Institute for Sustainable Futures

Sustaining rural water services against climate change in Vanuatu: A project brief

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This project brief is based on doctoral research on the ways in which community-managed water services are affected by and sustained against climate change disturbances. The research engaged community members and local government authorities in two rural case study sites in Sanma and Malampa provinces from July to December 2016. The research was supported by an Australian Government Research Training Program Scholarship.

The brief is intended for relevant Government of Vanuatu authorities and other Vanuatu-based stakeholders. It outlines problems that climate change potentially creates for rural water services in Vanuatu and provides advice on what can be done differently to address climate impact challenges.

About the author

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Acknowledgements

Thank you to all the women and men of Namoru, Uripiv, and the Government of Vanuatu that generously gave their time to participate in the research project that produced this brief. Thank you to Tiffany Vira who acted as a research assistant and interpreter in the field. Thanks to Juliet and Willetts and Joanne Chong for their inputs and feedback on the research project.

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Cite this documents as:

ISF-UTS 2018, ‘Sustaining rural water services against climate change in Vanuatu: A project brief’, ISF-UTS, Sydney

How does climate change impact rural water services?

Climate change and its effects

Indisputable scientific evidence shows that climate change is occurring worldwide. Climate change refers to statistically significant changes in the properties of the climate (e.g. temperature and rainfall variation) that persist for long periods of time. Global climate change is primarily driven by global warming caused by an increase in greenhouse gases (e.g. carbon dioxide, methane, and nitrous oxide) released into the air. The increase in greenhouse gases mostly comes from growing populations and increased industrial activity in large countries. Climate change can be slowed if the biggest polluters of the world decrease the amount of greenhouse gases that they produce. However, too much greenhouse gas has already been released and it is now inevitable that some degree of climate change is developing.

Effects of climate change in Vanuatu are already taking place. Measurements of annual mean, maximum, and minimum temperatures show significant increases since 1948. Satellite data shows that sea levels are higher than before. Increased carbon dioxide in the atmosphere has caused the ocean around Vanuatu to become more acidic. Effects of changes in the climate have far-reaching potential to impact resource systems and services in Vanuatu, including water services.

Climate projections for Vanuatu

Future changes in the climate are difficult to predict accurately at small scales. It is known that the climate in Vanuatu will continue to change, but in the ways in which it will change are less clear. Climate scientists have used the best data available to create models for predicting the most likely ways that climate will change in Vanuatu over the course of the 21st century including[1]:

- Annual mean temperature and the number of extremely hot days will increase
- The number of days with extreme rainfall will increase
- Sea level will continue to rise
- Tropical cyclones will become less frequent but more intense

However, climate change makes it more and more difficult to predict what the climate will be like and it is expected that the climate in Vanuatu will become increasingly variable. Furthermore, El Niño and La Niña effects are likely to continue to cause considerable variation in the climate from year-to-year. It is important to consider the wide range of potential impacts that different climate scenarios could have on rural water supplies.

[1] See http://nab.vu/sites/default/files/documents/15_PACCSAP-Vanuatu-11pp_WEB.pdf

Physical, social, and environmental impacts on rural water services

Climate change has the potential to impact rural water services in many different ways. One way to look at the different impacts is to categorise them in terms of physical, social, and environmental impacts.

Physical impacts

Understanding the physical impacts involves thinking about the ways in which climate change effects can cause hazards that physically threaten the functionality of water supply infrastructure. Potential impacts that climate hazards can have on water supplies include the effects of droughts (or dry spells), floods, cyclones or storms and saline intrusion. The **risk** that these hazards pose for the water supplies depends on the **exposure** and **sensitivity** of the water supply to the specific hazard. The higher the exposure and sensitivity a water supply has to a specific hazard, the higher the risk. Taking action to reduce the exposure or sensitivity of the water supply to a hazard is known as **risk management**.

Physical impacts are important to consider because water systems in rural areas of Vanuatu are often old or poorly built. Increased stress from climate hazards could reduce the functionality of poor infrastructure more frequently or cause it to fail permanently. Some potential impacts of climate hazards on different types of water supply systems are listed in the table below.

