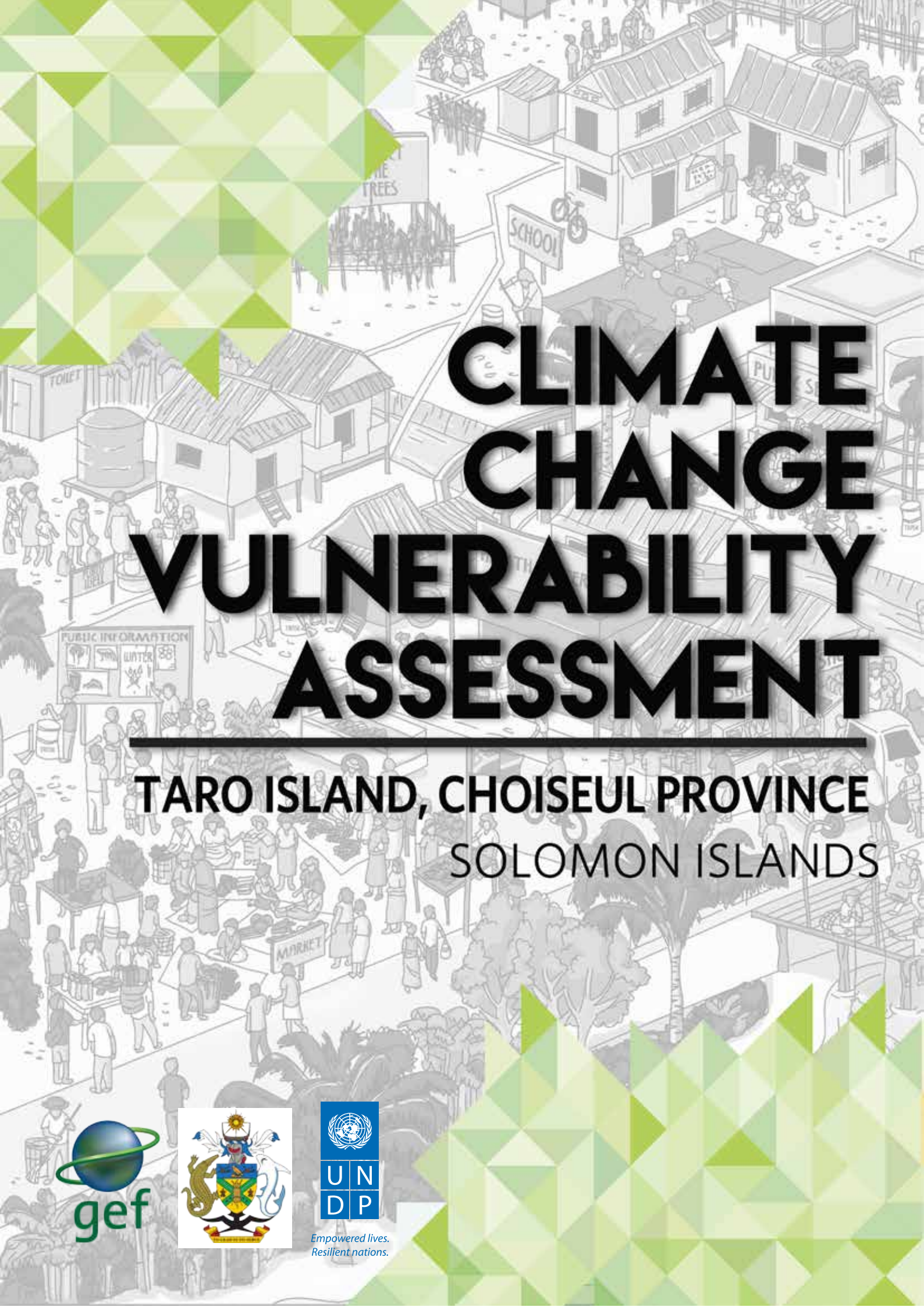

CLIMATE CHANGE VULNERABILITY ASSESSMENT

TARO ISLAND, CHOISEUL PROVINCE

SOLOMON ISLANDS

gef

UNDP

Empowered lives.
Resilient nations.

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ACRONYMS AND ABBREVIATIONS

CCVA	Climate Change Vulnerability Assessment
COP	Conference of the Parties
GEF	Global Environment Facility
IPCC	Intergovernmental Panel on Climate Change
LDCF	Least Developed Country Fund
LPA	Local Planning Area
MECDM	Ministry of Environment, Climate Change, Disaster Management and Meteorology
MHMS	Ministry of Health & Medical Services
MMERE	Ministry of Mines, Energy, and Rural Electrification
NAPA	National Adaptation Programme of Action
NGO	Non-Government Organization
RCP	Representative Concentration Pathways
SIWSAP	Solomon Islands Water Sector Adaptation Project
UNDP	United Nations Development Program
WASH	Water, Sanitation and Hygiene

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EXECUTIVE SUMMARY

CONTEXT AND TRENDS

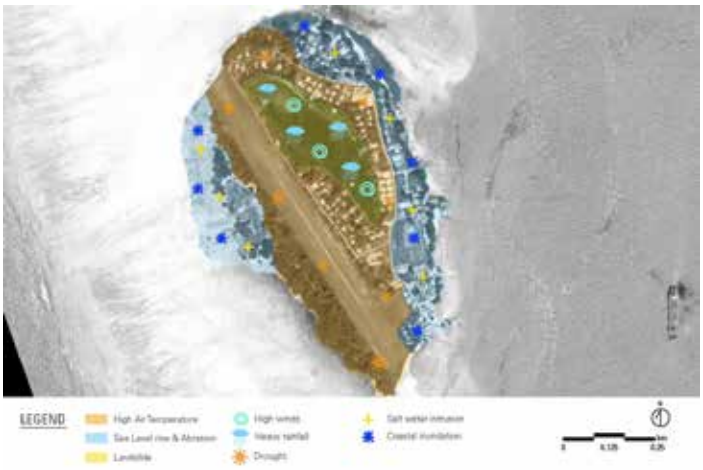
Taro is a town located on a small, flat coral island; it is also the provincial capital of the Province of Choiseul located in the far west of the Solomon Islands. The township was declared provincial capital in 1990 and since that moment it has grown with the location of government offices, public services, such as a hospital and school, and forestry and mining businesses. Taro's estimated population is 1,423 inhabitants, approximately 53% are male and 47% are female; 28% are youth and children *(Source: SIWSAP Project Document, 2014)*.

TRENDS

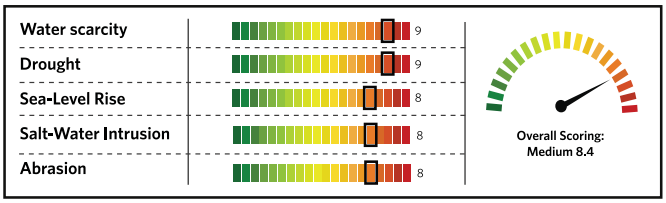
- OVER THE NEXT 20 YEARS IT IS LIKELY THAT THE EXTRACTION OF TARO'S CORAL REEFS, FOR BUILDING MATERIALS IS DAMAGING THE MARINE ECOSYSTEM AND POTENTIALLY UNDERMINES COASTAL DEFENSES.
- JOBS AND PUBLIC SERVICES WILL CONTINUE TO ATTRACT NEWCOMERS TO TARO BUT THERE IS LIMITED LAND FOR EXPANSION. IF POPULATION PRESSURES PERSIST NEW HOMES WILL CONTINUE TO BE BUILT IN THE SWAMP AREA, BUT POPULATION DENSITY IS LIKELY TO RISE.
- THE PROVINCIAL GOVERNMENT IS PLANNING TO INCENTIVIZE EXPANSION OF AN URBAN AREA TO THE MAINLAND, BY CREATING A LOCAL PLANNING AREA CALLED CHOISEUL BAY.

SUMMARY OF EXPOSURE

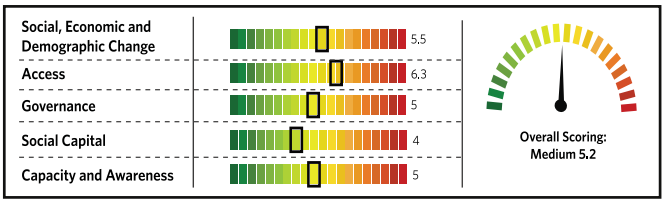
Since Taro is an island community it is exposed to a number of natural hazards; for the local population water scarcity and droughts are the most serious. These problems are particularly problematic for island communities like Taro where they cannot easily access water from the Mainland. Other important climate hazards identified are temperature rise, sea level rise, saltwater intrusion and coastal erosion. Changing climate conditions have long-term impacts, which can significantly affect the economy, raise costs, and make entire communities more vulnerable.



Summary of Exposure



Summary of Sensitivity



SUMMARY OF SENSITIVITY

Taro's sensitivity is medium, these are some of the points:

- **SOCIAL, ECONOMIC, DEMOGRAPHIC CHANGE:** THE FUTURE DEVELOPMENT OF THE PROVINCIAL CAPITAL IS HELD IN CHECK BY LIMITS TO GROWTH.
- **ACCESS:** THE ISOLATION OF TARO MEANS THAT SERVICES AND GOODS ARE DIFFICULT TO ACCESS AND ARE EXPENSIVE.
- **GOVERNANCE:** STRONG PROVINCIAL GOVERNMENT PROVIDES A SOLID BASIS FOR DEVELOPMENT BUT LOCAL GOVERNMENT IS LACKING.
- **SOCIAL CAPITAL:** THE COMMUNITY WORKS WELL TOGETHER BUT CONCERNS FOCUS ON GROWTH AND VISITORS.
- **AWARENESS:** AWARENESS ABOUT CLIMATE CHANGE IS LOW BUT CAPACITY IS GROWING

The following evaluation gives clear direction as to how different factors can be addressed, and sensitivity reduced.

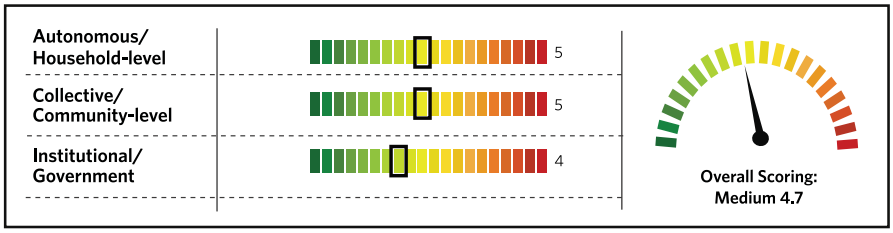
- **REGULATIONS:** DRAFTING LOCAL LAWS AND ORDINANCES GOVERNING BETTER WATER MANAGEMENT (SUCH AS GUIDELINES FOR WATER CONSERVATION AND RATIONING) WILL HELP ENSURE WATER RESOURCES ARE AVAILABLE DURING TIMES OF DROUGHT.
- **GOOD GOVERNANCE:** CLOSER COLLABORATION BETWEEN CIVIL SOCIETY, THE TOWNSHIP AND PROVINCIAL GOVERNMENTS CAN ENSURE THAT INFORMATION IS WELL KNOWN AND THAT COMMUNITY INPUTS ARE CONSIDERED.
- **PUBLIC CAMPAIGNS:** CAMPAIGNS ARE NEEDED, ESPECIALLY TO SHARE THE LOCAL PRACTICES WITH VISITORS.
- **GENDER MAINSTREAMING:** INCLUSION OF CONCERNS OF WOMEN, CHILDREN, AND OTHER DISADVANTAGED GROUPS IN ALL WASH ACTIVITIES.

SUMMARY OF ADAPTIVE CAPACITY

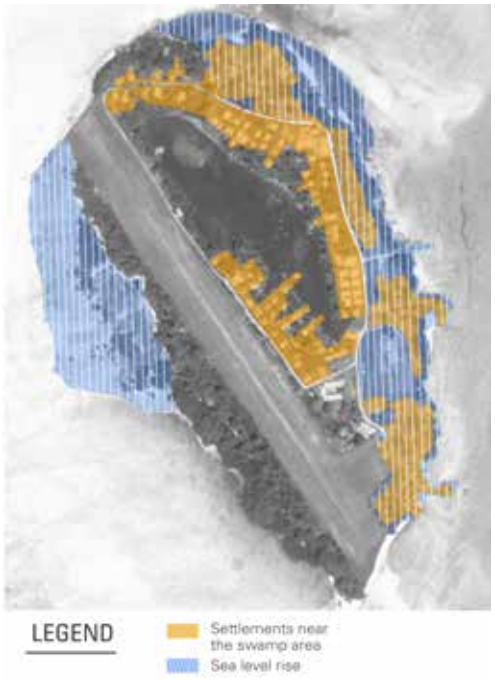
Adaptive capacity refers to the capacity, skills and organization that a community possesses to reduce vulnerability to climate change. There are actions at the household, community and institutional levels that can be done to increase adaptive capacity.

Some of these are:

- AT HOUSEHOLD LEVEL MEN AND WOMEN SHARE RESPONSIBILITIES – FOR EXAMPLE WOMEN ARE RESPONSIBLE FOR COOKING, CLEANING AND THE HOUSE, WHILE MEN ARE RESPONSIBLE FOR PHYSICAL JOBS LIKE CHOPPING FIREWOOD, FISHING, DIVING).
- THERE IS A GOOD CAPACITY IN THE COMMUNITY TO MAINTAIN WATER SUPPLY INFRASTRUCTURE, SUCH AS THE CAPACITY TO DIG WELLS AND FIX PUMPS.
- THERE IS STRONG CAPACITY, ORGANIZATION, AND WILLINGNESS FROM PROVINCIAL GOVERNMENT TO WORK WITH NATIONAL GOVERNMENT TO IMPLEMENT LOCAL WASH REGULATIONS .



SUMMARY OF VULNERABILITY



Taro is vulnerable to climate change not only due to its exposure to a variety of climate hazards, but also due to a number of man-made factors that make it sensitive.

- **MANAGING GROWTH:** BEING A SMALL SETTLEMENT ON AN ISLAND THE TASK OF MANAGING GROWTH IS ONE OF TARO'S BIGGEST CHALLENGES. THERE ARE LIMITED WATER RESOURCES, SERVICES AND INFRASTRUCTURE, WHICH ALREADY SEEM CLOSE TO BEING OVERSTRETCHED. THE ARRIVAL OF NEWCOMERS, AND TEMPORARY VISITORS, ALREADY IS INCREASING DEMAND FOR WATER BEYOND WHAT CAN BE HANDLED.
- **WATER SCARCITY:** WHAT MAKES TARO SO VULNERABLE IS THAT THERE ARE NO OTHER SOURCES --BEYOND GROUNDWATER AND RAINWATER – TO BE FOUND. THIS PUTS THE BURDEN ON INDIVIDUAL HOUSEHOLDS AND THE COMMUNITY TO CONSERVE WATER AND MANAGE IT APPROPRIATELY. THERE ARE INADEQUATE GOVERNMENT REGULATIONS, SERVICES AND PLANNING FOR TIMES OF SCARCITY.
- **GOVERNANCE CAN BE IMPROVED:** AT THE MOMENT THERE IS NOT ENOUGH OUTREACH TO RAISE AWARENESS, NOR GOVERNMENT ACTION (IN THE FORM OF LEGISLATION AND REGULATIONS) TO ENSURE THAT WATER MANAGEMENT IS SUSTAINABLE. GOVERNANCE CAN BE IMPROVED AT THE LOCAL LEVEL, AND THROUGH BETTER COORDINATION BETWEEN TARO AND PROVINCIAL GOVERNMENT.

POLICY RECOMMENDATIONS

- **RULES AND REGULATIONS GOVERNING WATER USE AND SUPPLY:** PROTECTION OF EXISTING WATER SOURCE, CATCHMENT AREAS AND EASEMENTS ARE NEEDED IN ORDER TO PRESERVE WATER SUPPLY SYSTEMS IN THE FUTURE.
- **A TOWN CLERK IS NEEDED TO RESPOND TO LOCAL ISSUES AND SUPPLY INFORMATION:** CLOSER COLLABORATION OF CIVIL SOCIETY, TOWNSHIP AND PROVINCIAL GOVERNMENT ARE IMPORTANT TO BUILD MORE TRANSPARENT GOVERNENACE SYSTEM.
- **IMPROVED RAINWATER-HARVESTING CAPACITY FOR TARO:** ADDITIONAL CAPACITY COULD BE ACHIEVED BY ADDING RAINWATER CAPTURE TO INDIVIDUAL HOUSES, BUT ALSO ON COMMUNAL BUILDINGS, LIKE THE CHURCH AND SPORTING FACILITIES.
- **IMPROVEMENTS OF FAMILY'S COLLECTIVE CAPACITY** ARE NEEDED TO ADAPT TO CLIMATE CHANGE, FOR EXAMPLE THE NEED BETTER INFORMATION SYSTEMS AND TRAINING ON EARLY WARNING APPROACHES, EVACUATION, WATER MANAGEMENT, AND WATER CONSERVATION MEASURES DURING TIMES OF STRESS.
- **STRENGTHENING WOMEN'S ROLES IN PROVIDING INFORMATION:** WOMEN PLAY A VERY IMPORTANT ROLE IN THE COMMUNITY IN SHARING INFORMATION, SO THEIR CAPACITY TO DO SO SHOULD BE STRENGTHENED.
- **CAMPAIGNS TO RAISE PUBLIC AWARENESS ARE NEEDED** FOR MORE EFFICIENT AND HEALTY USE OF WATER, PRESERVE NATURAL RESOURCES, AND TO STOP UNSUSTAINABLE PREACTICE LIKE BUILDING ON THE SWAMP, DUMPING TRASH IN NATURAL AREAS, AND MINING CORALS FOR BUILDING MATERIALS.

1. INTRODUCTION

The 2015 United Nations Climate Change Conference (COP21) held in Paris in December 2015 signaled a watershed moment in humanity's response to climate change. The outcome of this summit was a global resolution by governments to take urgent and immediate action in response to climate change impacts. Together they announced measures to diminish man's impact in causing global warming, and the implementation of adaptation steps to ensure a more resilient and sustainable future for communities across the world. Climate change finally is being taken seriously.

In some countries that sense of urgency is demanded more than others, because changing climate conditions are already being felt and putting local communities at risk. The Solomon Islands is one of those nations. It is at the frontline of climate change, and also efforts to respond to it. Being a low-lying nation made up of hundreds of islands in the Pacific Ocean the Solomon Islands are exposed to a number of climate hazards that include heavy rainfall, flooding, sea-level rise, droughts, tropical cyclones and strong winds.

In order to ensure a resilient future, one of the key priority actions for the country is to secure access to sustainable water supply, adequate sanitation and hygiene conditions, for all citizens wherever they are located. The importance of improving water resilience through integrated water resource management has been highlighted in a number of Solomon Islands' national policies and regional frameworks they are part of, including the Solomon Island National Climate Change Policy, the National Adaptation Programme of Action (NAPA), National Development Strategy 2015-2030, the Pacific Regional Action Plan on Sustainable Water and Wastewater Management, and the Pacific Island Climate Change Framework 2006 – 2015.

How do we go from national policy to local actions in enhancing water resilience in the Solomon Islands?

The Government of Solomon Islands has embarked on a four-year initiative called the Solomon Islands Water Sector Adaptation Project (SIWSAP), to improve the resilience of water resources. The initiative is in partnership with United Nations Development Program (UNDP), through financial support from the Least Developed Country Fund (LDCF), which is managed by the Global Environment Facility (GEF). The program responds to the impacts of changing climatic conditions, particularly for vulnerable communities in Solomon Islands.

SIWSAP's overall objective:

'To improve the resilience of water resources to the impacts of climate change in order to improve health, sanitation and quality of life, and sustain livelihoods in targeted vulnerable areas'.

The project is a collaborative partnership between several ministries of the Government of the Solomon Islands: the Ministry of Mines, Energy, and Rural Electrification (MMERE), the Ministry of Environment, Climate Change, Disaster Management and Meteorology (MECDM), and the Ministry of Health and Medical Services – Environmental Health Division. Whilst other projects have focused on the water sector have sought to improve coverage and sustainability of water supply in the Solomon Islands, SIWSAP is different in that it integrates climate change considerations in the vulnerability assessment. SIWSAP also builds on the provincial and community-based various climate change adaptation planning and mainstreaming initiatives that are taking place led by MECDM . It does so with an emphasis on medium-

Previous initiatives that SIWSAP CCVA is building on include: Choiseul Province Climate Change Vulnerability and Adaptation Assessment Report (2013); Honiara, Solomon Islands, Climate Change Vulnerability Assessment (2014); SWoCK Vulnerability and Adaptation (V&A) Assessment in Guadalcanal,Isabel, Makira, and Malaita (2012-2013); WASH and Climate Change Development – Strategy, technical brief; Community Drinking Water Safety and Security Planning Pacific Island Countries (2014 / 2015); SIWSAP PPG Pilot Site Reports (2013)

to long-term participatory planning, adaptive water management interventions, improved knowledge management, and governance related to water and sanitation. SIWSAP's ultimate goal is to enhance the livelihoods and empower resilient communities to better respond to climate change.

This Climate Change Vulnerability Assessment (CCVA) is one of the first steps of the participatory water sector adaptation planning process that aims to inform and initiate water resilience actions on the ground.

1.1. WHAT IS A CLIMATE CHANGE VULNERABILITY ASSESSMENT?

The Climate Change Vulnerability Assessment (CCVA) is a participatory process between citizens, communities, the provincial and national government of Solomon Islands, and local civil society organizations, to identify weaknesses and assess potential vulnerabilities to climate change, in particular as they relate to water, sanitation and hygiene. The CCVA is designed with two functions in mind: (i) to support a process of raising awareness and building understanding about climate change impacts; and (ii) to support the process of developing a participatory and evidence-based adaptation plan or mainstreaming adaptation into existing development and/or sectoral plans that will inform prioritization of current and future water sector adaptation implementation.

