



WMO HydroHub User-Provider Workshop Summary

Samoa and Fiji

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Executive summary

Two Global Hydrometry Support Facility (WMO 'HydroHub') workshops were held in Samoa and Fiji in November 2023, to help address service-delivery optimisation between National Meteorological and Hydrological Services (NHMSs) and hydrological information sectorial users. The User-Provider Workshops were carried out with the objectives of; 1) Developing an improved understanding of key sector-based hydrological information needs by Fijian and Samoan end-user communities. And, 2) to identify and co-develop recommendations for hydrological information product types and potential development pathways such as through the Global Hydrological Status and Outlook System (HydroSOS) and/or other potential initiatives.

The feedback from the workshops in both Samoa and Fiji generally indicated that there is a need for greater inter-stakeholder communication about hydrological data that are being collected by various organisations. Universally there was a wish to build collaboration between stakeholders to develop a Pacific Islands Hydrological Outlook Forum aligned with the Pacific Islands Climate Outlook Forum

Based on the outcomes from the workshops, short (12 month), medium (1-2 years) and long-term (2-5 years) goals were identified and structured so in the short-term building collaboration, identifying efficiencies between donor projects and seeking further funding opportunities to develop data quality and management initiatives are prioritised. This approach sets up medium term goals to enhance hydrological summary projects in a sustainable way and initiated outside of the World Meteorological Organization HydroSOS, and WHOS initiatives, such as the Worldwide Data Explorer (WDE). In the longer term it is planned that the preparatory work of the short to medium term goals will aid in country aspirations to achieve national data hubs to automatically generate relevant long-term statistics and reduce the uncertainty associated with predictions. Both Fiji and Samoa have goals of continual improvement of hydrological data and analytical systems to provide the best possible assessments of water flux through the landscape and water-related early warning systems.

1 Background

Hydrological data are essential for a wide variety of sectors, whether they are for use in watershed management, disaster preparedness and mitigation, infrastructure and industry development, urban planning, energy production, domestic water supply, health, agriculture, mining, tourism or environmental conservation.

In Fiji and Samoa, several of these sectors use hydrological data but there are others that could realise improved decision support from tailored hydrological information products. Furthermore, in much of the region, hydrological data collected by National Meteorological and Hydrological Services (NMHSs) do not always address the actual needs and requirements of both existing and potential data users. Conversely, the potential data users are not always aware of what hydrological data are collected by NMHSs and what services they can support.

This situation can occur with unestablished connections to potential users, weak public-private collaborations and less than effective feedback processes. Consequently, hydrological data can often not be fit for some purposes, perhaps of unknown quality and/or lacking metadata, and thus with unrealised full value. And through not being fully valued, the result is low uptake and cost recovery of NMHS services.

In view of this, optimisation of NMHS service delivery and application of a user-oriented approach for NMHS operations are therefore crucial.

1.1 Workshop Purpose and Objectives

To help address service-delivery optimisation challenges between NHMS and hydrological information sectorial users, User-Provider Workshops under the auspices of the Global Hydrometry Support Facility (WMO HydroHub) were carried out in Fiji and Samoa with the objectives of:

1. Developing an improved understanding of key sector-based hydrological information needs by Fiji's and Samoa's core hydrological information end-user community.
2. To identify and co-develop recommendations for hydrological information product types and potential development pathways such as through the Global Hydrological Status and Outlook System (HydroSOS) and/or other potential initiatives.

2 Workshop attendees

The Global Hydrometry Support Facility, WMO HydroHub, makes available a portfolio of expertise of WMO Members (from science to technology services) to support end-users of hydrometeorological data and services from various economic sectors. These connections help increase the base of hydrometeorological data, catalysed by innovative technologies and approaches, to support WMO Members in water-related decision-making.

With the aim of developing and informing a strategy to improve the presentation, quality, and access to hydrological data, User-Provider Workshops were held in Samoa and Fiji in November 2023. The workshops were hosted by the Samoan Water Resources Division of the Ministry of Natural Resources and the Environment (MNRE-WRD), and the Fiji Meteorological Service Hydrology Division (FMS-H).

The Samoan workshop was held on 14-17 November 2023, and the Fijian workshop was held the following week on 18-20 November 2023. The format of both workshops was as follows:

Day 1 – HydroHub Project Partners meeting

Day 2 – HydroHub Presentations and Stakeholder discussions (See detail in Appendix A)

Day 3 – HydroHub Project Partners Debrief

The workshops were well attended by the host (MNRE-WRD and FMS-H) and stakeholder organisations (Table 2-1), and staff (Figure 2-1 and Figure 2-2).

Table 2-1: Organisations represented at HydroHub workshops in Samoa and Fiji.

