Pacific Countries and Territories Hydrological Capacity Assessment and Needs

October 2019

Pacific Meteorological Council

SPREP Secretariat of the Pacific Regional Environment Programme

World Meteorological Organization

Climate and Oceans Support program in the Pacific

UNDP Empowered lives. Resilient nations.

UNESCO United Nations Educational, Scientific and Cultural Organization

Sustainable Development Goals

Pacific Community Communauté du Pacifique

wave consulting

India-UN Development Partnership Fund

Document Management

Version	Date	Document ID	Authors
1 – Draft	31 August 2019	2019-032-D14	R.Catchlove, B.Stewart & A.Hankinson
2 – Final	20 October 2019	2019-032-D15	R.Catchlove, B.Stewart & A.Hankinson

Disclaimer

Citation

Catchlove, R., Stewart B, and Hankinson A., 2019. Pacific Countries and Territories Hydrological Capacity Assessment and Needs. A report for Pacific Hydrological Services Panel and SPREP.

Acknowledgements

Wave Consulting wish to acknowledge the following individuals and organisations for their support and contribution to the project:

- Azarel Mariner, project manager from SPREP
- Chari of Pacific Hydrological Services Panel, Malaki Iakopo
- All members of the Pacific Hydrological Services Panel
- All the respondents to the survey

Funders

The project was possible through the funding from WMO, UNDP, UNESCO, India-UN Development Partnership Fund, and Climate and Oceans Support Program in the Pacific (COSPPac).

Table of Contents

Executive summary

This document reports on the assessment of the hydrological capacity, gaps and needs of 21 different countries in the Pacific region (members of the Secretariat of the Pacific Regional Environment Programme (SPREP)). The project was managed by SPREP and guided by the Pacific Hydrological Services Panel (PHS Panel). The World Meteorological Organisation (WMO), the United Nations Development Programme (UNDP) and the United Nations Education, Scientific and Cultural Organisation (UNESCO) provided the funding for this project.

Hydrological services are defined as the systematic approach to water resources data recording, collection, processing, storage, archiving, rescuing, production and dissemination of data and information, and hydrological forecasting and management.

The project was undertaken in six stages by Wave Consulting Australia:

1. Desktop review of past projects
2. Design of online survey
3. Delivery of the online survey
4. Country visits and interviews
5. The PMC/PHS meeting August 2019
6. Reporting

The countries and territories in the Pacific are amongst the most vulnerable to climate change impacts, which are forecast to include changes in rainfall patterns, storm surges and sea level rise. Water security, flooding and climate change are key issues in the Pacific region, affecting millions of people every day. Each island state relies on different water sources to meet the needs of the community, and this often changes across islands and provinces within the country. The islands that are often considered to be the most vulnerable are atolls, which rely on groundwater lens for water supply.

The Intergovernmental Panel on Climate Change (IPCC, 2014) has stated that “small islands do not have uniform climate change risk profiles. Rather, their high diversity in both physical and human attributes and their response to climate-related drivers means that climate change impacts, vulnerability, and adaptation will be variable from one island region to another and between countries in the same region.”

The desktop review of past projects (46 projects) identified that, although high quality hydrological services were fundamental to the success of many of the projects, the level of involvement of the National Hydrological Services was minimal and the level of funds being provided to improve the delivery of hydrological services by National Hydrological Services through international projects is low. The total funding being provided to “water-related” projects is considerable, and a greater proportion of these funds could be provided to the National Hydrological Services with significant net benefits to the sustainable development of the Pacific island communities. Also, the review identified that just over half of the past projects have been set up and delivered with a regional focus. This creates a challenge for the specific countries themselves to engage with a regional organisation and ensure specific and relevant on-ground benefits are realised in each country.

The online survey was completed in July and August 2019. Responses from eleven (11) countries were received through the online survey. In addition, there were twenty-five (25) good quality individual responses, some from NGOs or other departments (outside of water resources/hydrology).

Wave Consulting gathered additional data on four countries (Solomon Islands, Fiji, Kiribati, and Samoa) through country visits.

The Pacific Hydrological Services Panel (PHS Panel) was established by the Fourth Meeting of the Pacific Meteorological Council (PMC-4) to serve in the capacity of an advisory committee to the Pacific Meteorological Council (PMC) on hydrological services matters in the Pacific region a panel for hydrological services. Wave Consulting attended a PHS Panel meeting on 5 August 2019. Presentation of preliminary results of the assessment was undertaken with the Panel.

Based on the desktop study, the online survey, country visits and discussions with the PHS Panel, three critical pillars that must be first be adopted by a country to create an enabling environment and ensure that capacity building is not treated an isolated 'one-off' exercise with no long-term support were identified, namely, increasing funding and investment in hydrological services, developing and updating policy and legislation to support the service and extend the role, function and reach of hydrological services and raising the profile of water and its linkages with health and environmental benefits.

Virtually all countries in the region are susceptible to climate change and climatic influences on the main water supply source, highlighting the need to build capacity in the ability of hydrological services to monitor, analyse and predict the risks (and mitigation options) of water supply systems.

Some specific capacity building programs for the region have been identified, including, increasing data sharing, improving hydrological monitoring networks (including maintenance, spatial extent of the networks and new monitoring capabilities), linking infrastructure investments with ongoing knowledge and capacity, forming a formal partnership with the national meteorology services, improving data management, boosting training both technical and professional, enhancing internal relationships and partnerships, enhancing external relationships and partnerships, increasing analysis and forecasting (including now casting and long range forecasting) and extending communication and advocacy.

One of the main underlying health threats to communities in the Pacific region is access to clean water and sanitation. There is a very specific need to strengthen hydrological services' ability to work with the health ministry and centres to understand the nature of water-related threats, infrastructure, monitoring networks and solutions to creating safer and more reliable water supply and sanitation systems.

The report makes twelve (12) recommendations including the delivery of the priority capacity building needs identified above, establishment of a clear vision linking funding, capacity, and on-ground services, ensuring hydrological services have been directly linked to, and are integral in, achieving Sustainable Development Goals (SDGs), considering the benefits and the options to partner with the meteorology service, considering how to integrate the training needs for hydrological services into a proposed Pacific regional training centre, ensuring all countries have robust policy and legislation in place to support hydrological services, that is integrated with other relevant disciplines, creating a hydrology narrative that extends the narrative the Pacific has already developed on climate change and sea level rise, to raise the profile of the importance of water management, data and monitoring, focusing specifically on ensuring all regions have resilient and adaptive water systems, ensure all investment has a capacity building legacy, create a knowledge centre that captures the latest research (across atolls, mainland islands, groundwater, rainwater, surface water, desalination, and sea levels) and aims to accelerate the process of learning from shared experience, and sharing and celebrating what has been achieved.

1 Introduction

Water security, flooding and climate change are key issues in the Pacific region, affecting millions of people every day. Given this, national hydrological services are of significant value to communities and governments by improving water security and access, forecasting extreme weather, and monitoring the water cycle and its impact on people.

The countries and territories in the Pacific are amongst the most vulnerable to climate change impacts, which are forecast to include changes in rainfall patterns, storm surges and sea level rise. Ensuring that hydrological services have the capacity and capability to adapt to these impacts, is of critical importance to the people and communities of the region.

This project was commissioned to assess the hydrological capacity of 21 different countries in the Pacific region (members of the Secretariat of the Pacific Regional Environment Programme (SPREP)) and identify their gaps and needs. It was managed by SPREP and delivered by Wave Consulting Australia, and funded by World Meteorological Organisation (WMO), United Nations Development Programme (UNDP) and United Nations Education, Scientific and Cultural Organisation (UNESCO).

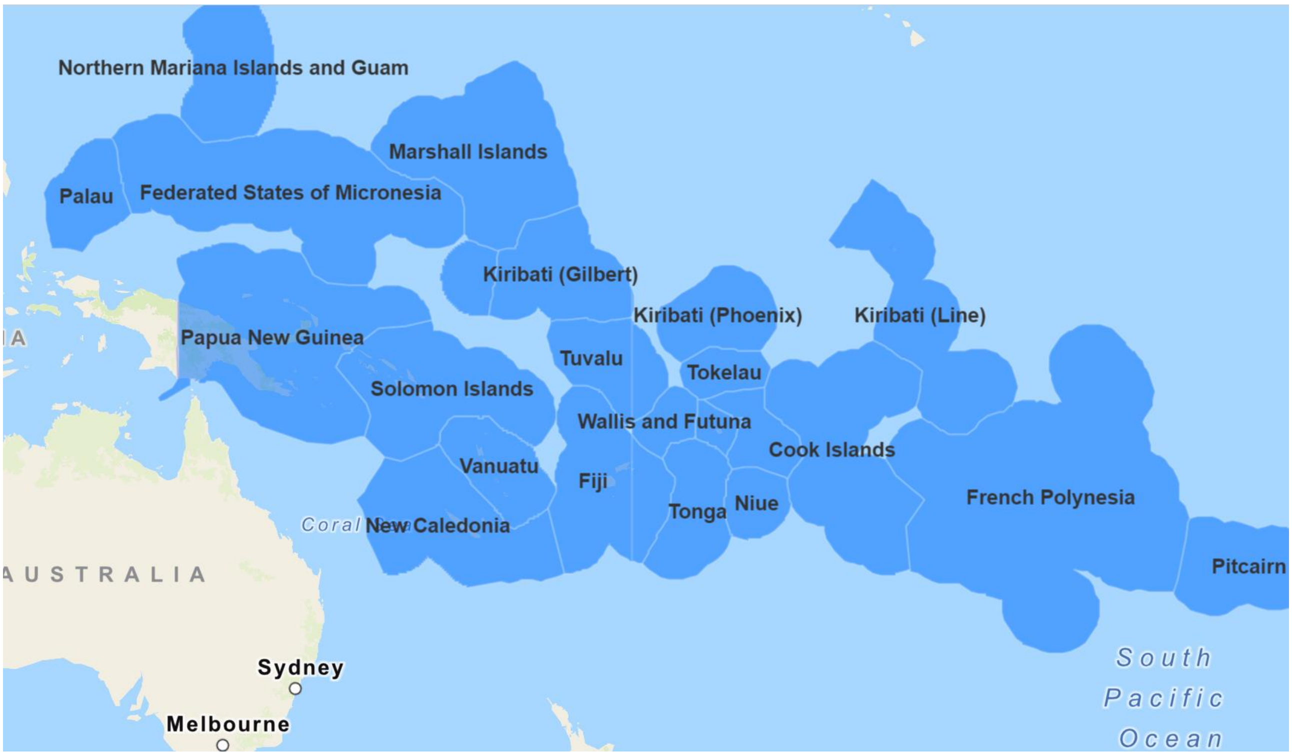


Figure 1. Pacific region and countries and territories included in this study

1.1 Pacific Meteorological Council and Pacific Hydrological Services Panel

Hydrology and meteorology are closely linked. Countries around the world often merge the two national services to deliver better and more accurate predictions and services. In contrast, in the Pacific these two services are often not delivered by the one ministry or department.

Discussions over several years between meteorologists, hydrologists, heads of departments and country leaders have led to the recent establishment of the Pacific Hydrological Services Panel (PHS Panel). The PHS Panel was established by the Fourth Meeting of the Pacific Meteorological Council (PMC-4) to serve in the capacity of an advisory committee to the Pacific Meteorological Council (PMC) on hydrological services matters in the Pacific region a panel for hydrological services. In establishing the Panel, the PMC acknowledged that there is a benefit and opportunity to improve the services through developing a closer relationship and institutional / governance model.

The purpose of the PHS Panel, as documented in the terms of reference is:

> *[T]o provide general advice and guidance to the PMC on matters related to hydrological services, with an emphasis on flood and drought warning and management at the national and regional level, as prescribed in the Pacific Island Meteorological Strategy 2017-2026 and other international and regional frameworks such as the Framework for Resilient Development in the Pacific.*
>
> *The PHS Panel will also assist the work of the PMC by collaborating with relevant partners on the development and implementation of new programmes and initiatives to enhance the capabilities of PICTs to provide quality hydrological services.*

In 2018/2019, the PHS Panel agreed to conduct a survey and explicitly report on the nature of hydrological services, capacity, gaps and needs in the Pacific region.

This project delivers on that action. It will help inform the future direction of projects delivered through the PHS Panel, and enable the WMO, UN, World Bank and others to clearly understand how capacity and outcomes from hydrological services in the region could be improved.

1.2 Scope

The scope of this project is "***To conduct a capacity needs and gaps assessment for the Pacific Islands Hydrological Services**.*"

Specifically the project scope is to produce a report providing a comprehensive overview of the hydrological capacities, gaps and needs in the countries, with recommendations developed in consultation with the PHS Panel and its members which are suitable for developing projects and initiatives to address the identified gaps and needs at a country and regional level.

The scope covers the 21 member countries of Secretariat of the Pacific Regional Environment Programme:

- American Samoa
- Cook Islands
- Federated States of Micronesia
- Fiji
- French Polynesia
- Guam
- Kiribati
- Marshall Islands
- Nauru
- New Caledonia
- Niue
- Northern Mariana Islands
- Palau
- Papua New Guinea
- Samoa
- Solomon Islands
- Tokelau
- Tonga
- Tuvalu
- Vanuatu
- Wallis and Futuna

2 Background

2.1 The region

The Pacific Islands region extends from Palau in the west to Pitcairn Islands in the east, and from French Polynesia in the south to Guam in the north. The region covers 30 million square kilometres. See Figure 1 for a map of the region and countries included.

The largest populations are in the Papua New Guinea, Fiji and Solomon Islands, with some of the smaller states such as Tokelau, Niue, Nauru, Tuvalu, and Wallis and Futuna all having less than 15,000 total population.

2.2 Regional water and climate impacts

The region is made up of many small island states and some larger islands, and several assessments have documented that the climate is changing, and this is impacting on the wellbeing, and in some cases survival, of people in the region. Each island state relies on different water sources to meet the needs of the community, and this often changes across islands and provinces within the country. The islands that are often considered to be the most vulnerable are atolls, which rely on groundwater lens for water supply (see Figure 2 below).

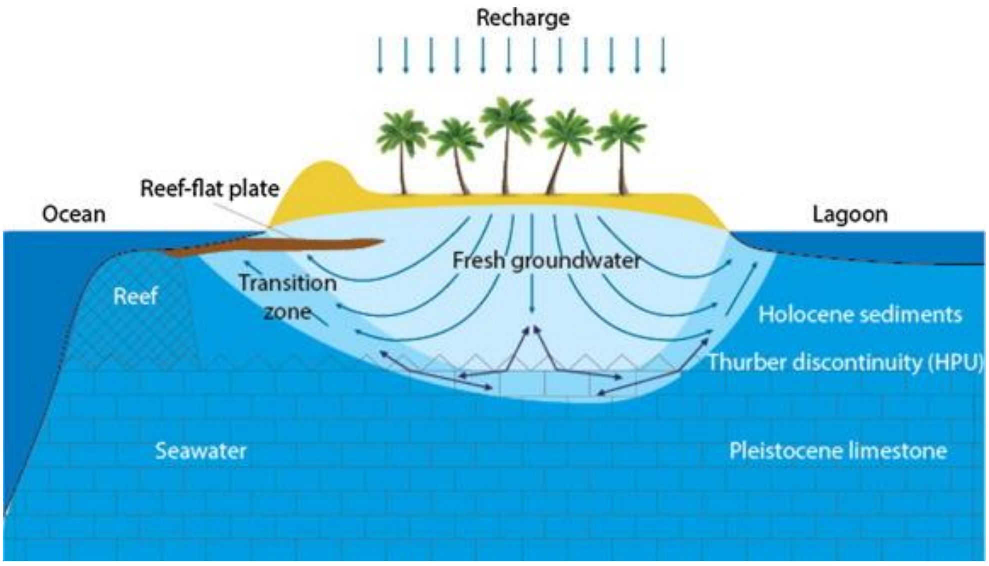


Figure 2. Cross section of groundwater lens (Source: Werner et al, 2017).

The most recent Assessment Report by the Intergovernmental Panel on Climate Change (AR5 Climate Change 2014: Impacts, Adaptation, and Vulnerability) had a specific chapter on the small island states, which clearly captured the nature of threats and impact on the region:

> *Current and future climate-related drivers of risk for small islands during the 21st century include sea level rise (SLR), tropical and extratropical cyclones, increasing air and sea surface temperatures, and changing rainfall patterns (high confidence; robust evidence, high agreement). {WGI AR5 Chapter 14; Table 29-1} Current impacts associated with these changes confirm findings reported on small islands from the Fourth Assessment Report (AR4) and previous IPCC assessments. The future risks associated with these drivers include loss of adaptive capacity {29.6.2.1, 29.6.2.3} and ecosystem services critical to lives and livelihoods in small islands. {29.3.1-3}*

SLR poses one of the most widely recognized climate change threats to low-lying coastal areas on islands and atolls (high confidence; robust evidence, high agreement). {29.3.1} It is virtually certain that global mean SLR rates are accelerating. {WGI AR5 13.2.2.1} Projected increases to the year 2100 (RCP4.5: 0.35 m to 0.70 m) {WGI AR5 13.5.1; Table 29-1} superimposed on extreme sea level events (e.g., swell waves, storm surges, El Niño-Southern Oscillation) present severe sea, flood and erosion risks for low-lying coastal areas and atoll islands (high confidence). Likewise, there is high confidence that wave over-wash of seawater will degrade fresh groundwater resources {29.3.2} and that sea surface temperature rise will result in increased coral bleaching and reef degradation. {29.3.1.2} Given the dependence of island communities on coral reef ecosystems for a range of services including coastal protection, subsistence fisheries, and tourism, there is high confidence that coral reef ecosystem degradation will negatively impact island communities and livelihoods.

Given the inherent physical characteristics of small islands, the AR5 reconfirms the high level of vulnerability of small islands to multiple stressors, both climate and non-climate (high confidence; robust evidence, high agreement). However, the distinction between observed and projected impacts of climate change is often not clear in the literature on small islands (high agreement). {29.3} There is evidence that this challenge can be partly overcome through improvements in baseline monitoring of island systems and downscaling of climate model projections, which would heighten confidence in assessing recent and projected impacts. {WGI AR5 9.6; 29.3-4, 29.9}

Small islands do not have uniform climate change risk profiles (high confidence). Rather, their high diversity in both physical and human attributes and their response to climate-related drivers means that climate change impacts, vulnerability, and adaptation will be variable from one island region to another and between countries in the same region. {Figure 29-1; Table 29-3} In the past, this diversity in potential response has not always been adequately integrated in adaptation planning.

(excerpt from the executive summary, Chapter 29, AR5 Climate Change 2014: Impacts, Adaptation, and Vulnerability)

Climate change and water issues are known to be critical threats to the wellbeing and survival of communities in the region. Past evaluations of the Sustainable Development Goals have highlighted the high percentage of people in the Pacific region that are already without access to clean drinking water and sewage services (relative to other regions in the world) (UN Water, 2016).

The potential for climate change to exacerbate existing issues with water security and access to clean water and sanitation highlights how critical hydrological services are to the quality of life in the Pacific Island region.

2.3 Defining hydrological services and capacity

Hydrological services are defined as the systematic approach to water resources data recording, collection, processing, storage, archiving, rescuing, production and dissemination of data and information, and hydrological forecasting and management.

Hydrological services include policy, monitoring, analysis, forecasting and reporting of groundwater, surface water, storages, rainfall, desalination, marine and water quality elements within a country, at a range of time scales.

Across the region there are a range of different climates, topography, population densities and water-related issues which affects the capacity to provide hydrological services in each country differently. However, with that in mind, Figure 3 provides a graphic representation of the issues that influence capacity, as well as the step changes countries and ministries often transition through as they improve their hydrological services and capacity.

