatic monitoring and warning systems to support disaster resilience in the Pacific**

Shaun Williams<sup>1</sup>, Jimmy Gomoga<sup>2</sup>, Alan Porteous<sup>1</sup>, Samuel Maiha<sup>2</sup>, Graham Elley<sup>1</sup>

1. National Institute of Water and Atmospheric Research (NIWA), New Zealand

2. National Weather Service, Papua New Guinea

### **Summary**

The Government of Papua New Guinea, under the Climate Change Development Authority (CCDA), is developing a programme to Enhance the Adaptive Capacity of Communities to Climate Change-related Floods in the North Coast and Islands Region of Papua New Guinea (PNG). Under this programme, a partnership was developed between PNG National Weather Service (NWS), NIWA, Conservation and Environment Protection Authority (CEPA) and UNDP to implement a pilot project – The Establishment of a Flood Early Warning System for the Bumbu River, Morobe Province, and installation of automatic weather monitoring equipment in five provinces of: East Sepik, Madang, Morobe, New Ireland and Northern provinces.

A phased approach was adopted to achieve the project objectives, as listed below:

- Phase 1: An inception visit was completed from 27 March – 7 April 2017. As well as briefings with UNDP, the inception visit was used to confirm the project scope in detail with key stakeholders and as an initial opportunity to provide field training for meteorology staff from the PNG NWS, hydrology staff from the CEPA, and staff from the Morobe Provincial Disaster Centre (PDC).
- Phase 2: Pre-installation site inspections and situation assessment were carried out between May and September 2017. This phase focussed on a detailed review of the Bumbu catchments to identify sites for installation of three river water-level stations, five rain gauges and an automatic weather station (AWS) in the Morobe province, including site logistics and implementation planning. This phase also involved pre-installation visits to the other four project provinces to assess the proposed monitoring sites and logistics associated with installation of an AWS in each province. Prior to phase 3 installation activities, technical instrumentation training was undertaken in New Zealand at NIWA, for key meteorology staff from the PNG (NWS), and hydrology staff from the (CEPA).
- Phase 3: Station installations in Morobe province and in each of the other four provinces. This phase was carried out over successive installation missions between November 2017 and April 2018, and involved commissioning of satellite based near-real time telemetry of field data, including integration into PNG's meteorological and hydrological databases for longer term analytical use including initial development of hydro-meteorological and climate products. Hands-on equipment and systems technical training was also provided to NWS and CEPA hydrology technicians during installation activities.
- Phase 4: Operationalisation and sustainability; this phase included the design of a Flood Warning methodology using data from the monitoring network, and development and evaluation of a Flood Simulation Exercise. This exercise brought together key hydro-meteorological monitoring and forecasting staff from NWS and CEPA, as well as disaster management/adaptation staff from the Morobe Provincial Disaster Centre (PDC Morobe), National Disaster Centre (NDC) and Climate Change and Development Authority (CCDA). This phase also included the delivery of a 'Final Report' for the pilot project.

Results and outcomes of the project included:

- Construction, delivery and installation of three river water level stations at key locations along catchments of the Bumbu River.

- Construction and deployment of five automatic rain gauges deployed around the Morobe region, and;
- The installation a full meteorological AWS at Nadzab airport in Lae and at PNG NWS sites in the surrounding provinces of East Sepik, Madang, New Ireland and Northern.
- Data from all stations are automatically telemetered in near-real time to NIWA's NEON IP web-based telemetry server and are readily accessible by NWS and CEPA (and other project partners) for monitoring and forecasting operations.
- All site data are automatically integrated into PNG's meteorological and hydrological databases CLIDE (for climate information) and TIDEDA (for hydrological information), respectively. This combined data management platform enables these data to be used by PNG NWS to generate climate information and early warning products to meet sector-specific needs using the product generator, CliDEsc.
- Definition of initial Bumbu River flood warning thresholds, including a baseline operational monitoring and warning framework which can be adaptively refined following system performance reviews after actual events.
- Development and delivery of operational and maintenance (O&M) resources/framework for key NWS and CEPA staff, both during specific training exercises at NIWA and during all site installation activities.
- Delivery of targeted hydro-meteorological instrument training in New Zealand, as well as on-the-job field training and flood forecasting operations training in PNG.
- Longer-term maintenance consideration and recommended pathways for system/network upscaling and development.

To reinforce and build on the initial training PNG NWS staff gained access to additional meteorological and climate services training at NIWA was delivered through the New Zealand Ministry of Foreign Affairs and Trade (NZ MFAT) facilitated Short Term Training Scholarship (STTS) awards allocation for PNG. This training involved four PNGNWS staff and was targeted at strengthening capability in the fields of meteorological instrumentation and network management, information communications and technology, and climate information products generation.