Samoa Sector Groups	Fiji Sector Groups
Disaster Management Office (DMO)	Fiji Met. Service
Tourism sector	Private sector
Scientific Research Organisation of Samoa (SROS)	Public sector and management of lands
MNRE / Met.	Fiji Roads Authority
MNRE / Hydro.	Mineral Resources Department (Ministry of Land and Mineral Resources)
Land Transport Safety Authority	IFRC Climate - Red Cross
Technical division (Water Quality Unit) of Samoa Water Authority (SWA)	Ministry of Agriculture and Waterways
Water Sanitation and Hygiene Sector	Ministry of Rural and Maritime Development and Disaster Management
	Ministry of Rural and Maritime Development and Disaster Management
	UN / non-government
	Department of Water and Sewerage
	Department of Energy
	Education/Academia, University



Figure 2-1: Attendees at User-Provider Workshop at MNRE Office, Apia, Samoa, Thursday 16 November 2023.



Figure 2-2: Attendees at User-Provider Workshop at FMS Office, Suva, Fiji, Tuesday 21 November 2023.

3 Workshop discussions and survey results

The feedback from the workshops in both Samoa and Fiji generally indicated that there is a need for greater inter-stakeholder communication about hydrological data that are being collected by various organisations. While there is a range of products derived from collected data available (e.g., early warning systems, climate outlook services, sugar cane forecasts, drought forecasts etc.), the raw data behind these products (and other associated data sets), are not easily available to other organisations.

The need for sustainable long term quality data collection, data sharing and data products was recognised by all attendees at both workshops. However, there are ongoing funding and staffing challenges that inhibit a cross-sector approach to hydrological data collection and research.

Greater appreciation and understanding of the linkages between data and hydrological processes, hazard risk, ecosystem health and human health was also identified as an issue (in that it is vital for policy development around public health, and land and infrastructure development). Again, it was recognised, that there are often limited resources to undertake and communicate such issues.

A discussion and review of data stored within the organisations showed that both MNRE-WRD and FMS-H are aware of and follow data quality and data archiving procedures. Generally, hydrological (surface water) data are stored on central databases. Other organisations tend to use non-networked Excel files to store data which poses a risk to data longevity and investment made in collecting those data. Such approaches also limited the availability and use of data for analysis of hydrological state and trends.

There were differing perspectives on data availability. Generally, the developers of data products for dissemination believed that data and products were freely available, but other stakeholders were unaware of such products and data or did not know where to go to get data. The discussion around this issue led all organisations to conclude that there needs to be a better understanding of how to communicate data and promote technological literacy and storage locations.

The development of professional relationships was seen as critical to assist in asset planning, and funding applications, with the hope that multi-sector applications illustrate the need for proposed projects, and with cross-sector support operational expenditure will assist in keeping projects going past the initial capital expenditure.

At the Fiji workshop it was noted that more engagement activities were needed to make people more aware of existing information dissemination platforms such as FMS (and MNRE) Twitter and Facebook pages.

3.1 User feedback survey results

Feedback was sought from all participants at the HydroHub workshops. The survey solicited a broad range of opinions on the types of data needed; demands of data collection; and potential use for different data types. Table 3-1 represents a collation of observations and requests from both countries).

Table 3-1: Summary of results from stakeholder surveys.

Use / Users	Information Needed	Scale / Frequency	Form of Delivery
Energy sector	Water level	Monthly and events based	Apps
Micro-hydropower	Discharge		Software platform
Hydro-dams	Rainfall and flow forecast (specific need for rain gauges in current blind spots) Soil moisture distribution Agricultural planning information Up to data land maps		Portals
National Disaster Management Office	Rainfall forecasts	Before and during disaster	NEON app.
	Neon user-access for national emergency centre		
National disaster preparedness	River level		Web-link
University of South Pacific	Flow data	On demand or as needed	NEON app.
	Water level Rainfall		
	Groundwater	NOTE: Policy under-development, proposals, products (insurance).	Web-link
	Students should have better access to data for research purposes		
General assessment, production, agriculture	Rainfall data	Instant/daily - determine drainage design (highest resolution possible)	Impact Statements
	Long records to understand volumes e.g., analysis of data to assess and determine the groundwater recharge of an area	Monthly totals (10+ years)	Radio Wide Reach
Energy Security (decisions have a monetary value)		Quarterly	Social Media
			Right way, at the right time to the right community
			Topic appropriate
			Central data portal/ analysis
Drainage and infrastructure design	Streamflow volume	- 10-minute data, with easily accessible stakeholder downloadable Quality Controlled data	Uncertainty and risk appropriate
			- Lack of information for geomorphological assessment
Chemical and bacteria control	Water Quality	- Data requested monthly as a monthly aggregate	
	- Planning and management of Agricultural irrigation		
	- Pollutants to the lagoon and coral reefs		
	- Drinking water quality (includes predicting costs for WAF related to water treatment)		
Big data	Spatial data	Central data portal/ analysis	Vanua-GIS website
			Distributed flow statistics maps
Agriculture (e.g. irrigation)	Outlook for water availability and demand		Weekly and sub-seasonal
Reservoir, water storage (e.g. drinking water supply)			
Rainwater harvesting			