Examples of impacts of climate hazards on different types of rural water systems

	Drought or dry spell	Floods	Cyclones or storms	Saline intrusion
Springs	Water production slows or stops completely	Flood water can spill into and contaminate unprotected springs	Debris from storms can clog the intake	Typically at higher elevations and not affected
Wells	Wells are slower to refill and more likely to become salinized	Flood water can spill over walls into well or carry contaminants underneath the ground and into the well	Debris from storms can fall into the well	Well water can be salinized by storm surges, over-abstraction, or sea-level rise
Boreholes	Water production may slow but performs better than springs or wells	Flood water can spill into boreholes if they are not properly sealed	High winds can damage pumps	Groundwater can be salinized by storm surges, over-abstraction, or sea-level rise
Rainwater harvesting	Rainwater tanks may quickly empty; roofs become dusty or dirty and contaminate tanks when rain starts again	Flood water can spill into underground tanks	High winds can damage roofs, gutters, and tanks	Typically not affected
Piped systems	Lower water flows may create negative pressure in the pipes which allows contamination to enter	Pipes can be damaged by floods and contaminated water can enter through leaks in joints	High winds can damage pipes and standpipes	Saline water can intrude through joints of pipes that are close to the coast

Key terms and their relevance for water services

Hazard: A physical event, trend, or impact as a result of climate change that threatens to disrupt water access now or in the future. For example, a drought is a hazard that may be influenced by future climate change.

Risk: The potential (usually negative) consequence for water access that a particular hazard creates. For example, flooding (a hazard) creates the risk of microbiological contamination to open wells. The level of risk is determined by the exposure and sensitivity of a water service to a specific hazard.

Exposure: The degree, duration, and/or extent to which a water system is in contact with a hazard. For example, water supplies located close to the coast are more exposed to storm surges than water supplies further away from the coast.

Sensitivity: The degree to which a system is modified or affected by a hazard. For example, an unprotected spring is more sensitive to flooding from intense rainfall than a protected spring.

Risk management: Actions to reduce the risks that climate hazards create for water supplies by reducing the exposure or sensitivity of the water supply to an identified hazard

Adaptive capacity: The ability people to adjust to potential damage, take advantage of opportunities, or respond to consequences from climate change to maintain water access.

Social impacts

Although often overlooked in the water, sanitation, and hygiene (WASH) sector, climate change also has potential consequences for **social sustainability**. Socially sustainable communities are equitable and inclusive, and enable their members to support one another to meet basic needs, uphold human rights, and ensure good quality of life.

Women and **vulnerable** groups (such as the poor and people living with disabilities) are often affected more than others when rural water supplies are not functioning properly. If climate change causes rural water supplies to stop functioning more frequently, women and vulnerable groups are likely to suffer more than others. This can lead to higher inequality and worsened social sustainability of rural water services.

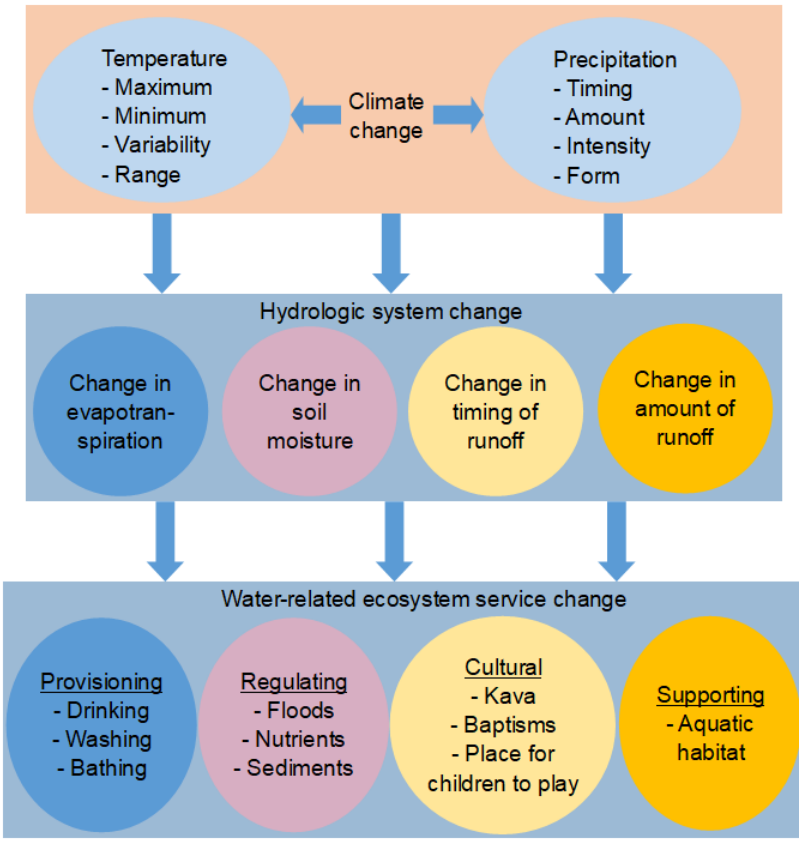
Communities are better able maintain water access against the challenges of climate change if their members have high **adaptive capacity**. Many factors contribute to levels of adaptive capacity in Pacific island communities (see page 9). Social impacts are important to consider because vulnerable groups in Vanuatu have lower adaptive capacity than others, which means they require special support to access water against climate change impacts.