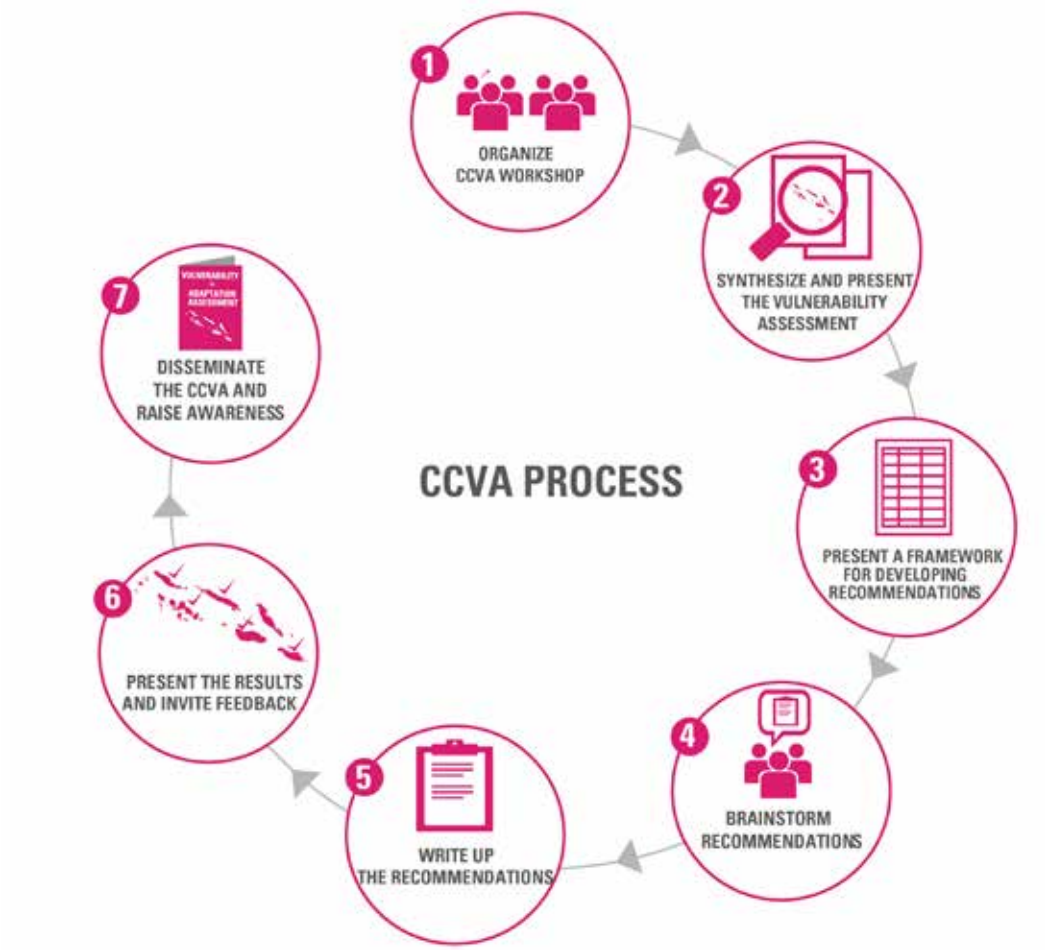


Figure 1: *Step-by-Step process diagram of the Climate Change Vulnerability Assessment (CCVA)*

Understanding about the causes and impacts of climate change is still limited in the Solomon Islands, so raising awareness is important because it allows citizens and governments to decide how to best prepare their communities and adapt to the threat of climate change. Developing a climate change adaptation plan is also essential because it engages people to think about the future of their community, and decide upon the most suitable portfolio of adaptation options are needed so they can achieve their development goals despite potential negative impacts from climate change.

Participation and involvement of many members of the community helps to not only include diverse views and opinions, but it also gives credibility and visibility to the process.

1.2. HOW TO USE THIS CCVA REPORT

This CCVA document is designed to communicate knowledge about climate change to two distinct audiences: firstly to residents and civil society members living in communities across the Solomon Islands, including women, children and the elderly; and secondly to government officials, development agencies, and policy decision-makers. It is designed to be read by individual readers, and also used in workshop gatherings for large numbers. There are two main features of the CCVA that are useful for raising awareness: colorful illustrations, which can be used to provoke reflection and facilitate discussion; and narrative text, that can be used by a facilitator to read aloud to participants of workshops, telling stories about climate impacts, and help encourage reflection and discussion.

Efforts to communicate climate change often fail to reach wide audiences because they often present information in complex and scientific terms that citizens and community members struggle to relate to and absorb. This CCVA is designed to generate discussion and reflection, and lead its audience towards thoughtful consideration about how to make their communities more resilient and better adapt to climate change.

The main concept related to assessing vulnerability is that while exposure to climate hazards, such as heavy rainfall, flooding, sea-level rise, strong winds, droughts and tropical cyclones, is difficult to alter, we can change our sensitivity and adaptive capacity to them. The CCVA will further explain those terms and concepts, but it hopes to convince people that reducing vulnerability to climate change is in our hands, and that it is possible to ensure a resilient future for communities all across the Solomon Islands.

The results of the CCVA help to establish a reference and point of departure in the creation of a community-based Water-Sector Climate Change Adaptation Plan (referred to as WS-CCA). This WS-CCA will be a medium- to long-term planning document that can support efforts to plan for, and implement, projects, policies, and actions that increase resilience to climate change impacts, and improve the sustainability of WASH interventions.

1.3. CCVA METHODOLOGY FOR TARO

The CCVA was created through a six-month long participatory methodology that engaged with a diverse set of community stakeholders, and incorporated their voices and comments into successive versions of the report. The survey took place between September 2015 and February 2016, during this time a team of experts and government officials from MMERE, MECDM and SIWSAP visited Taro on two occasions. During these visits two workshops were held which engaged participants in discussions about climate change impacts, water and sanitation issues, and the governance of water and natural resources. These workshops were both learning sessions as well as opportunities to gather information, and verify analyses. A further survey was also conducted on community perspectives regarding exposure to climate hazards (See Appendix A4).

2. INTRODUCTION TO CLIMATE CHANGE

Climate change is being experienced all over the world, its effects are being felt in changes in weather patterns, more extreme weather conditions, and rising sea-levels. Climate change is caused by human activities, such as driving cars, farming, and burning coal; these activities produce greenhouse gases – mainly carbon dioxide, methane and nitrous oxide – which gather in the atmosphere and act to trap the sun's heat.

The more greenhouse gases we emit, the faster the world's climate heats up. This process is often called 'global warming' but it is better to think of it as 'climate change' because it is likely to bring about more extreme events – floods, storms, cyclones, droughts and landslides – rather than an increase in temperature alone. Climate change could have significant impacts on the economy, environment and the way we live.

GOVERNANCE AND THE MANAGEMENT OF WATER

Management of scarce natural resources, such as water, is at its heart a governance issue. What water reserves are scarce, or there are are limited natural resources, coordinated measures have to be taken by all members of that community so that they can share in accessing it. Such measures might include imposing a limit to the amount of water each household can use, or agreeing upon certain times of day that people can use it. These regulations help ensure that that limited amount of water is enough for everyone, today and into the future.

However, if, for example, households or groups in that community, decide to break those rules, taking more water than they are allowed to, the water management system is threatened. This behavior may set an example to other households to also disobey the rules, drawing on water resources as they will; this will result in there being less and less water for others. Soon enough the limited resource will be finished for everyone. This situation is referred to as the 'Tragedy of the Commons'; when communal resources are well managed and shared, there is enough for everyone. But when people act selfishly and there are now regulations governing the sustainable use of their resource, then it will likely be used up, or only available for a few.

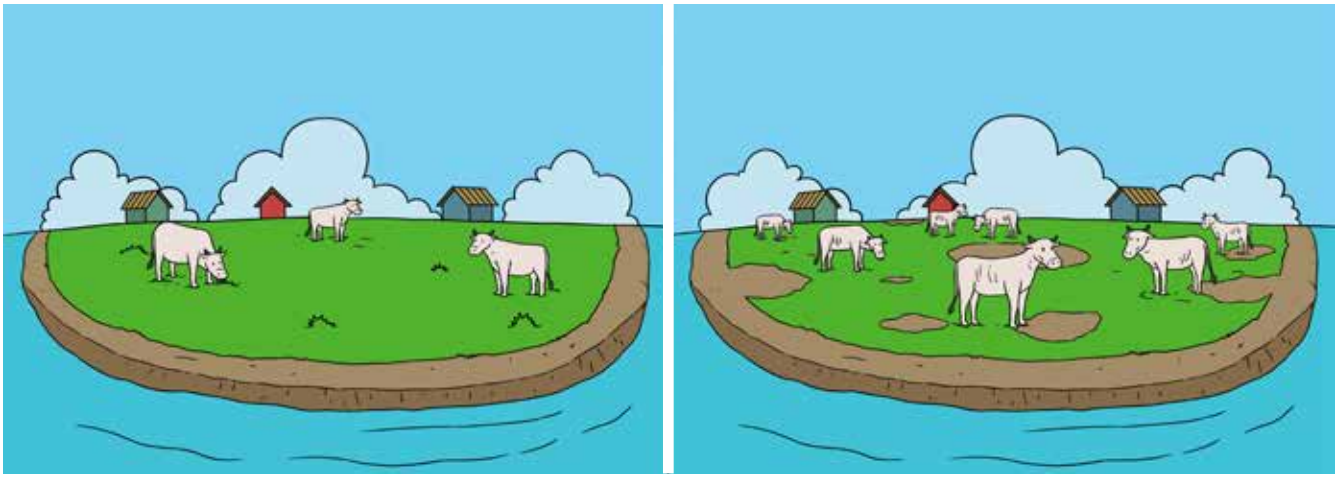


Figure 2: Tragedy of the Commons - *Natural resources that are managed with good governance and understanding between all parties (left picture) will last longer than if people act selfishly and only in their own self-interest (right picture). This requires sacrifice for the greater good of the community and for people to abide by regulations.*

Section A1 (in the Appendix) provides some more information about climate change and what causes it.

2.1 WHAT DOES CLIMATE CHANGE MEAN FOR THE SOLOMON ISLANDS?

This section looks at projected climate changes and associated hazards for the Solomon Islands. Section A2 in the Appendix describes past changes and variations in the climate of the Solomon Islands.

While all countries are experiencing climate change some are more vulnerable and more at risk than others. The Solomon Islands is one of those countries. As a small island nation with many of its islands lying low and with limited water resources, slight changes in the climate have a disproportionate impact upon the country. Scientific evidence demonstrates that these changes are only due to continue, further impacting the Solomon Islands.

Over the remainder of this century, and possibly beyond, average annual temperatures and incidence of extremely high daily temperatures will continue to rise for the Solomon Islands *(very high confidence)*. The amount of increase is dependent upon the future concentration of greenhouse gases in the atmosphere, which in turn is dependent upon future global emissions of these gases. The difference between relatively low and high greenhouse gas concentrations by the end of the century is a temperature increase for the Solomon Islands of between approximately 1 and 3 °C above the 1986-2005 mean temperature.

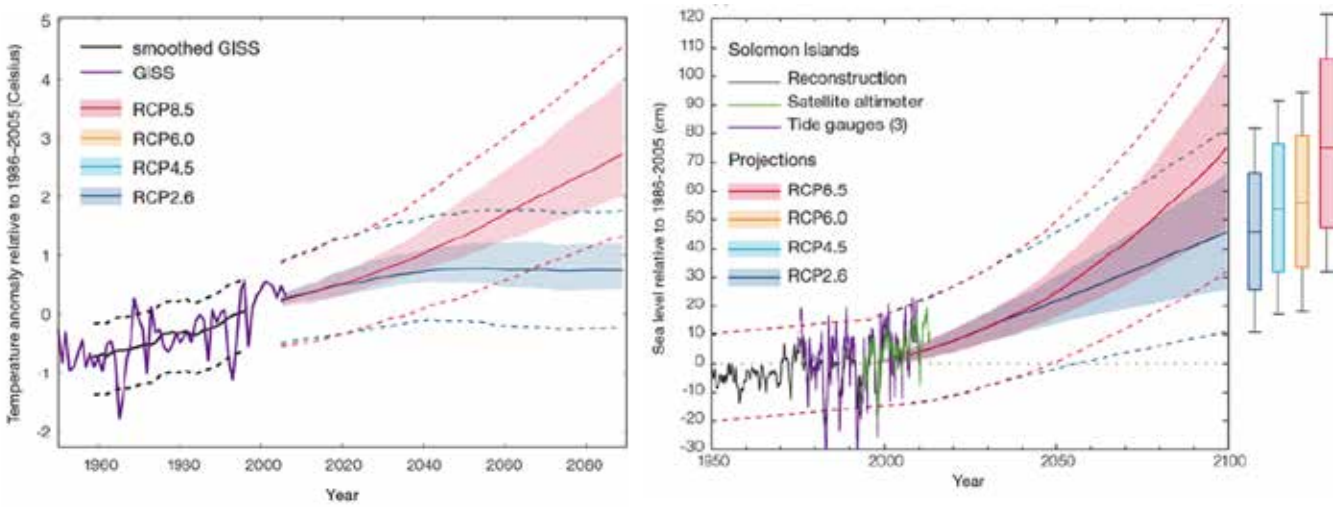


Figure 3: *Historic trends and projected future changes of the average annual temperature anomaly (left) and the average sea level (right) for the Solomon Islands region. The pink band represents future changes if global greenhouse gas emissions remain high, while the blue band represents future changes if emissions are substantially reduced.*

Annual rainfall is projected to increase only slightly for the Solomon Islands *(low confidence)*, though there are likely to be more extreme rain events *(high confidence)*, which can cause flooding. Incidence of drought is projected to decrease slightly *(low confidence)*, while ocean acidification is expected to continue *(very high confidence)*.

The sea level will continue to rise throughout the Solomon Islands region (and around the world) as the temperature of the oceans increases (resulting in "thermal expansion" of ocean water) and land-based glacial ice melts *(very high confidence)*. Figure 3 shows the projected rise in sea level for the Solomon Islands region for the remainder of this century. The solid blue (RCP2.6) and red (RCP8.5) lines indicate that sea level is likely to rise by between about 45 and 75 cm by the year 2100, from present day levels, although it is possible (blue and red shading) that the rise could be as low as 25 cm or as high as 105 cm.

A decrease in tropical cyclone genesis (or formation) frequency for the south-west basin is also projected for the remainder of this century *(medium confidence)*, while the mean maximum wind speed and rainfall rates of tropical

cyclones are projected to increase. At present, the best guidance is that globally, these increases are likely to be between 2% and 11% for wind speed, and by around 20% for rainfall rates, within 100 km of the cyclone centre *(medium confidence)*.

Lastly, the risk of coral bleaching in the seas around the Solomon Islands (and many other Pacific Island locations) will increase in the future *(very high confidence)*, and while El Niño and La Niña events will continue to occur in the future *(very high confidence)*, there is currently little consensus on whether these events will change in intensity or frequency.

2.2 WHAT CLIMATE HAZARDS WILL IMPACT THE SOLOMON ISLANDS AND HOW?

The following hazards are listed in order of greatest to least exposure risk for the Solomon Islands in general, though the order for specific localities may vary depending upon local conditions. Following a description of each hazard are listed some of the socio-economic and ecological consequences of climate change-related impacts that they may cause. These can be severe, affecting people throughout the Solomon Islands at all scales – the national, provincial and local.

SEA-LEVEL RISE

Many low-lying areas in the Solomon Islands are already prone to the impact of sea level rise, which is already causing salt-water intrusion into shallow fresh water lenses. Higher sea levels in the future will mean more of this impact, as well as increased coastal inundation during very high tides and storm surges.

Sea-level rise may potentially have the following impacts:

- HIGHER COSTS ASSOCIATED WITH FRESHWATER SUPPLY IF GROUNDWATER BECOMES BRACKISH
- MORE DAMAGE TO HOUSES AND OTHER BUILDINGS NEAR THE COAST AS STORM SURGES INUNDATE FURTHER INLAND
- REDUCED LAND AREA AS BEACHFRONT SHIFTS INLAND
- LOSS OF PRODUCTIVE LAND FOR AGRICULTURE DUE TO REGULAR SALTWATER INUNDATION
- HIGHER COSTS ASSOCIATED WITH BUILDING AND MAINTAINING COASTAL PROTECTION STRUCTURES

HEAVY RAINFALL AND FLOODING

It is expected that a higher frequency of heavy rainfall events, associated with higher temperatures and the ability of a warmer atmosphere to hold more moisture, will result in more flooding events. While a comprehensive assessment of projected future flooding has not been performed for the Solomon Islands as yet, there is a general rule of thumb that the intensity of heavy rainfalls may increase by around 8% for every 1 °C increase in air temperature (based on the Clausius-Clapeyron relationship).

Heavy rainfall and flooding potentially have the following impacts:

- GREATER DISRUPTION TO COMMUNITIES (INCLUDING INJURIES AND LOSS OF LIFE)
- INCREASED COSTS (PROTECTION SCHEMES AND CLEAN-UP) DUE TO MORE FLOODING EVENTS
- HIGHER COSTS (AND POTENTIAL LOSS OF LIFE) ASSOCIATED WITH MORE SEVERE TROPICAL CYCLONE DISASTERS
- INCREASED LIKELIHOOD FOR LAND SLIDES, HIGH SEDIMENT RUN-OFF, AND FLOODING. CATCHMENT AREAS WHERE LOGGING IS PRACTICED ARE PARTICULARLY VULNERABLE
- IMPACTS TO AGRICULTURAL PRODUCTIVITY THAT INCREASE THE VULNERABILITY OF FOOD SECURITY
- DAMAGE TO WATER SUPPLY INFRASTRUCTURE, SUCH AS PIPELINES, AND HAND-DUG WELLS, ESPECIALLY FOR LOW LYING ATOLLS

TROPICAL CYCLONES

While the number of cyclones may decrease in the future, it is also expected that their wind and rainfall intensity may increase, meaning more damage when they do hit. Tropical cyclones are the most devastating climate hazard for the Solomon Islands, and many other Pacific Island countries; thus it is imperative that communities prepare for the impacts of tropical cyclones. This includes such high priorities as: hardening of infrastructure, establishing procedures for evacuations and mobilization of resources, and getting access to timely forecasts and warnings.

Tropical cyclone damage may potentially have the following impacts:

- DISRUPTION TO COMMUNITIES INCLUDING INJURIES AND LOSS OF LIFE
- INCREASED COSTS, DUE TO PROTECTION SCHEMES AND CLEAN-UP, DUE TO MORE FLOODING EVENTS
- HIGHER COSTS, AND POTENTIAL LOSS OF LIFE, ASSOCIATED WITH MORE SEVERE TROPICAL CYCLONE DISASTERS

DROUGHT

Droughts (and their related impact on water security, fire risk and agricultural productivity) will continue to be a hazard into the future (e.g. related to El Niño), though any changes to their frequency and intensity is very uncertain. Annual rainfall is projected to increase slightly for the Solomon Islands, however there is a large degree of uncertainty so confidence in the projection is low.

Drought may potentially have the following impacts:

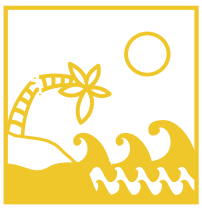
- HIGHER COSTS ASSOCIATED WITH FRESHWATER SUPPLY (E.G. SHIPPING IN WATER) IF STREAMS AND RAIN TANKS DRY UP AND/OR GROUNDWATER IS DEPLETED
- HEALTH IMPACTS INCREASE AS PEOPLE ARE DRINKING WATER FROM TAINTED SUPPLIES
- A REDUCTION IN AGRICULTURAL PRODUCTIVITY DUE TO LOW RAINFALL
- HIGHER COSTS ASSOCIATED WITH IMPORTING BASIC FOOD SUPPLIES

HIGH WINDS

Little is known of how the frequency and intensity of tropical storms (that are not tropical cyclones) may change in the future. However, it is likely that such storms, which are often associated with high winds, will continue to be a hazard for many parts of the Solomon Islands.

High winds may potentially have the following impacts:

- DISRUPTION TO COMMUNITIES, INCLUDING INJURIES AND LOSS OF LIFE
- DAMAGE TO SETTLEMENTS AND INDIVIDUAL HOUSES
- DAMAGE TO WATER SUPPLY INFRASTRUCTURE
- TREES BLOWN OVER
- INCREASED COSTS DUE TO REPAIRS AND CLEAN-UP
- LOSS OF INCOME FROM AGRICULTURE AND FORESTRY
- INCREASED RISK OF COASTAL EROSION OF LAND
- LOSS OF PRODUCTIVITY AS OUTDOOR ACTIVITIES ARE RESTRICTED DURING PERIODS OF HIGH WIND (PARTICULARLY OCEAN RELATED INDUSTRIES/TRANS PORT)
- HIGH EVAPORATION RATES CAUSE DEPLETION OF WATER RESERVES OF RESERVOIRS AND DAMS
- IN COASTAL AREAS SALT SPRAY CAUSES WATER QUALITY PROBLEMS FOR RAIN WATER TANKS

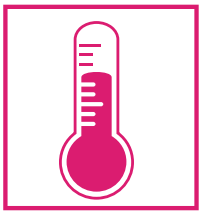


COASTAL EROSION

Frequent storms and high seas are already causing increased coastal erosion across all of the Solomon Islands. As the sea rises, coastal erosion issues will exacerbate and may lead to the loss of beaches and clogging of mangrove forests.