Use / Users	Information Needed	Scale / Frequency	Form of Delivery
Impacts of climate change	<p>Will changing climate patterns impact the availability of irrigation water and hence impact on the agricultural output?</p> <p>Will changing climate patterns impact drinking water supply?</p> <p>Will changing climate patterns impact flood frequency and magnitude?</p>	- As needed	
Vulnerability assessment - social, livelihood, safety, infrastructure resilience	Flood risk mapping Exposure: Asset information, flood exposure assessment, data accessibility	Easily accessible information / wiki	Web-based Communication of results may need to be targeted in communities with little cellular/internet communication
Flood plain management Community risk awareness	Risk informed community	Needs/risk assessment at national level	Targeted assessment of most at risk catchments
Commercial sectors (happy to pay for specialist outputs)	<p>Australian run-off incidence</p> <p>IFD curves rainfall and Run-off AP/HIRDS</p> <p>Uncertainty / prediction reliability</p> <p>Allowance for climate change</p> <p>Hydrological flux for different outputs</p>	<p>- As and when contracted</p> <p>- Regular (5 year) updates of national hydrological statistics</p> <p>- Associated with outputs/purposes as required</p>	

4 Challenges and recommendations

The approaches to hydrological data collection and management in Fiji and Samoa are not unique to these countries. Examples of how multi-organisation data are collated and shared could be investigated further but is outside the scope of this report. Should such work be commissioned, then sector wide workshops should be undertaken to communicate data quality processes and standards required, to ensure metadata are universally understood across organisations. The following challenges and recommendations were identified during the two workshops and subsequent user-feedback.

4.1 Information management and data sharing

There is a wide range of data collection occurring, but users are not always aware of what is available. It is therefore necessary to co-ordinate efforts to enhance data organisation, to allow identification of catchment-scale hydrological pathways and response characterisation. This would help build better modelling capabilities.

Protocols need to be established for data sharing, ensuring compliance with data protection and privacy regulations. For this, regionally (across Pacific countries) standardised information management systems with a central repository, or wiki to direct potential data users to the right source should be considered. For instance an online web maps. There would be issues related to administration and keeping links/system alive, storage locations, etc.

There is a need to develop standardised data formats, metadata requirements and secure data repositories. CliDE was seen as a potentially useful raw and processed data storage location for various data streams outside of those collected by the NMHS. However, there were concerns over data accesibility and uncontrolled data useage. A potential sollution was seen with the ability to digitally fence off data to allowed controlled access through the responsible agency, and through the provision of standardised analysis and data products.

4.2 Water Outlook Forum

A key output from the HydroHub meeting is the identification of a shared intention to develop a water outlook forum for stakeholders. This intention aims to build collaboration between stakeholders within country, and across the Pacific with the development of a Pacific Islands Hydrological Outlook Forum aligned with the Pacific Islands Climate Outlook Forum.

This forum would assist the necessary collaboration and learning necessary to collectively achieve the short-, medium-, and long-term goals set out in (Section 4.4). It was noted in the stakeholder meetings and subsequent discussion that NIWA or similar organisations could provide guidance on how New Zealand's hydrological data and archiving issues are dealt with and shared, and how those data are developed into outlook products at different timescales. It should be noted that Fiji and Samoa have some national and catchment scale status and short term outlook products already, e.g., rainfall (<https://www.met.gov.fj/index.php?page=ClimateOutlook>) and sugarcane outlooks ([Fiji Meteorological Service](#)). There was however a forward-looking demand for process-based models that require quality assured and quality-controlled data for more spatially discrete and consistent predictions, as well as building towards seasonal outlook forecasts (i.e., discussions between expert hydrologists based on available climate data to produce drought indices, soil moisture estimates (below, average, above normal estimates)).

4.3 Modelling

The following challenges remain for implementation of modelling strategies:

- Securing adequate climate outlooks and knowledge to properly downscale data to basin level including collaboration with sub-regional PICOF/PIHOF (Pacific Island Climate Outlook Forum / Pacific Island Hydrological Outlook Forum).
- Ensuring engagement of stakeholders, for data submission and quality control.
- Finding resources and strengthening capacity.
- Inter-department approvals for data standards, sharing and storage.
- Disparate data sources, different levels of QA and QC of collected data, and issues around collecting data and maintaining stations.
- Issues with data collection, and improvement, with the feedback above processes.