Environmental impacts

Environmental systems, on which safe water supplies depend, are also affected by climate change impacts. Environmental systems (including water bodies, plants, and soil) help **purify, store, and regulate** the flow of freshwater which creates naturally available sources of clean water for rural communities. Climate change has potential to harm these environmental systems which can consequently affect the quantity, quality, and flow of natural water sources.

Stress on environmental systems from climate change interacts with **man-made activities** to affect water resources. Changes in the climate can cause changes in parts of the water system like how quickly water dries up, how much water goes into the soil, and how much water stays on top of the ground. These parts of the water system are also affected by man-made activities that remove native trees and plants, compress the soil to make it harder, and introduce pollution (e.g. from toilets). The combination of climate change stress and human activities harm the natural ability of the environment to purify, store, and regulate the flow of water for communities to use.

Environmental systems that produce clean water can be **ecologically resilient** against the effects of climate change. This means healthy environmental systems are better able to continue producing clean water as they are exposed to climate hazards. However, ecological resilience is reduced when trees and plants is are removed for gardens and farms (e.g. coconut plantations), water catchments are split by roads, and pollution is introduced.



Changes in the climate affect natural hydrologic systems which in turn affects ecosystem services to human populations

Source: Adapted from Chang, H. & Bonnette, M. R. 2016. Climate change and water-related ecosystem services: impacts of drought in California, USA. *Ecosystem Health and Sustainability*, 2(12).

Examples of climate challenges facing rural water services

Namoru case study

Namoru community has a population of approximately 400 people, and is located on the southern end of the island of Espiritu Santo. The primary water supply for Namoru is a gravity-fed piped system which is accessed via 24 separate standpipes. Water for this supply comes from an unprotected spring in the hills behind the village. The water supply was constructed by the government in the 1980s and managed thereafter by a water committee. The committee consists of six elected volunteers from the community who are changed periodically. The community also collects water from two secondary sources: a spring-fed stream that runs along the northeast corner of the village and the Wailapa River located approximately 700m east from the main entrance of the village. Water is retrieved from both of these sources using containers.

An unprotected spring is the source of water for the Namoru piped water supply

During heavy rainfall, the water in the piped supply often becomes dirty. The main reason for this is that the spring source is unprotected and exposed to surface runoff. Trees and plants uphill of the spring source were removed long ago for coconut plantations which may have increased surface runoff. There are also many leaks in the pipes which allows for dirty water to enter the pipes during heavy rainfall. **If climate change causes more days with heavy rainfall as predicted, the community will be exposed to more frequent water contamination threats.**

When functionality of the piped water supply is affected due to contamination from heavy rain or water scarcity during dry spells, households living on the far edges of the village are affected the most. Households living furthest away from the spring source have their water cut off first and these families have to walk the longest distances to find secondary sources of water. Many of these families live farther away from the village centre because they own less land and needed to build their houses on their plantations. **If climate change causes more problems for the functionality of the water supply, the more remote households will be impacted the most.**

"Taem tang i emti, mifala lo ples ia mo lowei nomo kasem wota. Olgeta antap nomo klosap lo paep we i kam"

"Paep ia i stap gat problem. Taem olgeta antap yusum tumas paep…lo ples ia i gat problem. Bae i no save ron, i ron smol nomo. Samtaem bae i no save ron nomo"

Community members describe water shortages on the far end of the village

"Taem wota i finis lo haos, mifala no save sendem pikinini from ol pikinini olegta i pleiplei. Ol papa oli no save stap go aot, olgeta dring kava, wokbaot wantaem. Nao mama wantaem oli kasem wota."