Coastal erosion may potentially have the following impacts:

- INCREASED SALINE INTRUSION OF COASTAL AREAS. SEAWATER ENCROACHING INTO COASTAL HAND-DUG WELLS MAKES THEM MORE SALINE AND UNSTABLE
- INCREASED SAND TRANSPORT AWAY FROM BEACHES
- LOSS OF NATURAL SAND DUNES
- CLOGGING OF MANGROVE FORESTS DUE TO SEDIMENTATION
- HIGHER COSTS ASSOCIATED WITH BUILDING AND MAINTAINING COASTAL PROTECTION STRUCTURES
- LANDMASS SHRINKING, LEADING TO LOSS OF BEACH, BUFFERING ZONES AND COASTAL LAND

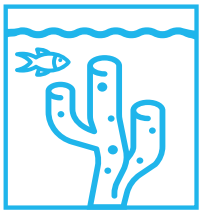


TEMPERATURE RISE (AIR AND SEA)

As the air and ocean temperatures around the Solomon Islands continue to increase over the remainder of this century, it is likely that there will be an increase in heat-related illnesses, such as heat stroke. Conversely, cold temperature-related illnesses such as respiratory diseases may decrease over time. Note that extremely high temperatures are also a problem for many animals, including livestock.

Higher temperatures for the air and sea may potentially have the following impacts:

- HIGHER MEDICAL COSTS ASSOCIATED WITH MORE HEAT-RELATED ILLNESSES
- POTENTIAL LOSS OF INCOME TO FISHERMEN DUE TO AQUATIC SPECIES LOSS AND/OR MIGRATION (ALSO RELATED TO OCEAN ACIDIFICATION)
- INCREASED EVAPORATION RESULTING IN THE DEPLETION OF WATER RESERVES FROM RESERVOIRS, DAMS, AND GROUNDWATER RESOURCES
- HIGHER RATES OF INTERNAL MIGRATION FROM RURAL AREAS TO TOWNS AS FOOD AND WATER SECURITY BECOMES STRESSED
- IMPACT ON TOURISM AS AIR TEMPERATURES EXCEED COMFORTABLE LEVELS
- REDUCTION IN AGRICULTURAL PRODUCTIVITY DUE TO GREATER INCIDENCE OF PLANT DISEASES/FUNGAL INFECTIONS IN A WARMER AND MORE HUMID CLIMATE
- HIGHER COSTS DUE TO HIGHER ENERGY DEMAND FOR AIR CONDITIONING AND POSSIBLY DESALINATION
- LOSS OF PRODUCTIVITY AS PEOPLE ARE NOT ABLE TO WORK OUTDOORS DUE TO HEAT



CORAL BLEACHING

Acidification and bleaching events will become more frequent in the future and these phenomena will continue to damage corals and affect the number and variety of marine species in the waters around the Solomon Islands. It is possible that some fish species may migrate out of the Solomon Islands' waters, if ocean temperatures become too high.

Coral bleaching may potentially have the following impacts:

- POTENTIAL LOSS OF INCOME TO FISHERMEN DUE TO AQUATIC SPECIES LOSS AND/OR MIGRATION
- IMPACT ON TOURISM AS CORAL REEFS BECOME BLEACHED
- ECOLOGICAL IMPACT OF LOSS OF SPECIES DIVERSITY
- INCREASED VULNERABILITY TO COASTAL EROSION AS CORAL REEFS PROVIDE AN EFFECTIVE EROSION BARRIER TO WAVES AND TIDAL ACTIVITY
- LOSS OF A CRITICAL FOOD SOURCE FOR MANY COASTAL COMMUNITIES

3. SOLOMON ISLANDS CLIMATE PROFILE

While Chapter 2 discussed the general patterns of climate change and related hazards expected for the Solomon Islands, this chapter gives an assessment of likely climate change trends, impacts and possible consequences. The chapter is divided into three scales: national, provincial and local (where the local scale is only for the SIWSAP pilot site locations).

3.1 NATIONAL-SCALE ASSESSMENT

The following general climatic trends are predicted for the Solomon Islands for the remainder of this century, and possibly beyond:

Figure 4: *A variety of climate hazards will affect communities throughout the Solomon Islands, these include: sea-level rise, heavy rainfall, flooding, temperature rise, tropical cyclones, strong winds, and droughts.*

In addition to these general trends, some more specific information and maps are presented in Appendix A3. The hazards associated with these climate changes, and their potential consequences for the people of the Solomon Islands are listed, at different scales, in Chapter 2.

Climate variable	Trend over the remainder of this century
Mean air temperature and very hot days	▲
Annual rainfall and drought	—
Intensity of heavy rainfall	▲
Sea level	▲
Tropical cyclone genesis (formation)	▼
Tropical cyclone intensity	▲
Ocean acidification	▲
Coral bleaching	▲

Table 1: National Level Trends for the Solomon Islands

Notes: *▲ = Increase; ▼ = Decrease; — = No trend identified*

3.2 PROVINCIAL-SCALE ASSESSMENT

While downscaled climate change projections are not available at the provincial scale for the Solomon Islands, we can see some geographic variation in the projected climate changes from global climate models. The maps shown in Appendix A3 show future changes in air temperature, rainfall, humidity and cloudiness that are based on the same global climate models that were used in the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5). Based on these maps, we can conclude that there are likely to be the following slight variations across the Solomon Islands region.

TEMPERATURE

There is very little difference in the projected temperature changes over the Solomon Islands region with the exception of Figure A3.2 (RCP2.6) where there is a very weak gradient of greater temperature change in the north compared with the south.

RAINFALL

Choiseul Province is projected to have a slightly larger increase for RCP8.5 (10 – 20%), compared with the other provinces (0 – 10%) (See Figure A3.3 in Appendix A3). This spatial pattern also shows up in Figure A3.5 (soil moisture), with a gradual gradient from higher to lower percentage increases from the northwest to the southeast of the country. Based on these projections, the north-western regions may be slightly less exposed to drought in the future than the south-eastern regions.

HUMIDITY AND CLOUDINESS

For specific humidity (Figure A3.6) and downward solar radiation at the surface (Figure A3.7) there is some indication in the RCP8.5 maps of larger changes (increase for specific humidity and decrease for solar radiation) in Choiseul Province, compared to the other provinces.

OTHER VARIABLES

For all other variables (i.e. heavy rainfall intensity, sea level rise, tropical cyclone risk, ocean acidification, and coral bleaching), there is no additional regional information available so the national assessment above should apply.

3.3 LOCAL-SCALE ASSESSMENT

The six pilot sites for the SIWSAP project are shown in the map below. All of these sites (and indeed, all locations in the Solomon Islands) will be exposed to the climate change trends and hazards described above. The local impacts of climate change however, will vary depending upon (among other things) the physical characteristics of the sites. Below, we outline the most significant climate change hazards for Taro.

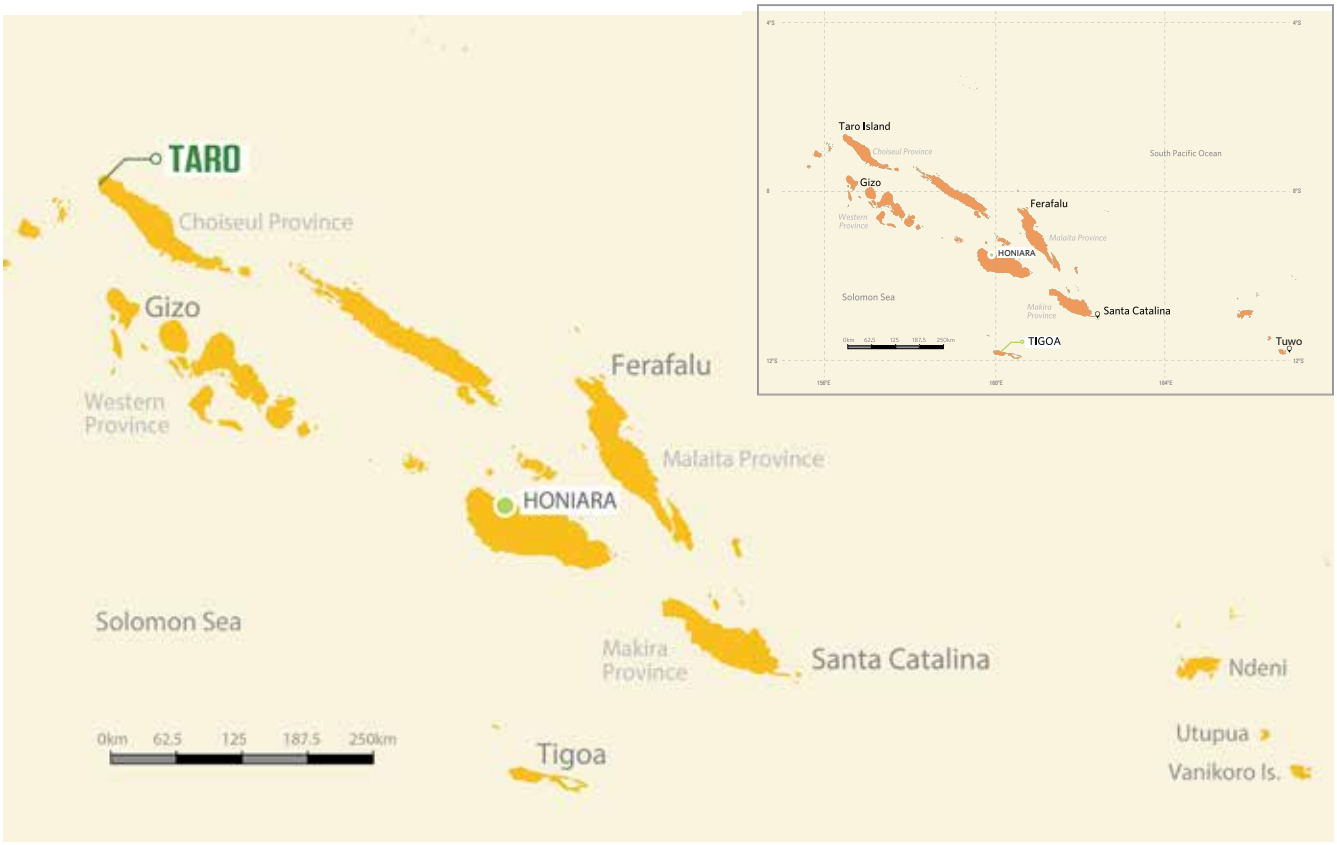


***Figure 5**: Location of Taro Township, Choiseul Province and six pilot sites for the SIWSAP project (see Inset).*

TARO TOWNSHIP

Taro is located on the coast and is greatly exposed to the impacts of sea level rise and storm surge. Coastal inundation, erosion and saltwater intrusion into shallow aquifers are therefore the major hazards for this location. Drought is also a major hazard, as when rainfall is low for long periods the amount and quality of fresh drinking water as well as agricultural production is severely reduced.

These maps are derived from data averaged from several global climate models. Any one of these models may show different (and plausible) spatial patterns than what are presented. The maps are based on data that are not downscaled to local conditions, but rather are from coarser resolution global model output. Nevertheless, at this time it is considered that the patterns shown in these maps are the best available guidance regarding the general spatial variability of climate changes over the Solomon Islands region.

4. TARO'S CONTEXT

4.1 GEOGRAPHIC

Taro is a town located on a small, flat coral island; it is also the provincial capital of the Province of Choiseul located in the far west of the Solomon Islands. The township was declared provincial capital in 1990 and since that moment it has grown with the location of government offices, public services, such as a hospital and school, and forestry and mining businesses. There is one road that runs almost the entire length of the island and a large swamp area that is partially inhabited and used to dump trash; for the most part the island is densely inhabited except for its northern side. There is also a local market where traders come from different islands, even from afar as Bougainville, Papua New Guinea, to sell their products. The island lies close to the Mainland of Choiseul but access is limited to small boats, and airplanes, that land on a landing strip (to the north) that takes up a significant portion of the island.

Taro Island's Total Area - 0.4 km2

***Figure 6**: An aerial image of Taro in 2005*

4.2 DEMOGRAPHIC

Taro's estimated population is 1,423 residents, approximately 53% are male and 47% are female; 28% are youth and children *(Source: SIWSAP Project Document, 2014)*. Since Taro became the provincial capital the number of residents has grown to where there are few lots of land available for new homes, and due to its limited size expansion is limited. There are currently Provincial land use plans being developed to extend industrial and residential areas to the Mainland, to what will be called the Choiseul Bay Local Planning Area. Given a national projected annual growth rate of 2.3% the population is projected to rise to 2,815 residents by 2035.

4.3 SOCIAL

There are a number of civil society organizations, church groups, and recreational activities active in Taro, resulting in a strong and cohesive society. There are a number of NGOs based in Taro, such as Save the Children and the Lau'ru Land Conference of Tribal Community, as well as a few climate change projects. Given a relatively homogenous character of

the inhabitants there are few sources of conflict amongst the local residents. There are, however, often problems caused by visitors from surrounding communities, and even as far afield as Papua New Guinea, who are drawn the market for trading. There have been complaints that such visitors often don't respect the rules and norms of Taro, and have even defecated in prohibited areas and vandalized water tanks. Social disturbances have been mostly been caused by visitors, not local residents.

A typical family in Taro consists of a husband, wife, and children, living together with extended family members including elderly family members. Gender roles in Taro are flexible with women also engaging in income generating activities alongside their male family members. However men rarely take part in household work, for example it is very rare for men to help women fetch water, so the burden of household tasks are almost entirely on women's shoulder.

4.4 ECONOMIC/ LIVELIHOODS

Many of the livelihoods of Taro come from government jobs in the public sector such as at the offices of the Provincial Government, the Provincial hospital or local school. Other than the telecommunications center, there are a few shops, but beyond that there are few alternative employment opportunities. Nearby on the Mainland there are abundant forestry resources so workers from Taro may commute there during the day to work on logging concessions.

In terms of securing livelihoods Taro's men and women perform different roles. Many women work in the informal sector, selling goods at the market, floral work, catering, handicrafts, and tailoring, in addition to their daily household work. On the other hand, men mostly hold salaried jobs in the formal sector, such as with the government and private companies. Men also perform tasks that require physical labor such as chopping firewood, building houses, fishing, and hauling timber.

4.5 PUBLIC SERVICES

There are a number of public services that are accessible for people throughout the province, such as the newly inaugurated Provincial Hospital.

Education	There is a public school in Taro, and a high school nearby on the mainland.
Electricity	Electricity is available in Taro for a fee, and is provided for by the Provincial Government.
Water	There are a few public wells providing supplementary water since most people use rainwater harvesting.
Waste Collection	Trash is collected but dumped into the swamp area.

4.6 WATER AND SANITATION AND HYGIENE

WATER

Taro's water supply is very limited and this makes the island vulnerable to climate change. The government does not provide water supply to residents; however, in times of drought they provide transport to the mainland for residents to collect water.

70% of the community has access to a rainwater tank system as a primary drinking water source (2015, SIWSAP survey). Tanks are privately purchased. There are a small number of public accessible rain tanks – generally requiring maintenance. Recent droughts have led to water shortages.

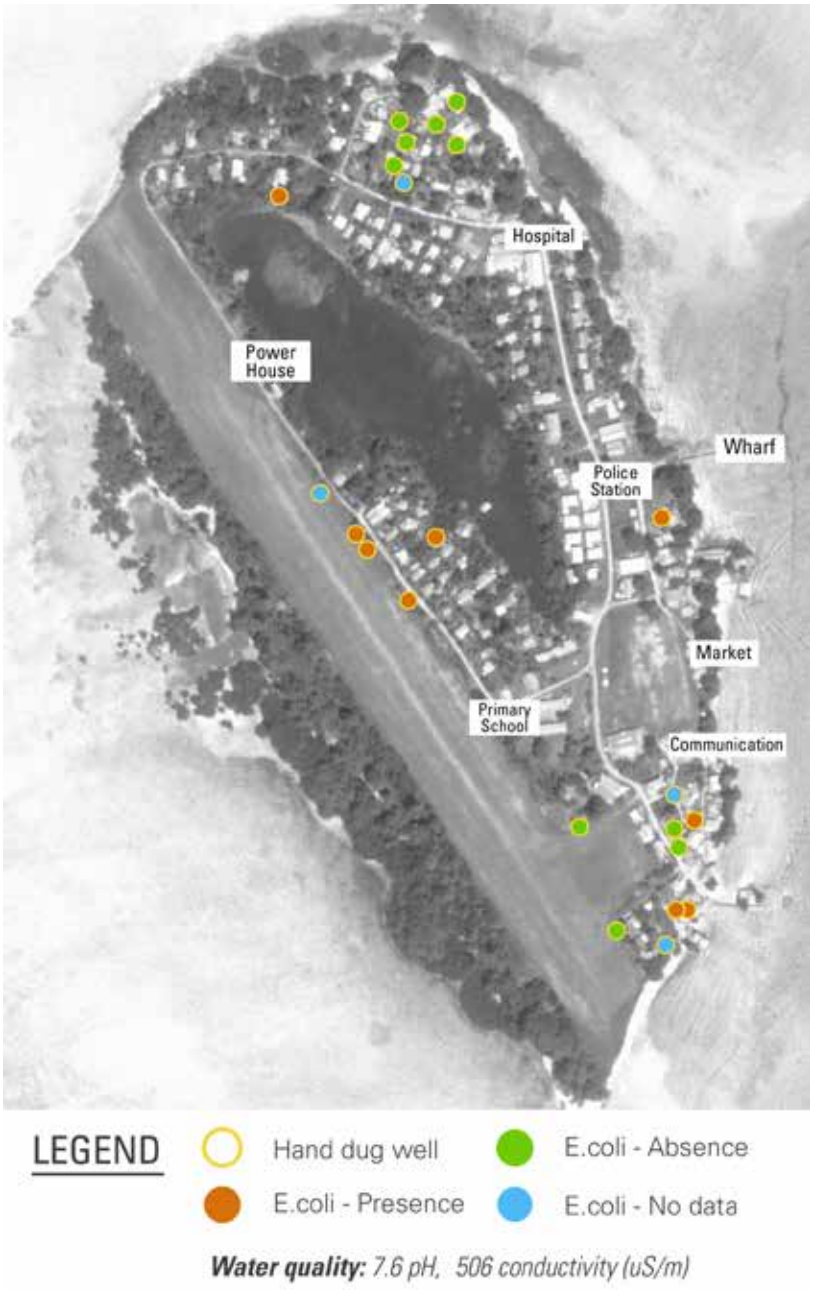


Figure 7: *WASH Map of Taro Township*

In addition there are 24 shallow open wells (2-3m depth) used for secondary purposes including washing, bathing and cooking. In absence of services and regulation people in Taro Township are largely self-reliant for water supply. Household investment in water tanks within Taro Township has increased in recent times in response to an increasingly unreliable piped water system, combined with recurring prolonged drought episodes.

The quality of the water varies between fresh (<400 ×S) to brackish (9500 ×S). Ongoing water quality testing and monitoring is required to determine the suitability of groundwater for either drinking or secondary purposes. There is a large brackish swamp, in two isolated sites the swamp is being used as a rubbish dump. This poses a risk to groundwater.

Alternative water supply options include groundwater from neighboring Supizae Island, stream and groundwater supplies from mainland Choiseul Island (2km away), and a possible proposed project of harvesting rainwater from the surface of the Taro airstrip.

SANITATION

73% of community do not have access to a toilet *(2015, SIWSAP study)*. A designated OD area is located across the airstrip on the south-west side of the island. This area is uninhabited and is close to the ocean. This site is the only place for day visitors to go to the toilet. Pig livestock are also restricted to this area.

There is a growing trend for household flush toilets with septic systems. Open bottom septic tanks adversely impact groundwater quality. If unchecked, medium to long-term, it is likely the ground water resource on Taro will be considered too polluted for use (without costly treatment) – thus placing further stress on limited water resources (namely rainwater collection).

These maps are derived from data averaged from several global climate models. Any one of these models may show different (and plausible) spatial patterns than what are presented. The maps are based on data that are not downscaled to local conditions, but rather are from coarser resolution global model output. Nevertheless, at this time it is considered that the patterns shown in these maps are the best available guidance regarding the general spatial variability of climate changes over the Solomon Islands region.

HYGIENE

Residents seem to have an understanding of important hygiene information such as the need to boil groundwater, washing hands and rubbish disposal. Previous projects have sensitized the community on the need for rubbish collection, sorting, reuse and disposal – however no action plan has been implemented. There are no local WASH guidelines or regulations administered by the Provincial Government.

4.7 TRENDS

A 'trend' indicates the general direction that different issues are moving towards. By imagining if trends continue helps to indicate what key issues will influence the future development of Taro.

ENVIRONMENTAL RESOURCES / ECOSYSTEM SERVICES

Over the next 20 years it is likely that the extraction of Taro's coral reefs, for building materials is damaging the marine ecosystem and potentially undermines coastal defenses.

DEMOGRAPHIC

Jobs and public services will continue to attract newcomers to Taro but there is limited land for expansion. If population pressures persist new homes will continue to be built in the swamp area, but population density is likely to rise.

POLICY

The Provincial Government is planning to incentivize expansion of an urban area to the mainland, by creating a Local Planning Area called Choiseul Bay.

Figure 8: *The following trends will shape the future of Taro's growth: extraction of rocks that is degrading the coral reefs surrounding the island, newcomers arriving on the island seeking jobs and services, and expansion to the surrounding areas of the Mainland.*

5. EXPOSURE

5.1. WHAT IS EXPOSURE?

Exposure refers to

> ***The degree of climate stress upon a particular unit of analysis (i.e. village, sector), may be characterized by long-term change in climate conditions, or changes in climatic variability including the magnitude and frequency of extreme events in the urban context (IPCC 2007).***

Our vulnerability to climate change is related to our *exposure* to climate hazards – which include droughts, heavy rainfall and sea-level rise. Exposure varies from one community to another based upon the location and characteristics of that community. For example, villages or townships located close to the sea are more exposed to sea-level rise and coastal erosion, while communities with hills may more worried about landslides brought about by heavy rainfall.

Changing climate conditions have long-term impacts, which can significantly affect the economy, raise costs, and make entire communities more vulnerable.