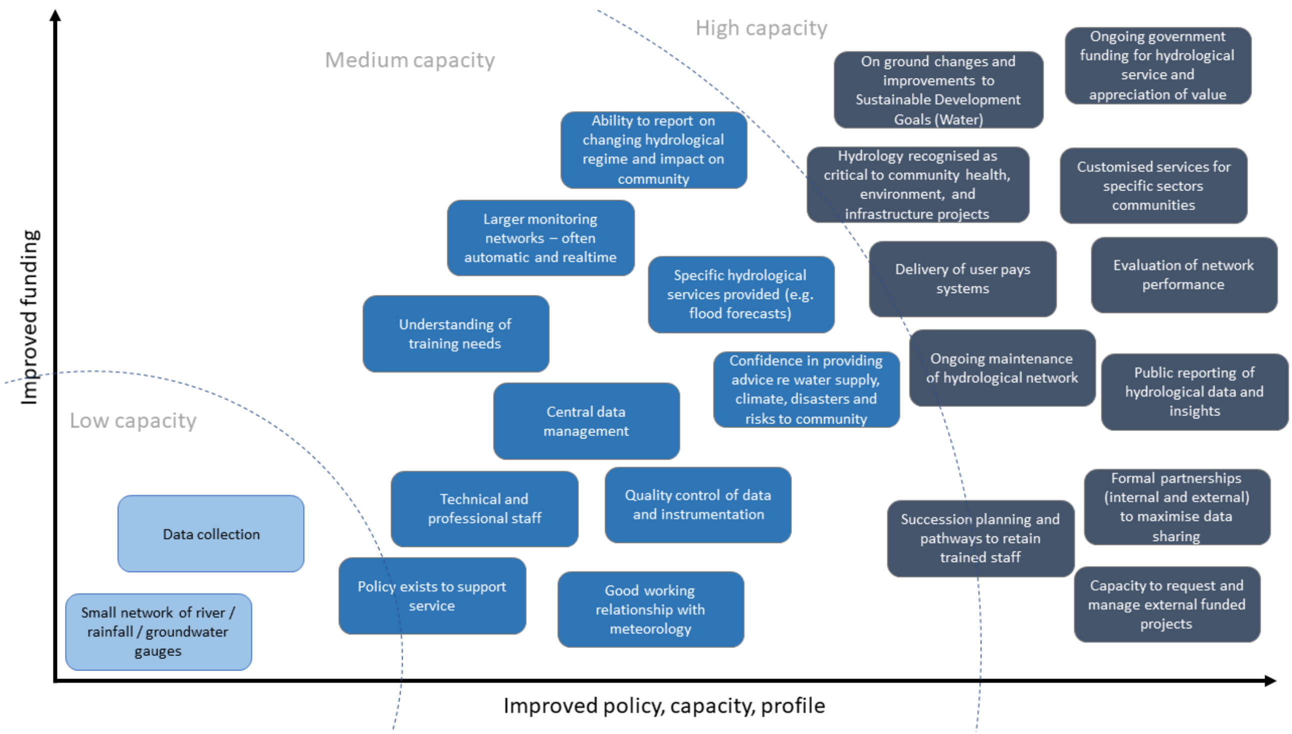


Figure 3. Conceptual elements of hydrological services and capacity

3 Method

The method to undertake this assessment is described below. There were six stages to this project, completed over a three-month period in mid-2019.

- **Stage 1 – Desktop review of past projects**. This involved a review of past projects, such as the Hydrological Cycle Observing System for the Pacific Island Countries - Pacific-HYCOS Project.
- **Stage 2 – Design of online survey**. In consultation with the PHS, an online survey was designed to gain feedback on existing hydrological services and opinions on capacity gaps and opportunities. The survey questions are included at Annex 2.
- **Stage 3 – Delivery of the online survey**. The survey was sent out by SPREP and the Pacific Community (SPC), with follow up reminders.
- **Stage 4 – Country visits and interviews**. Wave Consulting visited four countries to gather additional data: Solomon Islands, Fiji, Kiribati, and Samoa.
- **Stage 5 – PMC / PHS meeting August 2019**. A sub panel meeting was scheduled for 5 August 2019. Presentation of preliminary results of the assessment was undertaken with the panel.
- **Stage 6 – Reporting**. The final stage of the project was the drafting of report to document the assessment and needs. This was provided to all members of the PHS.

4 Results from desktop review of past projects

A total of 46 projects were identified through a desktop study of past projects. The projects identified as being relevant or related to this project are listed below, as well as a summary of their geographical distribution and the level of funding provided.

Projects ranged from region-wide initiatives with budgets in the tens of million dollars to smaller very targeted projects with budgets in the tens of thousands of dollars. Of the projects identified, only a few (Pacific-HYCOS, Catalogue of Rivers for Pacific Islands, The Pacific IWRM National Planning Programme, Advancing Groundwater Monitoring in Pacific Small Island Developing States) appear to have directly involved the National Hydrological Services in the activities being undertaken through the project. That is, that while high quality hydrological services were fundamental to the success of the projects, the level of involvement of the National Hydrological Services was minimal. It is essential that the National Hydrological Services participate in and benefit from projects and activities that rely on high quality hydrological services. There are several smaller targeted projects such as establishment of sustainable water supplies and bridge construction and design that require targeted and specific hydrological products and services.

Overall, based on this desk-top assessment the level of funds being provided to improve the delivery of hydrological services by National Hydrological Services through international projects is low. The total funding being provided to "water-related" projects is considerable, and a greater proportion of these funds could be provided to the National Hydrological Services with significant net benefits to the sustainable development of the Pacific island communities.

The findings from most of the more relevant studies confirm the findings of this review, including:

- *Pacific-HYCOS Project*: water resources available in small island developing states are vulnerable to climate extremes and population pressures. Pacific island countries have limited alternate options and only relatively small and finite water resources to meet increasing demand. Knowledge on how water supply from rivers, aquifers and rainwater harvesting respond to increased demands and climate variability is crucial to ensuring sustainable and productive water resources.

- *Advancing Groundwater Monitoring in Pacific Small Island Developing States*: the priority issues raised were: Need for the development of a groundwater database for pacific SIDS; Improvements in groundwater data collection; Development of products relevant for specific needs; Foster sustainability and continuity after completion of projects; and, Training.

- *The Pacific IWRM National Planning Programme*: Pacific Island countries have uniquely fragile water resources due to their small size, lack of natural storage, competing land use, and vulnerability to natural hazards. In most Pacific countries, even small variations in water supply can have a significant impact on health, quality of life, and economic development.

4.1 Project list

46 projects have been collated and are listed below in alphabetical order. More details on each project are included in Annex 3, including their location, budget, donors, main findings, and level of relevance to this report.

- Advancing Groundwater Monitoring in Pacific Small Island Developing States
- Building Human Development: Improving WASH in Solomon Islands
- Building Resilience to High-Impact Hydrometeorological Events through the Strengthening of Multi-Hazard Early Warning Systems (MHEWS) in Small Island Developing States (SIDS) and Southeast Asia
- Catalogue of Rivers for Pacific Islands

- Climate and Oceans Support Program in the Pacific (COSPPac)
- Climate Information Services for Resilient Development in Vanuatu
- Disaster Resilience for Pacific Small Island Developing States (RESPAC) Project
- EU – North Pacific - Readiness for El Niño project
- Finnish-Pacific (FINPAC) project - Pacific Islands Meteorological Services in Action
- Flood Control Master Plan and Priority Project in Nadi River Basin
- "iCLIM (Supporting the Regional Management of Climate Change Information in the Pacific)"
- Increasing Climate Resilience of Pacific Small Islands States (SIS) through the Global Climate Change Alliance (GCCA)
- Integrated Flood Management - Nadi Basin Pilot
- Nalauwaki Village on Waya Island - Safe Water Supply Project
- Nanuca Village Safe Water Project
- Nawerewere Hospital, Tarawa, Safe Water Supply Project
- Pacific Adaptation to Climate Change (PACC) Programme
- Pacific Adaptation to Climate Change and Resilience Building (PACRES)
- Pacific environment community fund consolidated regional report
- Pacific HYCOS Project
- Pacific Island Groundwater and Future Climates: First-Pass Regional Vulnerability Assessment
- Pacific Resilience Program
- Pacific Resilience Project II under the Pacific Resilience Program
- Pacific Risk Resilience Programme
- PCRAFI: Furthering Disaster Risk Finance in the Pacific
- Project for the Introduction of the Nationwide Early Warning System (NEWS) and Strengthening Disaster Communication
- Project to Support Strengthening Water Supply Service on Nadi/Lautoka Regional Supply
- Pro-Resilient Fiji – Strengthening climate resilience of communities for food and nutrition security
- Regional Ridge to Reef in Pacific Island Countries
- Regional Sustainable Energy Industry Development Project
- Safer, Cleaner Water and Sanitation for Solomon Islanders
- Scaling up eco-sanitation in the Outer Islands of Tuvalu
- Sector reform for rural WASH (Budget Support)
- Solomon Island Communities Build Potable Water Systems to Improve Livelihoods
- Solomon Island Water Sanitation and Climate Outlook
- Solomon Islands Water Sector Adaptation Project
- South Tarawa Water Supply Project
- Strengthening Hydro-Meteorological and Early Warning Systems in the Pacific.
- Strengthening Hydro-Meteorological and Early Warning Systems in the Pacific.
- Supporting Climate Change Adaptation for the Samoan Water Sector
- Sustainable Integrated Water Resources and Wastewater Management Project in Pacific Island Countries
- The Pacific IWRM National Planning Programme
- Towards Climate Change Resilience II: traditional knowledge-based adaptation and water security in Utwe Biosphere Reserve (Kosrae, Federated States of Micronesia)
- Updating Wetlands Inventories in the Oceania Region
- Water and Sanitation in Kiribati outer islands (KIRIWATSAN II)
- Water and sanitation sector policy support programme

4.2 Geographic distribution of past projects

The following figure shows the total number of projects targeting each country. Many of the projects listed above were focused on the whole region (i.e. explicitly suggested their project focus was on 10 to 20 countries), but that does not mean that the funding, impact and outcomes were equally distributed. These are shown as 'regional' for this geographic analysis.

Figure 4. Number of times country has been a focus or recipient of past projects.

An interesting observation from Figure 4 is that just over half of the past projects have been set up and delivered with a regional focus. This creates a challenge for the specific countries themselves to engage with a regional organisation and ensure specific and relevant on-ground benefits are realised in each country.

4.3 Funding provided to past projects

The team identified the funding amount for each project (usually in US dollars (USD $) or Euro (EUR €) currency). By distributing this funding across the term of the project and adding up the funding for the whole region in one year, we can illustrate the change in investment in hydrological services and water resources in the region over the past 20 years. Budgets were adjusted using the US inflation rate to be in 2018 US dollars.

In recent years there has been a growing emphasis and investment in climate change and resilience-related water projects. These projects are now almost at a similar scale of investment as the traditional water, sanitation and hygiene (WASH) projects.

The total investment in the region for the projects identified in this desktop process is approximately $440 million USD. It should be noted that several of these related to capital intensive water infrastructure projects, such as the South Tawara Water Supply Project (a desalination plant - $28.6 million USD), with minimal capacity building and links to ongoing support to improve capacity within the hydrological services.

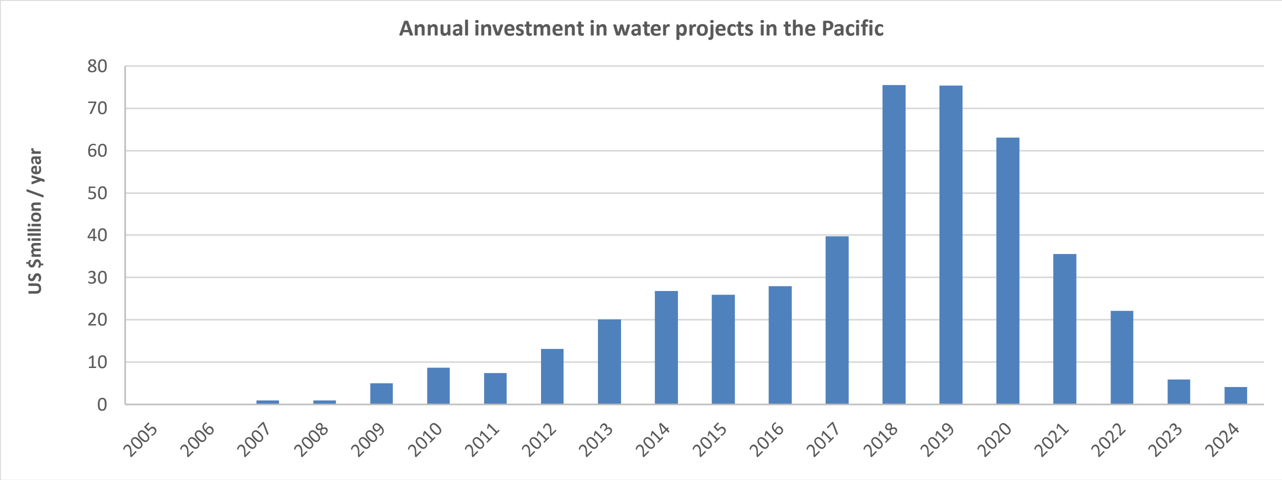


Figure 5. Level of investment in hydrological services and projects over time

5 Survey results

This section details the results of the online survey completed in July and August 2019 and is also supported by qualitative and anecdotal evidence collected by Wave Consulting while engaging with specific member countries.

11 countries provided detailed responses to the online survey. There was a total of 25 good quality individual responses, some from NGOs or other departments (outside of water resources / hydrology), which provide a useful alternative viewpoint on capacity and needs.

This section presents the main results from the online survey, with additional details included in country profiles at Annex 1.

5.1 Water and climate

Three questions in the survey asked respondents about the type of water resources available and how these may change with climate change.

These questions are important as they provide context on the type of water sources that hydrological services are based around and issues that these services face.

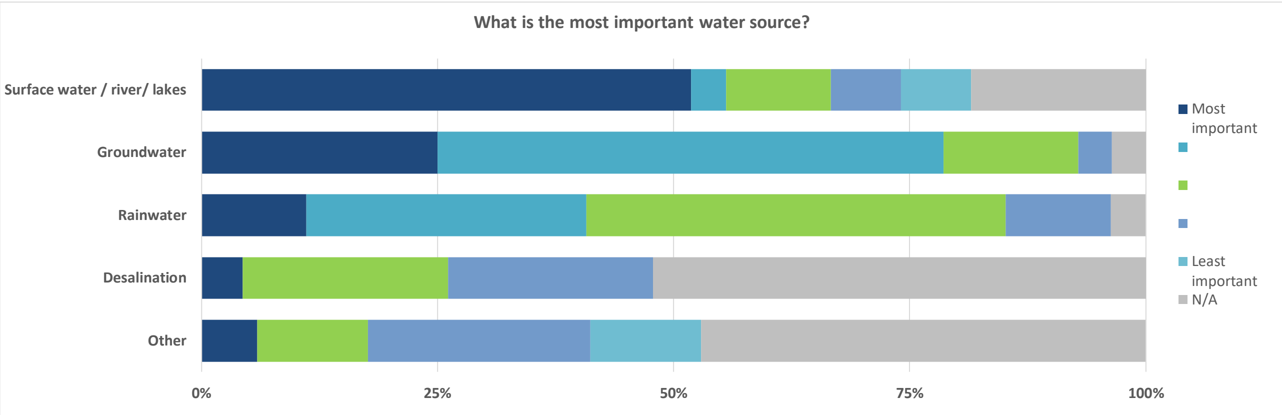


Figure 6. Survey results on the most important water source

The next figure reports on the response to a question asking respondents about the nature of data and monitoring of the hydrological regime and climate change.

Interestingly Figure 7 notes that the two most common water sources (as noted in Figure 6), are also the least well understood in relation to changes resulting from climate change, highlighting a key area for improvement in the region.

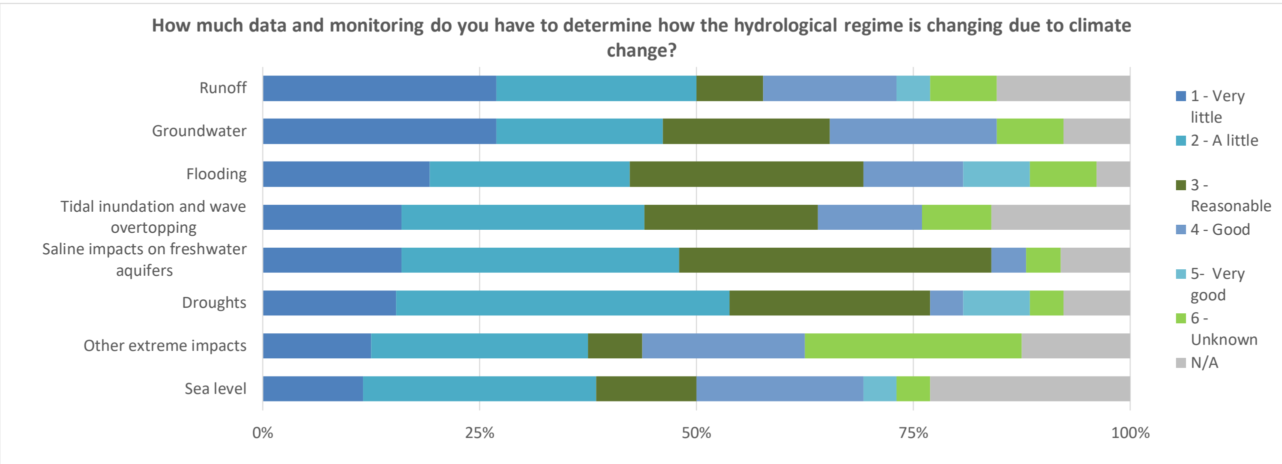


Figure 7. Available data to monitor the impact of climate change on the hydrological cycle

5.2 Capacity to measure hydrological data

Monitoring is a significant part of a hydrological service. The survey captured responses to how many stations the countries had in operation, and how they reported on the data received, and how many had lapsed.

When a respondent indicated that some monitoring stations had lapsed (highlighted in light blue in Figure 8, which is 5 out of 11 countries), a follow up question asked why they had lapsed. Some reasons for the decommissioning of stations were lack of ongoing funding to maintain the stations, vandalism and land rights issues.

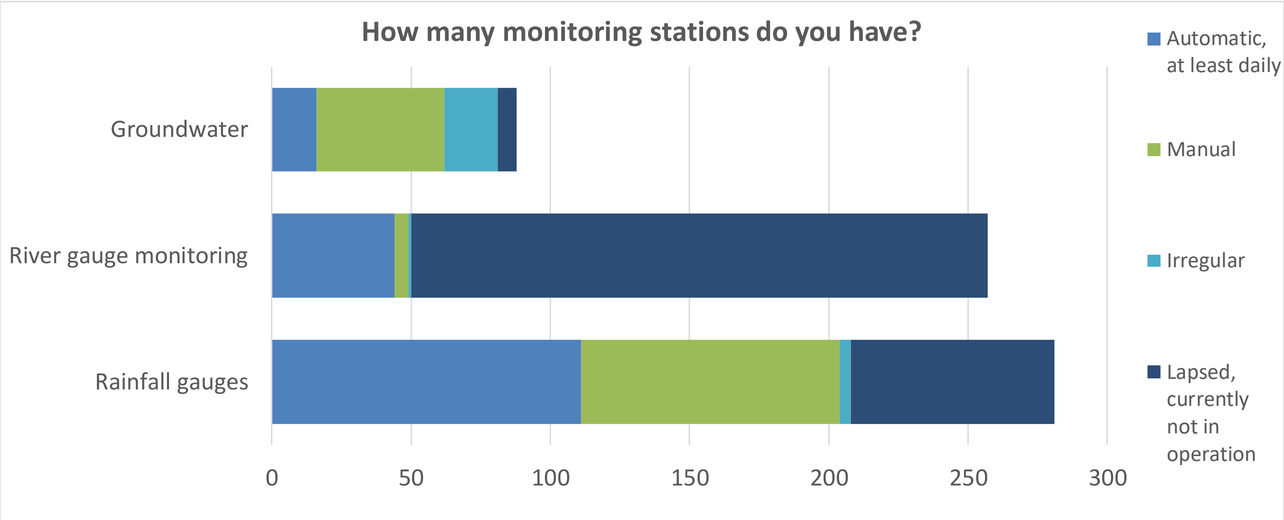


Figure 8. Total number of monitoring stations in the region? (11 countries)

Communications systems are a critical part of hydrological services, disaster management and dissemination of warnings and services. The survey asked about the type of communications systems relied on by monitoring stations. The survey data reinforces the role that mobile services play in hydrological data collection. The responses to this question do not correlate with the number of stations (in Figure 8), indicating that more analysis is required to confirm the type of communications systems that are being used, or to clarify gaps in communication systems.

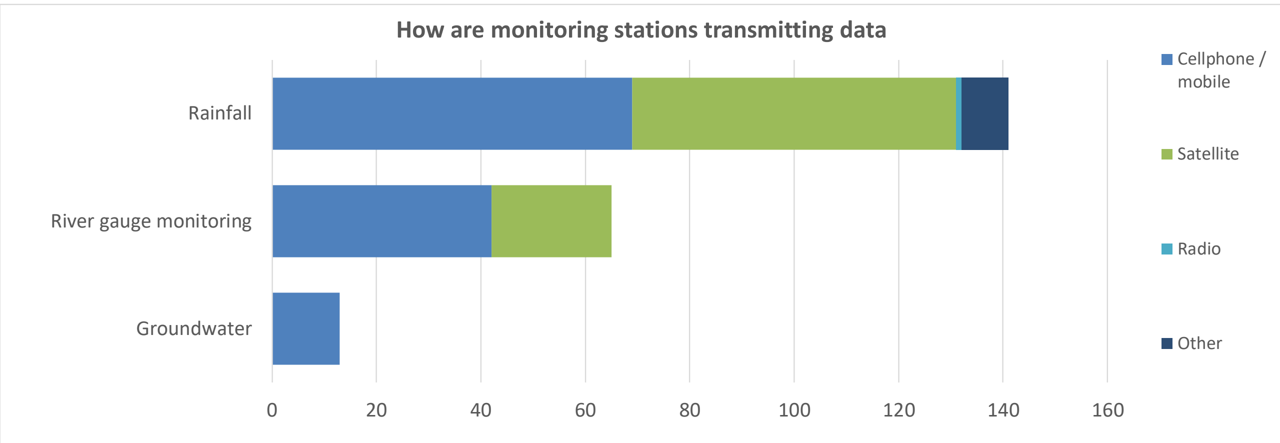


Figure 9. Type of communications systems used by monitoring networks? (11 countries)

Given the sparse networks, many lapsed stations and general lack of data available, it was surprising to note that respondents had a high degree of confidence in the data.