"Bae i no gud from se taem ol man i gud smol, be taem ol woman hemia bae oli go toktok from wota, bae oli no save lisin"

Women in Namoru describe water management challenges they face

Women are the primary managers of water at a household level in Namoru, but they have limited influence on decision-making about how the community should respond to climate hazards. At the time of the visit for this project, no women were included on the water committee. Further, women frequently stated that their voices were not listened to on matters of water. **Excluding women from decision-making processes weakens their adaptive capacity** for climate change because it lessens their influence on how the community secures water against climate hazards.

A secondary water source in Namoru community protected by thick vegetation

A spring-fed stream was an important secondary source of water for the community that is under threat from human activities and climate change. The stream was used by the community for bathing, washing clothes, and sometimes drinking.[2] Although the stream is currently suitable for non-potable purposes, it is under threat. **The community is increasingly removing trees and plants around the stream** to build new houses and plantations. Pit latrines are also beginning to be built closer to the stream. This land change and potential pollution could combine with climate change effects to cause algal blooms (*nalumlum*) to grow in the stream and make it unusable as a secondary source of water.

Uripiv case study

Uripiv is a low-lying limestone island located 3.5 km offshore of Lakatoro – the capital of neighbouring Malekula Island. Seven villages, a combined population of approximately 700 people, exist on Uripiv. The villages act as a single community in that they share resources, are close to one another, and make decisions together on community development issues.

Water needs in Uripiv are mostly met through the use of eight hand-dug wells and several dozen domestic rainwater harvesting systems spread throughout the community. The hand-dug wells vary in levels of development (e.g. well walls or concrete platforms). Water is retrieved from each well using rope and buckets, except for one well that is fitted with a solar pump. Groundwater in small low-lying islands like Uripiv (1.1 km^2 in size) typically exists as a shallow freshwater lens that sits above

[2] The stream is not safe for drinking, but during dry spells when the piped supply was disrupted, some households had no choice but to collecting water from drinking from the stream

seawater. The wells are informally managed collectively by the householders that used them. Storage receptacles for rainwater harvesting systems included pre-fabricated plastic tanks, in-situ underground cement tanks, and other locally sourced materials such as drums or barrels.

Water supplies in Uripiv are sensitive to droughts, heavy rainfall, and salinization. During droughts, rainwater tanks in the community become empty. During heavy rainfall, small floods causes pooling around the wells which sometimes spills into the wells and causes contamination. Increasingly variable rainfall in the future could cause these issues to become more severe or more frequent. Although evidence of sea-level rise was not documented in this project, the **wells on Uripiv are likely to be exposed to saline intrusion if climate change causes sea-level rise** in Uripiv in the future.

An underground rainwater storage tank (*lasitern*) built in-situ

Having access to multiple types of water sources in Uripiv gives flexibility to households for accessing water under different climatic conditions, but not all households can afford them. Households with rainwater harvesting systems use them during the rainy season when the wells are frequently contaminated by flooding, then switch to the wells in the dry season when rainwater tanks run empty. However, poorer households cannot afford domestic rainwater harvesting systems. Instead, they are either entirely dependent on the wells or need to ask permission from neighbours to use their rainwater. **Having low access to a variety of water sources weakens the adaptive capacity of the poorer households** to climate change.

Pooling around wells in Uripiv is common during heavy rainfall

> *"Naoia em i kam olsem solti. Ating from draesisen tumas, afta mekem se i no gat inaf wota. Sola i stap pulum, be i kam solti."*
>
> *"Bambae em i distroiem aelan from aelan i gat sos blo everiting. Wud mo everiting…mi no akseptum from we aelan em i mas gat wota andanit lo em blo produsem ol everiting."*

Uripiv community members comment on the water salinization problem

Increasing population and rising water demands on the island put increased stress on the shallow groundwater lens. One of the villages installed a solar pump on their well that previously provided pure freshwater. After months of using the solar pump regularly, the well is becoming salty because freshwater is being pumped out faster than the rain can add freshwater back into the ground. Climate change will also likely influence how quickly rainfall refills the freshwater lens and consequently make this problem worse.

What can be done differently

Accounting for climate change in rural water service plans requires different strategies than those found in usual WASH programmes. These strategies contribute to building capacity of rural water services in two areas: (i) **climate risk management** and (ii) **absorbing unpredictable climate-related disturbances**. Importantly, the potential for climate change to **affect some people more than others** needs to be considered.