Figure 9: *Exposure to climate change makes communities more vulnerable; above (right) island communities are exposed to tropical cyclones and high winds, while (right) earth's temperatures are rising, causing more incidences of heat-related illnesses.*

5.2. METHODOLOGY FOR IDENTIFYING AND PRIORITIZING EXPOSURE

During the months of December 2015 and January 2016 a team of multi-disciplinary experts led by MMERE-WRD EHD and MECDM consulted residents of each of the six pilot communities about what climate hazards were the most likely to affect them in the next two to five years, to establish which ones were most worrying to them. The team also consulted residents about what degree of impact each of the climate hazards would have. These two indicators serve to identify the level or risk that the community faces for each hazard. It also helps us to prioritize which climate hazards are considered most serious to residents, and that require consideration in adaptation strategies.

The two variables are defined as:

Likelihood: *Survey participants were asked how likely they felt that they would be affected by the climate hazard (from very unlikely to almost certain).*

Impact: *Survey participants were asked how much of an impact they thought that the climate hazard would have on them (from insignificant to disastrous).*

DESCRIPTOR		DESCRIPTION
Likelihood (L)		
1	Very Unlikely	Has not happened in the past and it is highly improbable it will happen in the next 24 months (or another reasonable period).
2	Unlikely	Has not happened in the past but may occur in exceptional circumstances in the next 24 months (or another reasonable period).
3	Possible	May have happened in the past and/or may occur under regular circumstances in the next 24 months (or another reasonable period).
4	Likely	Has been observed in the past and/or is likely to occur in the next 24 months (or another reasonable period).
5	Almost Certain	Has often been observed in the past and/or will almost certanly occurs in most circumstances in the next 24 months.
Impact (I)		
1	Insignificant	Hazardous event or climate-related impacts resulting in negligible effects compared to normal.
2	Minor	Hazardous event or climate-related effects potentially resulting in minor impacts (brief disruption to local economic activity, reduced effectiveness of water supply, minor physical damage).
3	Moderate	Hazardous event or climate-related effects resulting in moderate impacts to the community (physical damages to property, interruption of water supply, moderate environmental harm)
4	Major	Hazardous event or climate-related impacts resulting in serious effects to the community (major damages to homes and infrastructure, damage to water supply infrastructure, significant harm to environment and local ecosystems).
5	Catastrophic	Hazardous event or climate-related effects resulting in catastrophic and severe impacts to the community (widespread destruction of homes and infrastructure, breakdown and damages to water supply, irreversible damage to local ecosystems and environment).

Table 3: Tool 1 - Risk definitions for semi-quantitative risk assessment

Adapted from: *Sanitation Safety Planning: Manual for Safe Use of Water and Disposal of Wastewater (2015), World Health Organization*

			IMPACT (I)				
			Insignificant	Minor	Moderate	Major	Catastrophic
			1	2	3	4	5
LIKELIHOOD (L)	Very unlikely	1	1	2	3	4	5
	Unlikely	2	2	4	6	8	10
	Possible	3	3	6	9	12	15
	Likely	4	4	8	12	16	20
	Almost Certain	5	5	10	15	20	25
Risk Score (R) = (L) x (I)			**<5**	**6-10**		**10-15**	**>16**
Risk Level			**Low Risk**	**Medium Risk**		**High Risk**	**Very High Risk**

Table 4: Tool 2 - Semi-quantitative risk assessment matrix

Adapted from: *Sanitation Safety Planning: Manual for Safe Use of Water and Disposal of Wastewater (2015), World Health Organization*

RISK DESCRIPTOR	NOTES
High priority	It is possible the climate hazard will cause severe physical, economic, social, and environmental harm. It is an urgent priority to take actions to minimize risk.
Medium priority	It is possible the climate hazard will cuase moderate to serious harm to physical, economic, social, and environmental harm. Once high priority risks are controlled, actions need to be taken to minimize risk.
Low priority	Climate hazard will have a moderate impact upon the community. The risk should be monitored and revisited in the future.
Unknown priority	Further information is needed to evaluate the risk. Some action should be taken but it is not seen as posing a significant threat.

Table 5: Tool 1 - Risk category descriptions for the team-based descriptive risk assessment

Adapted from: *Sanitation Safety Planning: Manual for Safe Use of Water and Disposal of Wastewater (2015), World Health Organization*

	Risk (L x I)		
1	> 16	*Water scarcity*	*20.06*
2		*Drought*	*19.67*
3	11 to 15	High Temp (air)	13.17
4		Sea-level Rise	12.49
5		Salt-Water Intrusion	12.04
6		Coastal Erosion	12.00
7	6 to 10	High winds	10.95
8		High Temp (water)	10.46
9		Tropical cyclones	10.15
10		Extreme Rainfall	8.79
11	< 5	Terrestrial erosion	3.35
		Average	**11.65**

Table 6: Taro's Exposure Score

We tabulated the results and then multiplied the indicator of Likelihood with the indicator of Impact (L x I) to derive an index for Risk. The climate hazards were then ranked in descending order of magnitude; an average was calculated and this helped to determine which climate hazards would feature in this CCVA report (all those above the average). The table in the left side shows the result for Taro, which shows that water scarcity and drought have the highest risk score.

5.3. CLIMATE HAZARD RISK IN TARO

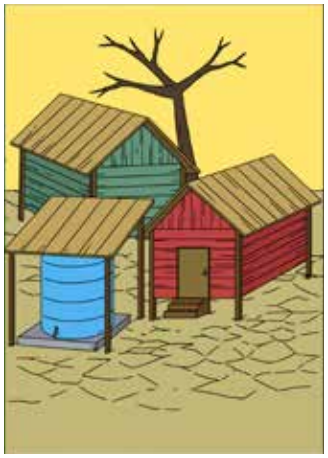
To better understand how each of the hazards identified by the community makes Taro vulnerable, we describe what each climate hazard is, how climate change affects it, and explain what impacts it is having on people and natural systems.

WATER SCARCITY

Water scarcity means that water is difficult to access during normal periods and during non dry-seasons; resulting in water shortages. Climate change can bring with it water scarcity – due to droughts and salt-water intrusion, both reducing the amount of water supply available to local communities. Water is essential to all life so without water everyone is affected, including livestock and crops. Water scarcity is particularly problematic for island communities like Taro where they cannot easily access water from the Mainland. Water scarcity affects public heath and safety and local economies.

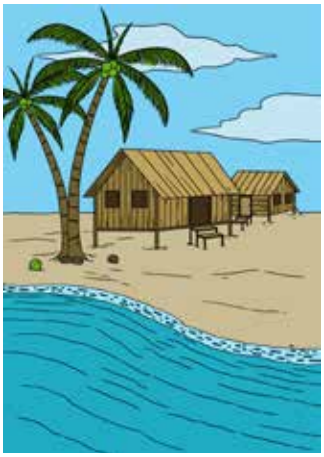
DROUGHT

Droughts are extended periods of water shortage during the dry season and during extreme weather events. Climate change means that periods between rain may get longer, even though the amount of rain is set to slightly increase. The impact of droughts is that there is little water available to households – this affects people's health, especially the elderly and children, and threatens public health safety if there is not water for hygienic conditions. Combined with salt-water intrusion droughts mean less consumption of water which is unhealthy.



TEMPERATURE RISE

High air temperatures mean that people feel the intense heat from the sun, causing people to become tired, thirsty and even suffer heat stroke. Climate change is causing air temperatures globally to rise. One result of heat-related illnesses are heat strokes, which are particularly dangerous for elderly people, women, and young children. Temperature rise also cause problems for livestock and other animals, which may stop producing milk because of trauma and death. Such impacts can impact the livelihood of local communities.

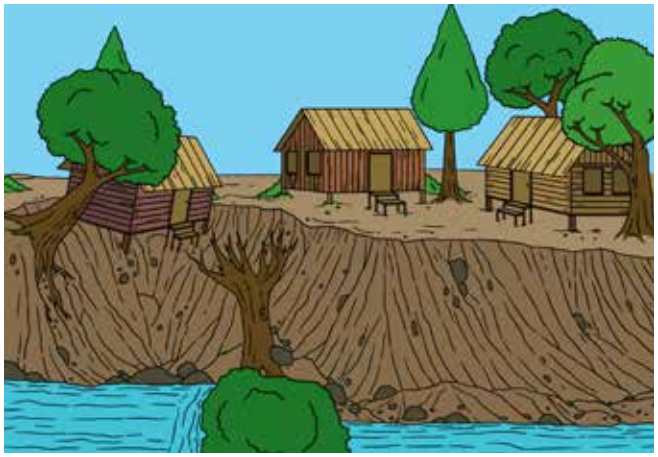


SEA-LEVEL RISE

Sea-level rise means that the level of the sea increases over time. Climate change has caused global air and sea temperatures to rise, melting the polar icecaps and glaciers, leading to an increase of the sea-level around the world. Sea-level rise happens slowly but steadily, and the impacts are very significant; it will change the relationship that communities may have with the sea. This is particularly problematic for low-lying islands like Taro. Sea-level rise can impact the island through increasing coastal erosion, salt-water intrusion, and change local fishing patterns.

SALT-WATER INTRUSION

Salt-water intrusion occurs when salt water enters underground aquifers, which store fresh water for people to drink. Climate change is raising sea-levels and bringing about more coastal erosion – this can provoke salt-water intrusion, making groundwater salty and unhealthy to drink. Salt-water intrusion damages the fresh water supply of local communities by reducing the amount of groundwater available. Less available water means more health problems, thirst, and vulnerability.



COASTAL EROSION

Coastal erosion occurs when waves and storm surges make coastlines recede because the sand and rocks have been washed away by the sea. Climate change is making high winds and strong waves more frequent and more powerful, and raising sea levels; these combine to cause coastal erosion. When beaches are eroded there is less area for communities to use for housing, recreation and agriculture activities. Coastal erosion also diminishes the natural barriers that communities use to protect themselves from waves. Another consequence is that that salt-water intrusion is more likely. Coastal erosion threatens low-lying coastal communities like Taro and raises vulnerability.

Principal Climate Hazards	Possible Short-Term Impacts *(Present - 5 years)*	Possible Long-Term Impacts *(5 years to 20 years)*
Water Scarcity	• Reduction in drinking water as streams and rain tanks dry up and/or groundwater is depleted • Reduction in agricultural productivity	• High costs associated with importing water and food supplies • Health impacts increase as people and animals are drinking water from tainted supplies
Drought	• Reduction in drinking water as streams and rain tanks dry up and/or groundwater is depleted • Reduction in agricultural productivity	• High costs associated with importing water and food supplies • Health impacts increase as people and animals are drinking water from tainted supplies
Temperature Rise (air)	• Reduction in agricultural productivity due to greater incidence of plant diseases/-fungal infections • More heat-related illnesses	• Higher medical costs • High costs associated with importing food supplies
Sea-Level Rise	• Groundwater becomes brackish • Damage to houses and other buildings near the coast as storm surges inundate further inland • Loss of productive land for agriculture due to regular saltwater inundation	• Higher costs associated with freshwater supply (potentially desalination) • Higher costs associated with building and maintaining coastal protection structures (such as sea walls)
Salt-Water Intrusion	• Groundwater becomes periodically or permanently brackish • Re-siting of wells required	• Higher costs associated with freshwater supply (potentially desalination) • Longer distances travelled to obtain fresh water
Coastal Erosion	• Loss of productive land • Damage to settlements and infrastructure from landslides • Sedimentation of waterways and lagoons	• Increased costs (protection schemes and clean-up) • Loss of income from agriculture and fisheries

Table 7: Primary and Secondary Impacts of Taro's Climate Hazards

Principal Climate Hazards	Women	Men	Children and Elderly
Water Scarcity and Drought	• As the principal collectors of water women have to walk farther during droughts due to depleted water sources. • The inadequate supply of water causes problems with hygiene and health for menstruating women, girls and pregnant and lactating women.	• Drought caused extra expenses for buying coconuts and bottled water to replace rainwater drinking source, which means men as the breadwinner have to work harder to fullfill the needs. • Reduction in agricultural productivity means lower income for farmers, as well as threatening food security in the area, as importing food from different island is not an easy thing.	• Water scarcity often results in the use of unhygienic water, which often cause dysentery, diarrhea and cholera, and skin problem, in which children and elderly are usually the most vulnerable.
Temperature Rise (air)	• For women, increase temperature increase the burden to do physical work, for example in order to seek more water. • This could also means spending more time to take care of the family member that more vulnerable to heat (children or elderly).	• Rising temperatures also affect agriculture productivity due to greater incidence of plant diseases / fungal infections, which for men means reduce income for the family. • More spending on imported food.	• Old people are more sensitive to high temperatures, as well as newborn babies and children.
Sea-Level Rise	• When SLR comes with strong winds, it increase the feel of anxiety of women about the safety of their children. • When SLR cause damage to houses, this increases the burden for women for cleaning and reconditioning the house. • SLR increase feels of anxiety of women about saving the household assets to reduce damage.	• Regular saltwater inundation makes the land less productive for farming, which means lower income for the farmers. • Damage to houses from sea level rise increases costs for reconstruction. • More expenses on fresh water, as the groundwater becoming brackish.	• Children and elderly lack the ability to evacuate when storms or tidal waves hit.
Salt-Water Intrusion	• When groundwater becomes periodically or permanently brackish, and water supply becomes limited, then women have more responsibilities to manage the use of water. • This also further increases women's labor time as they walk longer having to change water source often.	• More expenses for fresh water, as the groundwater becoming brackish.	• Limited stock of fresh water might affect the health of elderly and children. • This could also increase cases of dysentery, diarrhea and cholera, and skin problem.
Coastal Erosion	• Increases feeling of anxiety of women to the safety of their children and elderly. • Coastal erosion often cause damage to houses, which means increases the burden for women for cleaning and reconditioning the house.	• More expenses for reconstructing the damaged house. • Loss of income for those who works in agriculture and fisheries sector, which makes the whole family mire vulnerable.	• Children and elderly, have the lower ability to evacuate when storm or tidal waves comes, so they're the most vulnerable during hazardous time.

Table 8: Taro's Climate Hazard Impacts for Women, Men, Children and Elderly

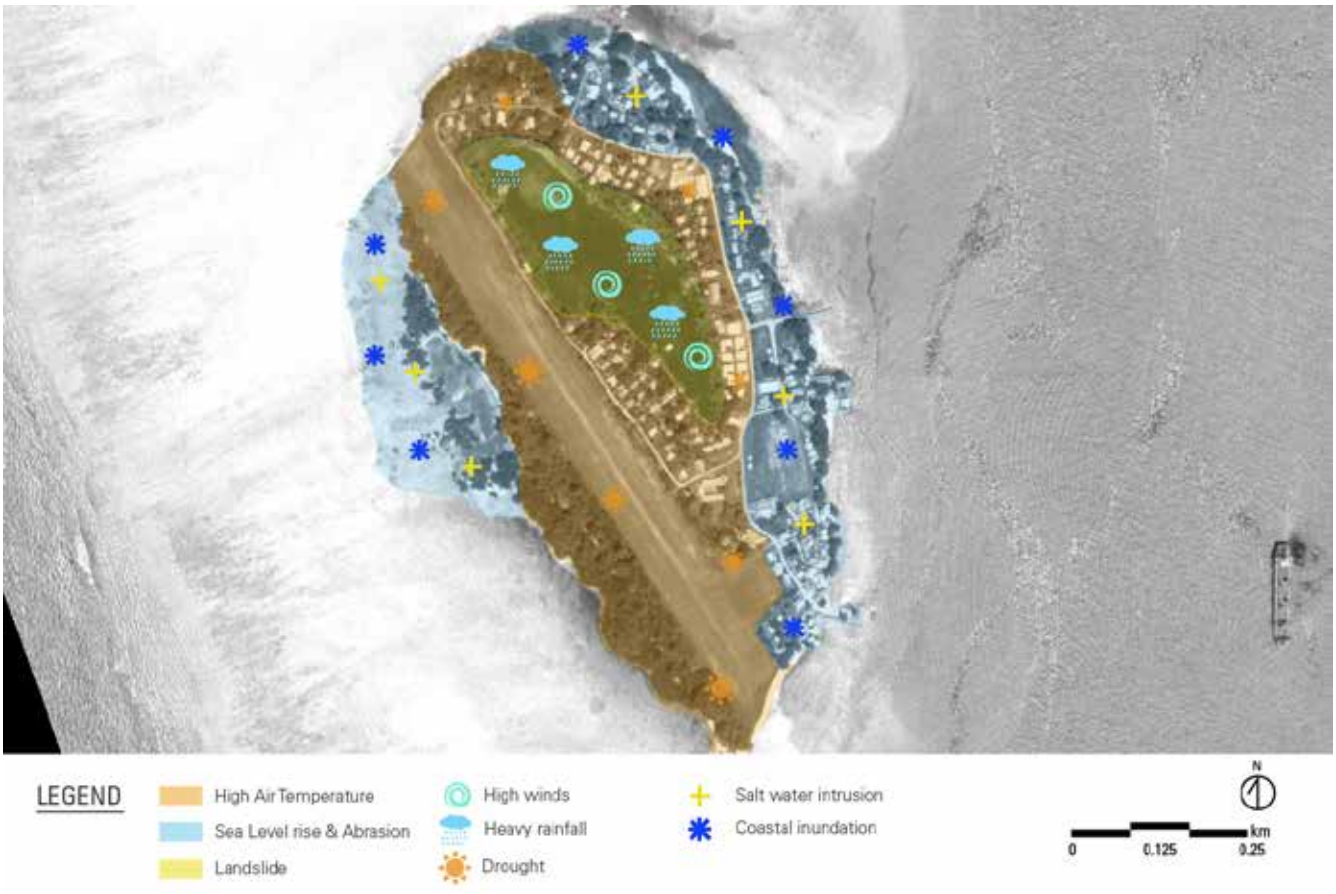
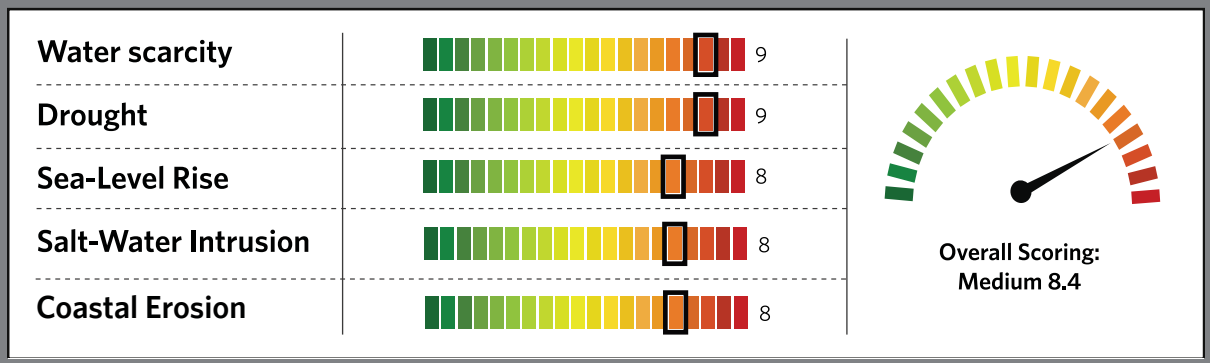


Figure 10: *Map of Exposure to Climate Hazards for Taro -- Taro is exposed to multiple hazards such as drought, high winds, temperature rise (air), sea-level rise, salt-water intrusion, and coastal erosion.*

SUMMARY OF EXPOSURE

Since Taro is an island community it is exposed to a number of natural hazards; for the local population water scarcity and droughts are the most serious.



Other important climate hazards identified are temperature rise, sea level rise, saltwater intrusion and coastal erosion.

Changing climate conditions have long-term impacts, which can significantly affect the economy, raise costs, and make entire communities more vulnerable.

6. SENSITIVITY

6.1. WHAT IS SENSITIVITY?

Sensitivity means

> ***"the degree to which different systems and sectors of the population are affected by climate related hazards" (IPCC 2007).***

Understanding climate change sensitivity requires us to think not only about the geography of a place and its environmental characteristics, but also its socio-economic context. Sensitivity refers to all the *non-climate*, or the *man-made*, factors can influence a community's vulnerability. Some examples include the community's economy, levels of education, access to basic services, or the ways in which residents are organized.

These *non-climate* or *man-made* factors contribute to making it more difficult for people to prepare for, or recover from, a climate event, and this will lead to the community being more vulnerable to its damaging effects.

Sensitivity varies according to the characteristics of each community, whereas exposure may be very similar for places that are near one another.

For example, two villages that are located nearby each other will likely experience the same hazards. But their capacity to survive these hazards, is likely to be different because they will differ in terms of their social organization, levels of access to public services, livelihoods and preparedness.

It is possible to reduce vulnerability to climate change by reducing a community's sensitivity.

If both villages suffered from high winds, the one with housing near the coastline might be more damaged, while the other, with housing set back far from the beach might have been protected from harm. The village that has more connections to people working in the capital may be able to mobilize money and supplies to aid in recovery better than the isolated village. Therefore a number of *man-made* factors influence the sensitivity of people, communities or systems, to climate change.

It is possible to reduce vulnerability to climate change by reducing a community's sensitivity. In order to make community sensitivity more legible this CCVA classifies sensitivity into five categories, those are: (i) social, economic and demographic change, (ii) access, (iii) governance, (iv) social capital, and (v) capacity and awareness. By looking at sensitivity through each of these five lenses it is possible evaluate a community's relative strengths and weaknesses, and use them to identify opportunities to reduce vulnerability.

6.2. SENSITIVITY IN TARO

There are a number of different ways that communities can become more sensitive to climate hazards, this leads to them becoming more vulnerable to climate change. To help to better understand them we categorize kinds of sensitivity into different themes.

SOCIAL, ECONOMIC AND DEMOGRAPHIC CHANGE

There are many social, economic and demographic characteristics that influence a community's sensitivity to climate change, such as migration, the local economy, the management of natural resources, and barriers to growth. Demography relates to the profile of the population – for example the age of the people who live there, and their gender. Old people, for example, may be particularly affected by hot weather, so it is important to note if the proportion of older people is significant. It also relates to gender -- female households represent those with limited access to land, credit, income and information to adapt to climate change hazards. The kinds of economic activity and livelihoods that sustain a community are also significant – sometimes livelihoods can be affected by changes in the climate – so having a diverse set of economic activities is important. A further example is the level of poverty of a community – if it is very poor households may have fewer options in adapting to climate change hazards, making them more vulnerable.