Figure 10. Confidence in data (n=27)

5.3 Users and stakeholders

Respondents were asked about who currently receives a product or information from the hydrological service. Farmers, aviation and tourism operators were rated as those sectors that are not receiving a service. Flood affected communities were those most likely to be receiving a service, but this does not necessarily imply all flood-affected communities at risk are receiving a service, nor does it provide any insight into how effective these outputs are from a user perspective.

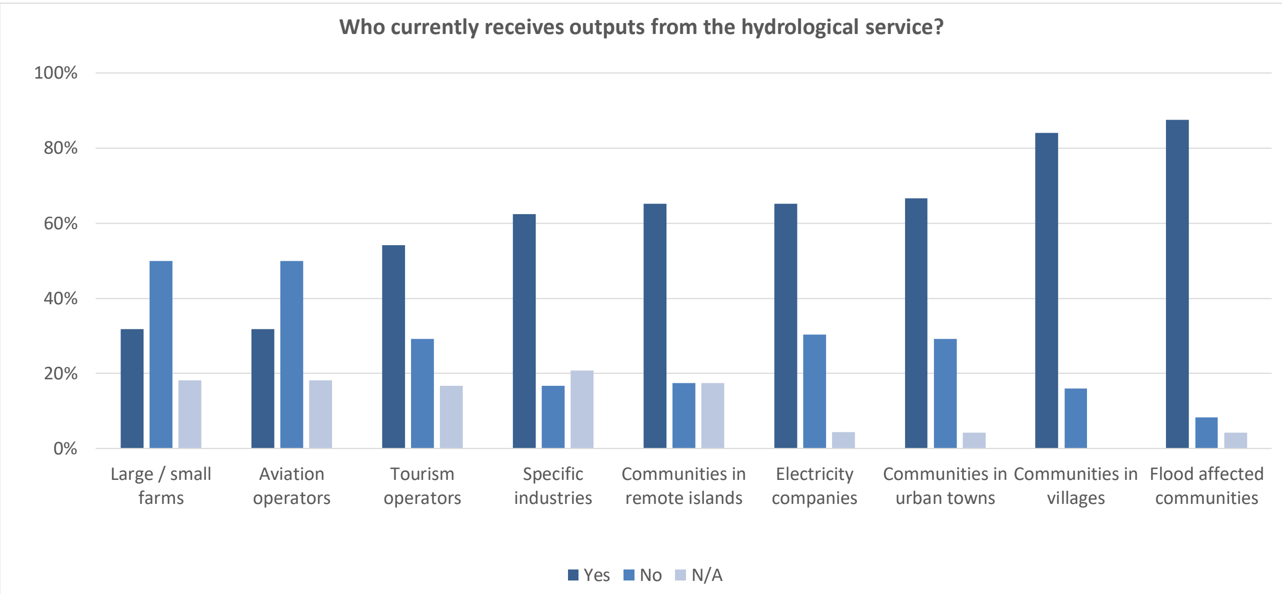


Figure 11. Who receives outputs from the hydrological service? (n=25)

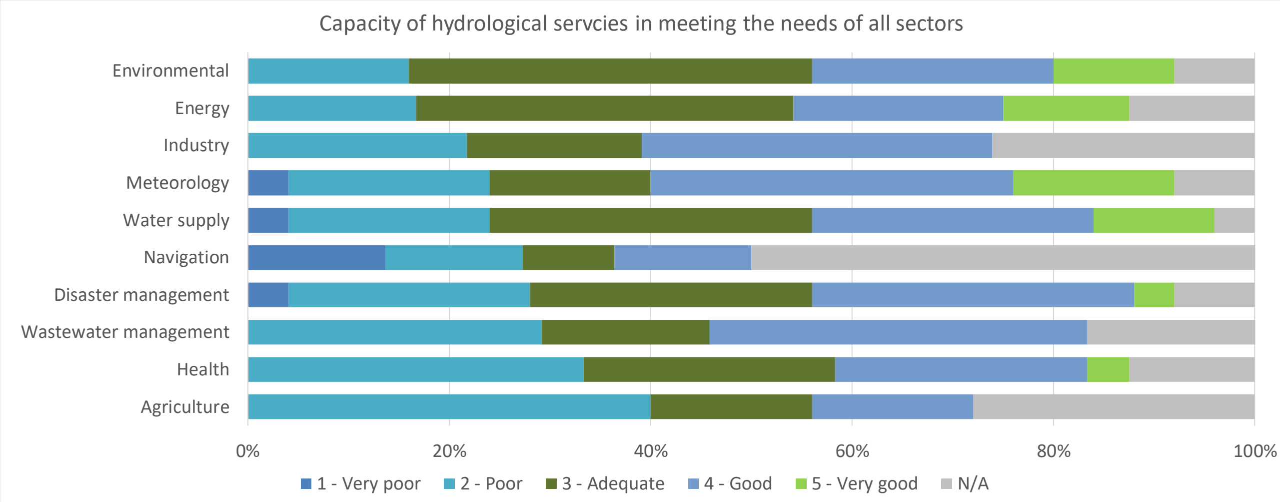


Figure 12. Meeting the needs of all sectors (n=25)

Agriculture, health and wastewater management sectors were rated as the sectors that were not having their needs met. It could be argued that there little need from the Navigation and Aviation sectors (though not specifically mentioned in this question) for hydrological services, and that is why they often rate lower in the perception of the respondents.

There is significant scope to expand the number of sectors that could benefit from hydrological services, which may also allow the national hydrological service to gain access to more data networks as well (e.g. monitoring by energy / hydro power companies and monitoring by the agricultural sector).

In terms of how well all respondents rated their working relationships with other sectors, several sectors stood out as having stronger and weaker relationships. The environment, disaster and infrastructure sectors stood out as sectors where there were strong relationships. The aviation, military and media industries stood out as sectors where there were weak relationships or connections.

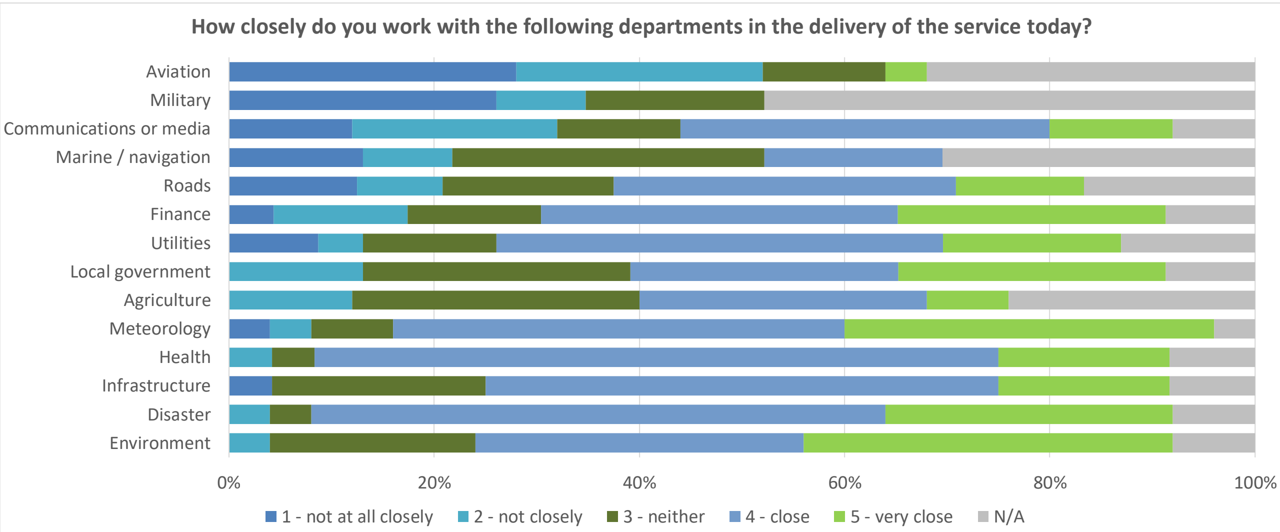


Figure 13. Close working relationships with all sectors (n=25)

5.4 Links with meteorological services

The survey included questions on the nature of the relationship the hydrological service had with their equivalent national meteorological service (see Figure 14). Anecdotally it is apparent that there are often good relationships between the services, but mostly very limited formal and real time sharing of data. Fiji is an exception, where the services were merged in 2012.

Data sharing, access and community needs were the most important benefits noted by respondents. There was little variation when the data was segmented by size of country.

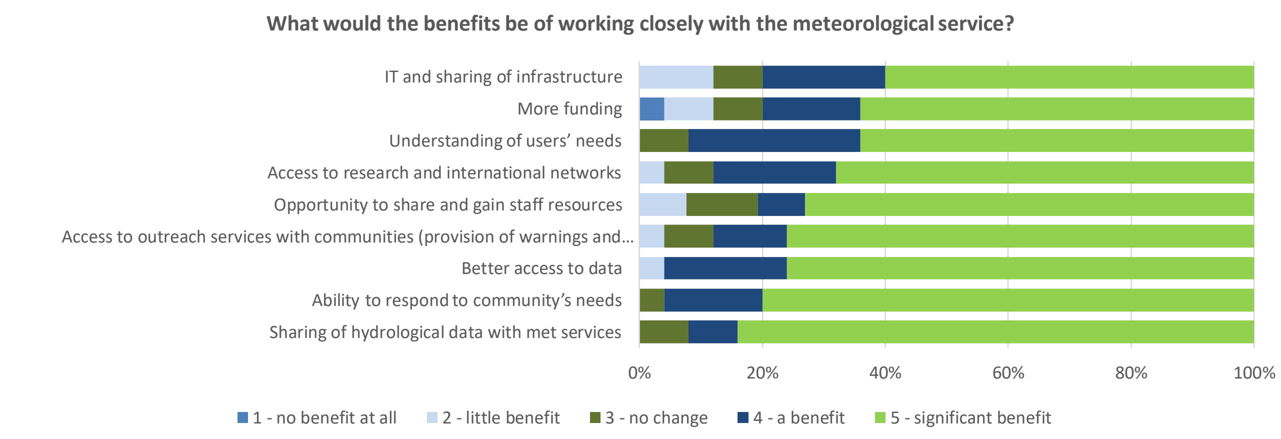


Figure 14. The benefits of working more closely with the meteorological service (n=26)

The highest barriers (Figure 15) to working more closely with the meteorological services were policy, legislation and funding. A lack of funding is an ongoing issue that many countries raised as a barrier to improving all aspects of hydrological services, not just the relationship with the meteorological services.

The need to update policy and legislation is also a critical issue that affects most countries, though it is predominantly an internal issue on which outside organisations and funders can have a limited impact unless significant agreements and commitments are in place.

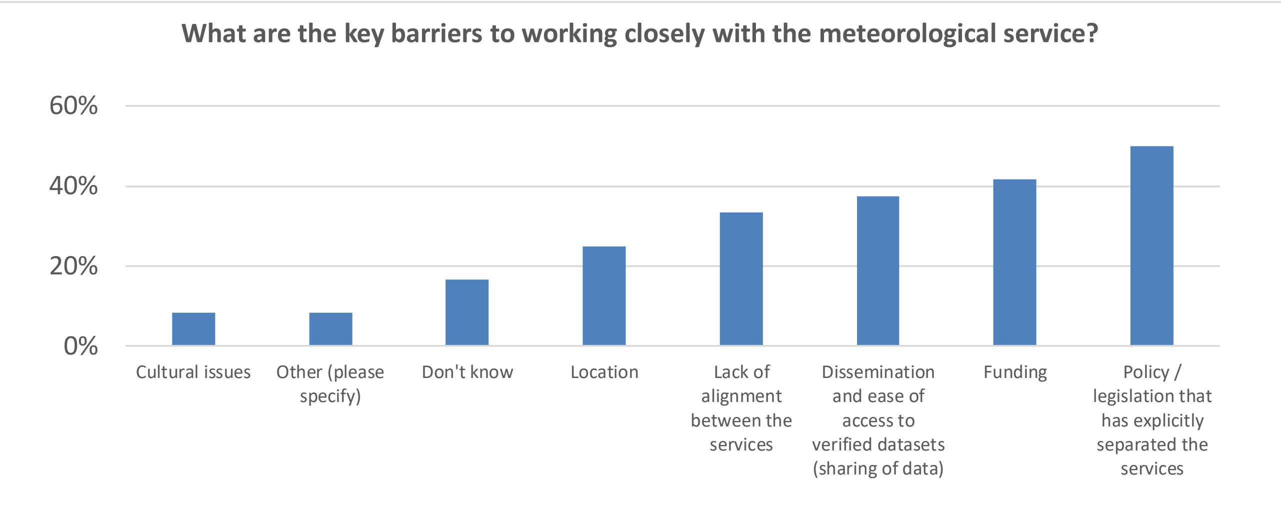


Figure 15. The barriers to working more closely with the meteorological service (n=24)

5.5 Current capacity of hydrological services

Capacity is varied across the region at an individual, organisational and national level, and is often constrained by the level of government support or interest, a lack of funds, and competing needs (improved transport, communications, health centres and hospitals and education facilities are key priorities for many developing countries).

The challenge is to raise the profile of water and hydrological services, to illustrate how investment in this sector can enable and accelerate improved transport, communications, health centres and hospitals and education facilities. This is particularly true in terms of water supply and sanitation projects, that rely on hydrological services and professionals to design and operate appropriate systems.

The survey asked respondents about how they would rate their capacity across several issues (see Figure 16). Forecasting, customised services / products, and working with the media were rated as having low capacity. The lack of capacity in forecasting and developing new products is consistent with the transition and evolution organisations go through (with government support and funding) as noted in Figure 3, which notes that a more advanced organisation is able to move beyond data monitoring into modelling and forecasting and engagement and communication with end users.

Respondents clearly had more confidence and capacity in monitoring and data collection, which is traditionally a staple of any hydrological service.

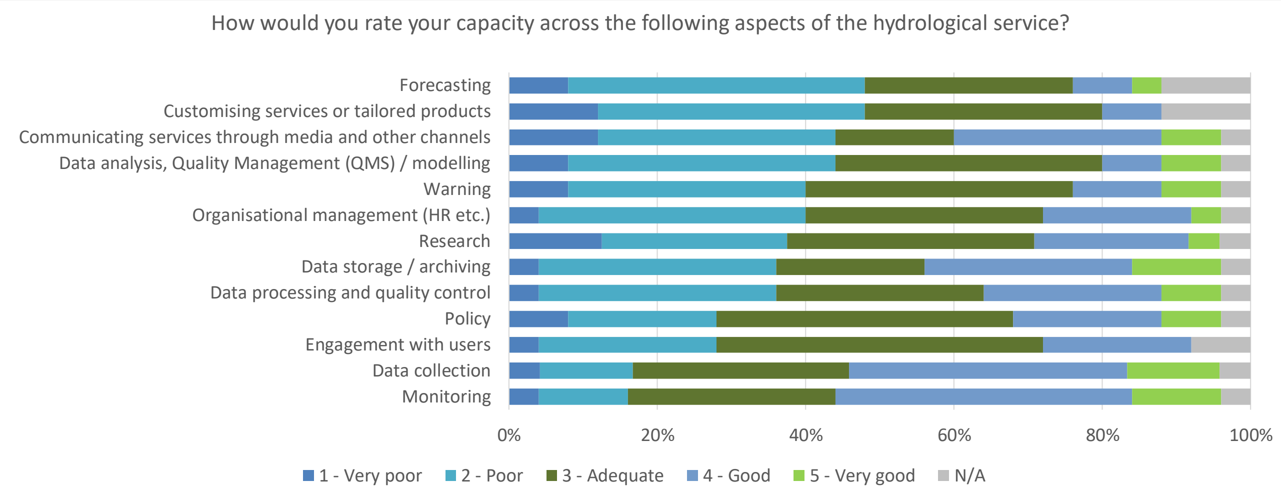


Figure 16. How would you rate your capacity (n=25)

5.6 Gaps and needs in hydrological services

Several of the figures above highlight potential gaps and needs. The figures below reinforce some of the issues raised implicitly in the data provided above and provide more detail in terms of exactly what respondents across the Pacific need to improve hydrological services.

Funding and resources are important issues, and Figure 17 captures where there is inadequate funding. Training and data management is the most common response, then instrumentation and staffing. The anecdotal evidence is that staffing is a critical problem, as staff are either nearing retirement or being attracted to other private sector jobs, with few people seeing public sector jobs in hydrology as a long-term prospect.

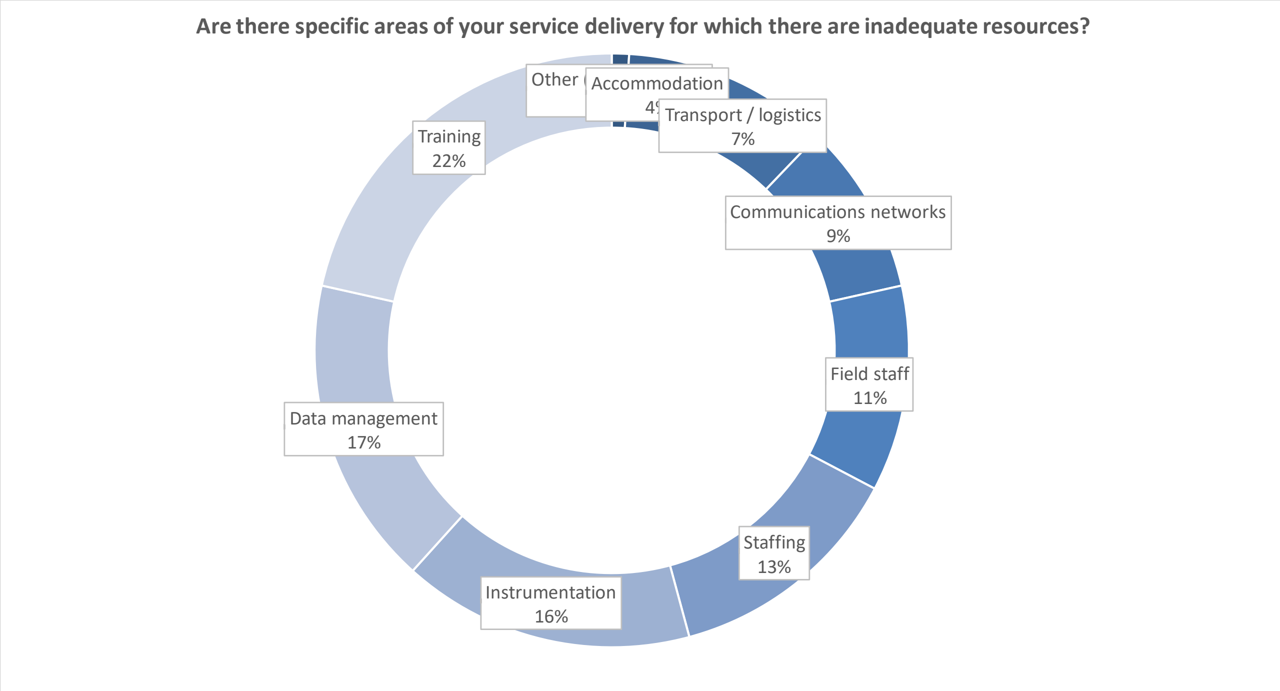


Figure 17. Inadequate resources (n=25)

In terms of the future training needs of individuals and staff to build organisational capacity, Figure 18 and Figure 19 examine the type of training that would be most useful. The data is split into two charts as there are too many training options listed to be presented in one chart.

The survey responses indicate that the most useful types of training are drought & flood modelling and forecasting, tertiary training, and monitoring of environmental parameters. It should be noted that all options in Figure 18 observe that 90% or more of respondents say these training options are 'useful' or 'very useful'.

There is clearly a very strong desire from individual and countries to improve their training and capacity.