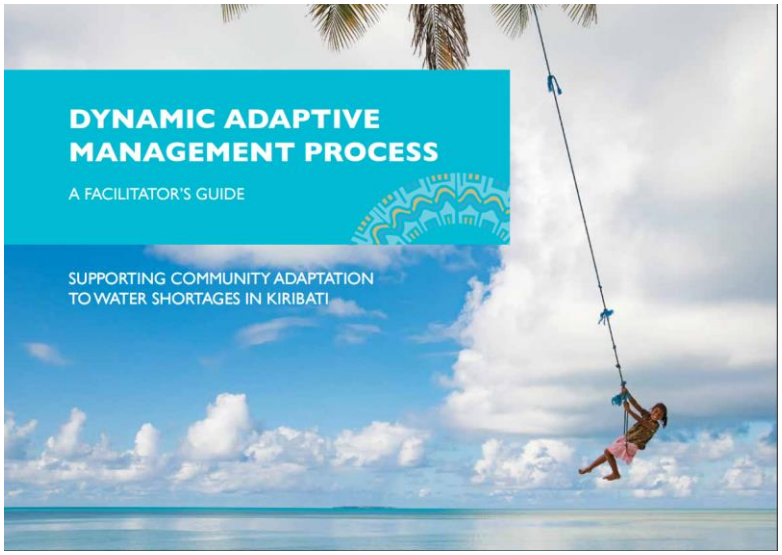
As introduced earlier in this brief, risk management involves identifying what hazards a rural water supply is exposed to, how sensitive the water supply is to those hazards, and what can be done to reduce the exposure and/or sensitivity. This is very similar to the Water Safety Planning (WSP) process. However, normal WSP processes usually focus on existing risks to water quality. Managing climate risks additionally involves considering more severe or frequent climate hazards in the **future** and the risk they pose to water availability, physical accessibility, and affordability (not just quality). Climate risk management is important because, even if climate hazards are not major disrupters right now, they are likely to more frequently affect rural water supply functionality in the future.

There are many resources available for designing climate risk management strategies including some particularly useful ones at https://www.gwp.org/en/WashClimateResilience/. Tools on this website provide advice on strategies for identifying climate risks, choosing options to manage the risks, how to mainstream climate risk management into WASH plans and strategies, and monitoring progress. Ideally, **every rural community should have a climate risk management strategy** for their water supply that is revised periodically as new information comes in about climate change.

Basic framework for planning for climate change risks

Resilience to climate change is also about building flexibility and empowering rural communities. Flexibility in rural water services means that there are multiple options for maintaining water access in case certain parts of the service system (e.g. the water resource, the infrastructure, or the management team) fail. Empowering rural communities involves providing them with the right assets, capabilities, and supportive institutions. Flexibility and empowerment are important because not all climate risks and can be predicted and planned for. **Communities that are more flexible and empowered can better handle whatever unexpected disturbances come their way**.

Resources on building resilience of rural water services to climate change through improved flexibility and empowerment are still under development. One way to build flexibility is to support communities to develop adaptive management plans that help them to make decisions about how to safely access water when climate hazards unexpectedly cause problems. The Dynamic Adaptive Management Process, developed in Kiribati but also useful in Vanuatu, is one such resource that helps in this regard:



Facilitators guide to the dynamic adaptive management process
https://www.uts.edu.au/sites/default/files/FacilitatorsGuideCommunityAdaptationKiribati.pdf

Another way to build flexibility is to encourage communities to develop multiple, decentralised water systems rather than become dependent on a single supply. This makes it less likely that a single climate hazard will eliminate all options for safely accessing water.

Communities can be empowered to respond to climate change in many ways. Recent research[3] has identified factors that enable the adaptive capacity Pacific island communities. These are listed in the table below along with an explanation of their relevance to water services.

Factors that enable adaptive capacity in Pacific island communities[3]

Factor	Sub-factor	How it builds adaptive capacity in relation to water
Human capital	Traditional and modern skills	People combine their traditional skills and knowledge of the land with modern knowledge on safe drinking water to identify adaptation options
	Population health	Physically healthy people have an easier time accessing water
	Change agents	Water "champions" can lead their community to identify solutions to new water problems

[3] Table adapted from Warrick, O., Aalbersberg, W., Dumaru, P., McNaught, R. & Teperman, K. 2017. The 'Pacific Adaptive Capacity Analysis Framework': guiding the assessment of adaptive capacity in Pacific island communities. *Regional Environmental Change*, 17(4), 1039-1051.