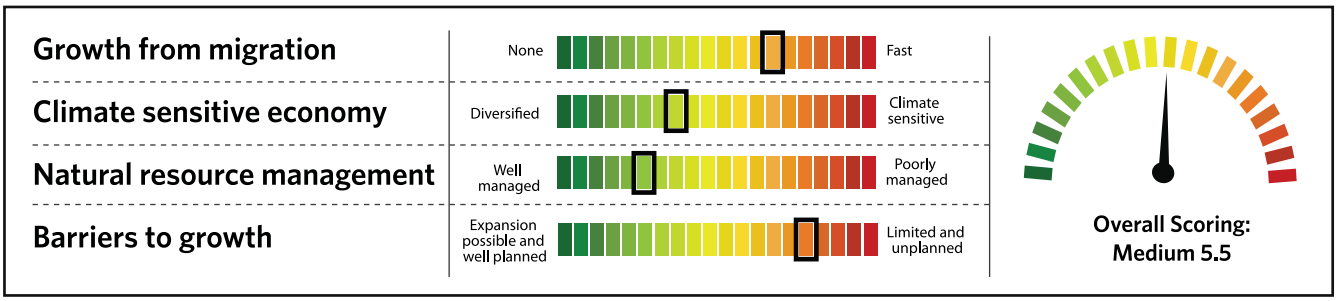
Figure 11: *The rise in population on such a small island is increasing sensitivity in Taro. Water supply, areas to dispose of trash, and appropriate places for sanitation infrastructure, are all limited. If development is not carefully planned and controlled then people will have difficulty accessing safe drinking water and other natural resources.*

The future development of the provincial capital is held in check by limits to growth

Taro is a relatively new town, it was declared a provincial capital for Choiseul in 1990, and enjoys good transportation connections with a small port and airport and good services. Taro has become a service hub for commercial logging and mining activity which helps drive the local economy and attract newcomers and businesses. But while the population and settlement continues to grow expansion is restricted by a lack of available land and water.

Some of the challenges of this growth reflect the insecurity of limited water sources and supply. For example newly installed toilets increase the vulnerability of groundwater that is drawn on by some households for drinking. Another issue is the increasing production of waste and outdoor defecation that is being disposed of in a nearby swamp and mangrove areas – thus there are a number of issues that constrain Taro's growth.

Insecurity of clean water supply adds a burden to women, when water is contaminated and clean water becomes scarce, their household and care-giving burden multiplies. They struggle to cope with poor health and sanitation issues, and consequently have less time to engage in paid work.



What is needed?

- INCREASED CAPACITY TO CAPTURE AND STORE WATER TO INCREASE WATER RESERVES
- DRAFTING OF LOCAL LAWS AND ORDINANCES TO SUPPORT WATER MANAGEMENT (SUCH AS RATIONING)
- THE CREATION OF RULES AND REGULATIONS GOVERNING WHERE NEW SETTLEMENTS CAN LOCATE
- THE DEVELOPMENT REGULATIONS TO LIMIT NEW SETTLEMENTS WHILE INCENTIVIZING DEVELOPMENT ON THE MAINLAND.
- CONSULTATION WITH WOMEN WHEN DRAFTING RULES AND REGULATIONS ON WATER MANAGEMENT.
- INITIATIVES THAT DECREASE WOMEN'S BURDEN AND INCREASE THEIR CAPACITY

ACCESS

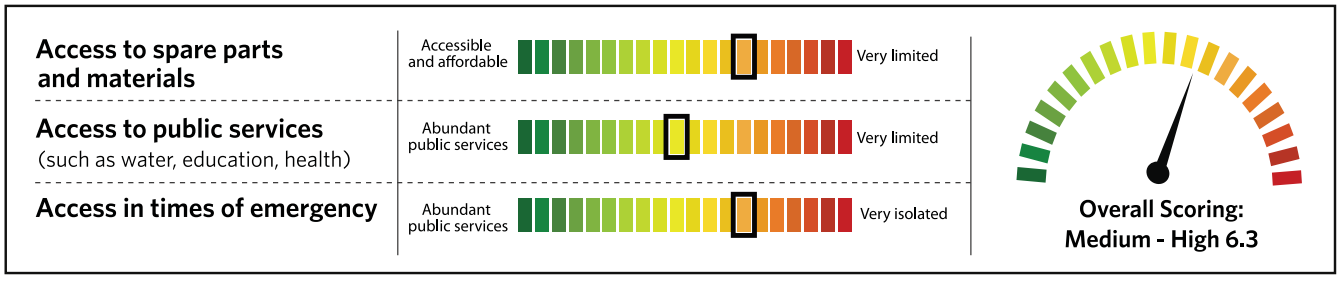
Access is another factor that can influence sensitivity to climate change – both access to services, as well as physical access to places and people. When a community has limited access to public services, such as education or health services, because the population has less information about climate hazards, and less medicine to combat illnesses. Access can also relate to the degree of isolation and ease of movement to other places. Isolation makes it difficult for residents to access materials to fix water pumps, or for the community to be reached to distribute emergency supplies after a cyclone. This increases sensitivity and makes residents more vulnerable .

The isolation of Taro means that services and goods are difficult to access and are expensive

Taro's location on an island means that it relies heavily on boat and airplane transportation for access, this raises the costs of basic goods, and makes it difficult to provide public services and energy. There is no government-supplied water or sanitation and water supply options are limited; so households are forced to pay for water, which is expensive. Given there are no additional water sources than ground water and rainwater Taro is sensitive to water shortages and droughts. Without limited access to water supply the health of residents can be threatened by extended periods of heat. Energy is also intermittent and unreliable.

Limited access to fresh and clean water further affects household members who are responsible for its collection. Although women in Taro sometimes receive help from men to collect water, they are the primary people responsible for household chores that require water management. When climate change impacts, such as drought, dry up nearby water source, it affects their daily lives and increases the time they spend having to seek out alterantive water sources. These challenges are both mental and physical in terms of management, particularly when water has to be paid for. When women who earn a limited income have no other option but to buy clean water, and manage its daily use, their mental and physical hardship increases. Similarly, women and girls, and pregnant women's sanitary needs are also limited when there is an inadequate supply of water.

Figure 12: *Taro's isolated and remote location increases its sensitivity because it means that important materials, such as those to fix water systems, are difficult to access and more expensive.*



What is needed?

- IMPROVING ACCESS TO SPARE PARTS FOR WATER SUPPLY SYSTEMS, PERHAPS THROUGH PARTNERSHIPS WITH LOCAL STORES AND WORKSHOPS.
- INVESTMENTS THAT IMPROVE THE SUPPLY OF BASIC SERVICES OF WATER, SANITATION AND POWER.
- IMPROVED PLANNING PRACTICES, THAT RESERVE CATCHMENT AREAS AND EASEMENTS, TO ACCOMMODATE THE DEVELOPMENT OF WATER SUPPLY SYSTEMS IN THE FUTURE.
- THE SUPPLY SYSTEMS FOR WATER AND SANITATION ARE MORE GENDER SENSITIVE AND EQUITABLE BY CONSIDERING THE NEEDS OF WOMEN, GIRLS, PREGNANT/ LACTATING WOMEN, THE DISABLED, AND THE ELDERLY.

GOVERNANCE

Governance refers to the relationship that citizens have with their government and the process in which the government manages public resources, takes decisions, and implements them. Poor governance describes poor enforcement of laws, the lack of engagement of government officials with people, and poor administration of public funds and resources. Good governance refers to effective processes of decision-making in which citizens and government work closely together, due to trust and communication.

Good governance is important in managing water supply because it helps to ensure that water can be distributed to meet the needs of the entire community, not just a select group. Good governance often results in durable and fair institutions; these can ensure that the administration and maintenance of water supply is effective and sustainable. Poor governance may result in a lack of enforcing regulations that protect water resources, a lack of information about regulations, or even a lack of trust in the government to administer water fairly.

Strong provincial government provides a solid basis for development but local government is lacking

The Choiseul Provincial Government has a very strong presence in Taro, collaborating with a number of development initiatives and being proactive about planning for the future expansion of the township. Expansion is one of Taro's primary challenges due to limits to water and land, and so the government is setting about to establish a Local Planning Area (LPA) for Choiseul Bay to designate an area of the Mainland for future expansion to alleviate pressures on existing limited resources. However there are a number of areas for government to improve, for example the provision of housing for government officials, the replacement of the Provincial water and sanitation post (now vacant), and the implementation and enforcement of water and sanitation regulations.

There is no active government office governing the township settlement, for example managing basic trash collection or services; these functions are dealt with by Provincial Government. Taro is only considered a ward, which means there is no way for residents to interact with officials responsible for local services or seek information (other than going to their ward representative who sits at the Provincial level). To improve governance in Taro it is important to empower the

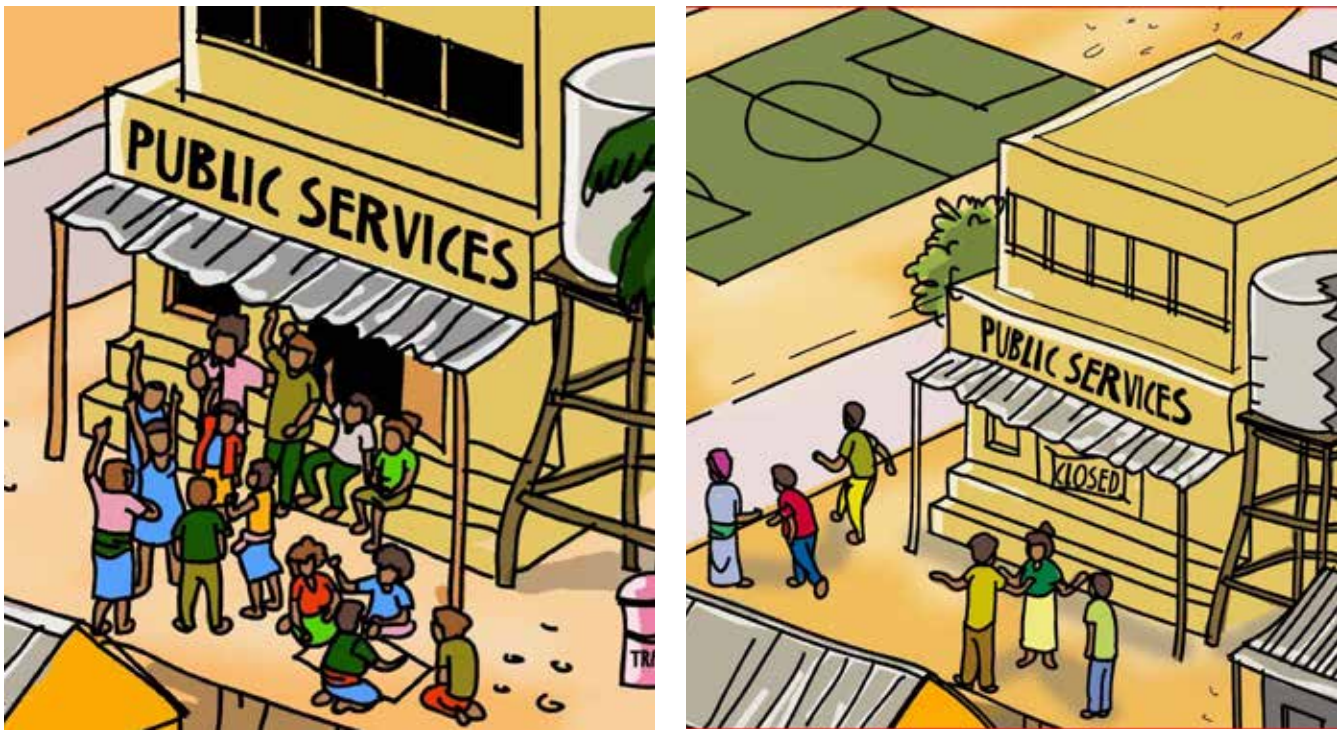
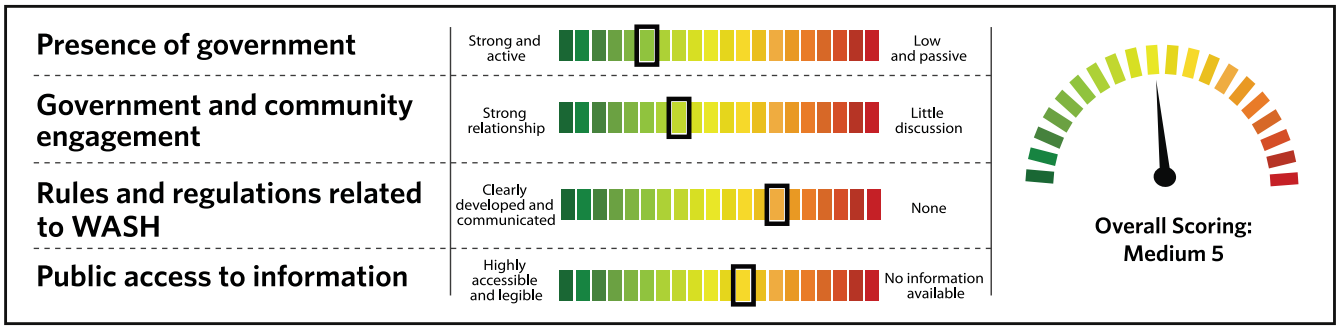


Figure 13: *Good governance results from open and collaborative engagement between local government and residents (left); poor governance occurs when government offices are closed and officials don't communicate with residents.*

township-level government. This can help reduce sensitivity to climate change by bringing government and community closer together and help solve problems.

Since men mostly work outside the home, they have more chances to interact with outsiders, such as the government, compared to women who are mostly involved in household work. Thus, women have limited opportunity to share their concerns and opinions.



What is needed?

- A TOWN CLERK AND OFFICE FOR RESIDENTS TO VISIT TO DISCUSS TOWNSHIP ISSUES AND SEEK INFORMATION.
- CLOSER COLLABORATION OF NGOS, CIVIL SOCIETY, TOWNSHIP AND PROVINCIAL GOVERNMENT.
- THE CREATION OF RULES AND REGULATIONS GOVERNING WATER MANAGEMENT AND SUPPLY
- INFORMATION IS MADE AVAILABLE TO THE PUBLIC IN A WAY THAT IS ACCESSIBLE FOR WOMEN, YOUTHS, AND THE ELDERLY.
- CAMPAIGNS TO RAISE PUBLIC AWARENESS ABOUT HOUSEHOLD WATER MANAGEMENT AND CONSERVATION PRACTICES.
- ENGAGEMENT OF WOMEN IN THE PLANNING PROCESS AND IN THE CREATION AND IMPLEMENTATION OF LAWS ON WATER GOVERNANCE.

SOCIAL CAPITAL

Social capital refers to the strength of relationships between community members that enables them to work together towards a common goal. A community that possesses good social capital may be one where households have close reciprocal relationships, good leadership, effective means of sharing information, peace and security. A community with low social capital is one where people distrust each other, there are few communal activities involving different groups, people don't communicate freely with one another, and there is crime and insecurity.

Social capital is an important factor in communities that effectively manage water resources because it can help them to circulate information about water rationing and effective water management, help to distribute scarce water resources evenly, and ensure collaboration in maintaining water supply infrastructure.

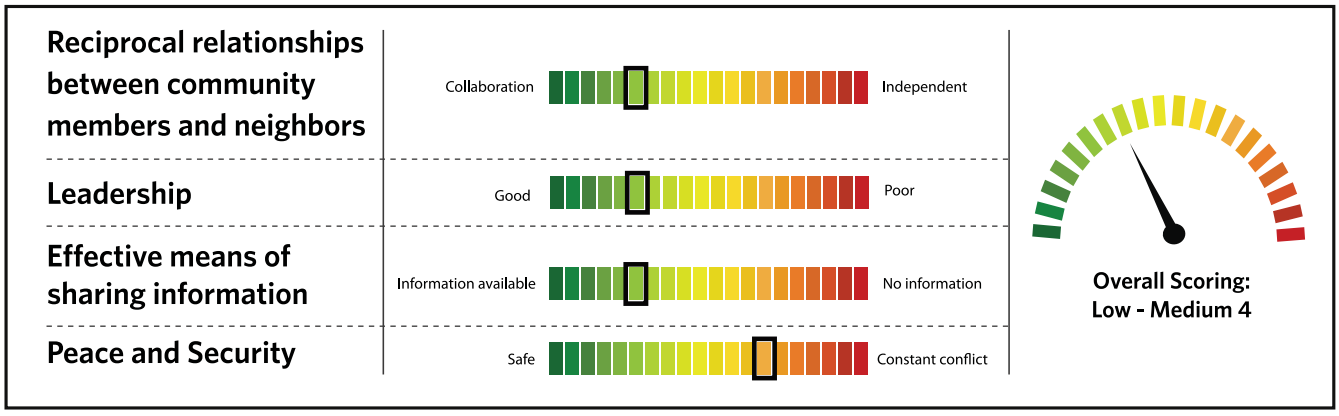
The community works well together but concerns focus on growth and visitors

The community of Taro is strong and well-organized community, the wantok system provides considerable social cohesion, and there are a number of active churches, NGOs and civil society organizations. These organizations are partnering with government and helping to involve community members to share information, prioritize community concerns and voice their needs. This kind of government-civil society collaboration is necessary for effective adaptation

to climate change and can be an important asset during times of need.

There is concern about the impacts of newcomers, usually traders or short-term visitors, who don't follow regulations and can cause disturbances. Taro also borders Papua New Guinea and there is a need to tighten security and regulate goods and peoples who go back and forth. With Taro's continued growth and prominence as a provincial capital growing numbers of visitors is inevitable and presents challenges to the community's traditionally strong social cohesiveness.

Figure 14: *Social capital results from well-organized and communicative community groups who share information and support each other. This helps strengthen their capacity to adapt to challenges.*



What is needed?

- REGULAR AUDIENCES WITH COMMUNITY MEMBERS TO SHARE PROGRESS AND INVITE COMMUNITY INPUTS REGARDING REGULATIONS AND GOVERNMENT DECISION-MAKING.
- AN UPDATED PUBLIC NOTICE BOARD TO SHARE GOVERNMENT AND CIVIL SOCIETY ACTIVITY.
- THE CREATION OF CHURCH AND NGO LEADERSHIP COMMITTEE TO SUPPORT RAISING PUBLIC AWARENESS.
- THE CAPACITY OF FAMILIES IS STRENGTHENED THROUGH IMPROVED INFORMATION SHARING, AWARENESS AND TRAINING ON GENDER SENSITIVE WATER USE AND MANAGEMENT.

CAPACITY AND AWARENESS

Capacity refers to the skills and abilities of a community, to solve problems and develop solutions; *Awareness* refers to the knowledge that community members may have about issues and their surroundings. Good capacity allows local communities to resolve issues themselves by taking action, without necessarily waiting for external support. Good capacity can support the maintenance of effective water supply systems, for example with skills like fixing broken parts, or doing maintenance checks.

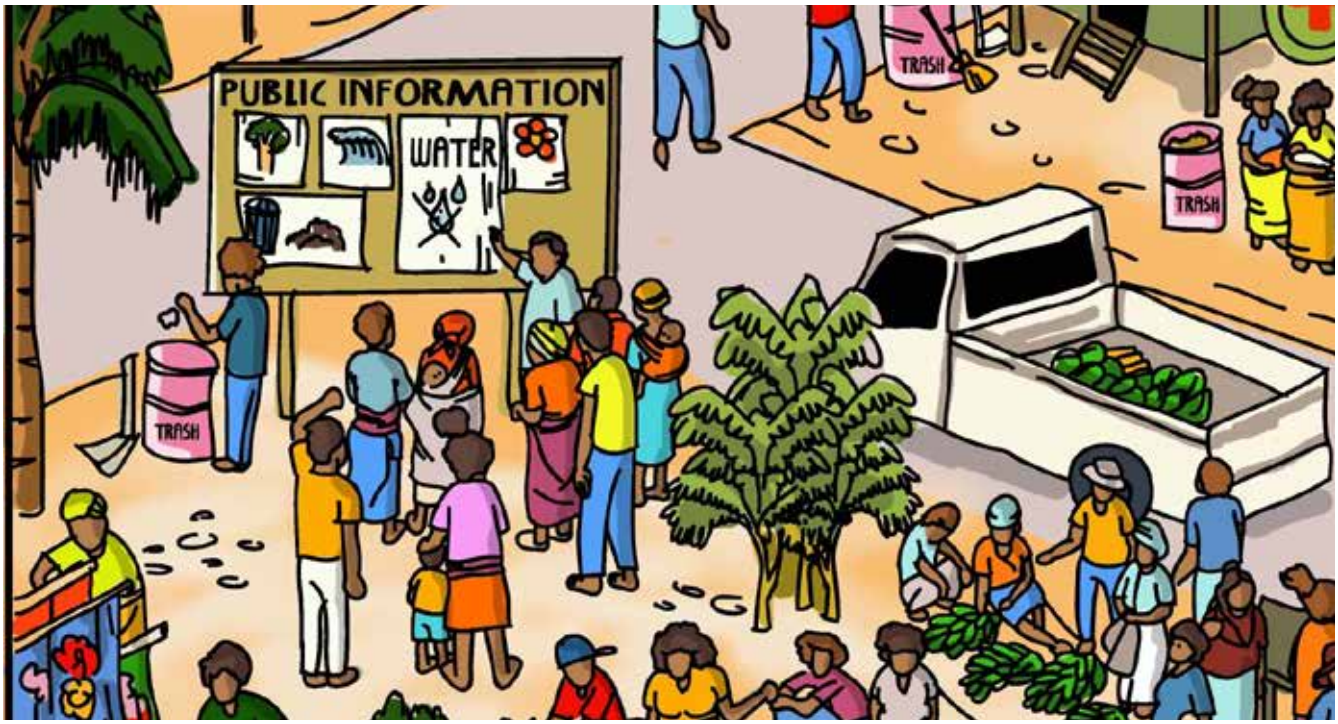


Figure 15: *Capacity and awareness is important because it allows residents to better understand issues, such as climate hazards and water shortage, and better strategize to reduce vulnerability.*

Good awareness allows local communities to react and know what actions need to be taken. Low capacity and awareness make communities sensitive to climate hazards because they have few skills or knowledge about problems or issues that are happening around them. Good awareness can translate into communities that know about proper hygiene, how to ensure clean water, and how to ensure households stay safe and healthy.