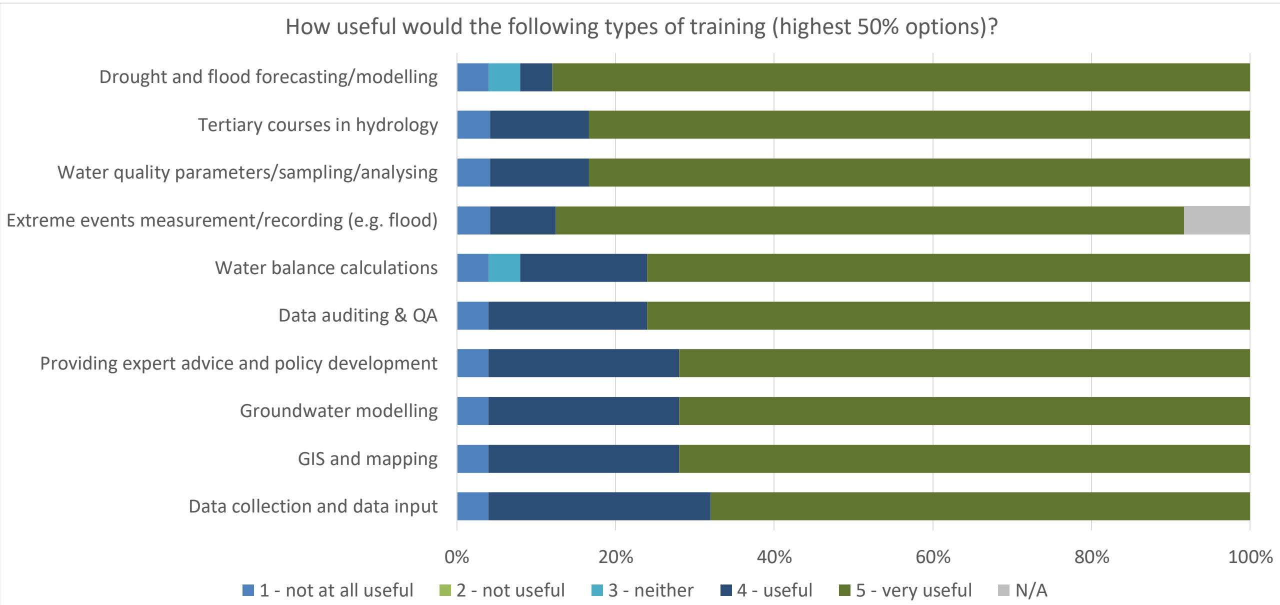


Figure 18. Training needs (highest 50% of preferred options) (n=25)

The training options that were rated as less useful (but again most are still rating as above 90% response as 'useful' or 'very useful'), were behaviour change programs, communications and cross section surveys.

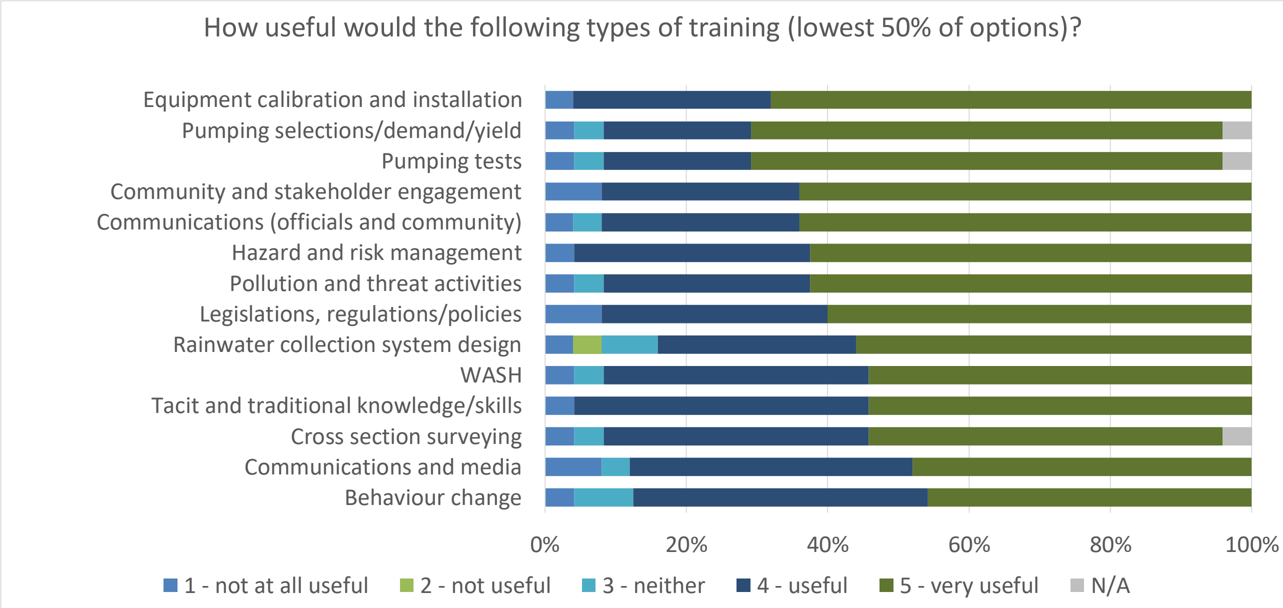


Figure 19. Training needs (lowest 50% of preferred options) (n=25)

6 Priority capacity building needs

This section outlines the main capacity building needs as identified in this survey, desktop analysis and country visits.

To underpin capacity building, there are some critical pillars that must be first be adopted by a country to create an enabling environment and ensure that capacity building is not treated an isolated 'one-off' exercise with no long-term support. These pillars are:

I. **Increasing funding and investment in hydrological services**. Without a base funding stream and acknowledgement by the host country that hydrological services matter, it is very difficult to build capacity and ultimately deliver water, health, environment and climate services to government and the community.

II. **Developing and updating policy and legislation to support the service and extend the role, function and reach of hydrological services**. Only just over half of the countries that responded to the survey indicated they had supporting policy. Of those that responded, some mentioned that it was inadequate, or very old legislation. Without a government-authorised and supported program that is enshrined in national legislation, it is very difficult to deliver a sustainable hydrological service. Priority should be given to developing policy and legislation that explicitly outlines the jurisdiction, roles and reach, as well as rules with which all landowners, businesses and communities must abide.

III. **Raising the profile of water and its linkages with health and environmental benefits**. An underlying theme in countries that have limited support for service provision is a lack of awareness of the value that hydrological services can provide in monitoring, reporting and advising government and communities on improvements to local communities and cities, and their health and environmental benefits. The ability to raise the profile of water, through any public mechanism: fact sheets, presentations to other ministries and Cabinet, externally funded projects, social media, a marketing campaign with dynamic banners on the side of roads (i.e. "Remember the 2012 flood, this area was underwater, listen for warnings") should be considered alongside the more detailed capacity building options proposed below.

Some specific capacity building programs for the region are detailed below (in priority of order). Note that, while they will not be applicable to every country, they will be high priorities for the majority of the 21 member countries of SPREP.

1. **Increasing data sharing**
    a. The ability to use and share existing hydrological data is a priority. A systematic program to engage with all ministries and authorities to understand the type of data currently being collected (), what hydrological data they have (current and historical), and then move towards a formal data sharing arrangement and central database for all users to access would have significant (and very cost effective) benefits. Engagement with departments and authorities that work on matters such as meteorology, health, water supply and sanitation, environment, climate change and forestry would be beneficial. A central database would include (at a minimum) monitoring stations for rainfall, river levels, groundwater, water quality, sea level and evapotranspiration.
2. **Improving hydrological monitoring networks**
    a. **Maintenance** of existing instrumentation and networks is highly valuable. Some countries indicated that several monitoring stations (rainfall, groundwater and surface water) are not being maintained, or have been decommissioned. A relatively cost-effective method

to increase understanding of hydrological issues in each country is achieved by reactivating these monitoring stations (assuming the instrumentation is still in working order). Funding is required to maintain these and may also be required to archive and store historical data.

b. Increase the **spatial extent of monitoring networks**. Only a very small percentage of the area is monitored and extending the networks to monitor all catchments (where there are populated areas and specific industries) would improve the ability to offer a national service and reach more sectors and communities. The use of satellite data or sharing communication infrastructure with other ministries (the meteorology agency) would enable more areas of each country to benefit from the services and data that hydrological services can provide.

c. Consideration of **next generation monitoring** sensors. In acknowledging that there are practical, communication and funding constraints in extending the monitoring networks, consideration should be given to the use of remote sensing systems to measure specific hydrological issues at an hourly, daily or seasonal frequency (depending on the set up of relevant remoting sensing satellites). The following parameters could be collected at a national and regional scale (sometimes with high resolution across a country): rainfall intensity, soil moisture, vegetation density, chlorophyll levels in surface and marine water bodies, turbidity in surface and marine water bodies, water temperature in surface and marine water bodies, extent of surface water flooding, extent of sea level / tides, topographical data to support hydrological modelling, and evapotranspiration.

3. Linking infrastructure investments with ongoing knowledge and capacity

a. Section 4 of this report noted several large WASH and climate adaptation infrastructure projects that appear not to have any ongoing and significant link to supporting and improving capacity in the national hydrological services. A priority is taking a systematic approach to building capacity within the water authorities and the hydrological services for every large-scale water project. For example, if between 2% and 5% of a project's budget could be dedicated to delivering on the following project steps and outputs, there would be significant capacity building benefits realised for each project: documentation of the process of developing options, documentation of the design, monitoring systems that connect and are stored in the national hydrological service, instrumentation that technicians in the national hydrological service can use, on ground training, training in identification of faults and repairs, additional materials and parts provided for typical maintenance over a 10 year period, communications systems that use the same technology as already in place, clear fact sheets and communications materials for a variety of audiences in the country, and funds to allow project managers and operators to share their experience of using and maintaining the infrastructure over the next 10 years.

4. Forming a formal partnership with the national meteorology services

a. A formal partnership and service agreement that allows hydrological services to work closely together with the meteorology services is a priority to improve data monitoring, analysis, forecasting and the delivery of services. In some instances, this may become a joint, co-located and integrated service, and in other instances it may be an agreement to share resources, data and improve the type and extent of services delivered to communities and industry. There are several direct and in-direct benefits to this partnership, such as resources to improve data management, maintaining of monitoring stations, IT infrastructure to support modelling and forecasting, and communications systems to deliver products to more communities.

5. **Improving data management**

    a. Data and knowledge are power. Data and knowledge also enable incredible insights and the opportunity to provide advice on some very significant issues such as climate change. A priority is **improved data management** at a local, regional and national scale, that would then support the hydrological services extending their service reach to more sectors and communities more frequently, and in real-time. Currently most agencies are relying on single desktops, or local servers, and don't have the capacity to scale up this data management aspect of the hydrological service. This is also critical where countries are considering embracing other technologies (i.e. remote sensing that involves orders of magnitude more data), partnering with other service providers, and offering products to more users.

6. **Boosting training – technical**

    a. **Training in the technical aspects** of hydrological services is a critical part of building capacity in all hydrological services. The ability of staff to understand exactly how sensors and communications work, to what standard they need to be maintained, how the sensors transmit data, and how the data is collected and stored, is a unique skill set that is not routinely available to most countries in the region. This capacity building priority could be also linked with infrastructure projects (rainwater, pumping, desalination projects in particular), that often include specific and complex technologies that must be maintained over a long period.

7. **Boosting training – professional**

    a. The capacity building and pipeline of trained professionals to lead the data management, analysis, modelling, forecasting, and advocacy of hydrological services to senior public servants, ministers and high-profile community leaders, is important in delivering and maintaining long term service capacity. The survey identified several specific areas that had high support for inclusion in a professional training course or program: drought forecasting, flood forecasting, extreme weather forecasting, water balance modelling, geospatial modelling and analysis, groundwater modelling and policy development.

8. **Enhancing internal relationships and partnerships**

    a. Hydrological services would be improved through strengthening partnerships and relationships within each country. Water issues cut across several ministries, and the ability to work with increased efficacy with these other ministers and departments is important. Understanding what the other ministries do to a greater extent would open new opportunities to work together and may also identify possible data sharing arrangements. Priority should be given to doing a systemic review of all ministries, to gather specific details about their services and possible benefits to hydrological services, and to understand what they may need or value from a hydrological service.

9. **Enhancing external relationships and partnerships**

    a. While more than half of the past projects that are listed in Section 4 referred to the fact that they were regional in their scope, there was not often clear evidence that all countries were actively engaged in the project. A priority is capacity building with the leaders and project managers of hydrological services to provide them with the skills and confidence to engage with external partners (funders, nation states, non-government organisations and private companies) to get the most from the regionally funded projects, and clearly articulate the local hydrological service needs to ensure that those projects fully consider and respond to local issues.

10. Increasing analysis and forecasting

a. **Nowcasting**. A high priority from respondents to the survey was the need to invest in supporting their ability to undertake forecasting for short term weather and flooding events (normally defined as 0 to 48 hours time frame). In some countries (Fiji, Papua New Guinea), a Flood Early Warning System (FEWS) has been established to support the delivery of this type of service, which requires a specific level of capability (and data) to operate. This could be extended to other countries, but there would need to be significant investment in capacity to ensure a FEWS could be set up and run by local practitioners.

b. **Long range forecasting.** Capacity building in providing long term forecasting is important, particularly as our understanding of climate change continues to improve. Hydrological services are traditionally very capable of providing forecasts for current and historical events, but usually don't have much skill or capacity in providing advice for long term forecasts. A priority is to develop capacity, with a clear view on who will benefit and how that forecasting will be used, in the hydrological services regarding long range forecasting.

c. **Water stressed communities**. Virtually all countries in the region are susceptible to climate change and climatic influences on the main water supply source, highlighting the need to build capacity in the ability of hydrological services to monitor, analyse and predict the risks (and mitigation options) of water supply systems. The global water industry has become more aware in the past decade or two of the need to develop resilient water systems and have a portfolio of water supply options available for cities, towns and communities. In the Pacific, for example islands where a groundwater lens is the primary water source, hydrological services need to build the capacity to advise on how to augment this with rainwater tanks, water recycling and desalination systems.

d. **Reducing water-related health risks.** One of the main underlying health threats to communities in the Pacific region is access to clean water and sanitation. There is a very specific need to strengthen hydrological services' ability to work with the health ministry and centres to understand the nature of water-related threats, infrastructure, monitoring networks and solutions to creating safer and more reliable water supply and sanitation systems. For example, where a health department designs and builds a block of community toilets without advice from the water authorities and hydrological services, they may not connect to the water supply properly or may be in flood prone sites and are then not used by the community. Such a situation would be a waste of funds and a lost opportunity, which could be easily avoided through capacity building in both health and hydrological services.

11. Extending communication and advocacy

a. A technical service such as the hydrological service is not normally skilled or experienced in undertaking communication tasks and advocacy, but this is also a priority for the service. The ability of all staff (secretaries, leaders, officers, technical and professional) to share what they do, why, and who benefits from their work, is important in improving the effective delivery of the service. Perhaps more importantly this will help support one of the pillars mentioned in the beginning of this section (building a profile of water issues), and also support a range of specific capacity building initiatives noted above. Building capacity in communications and advocacy could be incorporated into a training program as noted above. This type of capacity building is explicitly recognised and built into the International Water Centre's Masters of Integrated Water program.

7 Recommendations

The recommendations here have drawn from information gained through the desktop analysis, country visits and survey results.

Several of these should be prioritised and put into action immediately, based on what we know regarding the threat of climate change and vulnerable nature of communities, particularly given their often limited capacity to cope with the associated impacts.

The recommendations are:

1. Consider and deliver the priority capacity building needs outlined in Section 6. The heading of these pillars and priorities are:
    a. Increasing funding and investment in hydrological services
    b. Developing and updating policy and legislation
    c. Raising the profile of water and its linkages with health and environmental benefits
    d. Increasing data sharing
    e. Improving hydrological monitoring networks
    f. Linking infrastructure investments with ongoing knowledge and capacity
    g. Forming a formal partnership with the national meteorology services
    h. Improving data management
    i. Boosting training – technical
    j. Boosting training – professional
    k. Enhancing internal relationships and partnerships
    l. Enhancing external relationships and partnerships
    m. Increasing analysis and forecasting
    n. Extending communication and advocacy
2. Develop a clear vision linking funding, capacity, and on-ground services. In undertaking this project it became apparent that there was rarely a clear and documented strategy and vision at the national scale that would outline how increased funding would lead to improved capacity (and what type of capacity), and then would consequently lead to improvements for communities in water services or land management, reduced disaster risk or improved health outcomes.
3. Ensure hydrological services have been directly linked to, and are integral in, achieving Sustainable Development Goals (SDGs). Ensuring water security and meeting SDGs in a world affected by climate change are prudent outcomes to deliver.
4. Develop a specific and bespoke strategy and pathway for each country that:
    a. Defines capacity building and documents the existing level of capacity and levels to be reached

   b. Documents specific capability needs to be delivered for each project and investment so that there is no ambiguity as to how or when to improve capacity

5. Consider the benefits and the options to partner with the meteorology service to share data, share sensors, share communication networks, improve modelling capacity, and improve service delivery and reach
6. Consider how to integrate the training needs for hydrological services into a proposed Pacific regional training centre
7. Ensure all countries have robust policy and legislation in place to support hydrological services, that is integrated with other relevant disciplines
8. Create a hydrology narrative that extends the narrative the Pacific has already developed on climate change and sea level rise, to raise the profile of the importance of water management, data and monitoring
9. Focus specifically on ensuring all regions have resilient and adaptive water systems
10. Ensure all investment has a capacity building legacy
11. Create a knowledge centre that captures the latest research (across atolls, mainland islands, groundwater, rainwater, surface water, desalination, and sea levels) and aims to accelerate the process of learning from shared experience
12. Share and celebrate what has been achieved. While much focus is on what else should be done, it important to recognise the individuals and organisations that are working hard in the region and deserve acknowledgement for their passion and hard work in supporting their communities.

8 References

Adrian D.Werner, Hannah K.Sharp, Sandra C.Galvis, Vincent E.A.Post ,and Peter Sinclair, 2017. Hydrogeology and management of freshwater lenses on atoll islands: Review of current knowledge and research needs. Journal of Hydrology Volume 551, August 2017, Pages 819-844.

Nurse LA; McLean RF; Agard J; Briguglio LP; Duvat-Magnan V; Pelesikoti N; Tompkins E; Webb A, 2015, 'Small Islands', in Climate Change 2014: Impacts, Adaptation and Vulnerability: Part B: Regional Aspects: Working Group II Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, pp. 1613 - 1654, http://dx.doi.org/10.1017/CBO9781107415386.009

UN Water, 2016. SDG 6 Baseline report for Pacific.

Annex 1 – Country profiles

11 countries (Cook Islands, FSM, Fiji, Kiribati, New Caledonia, Niue, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu) provided complete responses to the survey. This Annex provides a summary of the responses from these 11 countries.

Cook Islands

Capital: Avarua

Region: Polynesia - Pacific (Oceania)

Population: 17,459 (2016, World Bank)

Question	***Sub question***	**Response**
What legislation exists to support and enable hydrological services?		0
What is total annual budget spent on hydrological services?	*$ (funded from within country)*	50,000 a year depending on the proposal
	$ (funded externally)	-
How many staff do you have within the hydrological services?	*Technical (male)*	Timothy Tangirere
	Technical (female)	-
	Professional (male)	Wilson Rani
	Professional (female)	-
	Other (male)	-
	Other (female)	-
What are the primary sources of water in your country (please rank in order of importance)?	*Groundwater*	3
	Rainwater	4
	Surface water / river/ lakes	4
	Desalination	N/A
	Other	0
Top three greatest threats to the delivery of hydrological services?	*1*	Lack of funding
	2	Extreme climate / weather
	3	Retention of qualified staff
How much data and monitoring do you have to determine how the hydrological regime is changing due to climate change?	*Groundwater*	A little
	Runoff	A little
	Saline impacts on freshwater aquifers	A little
	Flooding	A little
	Droughts	A little
	Sea level	A little
	Tidal inundation and wave overtopping	A little
	Other extreme impacts	A little

Please identify what impact predicted changes in climate might have on components of water resources in the area?	*Groundwater*	Increase
	Runoff	Increase
	Saline impacts on freshwater aquifers	Increase
	Flooding	Increase
	Droughts	No change
	Sea level	Increase
	Tidal inundation and wave overtopping	Increase
	Other extreme impacts	Increase
How many monitoring stations do you have?	*Groundwater (Automatic, at least daily)*	-
	Groundwater (Manual)	-
	Groundwater (Irregular)	-
	Groundwater (Lapsed, currently not in operation but could be)	4
	River levels (Automatic, at least daily)	-
	River levels (Manual)	5
	River levels (Irregular)	-
	River levels (Lapsed, currently not in operation but could be)	-
	Rainfall (Automatic, at least daily)	6
	Rainfall (Manual)	15
	Rainfall (Irregular)	-
	Rainfall (Lapsed, currently not in operation but could be)	-
	Water quality (pH)	Need to collect in the future
	Water quality (Turbidity)	Need to collect in the future
	Water quality (Salinity (EC))	Need to collect in the future
	Water quality (Sediment)	Need to collect in the future
	Water quality (Nitrogen)	Need to collect in the future
	Water quality (Phosphorous)	Need to collect in the future
	Water quality (E.coli/Coliform (Bacterial))	Need to collect in the future
	Water quality (Chlorophyll)	Need to collect in the future
	Water quality (Heavy metals)	Need to collect in the future
What confidence do you have with the data you collect and use to make decisions?		Confident

How closely do you work with the following departments in the delivery of the service today?	*Aviation*	N/a
	Communications or media	N/a
	Environment	N/a
	Finance	N/a
	Infrastructure	Close
	Local government	Close
	Marine / navigation	Neither
	Meteorology	Close
	Military	N/a
	Roads	Close
	Utilities	N/a
	Health	N/a
	Disaster	N/a
	Agriculture	N/a
How would you rate your capacity across the following aspects of the hydrological service?	*Policy*	Adequate
	Research	Adequate
	Monitoring	Good
	Data collection	Good
	Data processing and quality control	Good
	Data storage / archiving	Good
	Data analysis, Quality Management (QMS) / modelling	Adequate
	Forecasting	N/a
	Warning	Adequate
	Communicating services through media and other channels	Very poor
	Customising services or tailored products	N/a
	Engagement with users	Poor
	Organisational management (HR etc.)	Poor
If training was available, how useful would the following types of training be for your hydrological service?	*Cross section surveying*	Useful
	Pumping tests	Very useful
	Pumping selections/demand/yield	Very useful
	Equipment calibration and installation	Very useful
	Water quality parameters/sampling/analysing	Very useful
	Extreme events measurement/recording (e.g. flood)	Very useful
	Pollution and threat activities	Very useful
	Data collection and data input	Very useful
	Data auditing & QA	Very useful
	GIS and mapping	Very useful
	Water balance calculations	Very useful