Social capital	Community diversity	When different people have an opportunity to make their voice heard, more ideas can be drawn on to improve water management
	Leadership	Community leaders can motivate the community to work together to maintain water access
	Strength of collective action	Communities that work together can help their members to overcome challenges in accessing water
	Support services and networks	Government and non-government organisations provide assistance to communities that are struggling to access water
	Governance	Water management decision-making processes that are effective, fair, and transparent are more likely to build equality
Belief systems, worldviews, and values	Traditional and modern values	Christian, *kastom*, and human rights values can motivate community members to help one another to access water
	Willingness to accept change	Communities that are willing to try to new ideas for accessing and managing water can adapt
	Perception of self-efficacy	People that believe they can make difference are more likely to take action to help sustain water access for their community
	Long-term thinking	Communities that think about long-term, future risks to their water services are more likely to act on climate change
	Independence	Communities that are not entirely dependent on external organisations for making sure they can access water will help themselves
Resources and distribution	Land access	The availability of land on which to develop water supplies
	Fisheries access	Communities that have access to fishing areas have less to worry about and can focus on maintaining water access
	Income access	Communities with more money can afford to make adaptation to their water systems
	Infrastructure and services	Communities with better roads, telecommunications, schools, etc. can obtain better resources for managing their water supplies
	Water resources	Healthy water resources and water catchments are more resilient to climate change than degraded ones

Options	Adaptation options	Communities need ideas and resources on how they can adapt their water services
	Livelihood options	Communities that have different ways of earning income can better maintain funds for maintaining the water service
	Food acquisition options	Communities have different ways of getting food so they do not need to worry about hunger and can focus on maintaining the water service
Information and awareness	Access to relevant information	Communities need access to information about climate change and how it affects their water service
	Ability to analyse information	Communities understand the information they are given about climate change and know how to use it to make decisions about water management
	Communicated risks and importance	The risks that climate variability and climate extremes pose to water services are communicated to communities so they can respond accordingly
	Past experience dealing with climate events	Communities that have a history of maintaining their water access against disasters can draw on their experiences to adapt their water services as needed

It is also important to recognise that climate change does not affect everyone equally. Some people, often those with lower adaptive capacity, will face more challenges in accessing water against climate change. In the same community, or even within the same household, different people may have different needs for ensuring they can still maintain water access. Therefore, when seeking to support rural communities in adapting their water services to climate change, it is important to ask the following questions:

1. ***How does climate change affect water access for some people and places differently than for others? Why?***

2. ***Why are some groups of people better able to cope with and adapt to climate impacts on water better than others?***

3. ***What are the potential consequences for fair water access in Vanuatu as a result of these above differences?***

4. ***In what ways can climate change reinforce existing inequalities in water access?***

What role can the Government of Vanuatu play?

Communities should not be expected to do all the work of ensuring water access against climate change alone and **it is appropriate for the Government of Vanuatu to provide assistance**. It is not realistic to expect communities to sustainably manage water services on their own. Further, the Human Rights to Water and Sanitation framework, which is endorsed by the Government of Vanuatu, names the government as ultimately responsible for ensuring that citizens can access sufficient amounts of water that are safe, affordable, physically accessible, and acceptable to users.

There are a number of ways that the Government of Vanuatu can provide support to communities to ensure their water access is maintained against the effects of climate change.

Department of Water

Emphasise climate hazards during the DWSSP process: When Drinking Water Safety and Security Plans (DWSSPs) are developed with communities, the potential for climate hazards to affect water availability, quality, and accessibility should be considered. Even if climate hazards are not major problems right now, future climate change could make them bigger issues. Government of Vanuatu authorities can bring in outside knowledge about climate change and work with communities to identify current and future risks and possible options for managing them.

Prioritise the needs of vulnerable groups during the DWSSP process: When considering how climate hazards may affect the water system, also think about how different user groups (e.g. women or people living with disabilities) are affected by the hazards differently. Then, prioritise the needs of vulnerable groups when recommending risk management options.[4]

Develop climate hazard risk maps: Due to geography, some areas may be more prone to hazards like flooding, water scarcity, and salinization than others. If these areas are identified and mapped, data from the government water database can be used map water systems that are most at risk to climate hazards (e.g. unprotected springs located in flood prone areas or wells located close to the coast). The risks maps are also useful for informing local DWSSPs on what hazards are most significant.