Awareness about climate change is low but capacity is growing

Over the last few years there have been trainings given to community members about climate change, so capacity and awareness is growing. Almost all families have some kind of conservation measure in place, such as regulating the use of drinking water and using locks on taps in times of scarcity; but there is still room for more improvement, especially raising awareness for children and visitors. There is a lot of concern that newcomers to the island, who are often trading at the market, do not follow regulations and rules about the proper use of water resources and disposing of waste (both human waste and trash).

Taro's family units are closely knit and able bodied family members often look after those who are physically weak, such as children, elderly and those with special needs. Women in particular play important role. Participants from Taro's focus group discussion mentioned, "it is mainly mothers who are more aware and they inform the men and rest of the family." Women in Taro are mostly literate and they can effectively communicate necessary information with the children and other family members.

There is limited awareness about sanitation options so household toilets are perceived to be expensive; as a result only temporary measures are used, such as using the area beyond the runway as an open defecation site and the swamp as an open rubbish pit. Both these solutions are unsustainable in the long-term. Another issue related to awareness is the impact of extracting coral from reefs surrounding the island. Coral reefs are essential for Taro's long-term survival, so if this practice continues coastal erosion and salt-water intrusion will become increasing concerns.

Capacity: Skills to solve problems and develop solutions

Awareness: Knowledge that community members have about issues and surroundings

Overall Scoring: Medium 5

What is needed?

- CAMPAIGNS TO RAISE PUBLIC AWARENESS ABOUT CLIMATE CHANGE, HOUSEHOLD WATER MANAGEMENT AND CONSERVATION, ESPECIALLY FOR VISITORS, HOUSEHOLDS AND CHILDREN.
- PUBLICALLY ACCESSIBLE INFORMATION, FOR PEOPLE TO ACCESS INFORMATION ABOUT WATER RESOURCES AND CONSERVATION MEASURES.
- COMMUNITY SIGNBOARDS POSITIONED AT THE ENTRY POINTS OF THE ISLAND, SUCH AS AT THE PORT AND AIRPORT, TO RAISE AWARENESS TO VISITORS OF WATER AND SANITATION RULES AND REGULATIONS.
- PROVINCIAL GOVERNMENT CAN SUPPORT MAINTENANCE OF COMMUNITY WELLS, SOME NEED PUMPS.
- IMPROVEMENT OF FAMILIES' COLLECTIVE CAPACITY WITH BETTER INFORMATION SYSTEMS AND TRAINING ON EARLY WARNING APPROACHES, EVACUATION, AND WATER MANAGEMENT.
- THE STRENGTHENING OF WOMEN'S ROLES AS KEY INFORMATION PROVIDERS TO DEVELOP APPROPRIATE AND EFFECTIVE STRATEGIES TO PROVIDE INFORMATION TO DIFFERENT GROUPS OF PEOPLE.

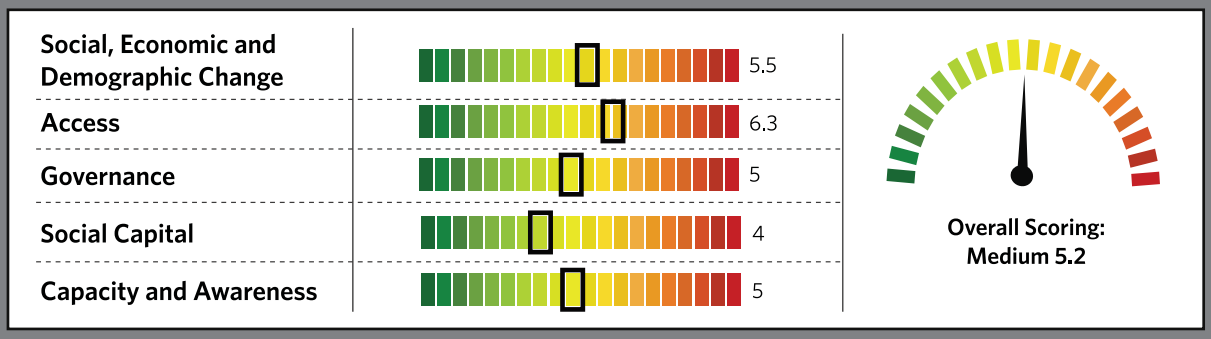
	ISSUE	SCORE
Social, Economic and Demographic Change	• Growing population restricted by available land. • Very expensive local services and resources • Demand for energy and water exceed capacity to supply • Solid waste and sanitation have no place to go	**MEDIUM**
Access	• Isolation means access to water is very limited • High prices for good and limited services • Limited access to clean water increases women's labor time and affects livelihood activities • Women also face challenges due to spending time collecting water when water sources dry up	**HIGH-MEDIUM**
Governance	• Strong and forward-thinking Provincial government • Government is open to collaboration with civil society	**MEDIUM**

	ISSUE	SCORE
Social Capital	• A number of local NGOs in active partnerships with government • Visitors may not know about local culture and regulations • Strong family ties support vulnerable groups such as children, the elderly and those with special needs.	**MEDIUM**
Capacity and Awareness	• Limited capacity for dealing with climate change so more awareness needed • Regulations to help manage scarce water resources Literate women are information agents for their family members during emergencies	**MEDIUM**

Table 9: Sensitivity in Taro

SENSITIVITY SUMMARY

Taro's sensitivity is medium, but this evaluation gives clear direction as to how different factors can be addressed, and sensitivity reduced.



Some of the key points are:

- **REGULATIONS:** DRAFTING LOCAL LAWS AND ORDINANCES GOVERNING BETTER WATER MANAGEMENT (SUCH AS GUIDELINES FOR WATER CONSERVATION AND RATIONING) WILL HELP ENSURE WATER RESOURCES ARE AVAILABLE DURING TIMES OF DROUGHT. THEY CAN ALSO INCENTIVIZE DEVELOPMENT ON THE MAINLAND AND MANAGE GROWTH IN TARO.
- **GOOD GOVERNANCE:** CLOSER COLLABORATION BETWEEN CIVIL SOCIETY, THE TOWNSHIP AND PROVINCIAL GOVERNMENTS CAN ENSURE THAT INFORMATION, ABOUT NEW REGULATIONS AND PLANNING, IS WELL KNOWN AND THAT COMMUNITY INPUTS ARE CONSIDERED. THERE SHOULD BE MORE REGULAR AUDIENCES BETWEEN COMMUNITY AND GOVERNMENT AND A TOWN CLERK AND OFFICE.
- **PUBLIC CAMPAIGNS:** CAMPAIGNS TO RAISE PUBLIC AWARENESS ABOUT CLIMATE CHANGE AND WATER CONSERVATION ARE NEEDED, ESPECIALLY TO SHARE THE LOCAL PRACTICES WITH VISITORS. PUBLIC SIGNBOARDS AND PUBLICALLY ACCESSIBLE INFORMATION, ABOUT WATER RESOURCES AND CONSERVATION MEASURES ARE ONE WAY TO RAISE AWARENESS.
- **GENDER MAINSTREAMING:** INCLUSION OF CONCERNS OF WOMEN, CHILDREN, AND OTHER DISADVANTAGED GROUPS IN ALL WASH ACTIVITIES, INCLUDING DRAFTING LOCAL LAWS, CONSULTATIONS, COORDINATION ABOUT WATER CONSERVATION AND PUBLIC CAMPAIGNS.

7. ADAPTIVE CAPACITY

7.1. WHAT IS ADAPTIVE CAPACITY?

Adaptive Capacity refers to

> ***"the ability of a system to adjust to climate change so as to moderate potential damage, take advantage of opportunities, or help cope with consequences" (IPCC 2007).***

Throughout history people throughout the world have been responding to climate change, doing so has helped ensure their survival and prosperity. Across the world communities have had to make adjustments to the ways they organize themselves, the way they sow their crops, build their homes, and manage their resources, because weather patterns have never been totally constant. So communities have shown adaptive capacity for a long time.

Adaptive capacity is a term given to the ways that people are able to respond to climate change to reduce their own vulnerability. It is important to remember that another way to reduce vulnerability, other than reducing sensitivity, is to increase a community's adaptive capacity.

7.2. ADAPTIVE CAPACITY IN TARO

AUTONOMOUS / HOUSEHOLD-LEVEL

Autonomous adaptive capacity refers to actions taken at individual or household level to protect livelihoods and assets from potential climate related hazards. Autonomous adaptation is usually small scale and effective for low intensity disasters. Adaptation is triggered by ecological changes in natural systems and by market or welfare changes in human systems.

Figure 16: *Adaptive capacity measures taken at the household-level are essential for community efforts to reduce vulnerability. Adopting measures to capture and conserve water are an example of adaptive capacity that, if practiced widely, can impact the whole island.*

Positive:

- THERE IS AWARENESS ABOUT DROUGHT AND WATER CONSERVATION AT THE HOUSEHOLD-LEVEL, AS WELL AS A POSITIVE ATTITUDE THAT DEMONSTRATES HIGHLY ADAPTIVE AND SELF-RELIANT PEOPLE.
- AT HOUSEHOLD LEVEL MEN AND WOMEN SHARE RESPONSIBILITIES – FOR EXAMPLE WOMEN ARE RESPONSIBLE FOR COOKING, CLEANING AND THE HOUSE, WHILE MEN ARE RESPONSIBLE FOR PHYSICAL JOBS LIKE CHOPPING FIREWOOD, FISHING, DIVING). WATER COLLECTION IS OFTEN SHARED, BUT MANY TIMES WOMEN FULFILL THIS TASK. THERE IS ALSO EQUITY IN GENDER ACCESS TO, AND CONTROL OF, OVER HOUSEHOLD RESOURCES.
- HOUSEHOLDS HAVE SHOWN INITIATIVE AND PREPAREDNESS TO PAY TO SELF-SUPPLY WATER OPTIONS.
- THERE IS ACTIVE INVESTMENT IN BOTH USING ADDITIONAL TANKS AND WELLS, AND SERVICES EXIST FOR RAINWATER TANK SUPPLY AND INSTALLATION, AS WELL AS WELL CONSTRUCTION AND PUMP MAINTENANCE. THERE IS ALSO A HIGH COVERAGE OF HOUSEHOLD RAINWATER TANKS AND A GROWING NUMBER OF PRIVATE HAND-DUG SHALLOW WELLS. HOWEVER, THERE IS STILL A HEAVY RELIANCE ON RAINWATER TANKS FOR DRINKING WATER.
- CLOSE FAMILY UNITS ARE A STRONG INTERNAL SUPPORT SYSTEM: WOMEN PROVIDE INFORMATION WHEN THERE IS A WATER SHORTAGE, AND MEN HELP WOMEN IN COLLECTING WATER AND SUPPORT PHYSICALLY WEAK MEMBERS, SUCH AS CHILDREN, THE ELDERLY AND THOSE WITH SPECIAL NEEDS.

Figure 17: *Households should be able to maintain and fix water storage tanks in order to ensure that they are functional at all times. This supports adaptive capacity because it increases available capacity to store water in times of drought.*

Negative:

- WHILE THERE IS MODERATE AWARENESS ABOUT HOW TO MANAGE HOUSEHOLD WATER RESOURCES DURING DROUGHTS NOT ALL HOUSEHOLDS RESPOND TO WATER MANAGEMENT RECOMMENDATIONS. E.G. MANY HOUSEHOLDS CONTINUE TO USE RAINWATER TANKS FOR ALL HOUSEHOLD NEEDS PURPOSES.
- TRASH IS DUMPED IN AN AREA OF THE SWAMP, WHICH MAY CAUSE PROBLEMS FOR GROUNDWATER IN THE FUTURE. THIS REVEALS THE LACK OF A SUSTAINABLE LONG-TERM SOLUTION.
- THERE IS SOME RELUCTANCE FOR SOME HOUSEHOLDS TO MAKE INVESTMENTS IN WATER SUPPLY INFRASTRUCTURE DUE TO UNCERTAINTY OVER WHETHER THE TOWNSHIP WILL BE RELOCATED IN THE FUTURE, OR IF THEY WILL BE MADE AVAILABLE THROUGH OTHER SOURCES.
- NOT MANY HOUSEHOLDS PERFORM MAINTENANCE ON THEIR RAINWATER HARVESTING SYSTEM. WHILE THERE ARE SIGNIFICANT BENEFITS TO BE MADE BY USING GUTTERING AND INCREASING TANK CAPACITY THERE IS LIMITED AWARENESS AND WILLINGNESS TO DO SO.
- AUTONOMOUS CAPACITY TO MANAGE WASH SYSTEMS IS MODERATE
- THERE IS VERY LIMITED EDUCATION AND MONITORING OF WATER USAGE AND MANAGEMENT WITHIN HOUSEHOLDS – THIS LEADS TO WATER SHORTAGES.

What is needed?

- MORE RESPONSIBLE USE OF WATER IN EACH HOUSEHOLD, THROUGH BETTER LEVELS OF AWARENESS AND RATIONING IN TIMES OF WATER SCARCITY. IMPROVE HOUSEHOLD MANAGEMENT MAY ALSO REQUIRE INVESTMENTS IN WATER TANKS.

COLLECTIVE/ COMMUNITY-LEVEL

Collective adaptive capacity refers to the capacity of or actions taken by groups. These are generally community initiatives aimed at reducing exposure or minimizing sensitivity, the efforts and benefits of which are sought after by a wider group than just individual households. Collective adaptation is geographically larger than autonomous adaptation and usually requires more resources and coordination.

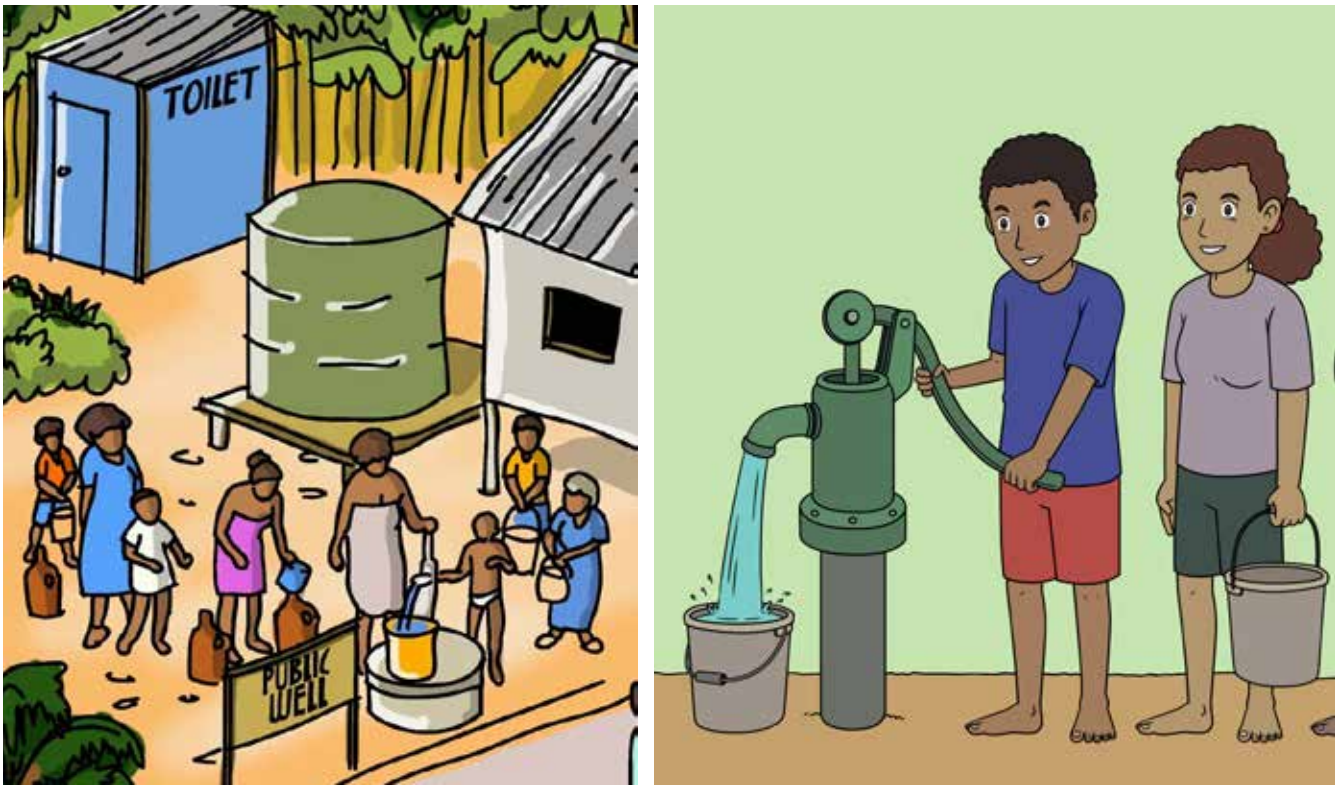


Figure 18: *Community-level adaptive capacity means that residents have the skills to maintain water supply infrastructure and know how to manage distribution of water, which can be as simple as managing lines.*

Positive:

- THE TARO COMMUNITY SHOWS ADAPTIVE CAPACITY DURING TIMES OF STRESS – FOR EXAMPLE, RECENTLY DURING A PERIOD OF DROUGHT WATER CONSERVATION MEASURES WERE TAKEN THAT INDICATE PEOPLE HAVE BECOME MORE WATER CONSCIOUS, AND USED A TANK FOR DRINKING WATER.
- THE SIWSAP PROJECT HAS RECENTLY CREATED A LOCAL WASH CLIMATE CHANGE COMMITTEE (CALLED THE PROJECT PILOT COMMITTEE) THAT IS MEETING REGULARLY.
- THE TOWNSHIP HAS BENEFITED FROM THE PROVISION OF INCREASED SERVICES, SUCH AS THE SPORTS CENTER, AND THERE ARE A NUMBER OF LOCAL NGOS, FOUR CHURCH GROUPS AND A STRONG WOMEN'S GROUP.
- THERE ARE A NUMBER OF PUBLIC SPACE REGULATIONS THAT ARE RESPECTED, FOR EXAMPLE DOGS ARE NOT ALLOWED, PIGS ARE CONFINED, AND WHICH AREAS ARE DESIGNATED FOR OUTDOOR DEFECATION. PEOPLE MAINTAIN CLEANLINESS OF PUBLIC AREAS.
- THERE IS A GOOD CAPACITY IN THE COMMUNITY TO MAINTAIN WATER SUPPLY INFRASTRUCTURE, SUCH AS THE CAPACITY TO DIG WELLS AND FIX PUMPS (HOWEVER TOILET EXPERTISE IS LACKING).

Figure 19: *There is evidence of good community-capacity to repair and maintain water supply infrastructure. This is essential for a community to be able to survive periods of drought since they can take full advantage of stored water reserves.*

Negative

- THERE IS NO ACTIVE WATER COMMITTEE IN TARO.
- VISITORS COMING TO THE ISLAND TO TRADE AT THE MARKET OFTEN DON'T RESPECT LOCAL REGULATIONS, DEFECATING IN THE OPEN AND THROWING TRASH ON THE GROUND.

Figure 20: *In Taro near the market there are signs to prevent dumping of trash, but visitors often ignore them and leave trash all over the ground. This can lower adaptive capacity because visitors are not following local rules and regulations.*

What is needed?

- MORE SHARING OF INFORMATION TO MAKE IMPORTANT WATER CONSERVATION INFORMATION AVAILABLE TO THE PUBLIC; ESPECIALLY USING INFORMATION BOARDS AND OUTREACH.
- THE FORMATION OF A WATER COMMITTEE TO MEET REGULARLY, DISSEMINATE INFORMATION, PERIODIC CHECKS ON WATER RESOURCES, AND COLLABORATION WITH LOCAL GOVERNMENT.

INSTITUTIONAL/ GOVERNMENT

Institutional adaptive capacity refers to the capacity of organizational systems. These might be programs, policies, regulations, human resources and technological expertise of government at the local, regional or national levels, as well as civil society groups.

Positive:

- THE PROVINCIAL GOVERNMENT IS LOCATED IN TARO, SO THEY ARE SUPPORTIVE TO THE POPULATION IN TIMES OF NEED. FOR EXAMPLE DURING A RECENT DROUGHT THE PROVINCIAL GOVERNMENT SPONSORED BOAT TRIPS TO COLLECT WATER AND DISTRIBUTED WATER CONTAINERS TO HOUSEHOLDS TO SUPPORT WATER COLLECTION DURING RECENT DROUGHTS.
- THERE IS STRONG CAPACITY, ORGANIZATION, AND WILLINGNESS FROM PROVINCIAL GOVERNMENT TO WORK WITH NATIONAL GOVERNMENT TO IMPLEMENT LOCAL WASH REGULATIONS .
- A NUMBER OF LOCAL ORDINANCES DEMONSTRATE A COMMITMENT TO PUBLIC HYGIENE.
- THE PLANNED RELOCATION OF TARO'S INDUSTRIAL AND COMMERCIAL AREA TO THE MAINLAND DEMONSTRATES ADAPTIVE CAPACITY IN THE FACE OF LIMITS TO WATER SUPPLY AND GROWTH. AT THE MOMENT A TOWN AND COUNTY PLAN IS BEING DRAFTED.
- GOVERNMENT HOUSING IS SUPPLIED WITH RAINWATER TANKS AND POUR FLUSH TOILETS WITH SEPTIC TANKS.