	Groundwater modelling	Very useful
	Rainwater collection system design	Very useful
	Communications (officials and community)	Very useful
	Providing expert advice and policy development	Very useful
	Legislations, regulations/policies	Very useful
	Community and stakeholder engagement	Very useful
	Communications and media	Very useful
	Drought and flood forecasting/modelling	Very useful
	Tacit and traditional knowledge/skills	Very useful
	Hazard and risk management	Very useful
	Tertiary courses in hydrology	Very useful
	WASH	Very useful
	Behaviour change	Very useful

Federated States of Micronesia

Capital:	Region:	Population:	
Palikir	Micronesia - Pacific (Oceania)	104,936 (2016) (World Bank)	

Question	***Sub question***	**Response**
What legislation exists to support and enable hydrological services?		Environmental Quality Protection Act, Water Quality Regulations, Environmental Impact Assessment Regulations
What is total annual budget spent on hydrological services?	*$ (funded from within country)*	-
	$ (funded externally)	$50,000 US
How many staff do you have within the hydrological services?	*Technical (male)*	3
	Technical (female)	1
	Professional (male)	1
	Professional (female)	0
	Other (male)	0
	Other (female)	0
What are the primary sources of water in your country (please rank in order of importance)?	*Groundwater*	1
	Rainwater	2
	Surface water / river/ lakes	3
	Desalination	0
	Other	0
Top three greatest threats to the delivery of hydrological services?	*1*	Lack of communications networks to share data and services with the community and stakeholders
	2	Lack of trained staff
	3	Lack of monitoring data
How much data and monitoring do you have to determine how the hydrological regime is changing due to climate change?	*Groundwater*	A little
	Runoff	Very little
	Saline impacts on freshwater aquifers	Very little
	Flooding	Very little
	Droughts	A little
	Sea level	A little
	Tidal inundation and wave overtopping	Very little
	Other extreme impacts	A little
Please identify what impact predicted changes in climate might have on components of water resources in the area?	*Groundwater*	Increase
	Runoff	Increase
	Saline impacts on freshwater aquifers	Increase
	Flooding	Increase
	Droughts	Increase
	Sea level	Increase

	Tidal inundation and wave overtopping	Increase
	Other extreme impacts	Increase
How many monitoring stations do you have?	*Groundwater (Automatic, at least daily)*	-
	Groundwater (Manual)	-
	Groundwater (Irregular)	-
	Groundwater (Lapsed, currently not in operation but could be)	-
	River levels (Automatic, at least daily)	0
	River levels (Manual)	0
	River levels (Irregular)	0
	River levels (Lapsed, currently not in operation but could be)	0
	Rainfall (Automatic, at least daily)	-
	Rainfall (Manual)	-
	Rainfall (Irregular)	-
	Rainfall (Lapsed, currently not in operation but could be)	1
	Water quality (pH)	Currently collect but inadequate coverage and frequency
	Water quality (Turbidity)	Currently collect but inadequate coverage and frequency
	Water quality (Salinity (EC))	Currently collect but inadequate coverage and frequency
	Water quality (Sediment)	Need to collect in the future
	Water quality (Nitrogen)	Need to collect in the future
	Water quality (Phosphorous)	Need to collect in the future
	Water quality (E.coli/Coliform (Bacterial))	Currently collect with adequate coverage and frequency
	Water quality (Chlorophyll)	Don't collect, and not proposing to collect
	Water quality (Heavy metals)	Need to collect in the future
What confidence do you have with the data you collect and use to make decisions?		Confident
	Aviation	Not closely
	Communications or media	Close

How closely do you work with the following departments in the delivery of the service today?	*Environment*	Very close
	Finance	Close
	Infrastructure	Close
	Local government	Close
	Marine / navigation	Neither
	Meteorology	Not closely
	Military	Neither
	Roads	Not closely
	Utilities	Not closely
	Health	Close
	Disaster	Close
	Agriculture	Close
How would you rate your capacity across the following aspects of the hydrological service?	*Policy*	Poor
	Research	Poor
	Monitoring	Poor
	Data collection	Poor
	Data processing and quality control	Poor
	Data storage / archiving	Poor
	Data analysis, Quality Management (QMS) / modelling	Poor
	Forecasting	Poor
	Warning	Poor
	Communicating services through media and other channels	Poor
	Customising services or tailored products	Poor
	Engagement with users	Poor
	Organisational management (HR etc.)	Poor
If training was available, how useful would the following types of training be for your hydrological service?	*Cross section surveying*	Neither
	Pumping tests	Very useful
	Pumping selections/demand/yield	Very useful
	Equipment calibration and installation	Very useful
	Water quality parameters/sampling/analysing	Very useful
	Extreme events measurement/recording (e.g. flood)	Very useful
	Pollution and threat activities	Very useful
	Data collection and data input	Very useful
	Data auditing & QA	Very useful
	GIS and mapping	Very useful
	Water balance calculations	Very useful
	Groundwater modelling	Very useful
	Rainwater collection system design	Very useful

	Communications (officials and community)	Very useful
	Providing expert advice and policy development	Very useful
	Legislations, regulations/policies	Very useful
	Community and stakeholder engagement	Very useful
	Communications and media	Very useful
	Drought and flood forecasting/modelling	Very useful
	Tacit and traditional knowledge/skills	Useful
	Hazard and risk management	Very useful
	Tertiary courses in hydrology	Very useful
	WASH	Useful
	Behaviour change	Useful

Fiji

Capital: Suva

Region: Melanesia - Pacific (Oceania)

Population: 898,760 (2016) (World Bank)

Question	***Sub question***	**Response**
What legislation exists to support and enable hydrological services?		Cabinet decision in 2012 the mandate for FMS to provide flood forecasting for the whole of Fiji
What is total annual budget spent on hydrological services?	*$ (funded from within country)*	$700,000
	$ (funded externally)	-
How many staff do you have within the hydrological services?	*Technical (male)*	9
	Technical (female)	2
	Professional (male)	2
	Professional (female)	1
	Other (male)	-
	Other (female)	-
What are the primary sources of water in your country (please rank in order of importance)?	*Groundwater*	2
	Rainwater	3
	Surface water / river/ lakes	1
	Desalination	0
	Other	0
Top three greatest threats to the delivery of hydrological services?	*1*	Lack of trained staff
	2	Lack of monitoring data
	3	-
How much data and monitoring do you have to determine how the hydrological regime is changing due to climate change?	*Groundwater*	Very little
	Runoff	A little
	Saline impacts on freshwater aquifers	Extreme climate / weather
	Flooding	Good
	Droughts	A little
	Sea level	Good
	Tidal inundation and wave overtopping	Reasonable
	Other extreme impacts	-
Please identify what impact predicted changes in climate might have on components of water resources in the area?	*Groundwater*	N/a
	Runoff	Increase
	Saline impacts on freshwater aquifers	-
	Flooding	Increase
	Droughts	Increase
	Sea level	Increase

	Tidal inundation and wave overtopping	-
	Other extreme impacts	-
How many monitoring stations do you have?	*Groundwater (Automatic, at least daily)*	0
	Groundwater (Manual)	-
	Groundwater (Irregular)	-
	Groundwater (Lapsed, currently not in operation but could be)	-
	River levels (Automatic, at least daily)	35
	River levels (Manual)	0
	River levels (Irregular)	-
	River levels (Lapsed, currently not in operation but could be)	-
	Rainfall (Automatic, at least daily)	72
	Rainfall (Manual)	67
	Rainfall (Irregular)	-
	Rainfall (Lapsed, currently not in operation but could be)	-
	Water quality (pH)	-
	Water quality (Turbidity)	-
	Water quality (Salinity (EC))	-
	Water quality (Sediment)	-
	Water quality (Nitrogen)	-
	Water quality (Phosphorous)	-
	Water quality (E.coli/Coliform (Bacterial))	-
	Water quality (Chlorophyll)	-
	Water quality (Heavy metals)	-
What confidence do you have with the data you collect and use to make decisions?		Confident
How closely do you work with the following departments in the delivery of the service today?	*Aviation*	Very close
	Communications or media	Very close
	Environment	Close
	Finance	-
	Infrastructure	-
	Local government	-
	Marine / navigation	-
	Meteorology	Very close
	Military	-
	Roads	Close
	Utilities	-
	Health	-
	Disaster	Very close

	Agriculture	Close
How would you rate your capacity across the following aspects of the hydrological service?	*Policy*	Poor
	Research	-
	Monitoring	Good
	Data collection	Good
	Data processing and quality control	Poor
	Data storage / archiving	Poor
	Data analysis, Quality Management (QMS) / modelling	Poor
	Forecasting	Good
	Warning	Good
	Communicating services through media and other channels	Good
	Customising services or tailored products	Poor
	Engagement with users	Adequate
	Organisational management (HR etc.)	Good
If training was available, how useful would the following types of training be for your hydrological service?	*Cross section surveying*	Very useful
	Pumping tests	-
	Pumping selections/demand/yield	-
	Equipment calibration and installation	Very useful
	Water quality parameters/sampling/analysing	-
	Extreme events measurement/recording (e.g. flood)	Very useful
	Pollution and threat activities	-
	Data collection and data input	Very useful
	Data auditing & QA	Very useful
	GIS and mapping	Very useful
	Water balance calculations	Very useful
	Groundwater modelling	Very useful
	Rainwater collection system design	Very useful
	Communications (officials and community)	Very useful
	Providing expert advice and policy development	Very useful
	Legislations, regulations/policies	Very useful
	Community and stakeholder engagement	Useful
	Communications and media	Useful
	Drought and flood forecasting/modelling	Very useful

	Tacit and traditional knowledge/skills	Very useful
	Hazard and risk management	Very useful
	Tertiary courses in hydrology	Very useful
	WASH	Neither
	Behaviour change	-

Kiribati

Capital:
Tawara

Region:
Polynesia - Pacific (Oceania)

Population:
114,395 (2016) (World Bank)

Question	*Sub question*	Response
What legislation exists to support and enable hydrological services?		0
What is total annual budget spent on hydrological services?	*$ (funded from within country)*	No specific budget for hydrological services
	$ (funded externally)	-
How many staff do you have within the hydrological services?	*Technical (male)*	5
	Technical (female)	2
	Professional (male)	-
	Professional (female)	2
	Other (male)	-
	Other (female)	-
What are the primary sources of water in your country (please rank in order of importance)?	*Groundwater*	1
	Rainwater	0
	Surface water / river/ lakes	0
	Desalination	0
	Other	0
Top three greatest threats to the delivery of hydrological services?	*1*	Extreme climate / weather
	2	Lack of analysis / processing of data
	3	Lack of trained staff
How much data and monitoring do you have to determine how the hydrological regime is changing due to climate change?	*Groundwater*	Good
	Runoff	N/a
	Saline impacts on freshwater aquifers	Reasonable
	Flooding	Reasonable
	Droughts	Reasonable
	Sea level	Good
	Tidal inundation and wave overtopping	Good
	Other extreme impacts	Good
Please identify what impact predicted changes in climate might have on components of water resources in the area?	*Groundwater*	Increase
	Runoff	Increase
	Saline impacts on freshwater aquifers	Increase
	Flooding	Increase
	Droughts	Increase
	Sea level	Increase

	Tidal inundation and wave overtopping	Increase
	Other extreme impacts	Increase
How many monitoring stations do you have?	*Groundwater (Automatic, at least daily)*	-
	Groundwater (Manual)	19
	Groundwater (Irregular)	-
	Groundwater (Lapsed, currently not in operation but could be)	-
	River levels (Automatic, at least daily)	-
	River levels (Manual)	-
	River levels (Irregular)	-
	River levels (Lapsed, currently not in operation but could be)	-
	Rainfall (Automatic, at least daily)	5
	Rainfall (Manual)	4
	Rainfall (Irregular)	-
	Rainfall (Lapsed, currently not in operation but could be)	-
	Water quality (pH)	Currently collect but inadequate coverage and frequency
	Water quality (Turbidity)	Currently collect but inadequate coverage and frequency
	Water quality (Salinity (EC))	Currently collect with adequate coverage and frequency
	Water quality (Sediment)	Need to collect in the future
	Water quality (Nitrogen)	Need to collect in the future
	Water quality (Phosphorous)	Need to collect in the future
	Water quality (E.coli/Coliform (Bacterial))	Currently collect but inadequate coverage and frequency
	Water quality (Chlorophyll)	-
	Water quality (Heavy metals)	Need to collect in the future
What confidence do you have with the data you collect and use to make decisions?		Some confidence
How closely do you work with the following departments in the delivery of the service today?	*Aviation*	Not closely
	Communications or media	Close
	Environment	Close
	Finance	-

	Infrastructure	Close
	Local government	-
	Marine / navigation	Not closely
	Meteorology	Close
	Military	-
	Roads	-
	Utilities	-
	Health	Close
	Disaster	Close
	Agriculture	Not closely
How would you rate your capacity across the following aspects of the hydrological service?	*Policy*	Very poor
	Research	Poor
	Monitoring	Adequate
	Data collection	Adequate
	Data processing and quality control	Poor
	Data storage / archiving	Poor
	Data analysis, Quality Management (QMS) / modelling	Adequate
	Forecasting	Very poor
	Warning	Good
	Communicating services through media and other channels	Good
	Customising services or tailored products	N/a
	Engagement with users	N/a
	Organisational management (HR etc.)	Poor
If training was available, how useful would the following types of training be for your hydrological service?	*Cross section surveying*	Useful
	Pumping tests	Useful
	Pumping selections/demand/yield	Useful
	Equipment calibration and installation	Useful
	Water quality parameters/sampling/analysing	Very useful
	Extreme events measurement/recording (e.g. flood)	Very useful
	Pollution and threat activities	Useful
	Data collection and data input	Useful
	Data auditing & QA	Useful
	GIS and mapping	Useful
	Water balance calculations	Very useful
	Groundwater modelling	Useful
	Rainwater collection system design	Useful
	Communications (officials and community)	Useful

	Providing expert advice and policy development	Very useful
	Legislations, regulations/policies	Useful
	Community and stakeholder engagement	Useful
	Communications and media	Useful
	Drought and flood forecasting/modelling	Very useful
	Tacit and traditional knowledge/skills	Very useful
	Hazard and risk management	Very useful
	Tertiary courses in hydrology	Very useful
	WASH	Useful
	Behaviour change	Useful

New Caledonia

Capital:	**Region**:	**Population**:	
Noumea	Melanesia - Pacific (Oceania)	272,200	

Question	***Sub question***	**Response**
What legislation exists to support and enable hydrological services?		No legislation support
What is total annual budget spent on hydrological services?	*$ (funded from within country)*	$500,000 US
	$ (funded externally)	-
How many staff do you have within the hydrological services?	*Technical (male)*	3
	Technical (female)	2
	Professional (male)	5
	Professional (female)	-
	Other (male)	-
	Other (female)	-
What are the primary sources of water in your country (please rank in order of importance)?	*Groundwater*	2
	Rainwater	4
	Surface water / river/ lakes	1
	Desalination	3
	Other	0
Top three greatest threats to the delivery of hydrological services?	*1*	Lack of monitoring data
	2	Lack of trained staff
	3	Lack of funding
How much data and monitoring do you have to determine how the hydrological regime is changing due to climate change?	*Groundwater*	Reasonable
	Runoff	Good
	Saline impacts on freshwater aquifers	Reasonable
	Flooding	Good
	Droughts	Good
	Sea level	Reasonable
	Tidal inundation and wave overtopping	Reasonable
	Other extreme impacts	-
Please identify what impact predicted changes in climate might have on components of water resources in the area?	*Groundwater*	5- unknown
	Runoff	Increase
	Saline impacts on freshwater aquifers	Increase
	Flooding	Increase
	Droughts	Increase
	Sea level	Increase
	Tidal inundation and wave overtopping	Increase

	Other extreme impacts	Increase
How many monitoring stations do you have?	*Groundwater (Automatic, at least daily)*	15
	Groundwater (Manual)	-
	Groundwater (Irregular)	60
	Groundwater (Lapsed, currently not in operation but could be)	-
	River levels (Automatic, at least daily)	40
	River levels (Manual)	-
	River levels (Irregular)	120
	River levels (Lapsed, currently not in operation but could be)	-
	Rainfall (Automatic, at least daily)	120
	Rainfall (Manual)	-
	Rainfall (Irregular)	-
	Rainfall (Lapsed, currently not in operation but could be)	-
	Water quality (pH)	Currently collect but inadequate coverage and frequency
	Water quality (Turbidity)	Currently collect but inadequate coverage and frequency
	Water quality (Salinity (EC))	Currently collect but inadequate coverage and frequency
	Water quality (Sediment)	Currently collect but inadequate coverage and frequency
	Water quality (Nitrogen)	Currently collect but inadequate coverage and frequency
	Water quality (Phosphorous)	Currently collect but inadequate coverage and frequency
	Water quality (E.coli/Coliform (Bacterial))	Currently collect but inadequate coverage and frequency
	Water quality (Chlorophyll)	Currently collect but inadequate coverage and frequency

	Water quality (Heavy metals)	Currently collect but inadequate coverage and frequency
What confidence do you have with the data you collect and use to make decisions?		Confident
How closely do you work with the following departments in the delivery of the service today?	*Aviation*	Not closely
	Communications or media	Neither
	Environment	Neither
	Finance	Not closely
	Infrastructure	Neither
	Local government	Close
	Marine / navigation	Not at all closely
	Meteorology	Close
	Military	Not closely
	Roads	Not closely
	Utilities	Neither
	Health	Close
	Disaster	Close
	Agriculture	Close
How would you rate your capacity across the following aspects of the hydrological service?	*Policy*	Poor
	Research	Adequate
	Monitoring	Adequate
	Data collection	Adequate
	Data processing and quality control	Adequate
	Data storage / archiving	Good
	Data analysis, Quality Management (QMS) / modelling	Poor
	Forecasting	Poor
	Warning	Poor
	Communicating services through media and other channels	Poor
	Customising services or tailored products	Poor
	Engagement with users	Poor
	Organisational management (HR etc.)	Poor
If training was available, how useful would the following types of training be for your hydrological service?	*Cross section surveying*	Useful
	Pumping tests	Useful
	Pumping selections/demand/yield	Useful
	Equipment calibration and installation	Useful
	Water quality parameters/sampling/analysing	Useful

	Extreme events measurement/recording (e.g. flood)	Useful
	Pollution and threat activities	Useful
	Data collection and data input	Useful
	Data auditing & QA	Useful
	GIS and mapping	Useful
	Water balance calculations	Useful
	Groundwater modelling	Useful
	Rainwater collection system design	Useful
	Communications (officials and community)	Useful
	Providing expert advice and policy development	Very useful
	Legislations, regulations/policies	Very useful
	Community and stakeholder engagement	Very useful
	Communications and media	Very useful
	Drought and flood forecasting/modelling	Very useful
	Tacit and traditional knowledge/skills	Very useful
	Hazard and risk management	Very useful
	Tertiary courses in hydrology	Very useful
	WASH	Very useful
	Behaviour change	Very useful

Niue

Capital:
Alofi

Region:
Polynesia - Pacific (Oceania)

Population:
1622

Question	***Sub question***	**Response**
What legislation exists to support and enable hydrological services?		Niue Water Act 2012 and Niue Metservices Act 2017
What is total annual budget spent on hydrological services?	*$ (funded from within country)*	0
	$ (funded externally)	$2,000 NZ
How many staff do you have within the hydrological services?	*Technical (male)*	2
	Technical (female)	0
	Professional (male)	1
	Professional (female)	0
	Other (male)	0
	Other (female)	0
What are the primary sources of water in your country (please rank in order of importance)?	*Groundwater*	1
	Rainwater	2
	Surface water / river/ lakes	N/A
	Desalination	N/A
	Other	N/A
Top three greatest threats to the delivery of hydrological services?	*1*	Lack of monitoring data
	2	Lack of government funding for hydrological services (priority)
	3	Lack of funding
How much data and monitoring do you have to determine how the hydrological regime is changing due to climate change?	*Groundwater*	A little
	Runoff	A little
	Saline impacts on freshwater aquifers	Reasonable
	Flooding	A little
	Droughts	A little
	Sea level	A little
	Tidal inundation and wave overtopping	A little
	Other extreme impacts	Very little
Please identify what impact predicted changes in climate might have on components of water resources in the area?	*Groundwater*	Decrease
	Runoff	Increase
	Saline impacts on freshwater aquifers	Increase
	Flooding	More variable