4.4 Roadmap

Based on the outcomes from the workshops, the following, short, medium, and long-term goals have been identified:

4.4.1 Short-term goals (next 12 months)

- Build collaboration between stakeholders to develop a Pacific Islands Hydrological Outlook Forum aligned with the Pacific Islands Climate Outlook Forum
- Stocktake of existing donor projects and align project outputs to gain efficiencies
- Seek funding to investigate options for data collection and sharing
- Investigate options for data quality and data management to include variables outside of Outlook for water availability and demand
- River flow status summaries

4.4.2 Medium-term goals (1-2 years)

- Work towards data summary products
- Linkages between organisations and national data standards
- Update
- Stocktake of water supply risks

4.4.3 Long-term goals (1-5 years)

- National data hubs and auto generated summary statistics
- Development of numerical flood and drought prediction and related services: IFD (Intensity Frequency Duration) curves, Rainfall and Runoff, Pacific HIRDS (High Intensity Rainfall Design System)
- Uncertainty / prediction / reliability
- Allowances for climate change
- Hydrological flux for different output formats

Appendix A Workshop agendas

Samoa User-Provider Workshop agenda: Thursday 16 November 2023

Time	Session	Objective	Presenter/Facilitator	Comments
9:15–9:30	Participant arrival and registration	Registering participants	Shaun (NIWA) & Emarosa (MNRE-WRD)	
9:30–9:45	Workshop Opening	Opening of End Users Workshop and Samoa's envisaged outcomes	Asuao (MNRE-WRD)	Workshop opening by ACEO of WRD Workshop Photo
9:45–10:15	Workshop Introduction	Presentations: WMO HydroHub and HydroSOS interlinking projects background and relation to the End Users Workshop Stakeholder pool: (2 week notice to them before workshop)	Igor: Projects background Shaun: End-user workshop incl questionnaire results	Presentations (15-mins each) High-level examples from other regions/countries will also be highlighted along with prelim questionnaire results
10:15–11:00	Group Breakout Session	Discuss aggregated hydrological information use and needs questionnaire results/findings according to sector groups	NIWA-WMO-MNRE team facilitator per group White paper (drawing board) discussion activities Facilitator: Shaun	Activity 1: Review and identify gaps from preliminary questionnaire findings in relation to hydro/water info needs (30 mins) Groups present back (15 mins: 3-5 mins per group)
11:00–11:20	Catered Tea Break			
11:20–12:00	Example products	Presentation: Review of example hydrological information products developed/used locally and in other parts of the world	Asuao: Examples from Samoa Lawrence: Examples from Aotearoa NZ James: Examples from other regions	Presentations (10-mins each plus Q+A) Includes how the information is being used by a specific sector or aggregated info for generic multi-sector use

Fiji User-Provider Workshop agenda: Tuesday 21 November 2023

Time	Session	Objective	Presenter/Facilitator	Comments
9:15–9:30	Participant arrival and registration	Registering participants	Shaun (NIWA) & Viliami (FMS)	
9:30–9:45	Workshop Opening	Opening of End Users Workshop and Fiji's envisaged outcomes	Taitusi Vakadravuyaca (Permanent Secretary of Public Works, Transport and Meteorological Service) Henry / Igor (WMO)	Workshop opening by Acting Director of FMS Workshop Photo
9:45–10:15	Workshop Introduction	Presentations: WMO HydroHub and HydroSOS interlinking projects background and relation to the End Users Workshop	Igor: Projects background Shaun: End-user workshop incl questionnaire results	Presentations (15-mins each) High-level examples from other regions/countries will also be highlighted along with preliminary questionnaire results
10:15–11:00	Group Breakout Session	Discuss aggregated hydrological information use and needs questionnaire results/findings according to sector groups	NIWA-WMO-FMS team facilitator per group White paper (drawing board) discussion activities Facilitator: Shaun	Activity 1: Review and identify gaps from preliminary questionnaire findings in relation to hydro/water info needs (30 mins) Groups present back (15 mins: 3-5 mins per group)
11:00–11:20	Catered Tea Break			
11:20–12:00	Example products	Presentation: Review of example hydrological information products developed/used locally and in other parts of the world	Viliami / Water Sector: Examples from Fiji Lawrence: Examples from Aotearoa NZ Evan: Examples from other regions	Presentations (10-mins each plus Q+A) Includes how the information is being used by a specific sector or aggregated info for generic multi-sector use

Appendix B Workshop photos

Samoa User-Provider Workshop agenda: Thursday 16 November 2023



Fiji User-Provider Workshop agenda: Tuesday 21 November 2023