Figure 21: *Governments can increase adaptive capacity by passing, and enforcing, rules such as those that require certain building regulations. For example that houses be made of strong materials, be raised above the ground to avoid flooding, and are away from vulnerable areas, such as the coastline.*

Negative:

- THERE HAS BEEN LIMITED SUPPORT OFFERED TO TARO FROM THE NATIONAL GOVERNMENT; AT THE MOMENT TARO DOES NOT HAVE AN ENVIRONMENTAL OFFICER OR DRM OFFICER STATIONED IN THE TOWNSHIP.
- MANY GOVERNMENT BUILDINGS DO NOT HAVE RAIN TANKS. MMERE-WRD AND UNDP, THROUGH GEF-LDCF FINANCING UNDER SIWSAP, HAS ASSISTED IN PROVIDING TANKS TO SOME OF THE GOVERNMENT BUILDINGS FOR COMMUNITY USE. MANY TOILETS IN GOVERNMENT HOUSING HAVE HAD NO MAINTENANCE AND SOME ARE IN DISREPAIR.
- THERE IS SOME RELIANCE ON DONOR PROJECTS; THIS CREATES A MENTALITY OF DEPENDENCY AND RELIANCE ON DONOR PROJECTS TO IMPLEMENT WASH PROJECTS.
- THERE IS A LACK OF SIGNAGE OR AWARENESS TO COMMUNITY/VISITORS ABOUT THE IMPORTANCE OF WATER CONSERVATION (PARTICULARLY AFTER DEALING WITH 2 RECENT DROUGHTS). FOR EXAMPLE THERE IS NO EARLY WARNING SYSTEM, AND A GENERAL LACK OF AWARENESS ABOUT THESE MEASURES.

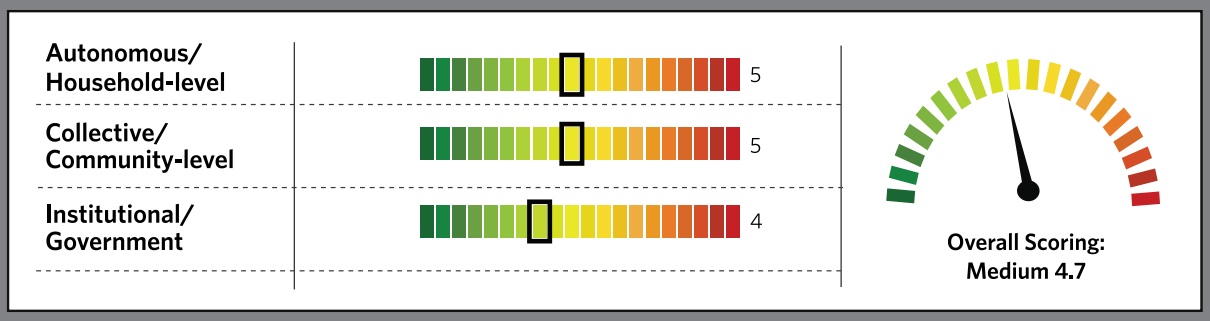
Figure 22: *If the government does not impose, or enforce, building regulations then houses can become badly damaged during heavy winds. This means that households can suffer injury and costly losses that further increase their vulnerability.*

What is needed?

- MORE INFORMATION SHOULD BE MADE AVAILABLE TO THE PUBLIC ABOUT WATER CONSERVATION MEASURES DURING TIMES OF STRESS.
- MORE ATTENTION FROM PROVINCIAL GOVERNMENT ABOUT WATER MANAGEMENT, AND SUPPORT TO LOCAL COMMUNITY-BASED INITIATIVES.

SUMMARY OF ADAPTIVE CAPACITY

Adaptive capacity refers to the capacity, skills and organization that a community possesses to reduce vulnerability to climate change. There are actions at the household, community and institutional levels that can be done to increase adaptive capacity.



Some of these are:

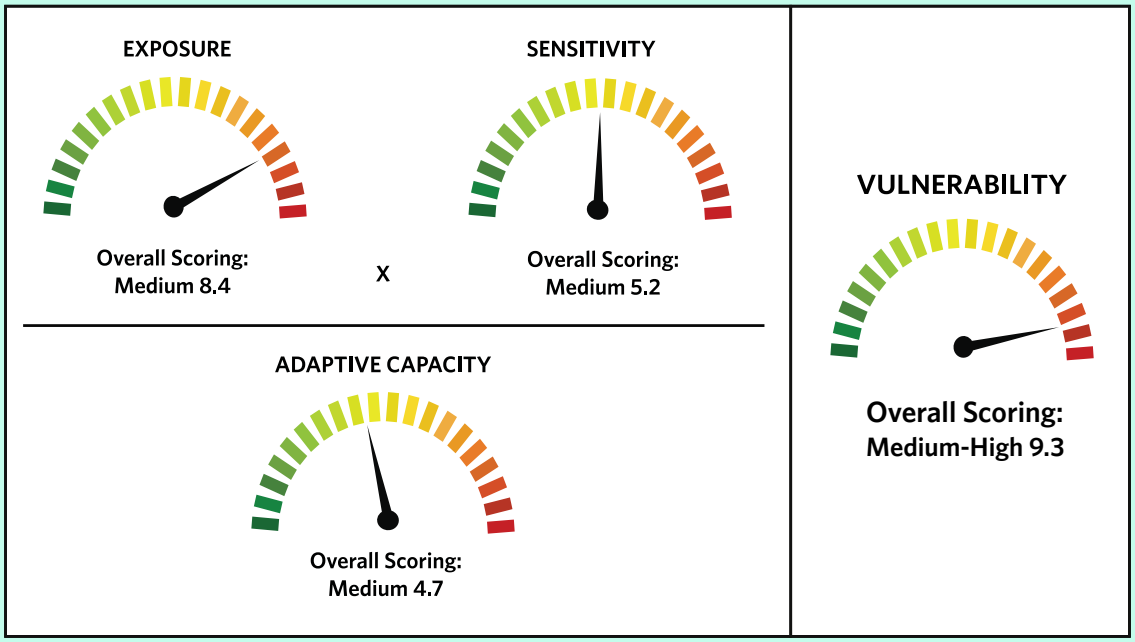
- CREATING A WATER COMMITTEE THAT WORKS WITH GOVERNMENT AND SHARES INFORMATION TO RESIDENTS ABOUT WATER REGULATIONS, PERIODS OF SCARCITY, AND CHECKS WATER SUPPLY INFRASTRUCTURE.
- BETTER ATTENTION, IN THE FORM OF REGULATIONS, OUTREACH, AND INVESTMENTS, BY PROVINCIAL GOVERNMENT TO SUPPORT WATER SECURITY.
- MORE INFORMATION NEEDS TO BE MADE AVAILABLE SO HOUSEHOLDS, COMMUNITY GROUPS AND VISITORS, UNDERSTAND HOW TO BETTER MANAGE WATER RESOURCES.

8. VULNERABILITY

Vulnerability refers to the extent to which individuals or communities are negatively affected by hazards – such as water scarcity and heavy winds in the case of the Solomon Islands. Understanding vulnerability is important because it helps people become aware of the hazards to which they are exposed. Being more aware of vulnerability also encourages people to change their behavior, if necessary, and make their families safer.

Vulnerability is usually calculated using the following equation:

$$\text{Vulnerability} = \frac{\text{Exposure x Sensitivity}}{\text{Adaptive Capacity}}$$



While in this CCVA we are not calculating exact quantities or levels of either of these indicators, what is important to understand is that vulnerability can be reduced by reducing Sensitivity, and/ or increasing Adaptive Capacity.

Vulnerability can be thought about in many different ways; one of the key aspects that this report will look at is the different ways in which vulnerability is distributed - who are the most vulnerable people, where they live and work, and what community systems are most at risk? Vulnerability can also be interrelated, where exposure to one kind of vulnerability (for example physical harm, also relates to their economic standing) so it is important to think about how different hazards and situations often relate to one another.

The CCVA is designed to support an adaptive planning process, we thus present two different future scenarios that can help support discussion and reflection on how measures can be taken to move communities towards a more resilient future. At the end of this chapter we present two possible scenarios for the medium- to long-term future, both have been developed with the help of community members thinking about current issues and trends, and projecting them forward.

8.1. VULNERABILITY IN TARO

Taro is vulnerable to a range of hazards given its small size and island setting. Of primary concern is the shortage of water supply; at the moment there is only enough accessed from groundwater wells and rainwater collection from rooftops. But if population pressures increase water shortages could become more severe as supply becomes insufficient for rising demand. Other climate hazards also threaten: sea-level rise can cause salt-water incursion and undermine scarce groundwater reserves, and high winds and coastal erosion are common place due to the island's exposure to offshore winds .

8.2. VULNERABLE PEOPLE, PLACES AND SYSTEMS

Vulnerability can be understood differently through a number of perspectives. To challenge us to think about it from a variety of dimensions, and ensure that we are considering all aspects of a community's well being, we are going to reflect upon vulnerability in terms of *Where? Who?* and *What systems?* are the most critical.

Following examination of the survey data, interviews and focus group discussions the following people, places and systems were identified as those being most vulnerable to the impacts of climate change, in particular in relation to WASH.

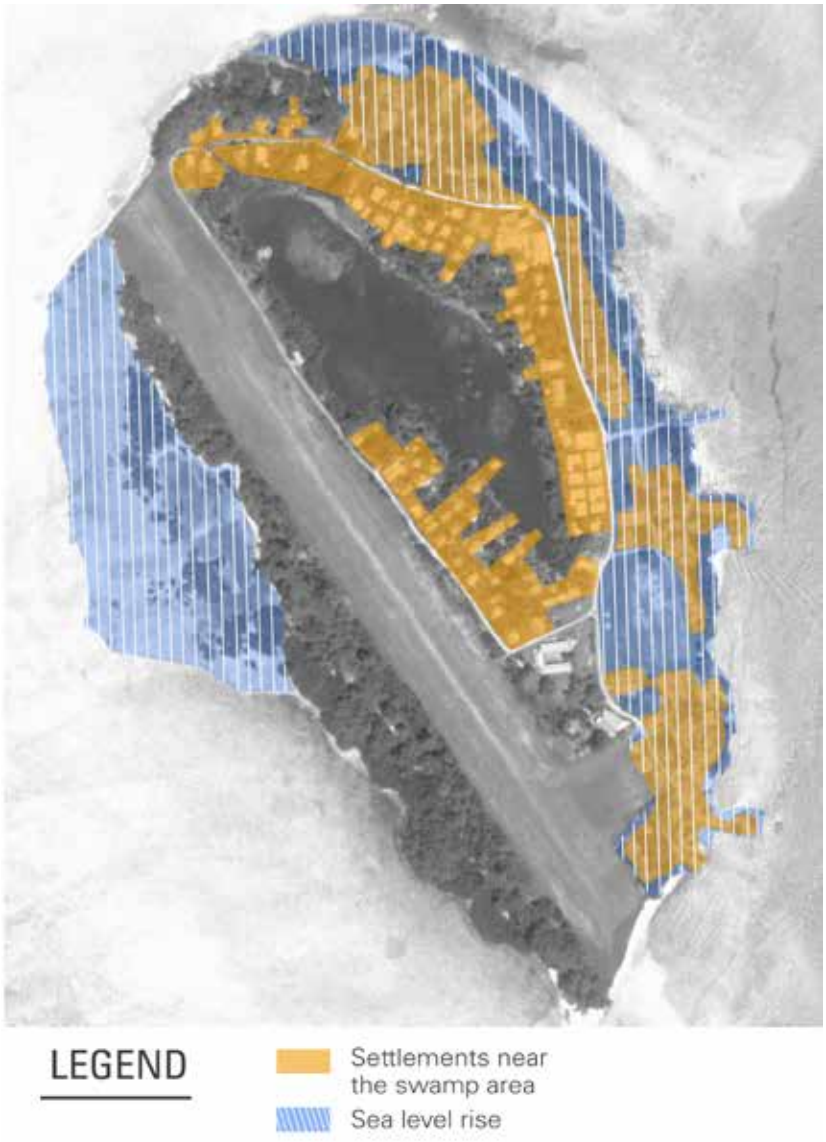


Figure 23: *Taro's vulnerable places and people.*

Vulnerable People

In the same way that climate hazards are not distributed evenly across the township or village, different groups of people can also be more susceptible, or vulnerable, to climate hazards than others. For example, the elderly and the young are more likely to suffer from extreme weather conditions, and are less likely to be able to evacuate an area during a disaster without assistance. Identifying which groups are more vulnerable than others can inform what measures will support them in the face of future climate hazards.

The assessment found the following groups are the most vulnerable to climate change because of their exposure to climate hazards, and the complex interaction that they have with multiple layers of physical and social vulnerabilities.

- THOSE WITH LIMITED CAPACITY TO CAPTURE RAINWATER: HOUSEHOLDS WHICH CANNOT SUPPLEMENT THEIR GROUNDWATER WATER SUPPLY WITH SUFFICIENT RAINWATER FOR DRINKING ARE VULNERABLE.
- THE ELDERLY: THE ELDERLY, ESPECIALLY THOSE WHO LIVE ALONE OR WITH SOME KIND OF DISABILITY, ARE

CHALLENGED TO FIND WATER RESOURCES AND REPAIR HOUSEHOLD WATER SUPPLY INFRASTRUCTURE.

- CHILDREN.
- HOUSEWIVES WHO PERFORM MULTIPLE HOUSEHOLD CHORES IN ADDITION TO WATER COLLECTION.

Vulnerable Places

Vulnerability is not distributed evenly, it varies from one place to another, with some areas particularly dangerous, or prone to harm. Using our analysis we can examine the spatial distribution of vulnerability and identify 'hotspots' which are particularly susceptible to climate impacts. This map can be used to give emphasis to some areas over others and inform the design of actions and strategies to reduce climate change vulnerability.

- HOUSEHOLDS LIVING CLOSE TO THE SWAMP AND DRAINAGE DITCH ARE VULNERABLE TO SMELLS AND WASTE.

Vulnerable Systems

The combination of impacts from both climate hazards and development trends on a township or village has the potential to negatively impact not only people and communities, but entire systems too. Systems can be man-made infrastructure or services, that support the basic functioning of the township or village, such as the water supply infrastructure, or trash collection system. But they can also be natural, ecosystems that provide services such as watersheds supplying water or mangrove areas protecting the coastline from coastal erosion. Systems are vulnerable to climate hazards, but some are particularly critical for the safe functioning of the settlement. The most important in this case are:

- GROUNDWATER: TARO'S MOST VULNERABLE SYSTEM IS ITS GROUNDWATER.

8.3. FUTURE VULNERABILITY SCENARIOS

Two contrasting future scenarios for Taro are presented, looking forward twenty years from now.

The first scenario is the 'Vulnerable Township Future'. In this scenario, despite the increase of exposure due to climate change, actions to reduce sensitivities and enhance adaptive capacities are not taken. As a result, current problems get worse, and the impacts of climate change cause further environmental and social challenges for the community.

The second scenario is called 'Resilient Township Future'. In this scenario, although exposure may increase due to climate change, various measures are taken to reduce sensitivities and enhance adaptive capacities. Community and government have decided to prioritize adaptation measures, built capacity and planned ahead in order to set in place the necessary regulations, behavior and infrastructure to make their community more resilient to climate change.

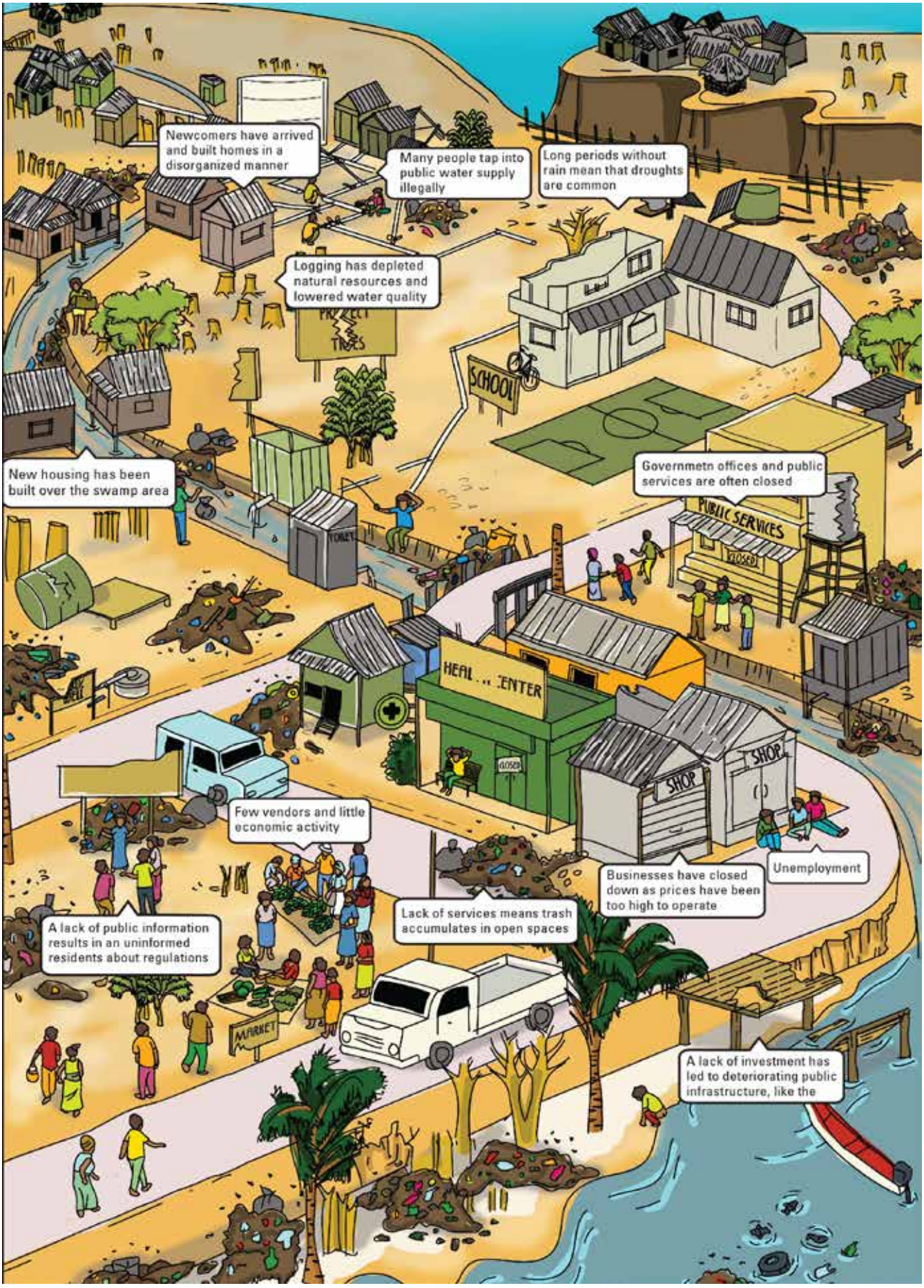
VULNERABLE TARO

Over the next twenty years the climate in Taro gradually changes, every year there are longer and longer periods without rain, and this has brought severe water scarcity and also very high temperatures. Unpredictable weather patterns have also caused multiple crop failures for rural communities all around Choiseul Province, which was devastating for farmers dependent on their taro and vegetable harvests. Once, in 2024 there was also a very severe tropical cyclone, and the damage of that historic storm is still visible today – the roof of the sports hall and a few government buildings collapsed, and they still haven't been fixed.

Over the course of twenty years few water conservation measures were put in place. Combined with a shrinking reef due to extraction of rocks, and overpopulation, this accelerated the depletion of groundwater, which became salty over time. There was also no action taken to create an adequate sanitation system, and this also contributed to pollution of groundwater. This has meant that in times of drought very little fresh water is now available – what is there is not even fit for drinking.

But in other ways Taro's situation improved. New government functions were assigned there and the market was expanded to become a regional hub. This drew more and more people to Taro's shores, not just for occasional trading, but people from all over Choiseul came to set up businesses and homes. Many also came to escape their impoverished rural communities, and also because their homes were destroyed in the cyclone of 2024. Without housing regulations many of these new settlements sprung up illegally, on the swamp, and then above the reef, even encroaching the airstrip. From a population of 500 in 2016 by 2036 the population has risen to 7,500.

But with all these new people, social capital and local governance began to break down. People commonly steal from each other's water tanks, which are also frequently vandalized. The lack of maintenance over the years also means that many aren't working, and residents haven't been able to use them, even though they are desperate to do so. While Taro has grown to become a city, it has come at the expense of sustainable access to water, and a stable society.