	Droughts	More variable
	Sea level	Increase
	Tidal inundation and wave overtopping	Increase
	Other extreme impacts	More variable
How many monitoring stations do you have?	*Groundwater (Automatic, at least daily)*	3
	Groundwater (Manual)	1
	Groundwater (Irregular)	-
	Groundwater (Lapsed, currently not in operation but could be)	-
	River levels (Automatic, at least daily)	0
	River levels (Manual)	-
	River levels (Irregular)	-
	River levels (Lapsed, currently not in operation but could be)	-
	Rainfall (Automatic, at least daily)	1
	Rainfall (Manual)	-
	Rainfall (Irregular)	-
	Rainfall (Lapsed, currently not in operation but could be)	3
	Water quality (pH)	Currently collect with adequate coverage and frequency
	Water quality (Turbidity)	Currently collect with adequate coverage and frequency
	Water quality (Salinity (EC))	Currently collect with adequate coverage and frequency
	Water quality (Sediment)	Currently collect with adequate coverage and frequency
	Water quality (Nitrogen)	-
	Water quality (Phosphorous)	-
	Water quality (E.coli/Coliform (Bacterial))	Currently collect with adequate coverage and frequency
	Water quality (Chlorophyll)	-
	Water quality (Heavy metals)	-
What confidence do you have with the data you collect and use to make decisions?		Not very much confidence at all

How closely do you work with the following departments in the delivery of the service today?	*Aviation*	Neither
	Communications or media	Neither
	Environment	Neither
	Finance	Neither
	Infrastructure	Neither
	Local government	Neither
	Marine / navigation	Neither
	Meteorology	Close
	Military	Neither
	Roads	Neither
	Utilities	Neither
	Health	Close
	Disaster	Close
	Agriculture	Close
How would you rate your capacity across the following aspects of the hydrological service?	*Policy*	Adequate
	Research	Poor
	Monitoring	Poor
	Data collection	Poor
	Data processing and quality control	Poor
	Data storage / archiving	Poor
	Data analysis, Quality Management (QMS) / modelling	Poor
	Forecasting	Poor
	Warning	Poor
	Communicating services through media and other channels	Poor
	Customising services or tailored products	Poor
	Engagement with users	Poor
	Organisational management (HR etc.)	Poor
If training was available, how useful would the following types of training be for your hydrological service?	*Cross section surveying*	-
	Pumping tests	Very useful
	Pumping selections/demand/yield	Very useful
	Equipment calibration and installation	Very useful
	Water quality parameters/sampling/analysing	Very useful
	Extreme events measurement/recording (e.g. flood)	-
	Pollution and threat activities	Very useful
	Data collection and data input	Very useful
	Data auditing & QA	Very useful
	GIS and mapping	Very useful
	Water balance calculations	Very useful

	Groundwater modelling	Very useful
	Rainwater collection system design	Very useful
	Communications (officials and community)	Very useful
	Providing expert advice and policy development	Very useful
	Legislations, regulations/policies	Very useful
	Community and stakeholder engagement	Very useful
	Communications and media	Very useful
	Drought and flood forecasting/modelling	Very useful
	Tacit and traditional knowledge/skills	-
	Hazard and risk management	-
	Tertiary courses in hydrology	-
	WASH	-
	Behaviour change	Very useful

Papua New Guinea

Capital:
Port Moresby

Region:
Melanesia - Pacific (Oceania)

Population:
8 100 000 (2016)

Question	***Sub question***	**Response**
What legislation exists to support and enable hydrological services?		Environment Act 2000
What is total annual budget spent on hydrological services?	*$ (funded from within country)*	Us$5000.00
	$ (funded externally)	-
How many staff do you have within the hydrological services?	*Technical (male)*	5
	Technical (female)	-
	Professional (male)	1
	Professional (female)	-
	Other (male)	-
	Other (female)	-
What are the primary sources of water in your country (please rank in order of importance)?	*Groundwater*	3
	Rainwater	2
	Surface water / river/ lakes	1
	Desalination	4
	Other	N/A
Top three greatest threats to the delivery of hydrological services?	*1*	Lack of government funding for hydrological services (priority)
	2	Retention of qualified staff
	3	Lack of trained staff
How much data and monitoring do you have to determine how the hydrological regime is changing due to climate change?	*Groundwater*	A little
	Runoff	Reasonable
	Saline impacts on freshwater aquifers	A little
	Flooding	Reasonable
	Droughts	Very little
	Sea level	Very little
	Tidal inundation and wave overtopping	Very little
	Other extreme impacts	6 - unknown
Please identify what impact predicted changes in climate might have on components of water resources in the area?	*Groundwater*	Increase
	Runoff	Increase
	Saline impacts on freshwater aquifers	More variable
	Flooding	Increase
	Droughts	Unknown
	Sea level	Increase

	Tidal inundation and wave overtopping	Increase
	Other extreme impacts	Increase
How many monitoring stations do you have?	*Groundwater (Automatic, at least daily)*	0
	Groundwater (Manual)	0
	Groundwater (Irregular)	0
	Groundwater (Lapsed, currently not in operation but could be)	0
	River levels (Automatic, at least daily)	-
	River levels (Manual)	-
	River levels (Irregular)	1
	River levels (Lapsed, currently not in operation but could be)	200
	Rainfall (Automatic, at least daily)	-
	Rainfall (Manual)	-
	Rainfall (Irregular)	4
	Rainfall (Lapsed, currently not in operation but could be)	70
	Water quality (pH)	Currently collect but inadequate coverage and frequency
	Water quality (Turbidity)	Currently collect but inadequate coverage and frequency
	Water quality (Salinity (EC))	Currently collect but inadequate coverage and frequency
	Water quality (Sediment)	Need to collect in the future
	Water quality (Nitrogen)	Currently collect but inadequate coverage and frequency
	Water quality (Phosphorous)	Currently collect but inadequate coverage and frequency
	Water quality (E.coli/Coliform (Bacterial))	Currently collect but inadequate coverage and frequency
	Water quality (Chlorophyll)	Need to collect in the future
	Water quality (Heavy metals)	Currently collect but inadequate coverage and frequency
What confidence do you have with the data you collect and use to make decisions?		Confident
	Aviation	Not at all closely

How closely do you work with the following departments in the delivery of the service today?	*Communications or media*	Not at all closely
	Environment	Very close
	Finance	Very close
	Infrastructure	Close
	Local government	Close
	Marine / navigation	Not closely
	Meteorology	Very close
	Military	Not at all closely
	Roads	Close
	Utilities	Close
	Health	Close
	Disaster	Close
	Agriculture	Close
How would you rate your capacity across the following aspects of the hydrological service?	*Policy*	Very good
	Research	Very poor
	Monitoring	Poor
	Data collection	Poor
	Data processing and quality control	Poor
	Data storage / archiving	Adequate
	Data analysis, Quality Management (QMS) / modelling	Very poor
	Forecasting	Poor
	Warning	Poor
	Communicating services through media and other channels	Very poor
	Customising services or tailored products	Very poor
	Engagement with users	Poor
	Organisational management (HR etc.)	Poor
If training was available, how useful would the following types of training be for your hydrological service?	*Cross section surveying*	Useful
	Pumping tests	Useful
	Pumping selections/demand/yield	Useful
	Equipment calibration and installation	Very useful
	Water quality parameters/sampling/analysing	Very useful
	Extreme events measurement/recording (e.g. flood)	Very useful
	Pollution and threat activities	Useful
	Data collection and data input	Useful
	Data auditing & QA	Useful
	GIS and mapping	Very useful
	Water balance calculations	Useful
	Groundwater modelling	Useful

	Rainwater collection system design	Useful
	Communications (officials and community)	Useful
	Providing expert advice and policy development	Useful
	Legislations, regulations/policies	Useful
	Community and stakeholder engagement	Useful
	Communications and media	Useful
	Drought and flood forecasting/modelling	Very useful
	Tacit and traditional knowledge/skills	Useful
	Hazard and risk management	Useful
	Tertiary courses in hydrology	Very useful
	WASH	Useful
	Behaviour change	Useful

Samoa

Capital: Apia

Region: Polynesia - Pacific (Oceania)

Population: 195 125 (2016)

Question	***Sub question***	**Response**
What legislation exists to support and enable hydrological services?		The Water Resources Management Act 2008
What is total annual budget spent on hydrological services?	*$ (funded from within country)*	Sat $80,000
	$ (funded externally)	Dependent on proposals
How many staff do you have within the hydrological services?	*Technical (male)*	5
	Technical (female)	1
	Professional (male)	-
	Professional (female)	-
	Other (male)	1 driver
	Other (female)	-
What are the primary sources of water in your country (please rank in order of importance)?	*Groundwater*	2
	Rainwater	4
	Surface water / river/ lakes	1
	Desalination	0
	Other	3
Top three greatest threats to the delivery of hydrological services?	*1*	Lack of trained staff
	2	Lack of analysis / processing of data
	3	Lack of funding
How much data and monitoring do you have to determine how the hydrological regime is changing due to climate change?	*Groundwater*	Reasonable
	Runoff	A little
	Saline impacts on freshwater aquifers	A little
	Flooding	Reasonable
	Droughts	Reasonable
	Sea level	Very good
	Tidal inundation and wave overtopping	Reasonable
	Other extreme impacts	N/a
Please identify what impact predicted changes in climate might have on components of water resources in the area?	*Groundwater*	Decrease
	Runoff	Increase
	Saline impacts on freshwater aquifers	Increase
	Flooding	Increase
	Droughts	Increase

	Sea level	Increase
	Tidal inundation and wave overtopping	Increase
	Other extreme impacts	N/a
How many monitoring stations do you have?	*Groundwater (Automatic, at least daily)*	7
	Groundwater (Manual)	12
	Groundwater (Irregular)	5
	Groundwater (Lapsed, currently not in operation but could be)	0
	River levels (Automatic, at least daily)	9
	River levels (Manual)	0
	River levels (Irregular)	0
	River levels (Lapsed, currently not in operation but could be)	7
	Rainfall (Automatic, at least daily)	8
	Rainfall (Manual)	7
	Rainfall (Irregular)	0
	Rainfall (Lapsed, currently not in operation but could be)	0
	Water quality (pH)	Currently collect but inadequate coverage and frequency
	Water quality (Turbidity)	Currently collect but inadequate coverage and frequency
	Water quality (Salinity (EC))	Currently collect but inadequate coverage and frequency
	Water quality (Sediment)	Need to collect in the future
	Water quality (Nitrogen)	Currently collect but inadequate coverage and frequency
	Water quality (Phosphorous)	Currently collect but inadequate coverage and frequency
	Water quality (E.coli/Coliform (Bacterial))	Currently collect but inadequate coverage and frequency
	Water quality (Chlorophyll)	Need to collect in the future

	Water quality (Heavy metals)	Need to collect in the future
What confidence do you have with the data you collect and use to make decisions?		Confident
How closely do you work with the following departments in the delivery of the service today?	*Aviation*	N/a
	Communications or media	Not closely
	Environment	Close
	Finance	Close
	Infrastructure	Close
	Local government	Neither
	Marine / navigation	N/a
	Meteorology	Very close
	Military	N/a
	Roads	Close
	Utilities	Close
	Health	Close
	Disaster	Very close
	Agriculture	N/a
How would you rate your capacity across the following aspects of the hydrological service?	*Policy*	Good
	Research	Adequate
	Monitoring	Good
	Data collection	Good
	Data processing and quality control	Adequate
	Data storage / archiving	Adequate
	Data analysis, Quality Management (QMS) / modelling	Poor
	Forecasting	Poor
	Warning	Poor
	Communicating services through media and other channels	Poor
	Customising services or tailored products	Poor
	Engagement with users	Good
	Organisational management (HR etc.)	Good
If training was available, how useful would the following types of training be for your hydrological service?	*Cross section surveying*	Useful
	Pumping tests	Very useful
	Pumping selections/demand/yield	Very useful
	Equipment calibration and installation	Useful
	Water quality parameters/sampling/analysing	Very useful
	Extreme events measurement/recording (e.g. flood)	Very useful

	Pollution and threat activities	Very useful
	Data collection and data input	Useful
	Data auditing & QA	Useful
	GIS and mapping	Very useful
	Water balance calculations	Very useful
	Groundwater modelling	Very useful
	Rainwater collection system design	Not useful
	Communications (officials and community)	Useful
	Providing expert advice and policy development	Very useful
	Legislations, regulations/policies	Useful
	Community and stakeholder engagement	Useful
	Communications and media	Useful
	Drought and flood forecasting/modelling	Very useful
	Tacit and traditional knowledge/skills	Useful
	Hazard and risk management	Useful
	Tertiary courses in hydrology	Very useful
	WASH	Useful
	Behaviour change	Useful

Solomon Islands

Capital: Honiara

Region: Melanesia - Pacific (Oceania)

Population: 599,419 (2016) (World Bank)

Question	***Sub question***	**Response**
What legislation exists to support and enable hydrological services?		0
What is total annual budget spent on hydrological services?	*$ (funded from within country)*	3.2 m SBD
	$ (funded externally)	16.0m SBD
How many staff do you have within the hydrological services?	*Technical (male)*	2
	Technical (female)	-
	Professional (male)	4
	Professional (female)	-
	Other (male)	-
	Other (female)	-
What are the primary sources of water in your country (please rank in order of importance)?	*Groundwater*	1
	Rainwater	2
	Surface water / river/ lakes	3
	Desalination	4
	Other	N/A
Top three greatest threats to the delivery of hydrological services?	*1*	Lack of funding
	2	Lack of monitoring data
	3	Lack of trained staff
How much data and monitoring do you have to determine how the hydrological regime is changing due to climate change?	*Groundwater*	Very little
	Runoff	Reasonable
	Saline impacts on freshwater aquifers	Reasonable
	Flooding	Reasonable
	Droughts	A little
	Sea level	N/a
	Tidal inundation and wave overtopping	-
	Other extreme impacts	-
Please identify what impact predicted changes in climate might have on components of water resources in the area?	*Groundwater*	Increase
	Runoff	Increase
	Saline impacts on freshwater aquifers	Increase
	Flooding	Increase
	Droughts	Increase
	Sea level	Increase
	Tidal inundation and wave overtopping	Increase

	Other extreme impacts	Increase
How many monitoring stations do you have?	*Groundwater (Automatic, at least daily)*	0
	Groundwater (Manual)	-
	Groundwater (Irregular)	-
	Groundwater (Lapsed, currently not in operation but could be)	-
	River levels (Automatic, at least daily)	-
	River levels (Manual)	-
	River levels (Irregular)	-
	River levels (Lapsed, currently not in operation but could be)	-
	Rainfall (Automatic, at least daily)	14
	Rainfall (Manual)	-
	Rainfall (Irregular)	-
	Rainfall (Lapsed, currently not in operation but could be)	-
	Water quality (pH)	Need to collect in the future
	Water quality (Turbidity)	Currently collect but inadequate coverage and frequency
	Water quality (Salinity (EC))	Currently collect but inadequate coverage and frequency
	Water quality (Sediment)	Don’t collect, and not proposing to collect
	Water quality (Nitrogen)	Don’t collect, and not proposing to collect
	Water quality (Phosphorous)	Don’t collect, and not proposing to collect
	Water quality (E.coli/Coliform (Bacterial))	Don’t collect, and not proposing to collect
	Water quality (Chlorophyll)	Don’t collect, and not proposing to collect
	Water quality (Heavy metals)	Don’t collect, and not proposing to collect
What confidence do you have with the data you collect and use to make decisions?		Very confident
	Aviation	Not at all closely

How closely do you work with the following departments in the delivery of the service today?	*Communications or media*	Not at all closely
	Environment	Very close
	Finance	Very close
	Infrastructure	Very close
	Local government	Very close
	Marine / navigation	Not at all closely
	Meteorology	Very close
	Military	Not at all closely
	Roads	Very close
	Utilities	Very close
	Health	Very close
	Disaster	Very close
	Agriculture	Very close
How would you rate your capacity across the following aspects of the hydrological service?	*Policy*	Adequate
	Research	Adequate
	Monitoring	Good
	Data collection	Good
	Data processing and quality control	Good
	Data storage / archiving	Good
	Data analysis, Quality Management (QMS) / modelling	Adequate
	Forecasting	Adequate
	Warning	Adequate
	Communicating services through media and other channels	Adequate
	Customising services or tailored products	Adequate
	Engagement with users	Adequate
	Organisational management (HR etc.)	Adequate
If training was available, how useful would the following types of training be for your hydrological service?	*Cross section surveying*	Very useful
	Pumping tests	Very useful
	Pumping selections/demand/yield	Very useful
	Equipment calibration and installation	Very useful
	Water quality parameters/sampling/analysing	Very useful
	Extreme events measurement/recording (e.g. flood)	Very useful
	Pollution and threat activities	Very useful
	Data collection and data input	Very useful
	Data auditing & QA	Very useful
	GIS and mapping	Very useful
	Water balance calculations	Very useful
	Groundwater modelling	Very useful

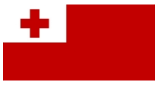
	Rainwater collection system design	Very useful
	Communications (officials and community)	Very useful
	Providing expert advice and policy development	Very useful
	Legislations, regulations/policies	Not at all useful
	Community and stakeholder engagement	Not at all useful
	Communications and media	Not at all useful
	Drought and flood forecasting/modelling	Very useful
	Tacit and traditional knowledge/skills	Useful
	Hazard and risk management	Very useful
	Tertiary courses in hydrology	Very useful
	WASH	Very useful
	Behaviour change	Useful

Tonga

Capital:
Nuku'alofa

Region:
Polynesia - Pacific (Oceania)

Population:
107 122 (2016)



Question	***Sub question***	**Response**
What legislation exists to support and enable hydrological services?		Water Resources Bill 2019, Tonga Water Board Act, Public Health Act, Waste Management Act, Environment Management Act, Lands Act,
What is total annual budget spent on hydrological services?	*$ (funded from within country)*	Top 200,0000
	$ (funded externally)	Top 800,000
How many staff do you have within the hydrological services?	*Technical (male)*	4
	Technical (female)	4
	Professional (male)	2
	Professional (female)	3
	Other (male)	2
	Other (female)	1
What are the primary sources of water in your country (please rank in order of importance)?	*Groundwater*	1
	Rainwater	2
	Surface water / river/ lakes	3
	Desalination	4
	Other	5
Top three greatest threats to the delivery of hydrological services?	*1*	Lack of infrastructure
	2	Lack of monitoring data
	3	Lack of analysis / processing of data
How much data and monitoring do you have to determine how the hydrological regime is changing due to climate change?	*Groundwater*	Reasonable
	Runoff	Very little
	Saline impacts on freshwater aquifers	A little
	Flooding	A little
	Droughts	Reasonable
	Sea level	Good
	Tidal inundation and wave overtopping	Good
	Other extreme impacts	Reasonable
	Groundwater	Decrease
	Runoff	Increase

	Saline impacts on freshwater aquifers	Increase
Please identify what impact predicted changes in climate might have on components of water resources in the area?	*Flooding*	Increase
	Droughts	Increase
	Sea level	Increase
	Tidal inundation and wave overtopping	Increase
	Other extreme impacts	Increase
How many monitoring stations do you have?	*Groundwater (Automatic, at least daily)*	6
	Groundwater (Manual)	14
	Groundwater (Irregular)	14
	Groundwater (Lapsed, currently not in operation but could be)	-
	River levels (Automatic, at least daily)	-
	River levels (Manual)	-
	River levels (Irregular)	-
	River levels (Lapsed, currently not in operation but could be)	-
	Rainfall (Automatic, at least daily)	-
	Rainfall (Manual)	-
	Rainfall (Irregular)	-
	Rainfall (Lapsed, currently not in operation but could be)	-
	Water quality (pH)	Currently collect but inadequate coverage and frequency
	Water quality (Turbidity)	Need to collect in the future
	Water quality (Salinity (EC))	Currently collect but inadequate coverage and frequency
	Water quality (Sediment)	Need to collect in the future
	Water quality (Nitrogen)	Currently collect but inadequate coverage and frequency
	Water quality (Phosphorous)	Currently collect but inadequate coverage and frequency
	Water quality (E.coli/Coliform (Bacterial))	Currently collect but inadequate coverage and frequency

	Water quality (Chlorophyll)	Need to collect in the future
	Water quality (Heavy metals)	Currently collect but inadequate coverage and frequency
What confidence do you have with the data you collect and use to make decisions?		Confident
How closely do you work with the following departments in the delivery of the service today?	*Aviation*	Not closely
	Communications or media	Not closely
	Environment	Neither
	Finance	Close
	Infrastructure	Neither
	Local government	Neither
	Marine / navigation	Neither
	Meteorology	Neither
	Military	Neither
	Roads	Neither
	Utilities	Close
	Health	Close
	Disaster	Close
	Agriculture	Neither
How would you rate your capacity across the following aspects of the hydrological service?	*Policy*	Good
	Research	Good
	Monitoring	Good
	Data collection	Good
	Data processing and quality control	Adequate
	Data storage / archiving	Good
	Data analysis, Quality Management (QMS) / modelling	Adequate
	Forecasting	Poor
	Warning	Very poor
	Communicating services through media and other channels	Adequate
	Customising services or tailored products	Poor
	Engagement with users	Adequate
	Organisational management (HR etc.)	Adequate
If training was available, how useful would the following types of training be for your hydrological service?	*Cross section surveying*	Very useful
	Pumping tests	Very useful
	Pumping selections/demand/yield	Very useful
	Equipment calibration and installation	Very useful
	Water quality parameters/sampling/analysing	Very useful