Encourage the development and maintenance of multiple water sources: Communities having access to different types of water sources helps to ensure that at least one will function under different climate conditions. For example, in Uripiv, when intense rainfall caused the wells to become contaminated, many households could meet their needs through rainwater harvesting. When the rainwater tanks ran empty in the dry season, households could meet their needs through the wells. Importantly, multiple water source should be made available to all community members at all times.

[4] For more information on equitable Water Safety Planning, see: Winterford, K., Ross, K., Willetts, 2014. Water Safety Planning Equity Study: Synthesis Report of Four Case Studies in Asia. Available at https://www.uts.edu.au/sites/default/files/article/downloads/Water_Safety_Planning_Equity_Study_Synthesis_Report_DRAFT.pdf

Promote adaptive water management: When training communities and water committees on managing rural water services, aim to develop their skills in managing their water adaptively. This involves recognising how different climate conditions affect their water supply and taking action accordingly (e.g. conserving water during dry periods). Climate change will make rainfall increasingly variable, thus there is increased importance on changing water management practices to match the conditions.

Protect water resources locally: Climate change puts strain on water resources and ecosystems too. In addition to watershed management plans at larger scales, communities should be supported to protect and restore the natural environment around their local water sources. Healthier water-related ecosystems are better able to naturally purify water and regulate floods.

Coordinate with Area Secretaries and Area Councils: Rural communities require ongoing support from government to sustainably manage their water services against climate change. Area Secretaries and Area Councils represent the most decentralised and local form of government in Vanuatu. Department of Water authorities should aim to utilise these officials, and offer their own resources to help them, in order to more effectively support communities. For example, Department of Water Authorities could regularly check in with Area Secretaries to learn if any climate hazards are causing water issues in the area. Where funding is available, support area council members to provide information to the provincial level.

Department of Local Authorities

Include water and climate change questions in monitoring guidelines: The Risk Resilient Planning, Budgeting and Monitoring Guidelines for Sub-national Government are a useful way to monitor how communities are progressing in preparing their water systems for climate change. Potential questions to add to the monitoring guidelines include: i) Does the community have a DWSSP that emphasises climate hazards and the needs of vulnerable groups? ii) Can community members access multiple types of safe water sources? iii) Does the community have an adaptive water management plan? iv) Are there local water source protection zones?

Assist in funding capital water expenses following decentralization policies: According to the Decentralization Act and the Monitoring Guidelines for Sub-national Government, funding may be delegated for prioritised rural development projects. Many communities may not be able to afford upfront costs associated with managing climate risks or diversifying their water sources. Local government authorities can pay more attention to how they can assist with these costs following the procedures laid out in the relevant decentralization policies.

Facilitate connections between communities and supportive agencies: Area secretaries should have documented contact information of various local governmental and non-governmental agencies that can provide support to communities. Contact information of supportive agencies working in the area of water or climate change adaptation should be given to communities by Area Secretaries who can ensure that any ensuing projects are in line with decentralisation policies.

Focus on equality and empowerment of the most vulnerable in all projects: Communities that have high levels of equality and actively support their most vulnerable members have higher capacity to handle the challenges of climate change to all sectors, not just water. Planning of rural development projects should always consider ways in which the benefits of the project will extend to groups such as the poor and people living with disabilities. Projects should also seek to empower people that usually have less decision-making power, such as women and young people.

Ensure Area Council members are trained and funded to visit communities: In the two study areas from this research[5], many Area Council members were unsure of their responsibilities and had no funding for transportation to consult with communities on their needs. This was one of the main communication barriers that prevented communities from voicing their needs to government. Ensuring that Area Council members are in contact with community disaster and climate change committees and water committees will strengthen the links between communities and government.

Formalize water committees as legal entities: Rural water committees can better communicate with local government if by-laws are passed to formalise them as legal entities in line with draft National Water Policy. This will allow the government to enter agreements with the communities to ensure that water services are being delivered as climate change impacts continue to develop. For example, local government authorities can help these legal entities establish bank accounts, collect fees, and accept financial transfers from government that can be used to upgrade and protect their water supplies against climate impacts.

[5] South Santo Area One and Central Malekula