Key challenges regarding the maintenance and sustainability of skills and services developed include:

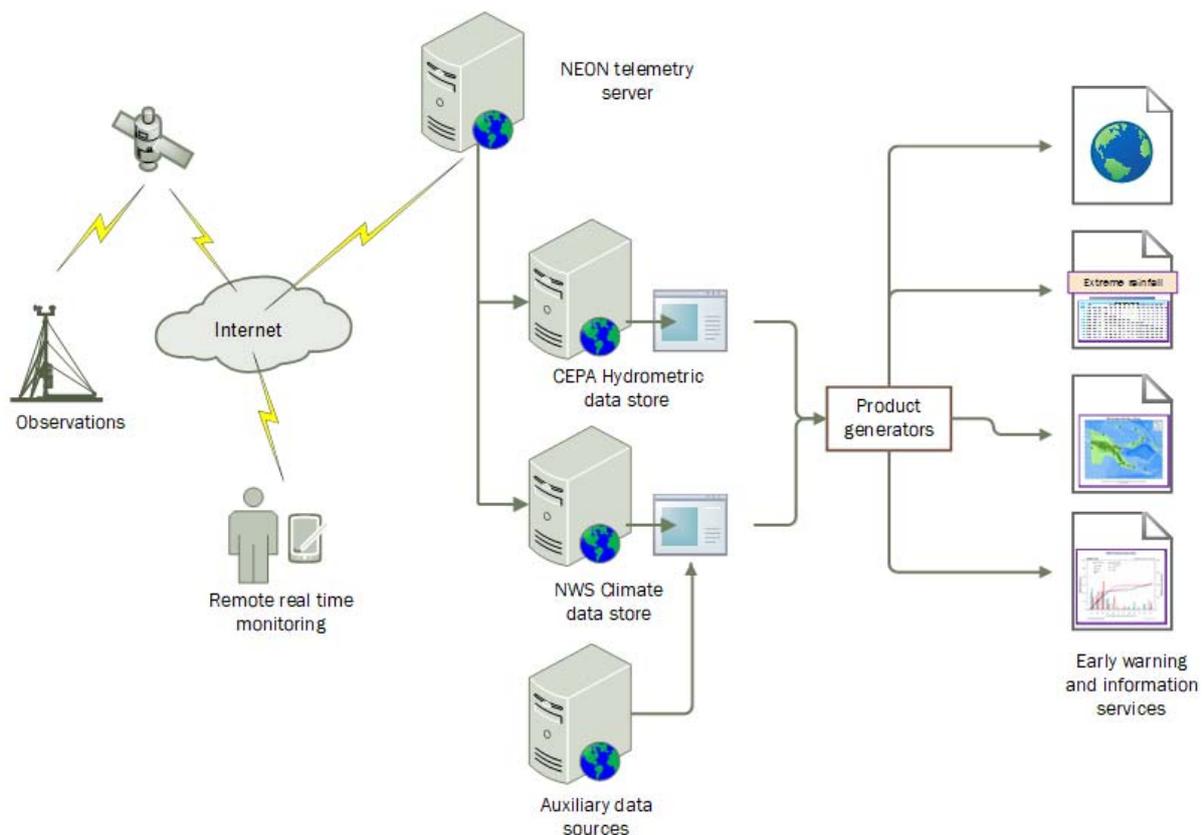
- Formalisation of operational service arrangements between key stakeholders, including station custodians and information beneficiaries via Memoranda of Agreement.
- Development of a monitoring and evaluation framework associated with system effectiveness and efficiency.
- Alignment and integration of similar hydrometeorological instruments and operations development, including strengthening mutual interaction and learning from Pacific Island neighbours.
- Ensuring ongoing capability strengthening in the operability and development of rainfall and flood monitoring, forecasting and warning provision in PNG.

The outcomes and recommendations of the project provide a basis for enabling key stakeholders to continue work towards refining, upscaling and developing a sustainable, regionally consistent, flood monitoring, forecasting and warning service for PNG.

#### Regional consistency and development consideration

The design of systems delivered through this project complements hydro-meteorological and climate early warning systems (CLEWS) development in several other member economies of the Southwest Pacific, many of which have shared information needs and challenges. This approach provides opportunities for the hydrology and meteorology agencies of member economies involved in delivering such information services to:

- Engage with and support each other at the technical level through mutual learning and information sharing to identify system challenges, identify and implement resolutions as well as pathways for addressing and improving the tools and systems.
- Collaboratively work through existing regional platforms such as the Pacific Meteorological Council (PMC) and others to identify collective needs and pathways for developing operational impact-based forecasting as well as forecast-based financing methodologies and system tools.
- Collaboratively work through existing platforms to seek consistency in donor financing to support longer-term system development, maintenance, sustainability, and the on-going capability strengthening for meteorological and hydrological services of member economies across the Pacific region.



**Figure 1: Climate early warning systems (CLEWS) data and information framework for PNG**

#### Information links

- PNGNWS
  - <http://www.pngmet.gov.pg/>
- CLEWS: Activities supporting Priority Actions of the Pacific Islands Meteorological Strategy (PIMS) 2012-2021
  - <https://www.pacificmet.net/sites/default/files/inline-files/documents/11.20%20New%20Zealand%20Country%20Report%20-%20PMC-4.pdf>