	Extreme events measurement/recording (e.g. flood)	Very useful
	Pollution and threat activities	Very useful
	Data collection and data input	Very useful
	Data auditing & QA	Very useful
	GIS and mapping	Very useful
	Water balance calculations	Very useful
	Groundwater modelling	Very useful
	Rainwater collection system design	Very useful
	Communications (officials and community)	Very useful
	Providing expert advice and policy development	Very useful
	Legislations, regulations/policies	Very useful
	Community and stakeholder engagement	Very useful
	Communications and media	Very useful
	Drought and flood forecasting/modelling	Very useful
	Tacit and traditional knowledge/skills	Very useful
	Hazard and risk management	Very useful
	Tertiary courses in hydrology	Very useful
	WASH	Very useful
	Behaviour change	Very useful

Tuvalu

Capital:	**Region**:	**Population**:	
Funafuti	Polynesia - Pacific (Oceania)	11 097 (2016)	

Question	***Sub question***	**Response**
What legislation exists to support and enable hydrological services?		0
What is total annual budget spent on hydrological services?	*$ (funded from within country)*	$50,000
	$ (funded externally)	-
How many staff do you have within the hydrological services?	*Technical (male)*	5
	Technical (female)	0
	Professional (male)	3
	Professional (female)	-
	Other (male)	-
	Other (female)	-
What are the primary sources of water in your country (please rank in order of importance)?	*Groundwater*	2
	Rainwater	1
	Surface water / river/ lakes	0
	Desalination	3
	Other	0
Top three greatest threats to the delivery of hydrological services?	*1*	Lack of funding
	2	Lack of infrastructure
	3	Climate change
How much data and monitoring do you have to determine how the hydrological regime is changing due to climate change?	*Groundwater*	Reasonable
	Runoff	Very little
	Saline impacts on freshwater aquifers	Reasonable
	Flooding	Very little
	Droughts	Very good
	Sea level	Reasonable
	Tidal inundation and wave overtopping	Reasonable
	Other extreme impacts	Good
Please identify what impact predicted changes in climate might have on components of water resources in the area?	*Groundwater*	More variable
	Runoff	More variable
	Saline impacts on freshwater aquifers	Increase
	Flooding	N/a
	Droughts	Increase
	Sea level	Increase
	Tidal inundation and wave overtopping	Increase

	Other extreme impacts	-
How many monitoring stations do you have?	*Groundwater (Automatic, at least daily)*	-
	Groundwater (Manual)	-
	Groundwater (Irregular)	-
	Groundwater (Lapsed, currently not in operation but could be)	3
	River levels (Automatic, at least daily)	-
	River levels (Manual)	-
	River levels (Irregular)	-
	River levels (Lapsed, currently not in operation but could be)	-
	Rainfall (Automatic, at least daily)	5
	Rainfall (Manual)	-
	Rainfall (Irregular)	-
	Rainfall (Lapsed, currently not in operation but could be)	-
	Water quality (pH)	Currently collect but inadequate coverage and frequency
	Water quality (Turbidity)	Currently collect but inadequate coverage and frequency
	Water quality (Salinity (EC))	Currently collect but inadequate coverage and frequency
	Water quality (Sediment)	Currently collect but inadequate coverage and frequency
	Water quality (Nitrogen)	Currently collect but inadequate coverage and frequency
	Water quality (Phosphorous)	Currently collect but inadequate coverage and frequency
	Water quality (E.coli/Coliform (Bacterial))	Currently collect but inadequate coverage and frequency
	Water quality (Chlorophyll)	Don't know
	Water quality (Heavy metals)	Don't know

What confidence do you have with the data you collect and use to make decisions?		Confident
How closely do you work with the following departments in the delivery of the service today?	*Aviation*	Not at all closely
	Communications or media	Very close
	Environment	Neither
	Finance	Close
	Infrastructure	Very close
	Local government	Very close
	Marine / navigation	Close
	Meteorology	Close
	Military	N/a
	Roads	N/a
	Utilities	Very close
	Health	Close
	Disaster	Close
	Agriculture	Neither
How would you rate your capacity across the following aspects of the hydrological service?	*Policy*	Adequate
	Research	Poor
	Monitoring	Adequate
	Data collection	Adequate
	Data processing and quality control	Poor
	Data storage / archiving	Adequate
	Data analysis, Quality Management (QMS) / modelling	Adequate
	Forecasting	Adequate
	Warning	Adequate
	Communicating services through media and other channels	Adequate
	Customising services or tailored products	Adequate
	Engagement with users	Adequate
	Organisational management (HR etc.)	Adequate
If training was available, how useful would the following types of training be for your hydrological service?	*Cross section surveying*	Very useful
	Pumping tests	Very useful
	Pumping selections/demand/yield	Very useful
	Equipment calibration and installation	Very useful
	Water quality parameters/sampling/analysing	Very useful
	Extreme events measurement/recording (e.g. flood)	N/a
	Pollution and threat activities	Very useful

	Data collection and data input	Very useful
	Data auditing & QA	Very useful
	GIS and mapping	Very useful
	Water balance calculations	Very useful
	Groundwater modelling	Very useful
	Rainwater collection system design	Very useful
	Communications (officials and community)	Very useful
	Providing expert advice and policy development	Very useful
	Legislations, regulations/policies	Very useful
	Community and stakeholder engagement	Very useful
	Communications and media	Very useful
	Drought and flood forecasting/modelling	Very useful
	Tacit and traditional knowledge/skills	Very useful
	Hazard and risk management	Very useful
	Tertiary courses in hydrology	Very useful
	WASH	Very useful
	Behaviour change	Very useful

Annex 2 – Survey questions

Q1. What country / territory are you based in?

Q2. Name of person completing the questionnaire?

Q3. What is your email address?

Q4. What is your organisation / institution?

Q5. Designation / position (name of post/duty, e.g. Director)?

Q6. How many years' experience do you have in the area of hydrology / water resources?

Q7. Please indicate the legal status of your institution

Q8. What legislation exists to support and enable hydrological services?

Q9. What are the primary sources of water in your country (please rank in order of importance)?

Q10. How well are you monitoring these water sources on a regular basis (on a scale from 1 – not at all to 5 – extremely well)

Q11. Which types of water quantity data are you collecting now, and need to collect in the future for hydrological services?

Q12. How many groundwater monitoring stations do you have?

Q13. How many groundwater monitoring stations are transmitted using the following communications methods?

Q14. How long are the records of the groundwater stations?

Q15. How many rainfall monitoring stations do you have?

Q16. How many rainfall monitoring stations are transmitted using the following communications methods?

Q17. How long are the records of the rainfall stations?

Q18. How many river gauge monitoring stations do you have (stage and or discharge)?

Q19. How many river gauge monitoring stations are transmitted using the following communications methods?

Q20. How long are the records of the river gauge stations?

Q21. How many stations have rating curves, and when were they last updated?

Q22. Which types of water quality data are you collecting now, and need to collect in the future for hydrological services?

Q23. How many stations have been decommissioned and why?

Q24. Which sectors will benefit from more monitoring as noted above?

Q25. What confidence do you have with the data you collect and use to make decisions? (Please select one or more of the following)

Q26. What are the main reasons for any lack of confidence in the data collected? (Please select all that apply)

Q27. Is the following data stored in a central database?

Q28. What year do the records go back to?

Q29. What hardware is the database using?

Q30. How do staff access and maintain the database?

Q31. Describe the impacts of climate extremes on the hydrological cycle in your country/territory and the impact of this on the delivery and need for hydrological services?

Q32. Please identify what impact predicted changes in climate might have on components of water resources in the area?

Q33. How much data and monitoring do you have to determine how the hydrological regime is changing due to climate change?

Q34. Is your organisation or ministry able to advise government, the community and other stakeholders on the potential impacts of climate change and climate extremes on your country/territory from a hydrological perspective?

Q35. If not, what resources would be required to enable your organisation to play its role in managing water in a changing climate?

Q36. What sectors does the hydrological service currently deliver services to? Please indicate using Yes/No against each of the options listed below.

Q37. Who currently receives outputs from the hydrological service?

Q38. How are hydrological services managed? (Please select one of the following)

Q39. How would you rate the capacity of the hydrological services in meeting the needs of these sectors right now?

Q40. What is the biggest factor impacting on the capacity of hydrological services at the moment?

Q41. How would you rate your capacity across the following aspects of the hydrological service?

Q42. Do you have any specific comments about the current capacity of hydrological services?

Q43. How important are the following issues in improving the capacity of the hydrological services?

Q44. How closely do you work with the following departments in the delivery of the service today?

Q45. What are the key barriers to working closely with the meteorological service? (Please select one or more of the following)

Q46. What would the benefits be of working closely with the meteorological service? (Please rate the following benefits on a scale of 1 – Very low benefit to 5 – significant benefit)

Q47. What happens if / when the hydrological service fails at the moment?

Q48. Who would be most affected if / when a service fails?

Q49. From a user or sector perspective what are some of the issues with the hydrological service? – (e.g. flood warnings do not provide enough information, don't arrive on time, inaccurate)

Q50. How many staff do you have within the hydrological services? (Across the following types of positions)?

Q51. What is the status of the resources at your disposal to deliver the hydrological service that you are required to provide?

Q52. Are there specific areas of your service delivery for which there are inadequate resources?

Q53. If training was available, how useful would the following types of training be for your hydrological service? (please select from 1 – not at all useful to 5 – very useful)?

Q54. What is the total annual budget spent on hydrological services? (Please include year and currency)

Q55. Which partnerships do you see as important in building capacity with the hydrological services?

Q56. Which partnerships do you see as important in securing more investment and funding to building capacity with the hydrological services?

Q57. What is the greatest threat to the delivery of hydrological services?

Q58. What has been the most significant change (positive or negative) to the hydrological services in this country in the past 10 years (e.g. New funding, a change in policy, a response to a specific disaster, new technology, training / capacity building, access to data, data sharing with met and other services, community engagement / satisfaction, regional initiatives)?

Q59. In ten years', time, with the same budget, do you anticipate the hydrological services in this country will be the same, worse, or better? (Please select one or more of the following)

Q60. Why?

Q61. In terms of the future of the whole hydrological service, what is the priority for future investment that will improve the service (please rate according to the following elements)?

Q62. Any other comments about the overall capacity, needs and gaps of hydrological services?

Q63. Do you have any interest in being involved in follow up (e.g. interviews or workshops)?

Annex 3 – Past project list

Start Year	End Year	Project Title	Agency	Location	Regional focus	Funders	Budget ($US million)	Aim	Report - Website	Findings	Theme	Relevance
2016	2016	Advancing Groundwater Monitoring in Pacific Small Island Developing States	IGRAC, WMO, SPREP, SPC, Fiji Met Service	Cook Islands, Fiji, Kiribati, New Caledonia, Niue, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu	Yes	WMO, UNESCO	$ 0.10	To review the state of groundwater resources and monitoring in their country and to learn on groundwater monitoring and assessment techniques.	http://ihp-hwrp.nl/wp-content/uploads/2016/11/Groundwater-Monitoring-in-Small-Island-Developing-States-in-the-Pacific.pdf	The priority issues raised were: Need for the development of a groundwater database for pacific SIDS; Improvements in groundwater data collection; Development of products relevant for specific needs; Foster sustainability and continuity after completion of projects; and, Training.	Groundwater	High
2011	2016	Building Human Development: Improving WASH in Solomon Islands	United Nations Children's Fund	Solomon Islands	No	European Development Fund - Euro 1.927 million	$ 2.14	For rural communities and school children to use improved water supply, improved sanitation facilities (with hygiene behaviours), and sector planners to support rural community water and sanitation in line with the Solomon Island Government policy and laws.	https://ec.europa.eu/europeaid/projects/building-human-development-improving-wash-solomon-islands_en	The project was particularly effective at improving access to "improved drinking water" in communities: exceeding its targeted by nine with 39 communities (5,000 people) now having access to improved drinking water sources. WASH in Schools efforts were generally also effective with 15 schools now having access to water and sanitation facilities. Also, the project was engaged in strategies which strengthened the enabling environment specific to the development of national WASH policies for rural communities and draft guidelines for schools.	WASH	High
2017	2021	Building Resilience to High-Impact Hydrometeorological Events through the Strengthening of Multi-Hazard Early Warning Systems (MHEWS) in Small Island Developing States (SIDS) and Southeast Asia	WMO and partners	Fiji and the countries that the RSMC Nadi is serving, namely Kiribati, Niue, Cook Islands and Tuvalu, with some services extending to Vanuatu, Samoa, Tonga, the Federated States of Micronesia, Solomon Islands, Palau, Nauru, Marshall Islands and Tokelau	Yes	Environment and Climate Change Canada (ECCC), granted 10 million Canadian dollars (US$ 7.5 million)	$ 7.50	To continue to support resilience building and disaster risk reduction (DRR) in Pacific and Caribbean SIDS and in Southeast Asia	https://public.wmo.int/en/resources/meteoworld/new-projects-strengthen-disaster-risk-reduction-and-climate-adaptation	In progress	Resilience	Medium
2011	2012	Catalogue of Rivers for Pacific Islands	SPC - WMO, EU UNESCO	Cook Islands, Fiji, Federated States of Micronesia, Palau, Papua New Guinea, Samoa, Solomon Islands, and Vanuatu.	Yes	EU, UNESCO	$ 0.10	To provide a snapshot of the characteristics of major streams and rivers and the available water resources data for eight Pacific Island Countries.	http://www.pacificwater.org/_resources/article/files/Binder1.pdf	Catalogue published and available online.	Water resources	High

Start Year	End Year	Project Title	Agency	Location	Regional focus	Funders	Budget ($US million)	Aim	Report - Website	Findings	Theme	Relevance
2012	2016	Climate and Oceans Support Program in the Pacific (COSPPac)	Australian Bureau of Meteorology in partnership with Secretariat of the Pacific Regional Environment Programme (SPREP) and Secretariat of the Pacific Community (SPC)	Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Niue, Nauru, Papua New Guinea, Palau, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu	Yes	AusAID	$ 22.05	Our aim is to enhance the capacity of Pacific Islands to manage and mitigate the impacts of climate variability and tidal events.	https://www.pacificmet.net/project/climate-and-ocean-support-program-pacific-cosppac	Independent progress review: https://dfat.gov.au/about-us/publications/Documents/pacific-climate-oceans-support-program-ind-prog-review.pdf	Climate change	Medium
2019	2022	Climate Information Services for Resilient Development in Vanuatu	SPREP	Vanuatu	No	Green Climate Fund	$ 18.10	The project will increase the ability of decision makers; development partners; communities and individuals across five target development sectors (agriculture, fisheries, infrastructure, tourism and water) to plan for and respond to the long and short term impact of climate change. The project will build capacity to harness and manage climate data; develop and deliver practical CIS tools; support enhanced coordination and dissemination of tailored information; enhance CIS related information and technology infrastructure and support the application of relevant CIS through real-time development process.	https://www.greenclimate.fund/-/climate-information-services-for-resilient-development-in-vanuatu	In Progress	Climate change	Medium
2019	2019	Disaster Resilience for Pacific Small Island Developing States (RESPAC) Project	UNDP with partners: Secretariat of the Pacific Regional Environment Programme, the Pacific Community, the Pacific Meteorological Council, and the Council of the Regional Organisation in the Pacific	Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Republic of Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu and Tokelau	Yes	UNDP - USD 7.5 million	$ 7.50	To improve Pacific SIDS resilience to climate-related hazards.	http://www.pacific.undp.org/content/pacific/en/home/operations/projects/resilience-sustainable-development/respac-project.html	In progress	Climate change	Medium

Start Year	End Year	Project Title	Agency	Location	Regional focus	Funders	Budget ($US million)	Aim	Report - Website	Findings	Theme	Relevance
2017	2020	EU – North Pacific - Readiness for El Niño project	Pacific Community (SPC)	Federated States of Micronesia, Palau, Marshall Islands	Yes	European Commission - Various Projects	$ 1.73	The European Union – North Pacific – Readiness for El Niño (RENI) project's overall objective is to enhance the resilience of the people of relevant PICs to the shocks and insecurities resulting from extreme El Niño events. The specific objective is to strengthen the implementation of a sustainable, multi sectoral, multi stakeholder approach to readiness for future El Niño events.	https://ec.europa.eu/europeaid/projects/eu-north-pacific-readiness-el-nino-project-marshall-islands_en	http://ccprojects.gsd.spc.int/eu-north-pacific-reni/ In Progress	Climate change	Medium
2013	2017	Finnish-Pacific (FINPAC) project - Pacific Islands Meteorological Services in Action	SPREP, IFRC	Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu.	Yes	Finnish Meteorological Service - Euro 3.7 million	$ 4.11	The FINPAC (Finnish Pacific) Project is a regionally coordinated meteorological project targeting the adaptation needs of Pacific Island Communities (PICs) to the effects of climate change. Accordingly, the adaptation approach developed in this project is based on the development of the capacity of National Meteorological Services (NMSs) to respond to the growing needs of communities to prepare and respond to the changing weather patterns and climate trends using improved meteorological services.	https://library.wmo.int/doc_num.php?explnum_id=3394	The product is a compendium prepared by the Finnish-Pacific (FINPAC) project on 'Reduced vulnerability of Pacific islands country's villagers livelihoods to the effects of climate change.	Climate change	Medium
2013	2016	Flood Control Master Plan and Priority Project in Nadi River Basin	Ministry of Agriculture, Rural and Maritime Development and National Disaster Management	Fiji	No	Japan JICA, ADB Fiji $2 million	$ 2.00	The outputs of the Project are as follows: 1) The Flood Control Master Plan in the Nadi River Basin 2) The Feasibility Study on the Priority Project(s) 3) Technical transfer to C/P through the Project	http://open_jicareport.jica.go.jp/pdf/12263521_01.pdf	https://reliefweb.int/report/fiji/adb-fiji-confirm-partnership-build-resilience-against-floods	Flooding	High
2014	2019	iCLIM (Supporting the Regional Management of Climate Change Information in the Pacific)	SPREP	To be confirmed	Yes	AusAID - Griffith University - AUD 3 million	$ 2.10	The goal of the Pacific iCLIM project is to enable better climate change resilience and adaptation planning in the Pacific region, by improving the ability of regional bodies and government to discover, store, access and utilise climate change information and data.	https://www.environment.gov.au/marine/international-activities/sprep-projects	In progress	Climate change	Medium

Start Year	End Year	Project Title	Agency	Location	Regional focus	Funders	Budget ($US million)	Aim	Report - Website	Findings	Theme	Relevance
2011	2016	Increasing Climate Resilience of Pacific Small Islands States (SIS) through the Global Climate Change Alliance (GCCA)	Pacific Community (SPC)	Pacific Region	Yes	European Commission - Euro 11.4 million	$ 12.65	The purpose of the project is to promote long term strategies and approaches to adaptation planning and to pave the way for more effective and coordinated aid delivery on climate change at the national and regional level.	https://ec.europa.eu/europeaid/projects/increasing-climate-resilience-pacific-small-islands-states-sis-through-global-climate_en	http://ccprojects.gsd.spc.int/wp-content/uploads/2016/11/web-Volume_1_Global_Climate_Change_Alliance_PICTs.pdf Key lessons learned were: • On-the-ground climate change adaptation activities supported by mainstreaming and targeted training, help countries tackle the adverse effects of climate change. • Partnering with other organisations contributes to the sustainability of project interventions. • Outer island communities that face isolation and logistical and transportation challenges require special attention. • Project activities specially designed for women, youth and senior citizens, ensure their involvement in building climate resilience. • Strengthening collaboration between line ministries and the ministry responsible for finance, enhances national systems, and may facilitate improved access to climate change funding in the future. • Video is one of the most effective ways to share lessons learned. • National communication materials need to be translated into local languages.	Climate change	Medium
2011	2015	Integrated Flood Management - Nadi Basin Pilot	Fiji & SOPAC, the Pacific Islands Applied Geoscience Commission	Fiji	No	World Bank	$ 1.40	The project objective is to pilot an integrated flood management approach in the Nadi basin as a measure to reduce disaster risk that can be replicated in other watersheds in Fiji and other Pacific countries. Three parts of the projects: • Institutional Strengthening of Flood Forecasting and Warning Systems • Flood Risk Assessment, Identification of Mitigation Measures, and Dissemination • Institutional Strengthening for Integrated Flood Management	http://projects.worldbank.org/P121843/integrated-flood-management-nadi-basin-pilot?lang=en&tab=overview	No published outcomes / findings	Flooding	High
2010	2010	Nalauwaki Village on Waya Island - Safe Water Supply Project	Rotary	Fiji	No	SkyJuice Foundation	$ 0.10		https://www.skyjuice.org.au/water-projects-pacific/	Rotary purchased a SkyHydrant water filtration unit, solar panel and pump which now provides a sustainable safe water supply of approximately 3500 litres per day for the school students plus associated families in the district. The school is receiving a greater number of enquires for enrolment now that it can offer safe reliable access to clean water.	WASH	High

Start Year	End Year	Project Title	Agency	Location	Regional focus	Funders	Budget ($US million)	Aim	Report - Website	Findings	Theme	Relevance
2010	2011	Nanuca Village Safe Water Project	Rotary and Samaritans Purse	Fiji	No	SkyJuice Foundation	$ 0.10	To provide safe, sustainable potable water supplies that are affordable and appropriate to the local communities they are installed in.	https://www.skyjuice.org.au/wp-content/uploads/2017/05/4.6-APPLICATION-BULLETIN-FIJI-2010-.pdf	The new water supply system utilizes 2 stages of filtration to produce clean bacteria free water. The first stage is a standard roughing filter designed to remove 80 percent of turbidity and large particles. The second stage is a dual bank of high capacity SkyHydrant ultra filtration units specifically designed for long term service. Each SkyHydrant can produce up to 10,000 litres per day.	WASH	High
2012	2012	Nawerewere Hospital, Tarawa, Safe Water Supply Project	Church of Latter Day Saints	Kiribati	No	SkyJuice Foundation	$ 0.10	To provide safe, sustainable potable water supplies that are affordable and appropriate to the local communities they are installed in.	https://www.skyjuice.org.au/water-projects-pacific/	Cannot find outcomes?	WASH	High
2009	2014	Pacific Adaptation to Climate Change (PACC) Programme	SPREP	Fiji, Cook Islands, Federated States of Micronesia, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tokelua, Tuvalu and Vanuatu.	Yes	Global Environment Facility (GEF) and the Australian Government, with the United Nations Development Programme (UNDP)	$ 20.80	is demonstrating best-practice adaptation in three key climate-sensitive areas: coastal zone management, food security and food production, and water resources management. Each country is hosting a pilot project in one of these theme areas to demonstrate how climate change adaptation can work on the ground.	https://www.sprep.org/pacc	Early in the process the project teams carried out vulnerability and adaptation (V&A) assessments to ensure the project addressed the priority needs of the communities in view of the climate risks they face. The projects were also assessed economically using cost–benefit analysis. As the projects progress, the project teams are producing technical guidelines to guide future adaptation work in coastal zone management, food production and food security, and water resources management.	Resilience	High
2018	2023	Pacific Adaptation to Climate Change and Resilience Building (PACRES)	SPREP, the Pacific Islands Forum Secretariat, the Pacific Community and the University of the South Pacific	Papua New Guinea, Samoa, Solomon Islands, Timor-Leste and Vanuatu.	Yes	European Commission - Euro 9.5 million	$ 10.55	The European Union funded Intra-ACP GCCA+ Pacific Adaptation to Climate Change and Resilience Building (PACRES) aims to ensure better regional and national adaptation and mitigation responses to climate change challenges faced by Pacific ACP countries.	https://ec.europa.eu/europeaid/projects/pacific-adaptation-climate-change-and-resilience-building-pacres_en	https://reliefweb.int/report/world/building-pacific-resilience-climate-change-across-15-countries-0 In Progress	Resilience	Medium
2017	2018	Pacific environment community fund consolidated regional report	Pacific Islands Forum Secretariat	Fiji, Kiribati, Palau, Papau New Guinea, Republic of Marshal Islands, Tuvalu, Vanuatu	Yes	Japan	$ 19.90	To improve rural communities' socio-economic living.		16 projects delivered across 14 countries, focused on solar in homes, and solar to support desalination and reserve osmosis plants. Some were only solar, and some were solar linked with water supply projects.	WASH	Low

Start Year	End Year	Project Title	Agency	Location	Regional focus	Funders	Budget ($US million)	Aim	Report - Website	Findings	Theme	Relevance
2007	2010	Pacific HYCOS Project	Pacific Islands Applied Geoscience Commission (SOPAC) in partnership with the World Meteorological Organisation, Fiji Meteorological Service and the United Nations Educational, Scientific and Cultural Organisation (UNESCO)	Cook Islands, Federated States of Micronesia, Fiji Islands, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu	Yes	SOPAC	$ 2.77	To improve assessment, management and protection of freshwater resources, by assessing water resources and building rainwater, surface water and groundwater monitoring networks for pilot river basins and aquifers.	https://hydrohub.wmo.int/en/projects/Pacific-HYCOS and http://www.pacific-iwrm.org/rsc/second-meeting-documents/09-HYCOS-Status-RSC-2.pdf	Water resources available in small island developing states are vulnerable to climate extremes and population pressures. Pacific island countries have limited alternate options and only relatively small and finite water resources to meet increasing demand. Knowledge on how rivers, aquifers and rainwater harvesting respond to increased demands and climate variability is crucial to ensuring sustainable and productive water resources.	Monitoring	High
2014	2014	Pacific Island Groundwater and Future Climates: First-Pass Regional Vulnerability Assessment	Geoscience Australia	Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Nauru, Niue, Palau, Papua New Guinea, Republic of Marshall Islands, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu	Yes	Pacific-Australia Climate Change Science and Adaptation Planning (PACCSAP) Program	$ 1.00	Geoscience Australia has undertaken a desktop analysis to better understand the vulnerability of fresh groundwater systems to future climate.	https://ecat.ga.gov.au/geonetwork/srv/eng/catalog.search#/metadata/79066	Regional assessments of groundwater vulnerability to climate hazards could be enhanced by improvements in key datasets and knowledge, particularly: improved elevation data for low-lying areas on all island types; improved understanding of key SLR thresholds; improved climate projections; improved hydrogeological characterisation of islands. Groundwater level and quality monitoring at targeted sites would both improve understanding of typical groundwater system responses to climate hazards and also guide management responses in the shorter and longer-term.	Groundwater	High
2015	2020	Pacific Resilience Program	Secretariat of the Pacific Community and the Pacific Islands Forum Secretariat	Fiji, Kiribati, Marshall Islands, Micronesia, Federated States of, Nauru, Palau, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu	Yes	World Bank Group - USD $32.29 million	$ 32.29	A series of projects to strengthen Pacific Island countries' resilience to natural disasters. The Pacific Resilience Program will be delivered under a combination of nationally and regionally implemented activities over five years – helping to consolidate and avoid duplication of resilience initiatives across the Pacific. The program will also help to effectively train local institutions, civil society groups, village communities, community volunteers and community groups in disaster-risk management and climate resilience.	http://projects.worldbank.org/P147839?lang=en	In Progress https://www.worldbank.org/en/news/press-release/2016/06/21/pacific-resilience-program-launched	Resilience	Medium
2017	2022	Pacific Resilience Project II under the Pacific Resilience Program	Pacific Community	Fiji, Kiribati, Marshall Islands, Micronesia, Federated States of, Nauru, Palau, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu	Yes	World Bank Group - USD $4 million	$ 4.00	The Objective of the Project is to strengthen early warning systems and climate resilient investments in shoreline protection in RMI.	http://projects.worldbank.org/P160096?lang=en	In Progress	Warning	Medium

Start Year	End Year	Project Title	Agency	Location	Regional focus	Funders	Budget ($US million)	Aim	Report - Website	Findings	Theme	Relevance
2014	2018	Pacific Risk Resilience Programme	Various	Fiji, Solomon Island, Tonga, Vanuatu	Yes	UNDP	$ 16.10	To mainstream the risks the PICs face from climate change and disasters into development planning and processes. Communities can become more resilient to climate change and disaster if routine government, community and other planning process take these risks into account.	http://www.pacific.undp.org/content/pacific/en/home/operations/projects/resilience-sustainable-development/PRRP.html	PRRP has helped programme countries create 22 new 'resilient development officer' posts within government. These posts are located in development agencies covering planning & finance, agriculture, and sub-national government. Their main function is to mainstream climate and disaster risk into development. More recently the programme has established partnerships with women & social welfare functions in order to ensure that gender and social inclusion are also mainstreamed into risk management. PRRP provides technical support to these posts to ensure that they are able to influence decision makers. These posts are also connected to equivalent posts in other Pacific countries for a truly south-south exchange. Partner Ministries have agreed to absorb these posts as ongoing public service positions within one or two years of their appointment.	Resilience	Medium
2017	2021	PCRAFI : Furthering Disaster Risk Finance in the Pacific		Fiji, Kiribati, Marshall Islands, Micronesia, Federated States of, Nauru, Palau, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu	Yes	World Bank Group - USD $29.73 million	$ 29.73	The project development objective is to improve access to post-disaster rapid response finance to Pacific Island Countries.	http://projects.worldbank.org/P161533?lang=en	In Progress	Resilience	Low
2018	2020	Project for the Introduction of the Nationwide Early Warning System (NEWS) and Strengthening Disaster Communication	Ministry of Meteorology, Energy, Information, Disaster Management, Environment, Climate Change and Communication	Tonga	No	Japan, JICA, Tonga $56 million pa'anga	$ 56.00	The project will provide, throughout Tonga, a disaster preparedness radio system, a sound alert system, and equipment and facilities to the Tonga Broadcasting Commission (TBC) so that warning and safety information for natural disasters can be promptly transmitted, thereby contributing to a mitigation in the destruction caused by natural disasters.	https://www.jica.go.jp/english/news/press/2018/180621_01.html	https://reliefweb.int/report/tonga/project-introduction-nationwide-early-warning-system-news-and-strengthening-disaster	Warning	Medium
2018	2021	Project to Support Strengthening Water Supply Service on Nadi/Lautoka Regional Supply	Water Authority of Fiji	Fiji	No	Japan, JICA	$ 21.00	To provide consistent safe drinking water supply 24/7 in Fiji.	https://www.jica.go.jp/fiji/english/office/topics/press180125.html	In Progress	WASH	High
2018	2020	Pro-Resilient Fiji – Strengthening climate resilience of communities for food and nutrition security	FAO	Fiji	No	European Commission - Euro 2.8 million	$ 3.11	The objective of the project is to structurally and sustainably reduce food and nutrition insecurity derived from the negative impact of climate change induced disasters by tackling the root and underlying causes of vulnerability. It will do so by strengthening the capacity of El Nino-affected communities; and village, provincial and national governments to identify climate risks and vulnerabilities, strengthen Early Warning Early Action (EWEA) systems.	https://ec.europa.eu/europeaid/projects/pro-resilient-fiji-strengthening-climate-resilience-communities-food-and-nutrition-security_en	https://reliefweb.int/report/fiji/pro-resilient-fiji-strengthening-climate-resilience-communities-food-and-nutrition In Progress	Food	Low

Start Year	End Year	Project Title	Agency	Location	Regional focus	Funders	Budget ($US million)	Aim	Report - Website	Findings	Theme	Relevance
2016	2019	Regional Ridge to Reef in Pacific Island Countries	Applied Geoscience Commission, Pacific Community	Cook Islands, Federated States of Micronesia, Fiji Islands, Kiribati, Nauru, Niue, Palau, Papua New Guinea, Marshall Islands, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu.	Yes	UNDP - GEF USD 0.928 million	$ 0.93	To test the mainstreaming of 'ridge-to-reef', climate resilient approaches to integrated land, water, forest and coastal management in Pacific Island Countries through strategic planning, capacity building and piloted local actions to sustain livelihoods and preserve ecosystem services.	http://www.pacific.undp.org/content/pacific/en/home/operations/projects/resilience-sustainable-development/regional-r2r.html	In progress	Resilience	Medium
2015	2020	Regional Sustainable Energy Industry Development Project	Pacific Power Association	Fiji, Kiribati, Marshall Islands, Micronesia, Federated States of, Nauru, Palau, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu, Papua New Guinea	Yes	World Bank Group - USD $5.66 million	$ 5.66	The objective of the Regional Sustainable Energy Industry Development Project is to increase the data availability and capacity of power utilities of the Pacific Island Countries and Papua New Guinea (PNG) to enhance their ability to incorporate and manage renewable energy technologies and long-term disaster risk planning.	http://projects.worldbank.org/P152653?lang=en	In Progress https://www.ppa.org.fj/seidp-background/	Resilience	Low
2018	2022	Safer, Cleaner Water and Sanitation for Solomon Islanders		Solomon Islands	No	World Bank & ADP	$ 15.00		https://www.worldbank.org/en/news/press-release/2019/05/16/safer-cleaner-water-and-sanitation-for-solomon-islanders		WASH	
2015	2017	Scaling up eco-sanitation in the Outer Islands of Tuvalu	Tuvalu	Tuvalu	No	European Commission - Euro 0.539 million	$ 0.60	The project aims at achieving sustainable household sanitation services provided at households in selected outer islands of Tuvalu, accompanied by a sustainable transformation of hygiene and sanitation practices in the target households and communities.	https://ec.europa.eu/europeaid/projects/scaling-eco-sanitation-outer-islands-tuvalu_en	Cannot find outcomes?	WASH	Medium
2015	2019	Sector reform for rural WASH (Budget Support)	Solomon Islands Government	Solomon Islands	No	European Commission - Euro 13 million	$ 14.43	The programme supports the government of Solomon Islands to improve deliverance of appropriate WASH infrastructures/programmes and allow access for rural people.	https://ec.europa.eu/europeaid/projects/sector-reform-contract-rural-wash-budget-support_en	Cannot find outcomes?	WASH	High

Start Year	End Year	Project Title	Agency	Location	Regional focus	Funders	Budget ($US million)	Aim	Report - Website	Findings	Theme	Relevance
2018	2022	Solomon Island Communities Build Potable Water Systems to Improve Livelihoods	Ministry of Agriculture and Livestock Development; Ministry of Development Planning and Aid Coordination; Solomon Islands	Solomon Islands	No	World Bank, AUSAID, EU, IFDA	$ 15.00	Today in Bolava, however, stand 20 new water tanks, each holding up to 2,000 litres of water. A new rainwater catchment and storage system, developed and operated by the community itself, is now in place.	https://www.worldbank.org/en/news/press-release/2019/05/16/safer-cleaner-water-and-sanitation-for-solomon-islanders	Today in Bolava, however, stand 20 new water tanks, each holding up to 2,000 litres of water. A new rainwater catchment and storage system, developed and operated by the community itself, is now in place.	WASH	High
2011	2011	Solomon Island Water Sanitation and Climate Outlook	SOPAC	Solomon Islands	No	Australia	$ 0.10				WASH	
2014	2019	Solomon Islands Water Sector Adaptation Project	MMERE	Solomon Islands	No	UNDP	$ 6.80				WASH	
2018	2024	South Tarawa Water Supply Project	Ministry of Finance and Economic Development	Kiribati	No	Asia Development Bank - Green Climate Fund - USD 28.6 million	$ 28.60	The proposed South Tarawa Water Supply Project (the project) is committed to supplementing existing water shortages and infrastructure improvements, by offering an opportunity for all residents on South Tarawa access to safe water.	https://www.adb.org/sites/default/files/project-documents/49453/49453-001-eia-en.pdf	https://www.greenclimate.fund/projects/fp091	WASH	High
2017	2020	Strengthening Hydro-Meteorological and Early Warning Systems in the Pacific.	Australia, New Zealand, Indonesia and Fiji as well as from the Secretariat of the Pacific Regional Environment Programme (SPREP)	Fiji and the countries that the RSMC Nadi is serving, namely Kiribati, Niue, Cook Islands and Tuvalu, with some services extending to Vanuatu, Samoa, Tonga, the Federated States of Micronesia, Solomon Islands, Palau, Nauru, Marshall Islands and Tokelau	Yes	Climate Risk and Early Warning Systems (CREWS) initiative's multi-donor trust fund - US$2.5 million	$ 2.50	The project seeks to strengthen resilience and more effective, people-centred early warnings through predictions provided by global and regional (RSMC) centres, which are made available to countries in a manner that supports their own forecasting requirements.	https://public.wmo.int/en/resources/meteoworld/new-projects-strengthen-disaster-risk-reduction-and-climate-adaptation		Resilience	
2017	2021	Strengthening Hydro-Meteorological and Early Warning Systems in the Pacific.	Australia, New Zealand, Indonesia and Fiji as well as from the Secretariat of the Pacific Regional Environment Programme (SPREP)	Fiji and the countries that the RSMC Nadi is serving, namely Kiribati, Niue, Cook Islands and Tuvalu, with some services extending to Vanuatu, Samoa, Tonga, the Federated States of Micronesia, Solomon Islands, Palau, Nauru, Marshall Islands and Tokelau	Yes	Climate Risk and Early Warning Systems (CREWS) initiative's multi-donor trust fund - US$2.5 million	$ 2.50	The project seeks to strengthen resilience and more effective, people-centred early warnings through predictions provided by global and regional (RSMC) centres, which are made available to countries in a manner that supports their own forecasting requirements.	https://public.wmo.int/en/resources/meteoworld/new-projects-strengthen-disaster-risk-reduction-and-climate-adaptation	In progress	Warning	Medium

Start Year	End Year	Project Title	Agency	Location	Regional focus	Funders	Budget ($US million)	Aim	Report - Website	Findings	Theme	Relevance
2012	2015	Supporting Climate Change Adaptation for the Samoan Water Sector	Samoa	Samoa	No	European Commission - Euro 3 million	$ 3.33	Improvement of the Drainage System in the Central Apia Business District.	https://ec.europa.eu/europeaid/projects/supporting-climate-change-adaptation-samoan-water-sector_en	Samoa has developed a framework of strategies, plans and governance structures that are considered best practice in the Pacific region. Climate change adaptation is reflected as a priority in many high-level plans and strategies. Samoa's vision is to improve quality of life for all its inhabitants through seven key development priorities, including environmental sustainability and disaster risk reduction.	Climate change	High
2013	2014	Sustainable Integrated Water Resources and Wastewater Management Project in Pacific Island Countries	SOPAC, United Nations Environment and Development Programmes (UNEP and UNDP)	Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu	Yes	Global Environment Facility (GEF) - USD 10.7 million	$ 10.70	To improve water resources management by focussing on best practices and demonstrations of Integrated Water Resources Management (IWRM) wastewater management and Water Use Efficiency (WUE) approaches and plans.	http://www.pacific-iwrm.org	From innovative community engagement techniques and enhancing community capacities to introducing new waste-reduction technologies and developing water-related polices; these stories show how the projects are positively impacting on the communities and generating a deeper understanding of IWRM across the Pacific.	WASH	High
2010	2010	The Pacific IWRM National Planning Programme	SOPAC	(Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu	Yes	European Union - Euro 2.8 million	$ 3.11	The programme specifically responds to theme five of the Pacific Regional Action Plan on Sustainable Water Management on "Institutional strengthening: Policy, Planning and Legislation" and to the implementation of the seventh Millennium Development Goal on environmental sustainability "to develop integrated water resources management and water use efficiency plans".	http://www.pacificwater.org/pages.cfm/water-governance/integrated-water-resource-management/pacific-iwrm-programme/the-pacific-iwrm-national-planning-programme/	Cannot find outcomes/findings statement?	Water resources	High
2019	2022	Towards Climate Change Resilience II: traditional knowledge-based adaptation and water security in Utwe Biosphere Reserve (Kosrae, Federated States of Micronesia)	UNESCO Office in Apia	Federated States of Micronesia	No	UNESCO - Towards climate change resilience	$ 9.00	To ensure that the knowledge produced and acted upon throughout the project is grounded in an on-going and relatively equal exchange between scientific knowledge and traditional knowledge.	http://www.unesco.org/new/index.php?id=137314#_ftn1 and https://www.sprep.org/news/federated-states-micronesia-launch-their-first-adaptation-fund-project-enhancing-climate	In Progress	Climate change	High

Start Year	End Year	Project Title	Agency	Location	Regional focus	Funders	Budget ($US million)	Aim	Report - Website	Findings	Theme	Relevance
1999	2000	Updating Wetlands Inventories in the Oceania Region	SPREP	Palau, Vanuatu and Kiribati	No	AusAID - Department of the Environment - AUD 40K	$ 0.03	To update the wetland inventories for the Oceania Contracting Parties involved; strengthening the baseline state of knowledge of wetlands in these countries.	https://www.environment.gov.au/marine/international-activities/sprep-projects and http://archive.wetlands.org/Portals/0/publications/Report/WI_GRoWI-Oceania_1999.pdf	The project built national capacity to conduct future wetland inventory updates, and to use information collated in the inventory process in national decision making.	Monitoring	Medium
2014	2018	Water and Sanitation in Kiribati outer islands (KIRIWATSAN II)	Secretariat of the Pacific Community (SPC)	Kiribati	No	European Development Fund - Euro 3.185 million	$ 3.54	This Action will focus on increased access to safe and sustainable water and sanitation and reduce WASH related diseases in Gilbert outer island group.	https://ec.europa.eu/europeaid/node/117306_fr	Over 9,000 people in 35 villages across the 16 outer islands of the Gilbert group in Kiribati now have improved access to water and sanitation facilities as a result of a five-year water and sanitation project.	WASH	High
2016	2022	Water and sanitation sector policy support programme	Samoa	Samoa	No	European Commission - Euro 17.1 million	$ 18.98	The Specific Objective of the Action is to provide financial assistance to Samoa to support the implementation of Samoa water and sanitation policy Water for Life 2012 to 2016 strategic plan and its successor. This plan has as its specific objective the supply of "Reliable, clean, affordable water and basic sanitation with the framework of Integrated Water Resources Management, for all people in Samoa to sustain health improvements and alleviate poverty". This supports the national goal as stated in the Strategy for the Development of Samoa 2012-2016 which is "For every Samoan to achieve a better quality of life".	https://ec.europa.eu/europeaid/projects/water-and-sanitation-sector-policy-support-programme_en	In Progress	WASH	High