Newcomers have arrived and built homes in a disorganized manner
Many people tap into public water supply illegally
Long periods without rain mean that droughts are common
Logging has depleted natural resources and lowered water quality
SCHOOL
New housing has been built over the swamp area
Governmetn offices and public services are often closed
PUBLIC SERVICES
CLOSED
HEAL .. :ENTER
CLOSED
SHOP
SHOP
Few vendors and little economic activity
Unemployment
Businesses have closed down as prices have been too high to operate
Lack of services means trash accumulates in open spaces
A lack of public information results in an uninformed residents about regulations
MARKET
A lack of investment has led to deteriorating public infrastructure, like the

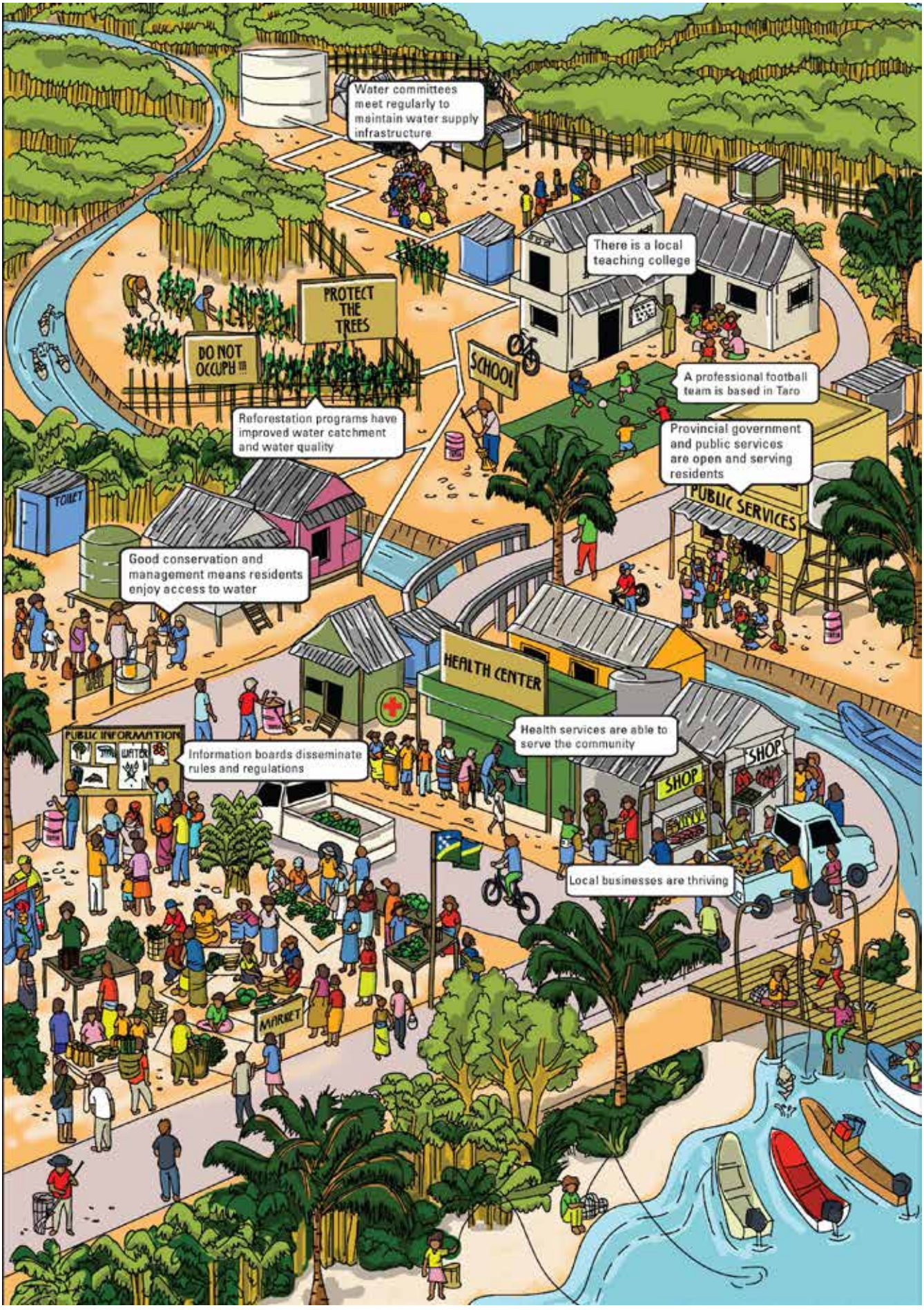
RESILIENT TARO

Over the next twenty years the climate in Taro gradually changes, every year there are longer and longer periods without rain, and this has brought severe water scarcity and also very high temperatures. Unpredictable weather patterns have also caused multiple crop failures for rural communities all around Choiseul Province, which was devastating for farmers dependent on their taro and vegetable harvests. Once, in 2024 there was also a very severe tropical cyclone, and the damage of that historic storm is still visible today – the roof of the sports hall and a few government buildings collapsed, and they still haven't been fixed.

Over the past twenty years the community set up a number of measures to manage their water resources; long ago they realized that this was one of the most important keys to the future of their community. The Water Committee they set up promoted good water conservation measures in schools and in homes, so whenever there was a drought they rationed effectively. They also developed a system of flush toilets, and a designated trash dump site, which helped to contain smells and preserve groundwater reserves. Private wells were well regulated so they were used only for household needs, and sparingly. This measures meant that by 2036 water was as plentiful as it was in 2020.

The Provincial Government's development of Choiseul Bay City has meant that settlements have grown up along the bay, with an industrial center, new markets and housing. Taro remains the administrative center, where people come to speak to government and process papers, but nothing more. That has meant that the population has remained largely stable. But the thriving urban area has brought good things to Taro, a professional football team, a local teaching college, and the regional headquarters of the Customs Division, to regulate thriving trade with Papua New Guinea.

Throughout the period Choiseul Bay has been able to absorb newcomers, who have blended well with local social norms and regulations because they've been able to access information. Government has also been proactive about listening to citizen needs, and become responsive -- setting up service delivery offices to ensure that problems are fixed and citizens are happy. Taro in 2036 is a bit bigger, but certainly a lot healthier and prosperous.


Water committees meet regularly to maintain water supply infrastructure
There is a local teaching college
PROTECT THE TREES
DO NOT OCCUPY
SCHOOL
A professional football team is based in Taro
Reforestation programs have improved water catchment and water quality
Provincial government and public services are open and serving residents
PUBLIC SERVICES
TOILET
Good conservation and management means residents enjoy access to water
HEALTH CENTER
Health services are able to serve the community
PUBLIC INFORMATION
WATER
Information boards disseminate rules and regulations
SHOP
SHOP
Local businesses are thriving
MARKET

SUMMARY OF VULNERABILITY

Taro is vulnerable to climate change not only due to its exposure to a variety of climate hazards, but also due to a number of man-made factors that make it sensitive.

- **MANAGING GROWTH:** BEING A SMALL SETTLEMENT ON AN ISLAND THE TASK OF MANAGING GROWTH IS ONE OF TARO'S BIGGEST CHALLENGES. THERE ARE LIMITED WATER RESOURCES, SERVICES AND INFRASTRUCTURE, WHICH ALREADY SEEM CLOSE TO BEING OVERSTRETCHED. THE ARRIVAL OF NEWCOMERS, AND TEMPORARY VISITORS, ALREADY IS INCREASING DEMAND FOR WATER BEYOND WHAT CAN BE HANDLED.
- **WATER SCARCITY:** WHAT MAKES TARO SO VULNERABLE IS THAT THERE ARE NO OTHER SOURCES --BEYOND GROUNDWATER AND RAINWATER – TO BE FOUND. THIS PUTS THE BURDEN ON INDIVIDUAL HOUSEHOLDS AND THE COMMUNITY TO CONSERVE WATER AND MANAGE IT APPROPRIATELY. THERE ARE INADEQUATE GOVERNMENT REGULATIONS, SERVICES AND PLANNING FOR TIMES OF SCARCITY.
- **GOVERNANCE CAN BE IMPROVED:** AT THE MOMENT THERE IS NOT ENOUGH OUTREACH TO RAISE AWARENESS, NOR GOVERNMENT ACTION (IN THE FORM OF LEGISLATION AND REGULATIONS) TO ENSURE THAT WATER MANAGEMENT IS SUSTAINABLE. GOVERNANCE CAN BE IMPROVED AT THE LOCAL LEVEL, AND THROUGH BETTER COORDINATION BETWEEN TARO AND PROVINCIAL GOVERNMENT.

9. PROBLEM IDENTIFICATION

In order to design strategies that enhance climate change adaptation it is important to dissect and analyze the issues that contribute to vulnerability. To help us do so we have created a few problem statements that focus our attention on the key issues that each site faces. The problem statement will be examined using the 'Problem Tree' method (introduced during the Adaptation Planning Phase), which allows workshop participants to discuss and identify the root causes of each problem, as well as their primary and secondary impacts.

1. WATER RESOURCES AND INFRASTRUCTURE ARE INADEQUATE FOR GROWING TOWNSHIP

Taro is a small island with a limited supply of water or infrastructure for water harvesting; the amount of water available to residents and visitors is becoming insufficient for growing demand. Climate change is impacting weather patterns, extending periods of water scarcity and drought, and sea level rise is undermining ground water due to saltwater incursion. If current trends continue there will be serious shortages of water due to these intersecting trends – this will make Taro very vulnerable to climate hazards and provoke public health issues. The most vulnerable people would be women, children and the elderly. Additional water catchment capacity, adequate planning to limit further growth, and proper water conservation measures are needed, as well as better health care and services for the most vulnerable.

2. LOW AWARENESS ABOUT WATER CONSERVATION METHODS AND SANITATION

Water is one of the priority exposure concerns of Taro because periods of drought and water scarcity are becoming more frequent, they present health concerns for vulnerable people like women, children, people with special needs, and the elderly. But there are no coordinated efforts, information or training, offered to the public to raise awareness and practice conservation. In addition several unsustainable practices continue, such as building on the swamp, dumping trash in natural areas, and mining coral for building materials, all threaten the natural ecosystems that Taro needs to ensure water resources are preserved. Low awareness about conservation and sanitation can threaten the health and lives of residents by undermining natural ecosystems and depleting groundwater reserves. More public information campaigns and outreach are needed, especially for women who play a key role in disseminating information amongst family members and the community.

3. GOVERNANCE OF WATER RESOURCES IS LACKING

Resolving local problems with water supply is challenging because there is little accountability for water supply at the local government level, and few opportunities for citizens to manage these problems together with government officials. There are also no regulations governing water use, as well as regulating growth; as a result individual households and civil society organizations may not be aware of how to best conserve and manage water in times of stress. These are all governance issues and require consultation and closer coordination between Provincial and local government, together with relevant agencies, and local residents. Lacking adequate regulations and management causes vulnerability because there are no clear rules that people have to follow, which can lead to shortages and threaten health for all people. Adequate consultation with women is necessary in formulating and implementing rules and regulations on water governance.

10. RECOMMENDATIONS

The objective of the CCVA is to better understand the nature of climate change in XX and how it will affect the community. The following recommendations are aimed at providing guidance to provincial and local government, civil society organizations and NGOs, and local community groups and residents, so they can better prepare for the challenges of responding to climate change hazards.

While this is not an exhaustive list the recommendations offer some specific actions and strategies that can be adopted in the Adaptation Plan, and implemented to help reduce vulnerability to climate change:

1. RULES AND REGULATIONS GOVERNING WATER USE AND SUPPLY

The creation of rules and regulations governing water management and supply are needed to sustain the water supy management in the area. Protection of existing water source, catchment areas and easements are needed in order to preserve water supply systems in the future. Investments also needed to improve the supply of basic services of water, sanitation and power.

2. A TOWN CLERK IS NEEDED TO RESPOND TO LOCAL ISSUES AND SUPPLY INFORMATION

As there is no active government office governing the township settlement, it is important to have a town clerk and office for residents to visit to discuss township issues and seek information. Closer collaboration of civil society, township and provincial government are important to build more transparent governenace system.

3. IMPROVED RAINWATER-HARVESTING CAPACITY FOR TARO

It is essential to improve the capacity to capture, and store, rainwater in Taro. Additional capacity could be achieved by adding rainwater capture to individual houses, but also on communal buildings, like the church and sporting facilities. In addition, better access to spare parts are needed to maintain these systems, perhaps through partnerships with local stores and workshops. Training would also be needed especially on how to keep the tanks-water clean. More attention and support from Provincial government are needed to support local community-based initiatives like in the maintenance of community wells, and to provide pumps.

4. IMPROVING FAMILY CAPACITY

Improvements are needed in terms of families' collective capacity to adapt to cliamte change, for example the need better information systems and training on early warning approaches, evacuation, water management, and water conservation measures during times of stress. Information should be communicated in a way that makes it accessible and legible to women, youths, and the elderly.

5. STRENGTHENING WOMEN'S ROLES IN PROVIDING INFORMATION

Women play a very important role in the community in sharing information, so their capacity to do so should be strengthened. Appropriate and effective strategies need to be developed to provide information to them and other groups of people. This can be done by delivering adequate trainings and involving women in raising awareness and conservation activities.

6. CAMPAIGNS TO RAISE PUBLIC AWARENESS ARE NEEDED

Public awareness campaigns about household water management and conservation practices are needed for more efficient and healty use of water, preserve natural resources, and to stop unsustainable preactice like building on the swamp, dumping trash in natural areas, and mining corals for building materials.

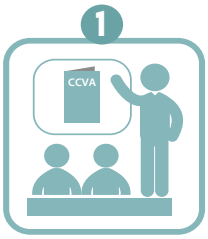
11. NEXT STEPS

The CCVA has two principal objectives, one is to raise awareness amongst residents and government by improving understanding about the nature of climate change and its will impact upon XX; the second is to serve as a planning tool that can assist community members and the government in developing the Water Sector Climate Change Adaptation Plan (WS-CCA).

The CCVA serves as a point of departure for the next steps of the climate change adaptation process, and a reference that identifies the most urgent issues, places and priorities that should be considered. These priorities will inform and define strategic thinking about how to best reduce vulnerability.

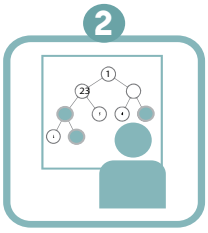
To use the CCVA effectively we recommend following the sequence of steps that will lead the community to creating their own WS-CCA. The process is designed to cover two workshops, during an estimated period of one month; it is important that a diverse range of community members are involved, including women, elderly, and youth community members. The steps are described in detail below:

WORKSHOP 1



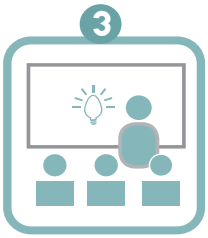
REVIEW VULNERABILITY ASSESSMENT

Review the CCVA document to remind workshop participants what has been learned about vulnerability (the priority people, places and systems), as well as refresh people's memory about potential solutions and recommendations.



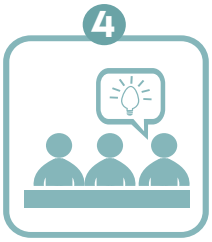
ELABORATE PROBLEM TREE EXERCISE

Drawing from lessons identified by the CCVA, the key vulnerability issues will be dissected and analyzed by stakeholders using the 'Problem Tree' approach. This helps to identify root causes of vulnerability and identify strategies and solutions.



DEVELOP A VISION AND OBJECTIVES

Planning for a resilient future requires envisioning what that future will be and what steps are needed to get there. The visioning exercise helps give direction to planning efforts and identify specific objectives that will guide the adaptation planning process.



CONSIDER STRATEGIC THINKING

Workshop participants will be reminded of the importance of *'thinking strategically'* so that project proposals balance the need for regulations, community organization, effective management, and infrastructure investments. A presentation will be made that that emphasizes the staging of a prioritized set of actions to ensure effective implementation.

DEVELOP PROPOSED OPTIONS

Participants will identify a set of proposed projects that enhance climate change resilience and reduce vulnerability in their respective site. Proposal development requires evaluating impact, feasibility, sustainability, and management requirements.

WORKSHOP 2

SELECT PROJECTS

Project selection will be conducted by a selected panel from each community, using a set of established criteria given by the SIWSAP programme, criteria cover social, technical, environmental, and financial considerations. Selected projects form the basis of the community's WS-CCA plan.

FINALIZE ADAPTATION PLANNING TIMELINE

Once projects have been selected they are placed in a sequence in a timeline which represents the strategic implementation plan or WS-CCA plan for the community.

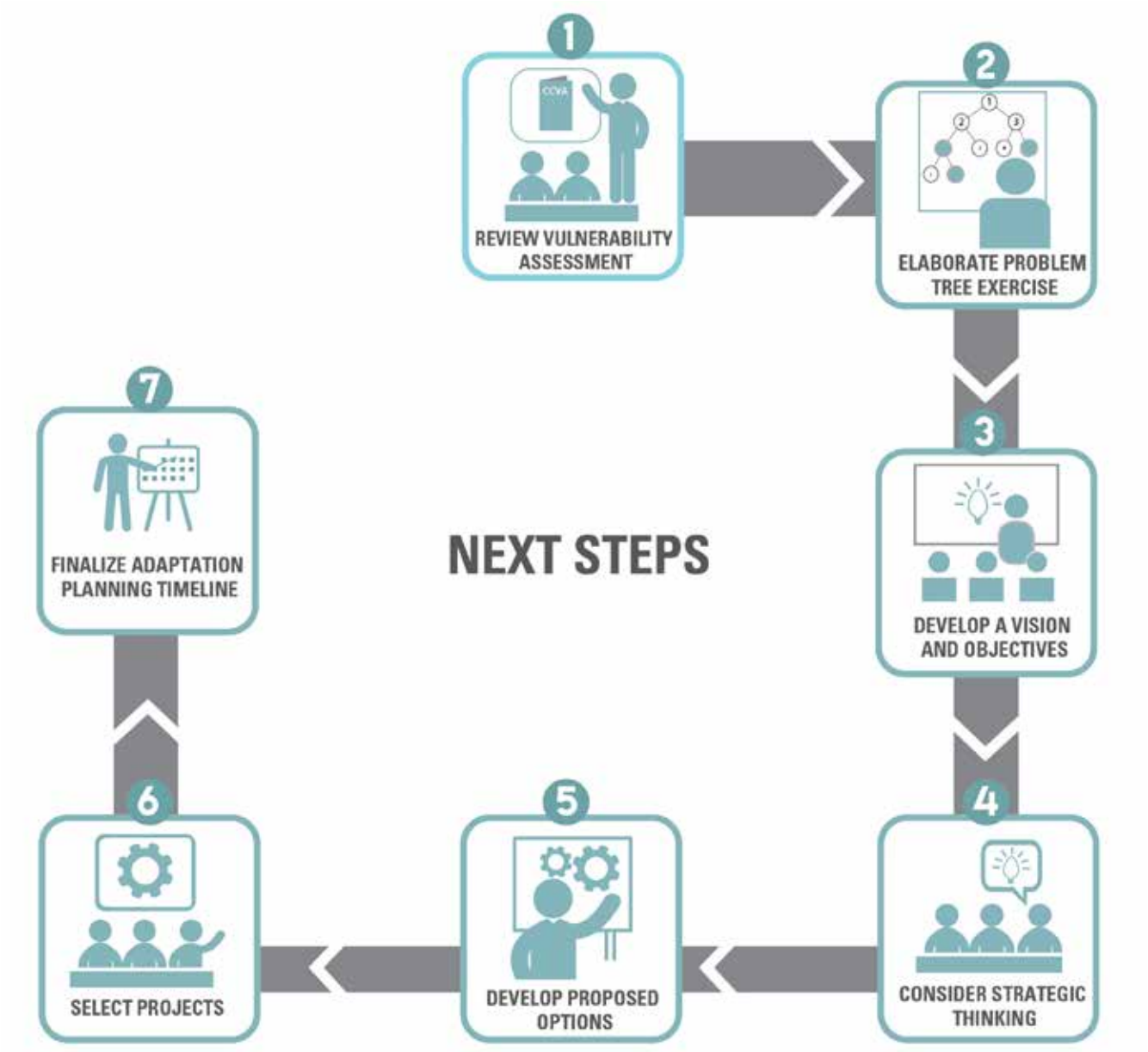


Figure 24: *Next step*

APPENDIX

A1 – WHAT IS CLIMATE CHANGE?

The United Nations Framework Convention on Climate Change (UNFCCC) defines "climate change" as:

> ***"A change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods".***

Thus, the UNFCCC thus makes a distinction between "climate change" attributable to human activities altering the atmospheric composition, and "climate variability" attributable to natural causes.

The Earth's climate is changing because people are adding heat-trapping "greenhouse" gases to the atmosphere, mainly by burning fossil fuels (such as coal and oil, which release carbon-dioxide when burned). The primary effect on the climate of increasing atmospheric greenhouse gas concentrations is the temperature of our air and oceans is increasing (see Figure A1.1, which shows that 2015 was the warmest year for at least the last 150 years).

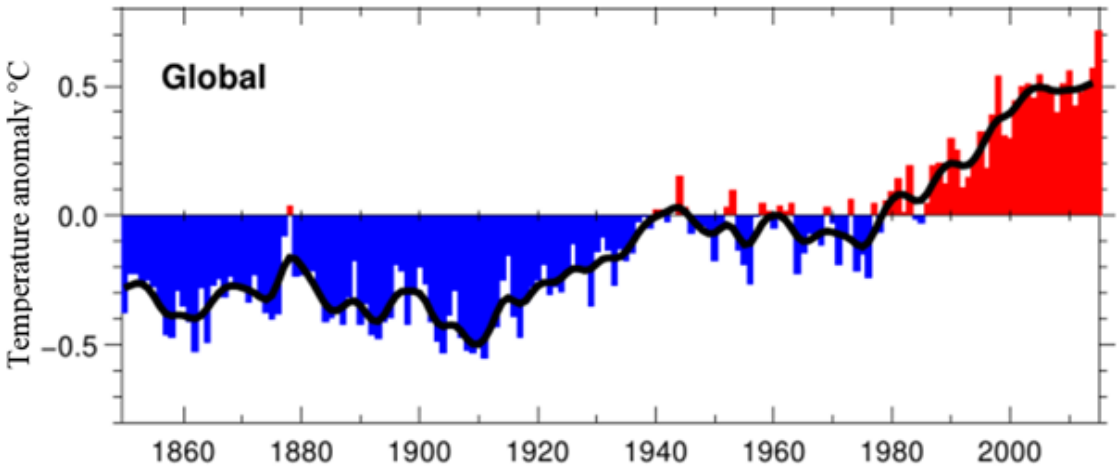


Figure A1.1: *Global average temperature (combined sea surface and air temperature) anomaly, from the period 1961-90, for the period 1850-2015 (last year is only up to October. From http://www.cru.uea.ac.uk/cru/data/temperature/).*

Higher temperatures are causing other climate-related changes around the world, such as melting glaciers and stronger storms. These changes are happening because the Earth's air, water (in all its phases), and land are all interconnected in what is called the "Earth System".

The Earth's climate has changed before, but this time is different. People are causing these changes, which are happening faster than any climate changes that modern society has ever seen before.

Climate change has already led to many biophysical impacts around the world, and as the planet continues to warm scientists expect that these impacts will become more frequent and severe. Figure A1.2 shows the kind of impacts that will have serious consequences for our planet's ecosystems and human societies.

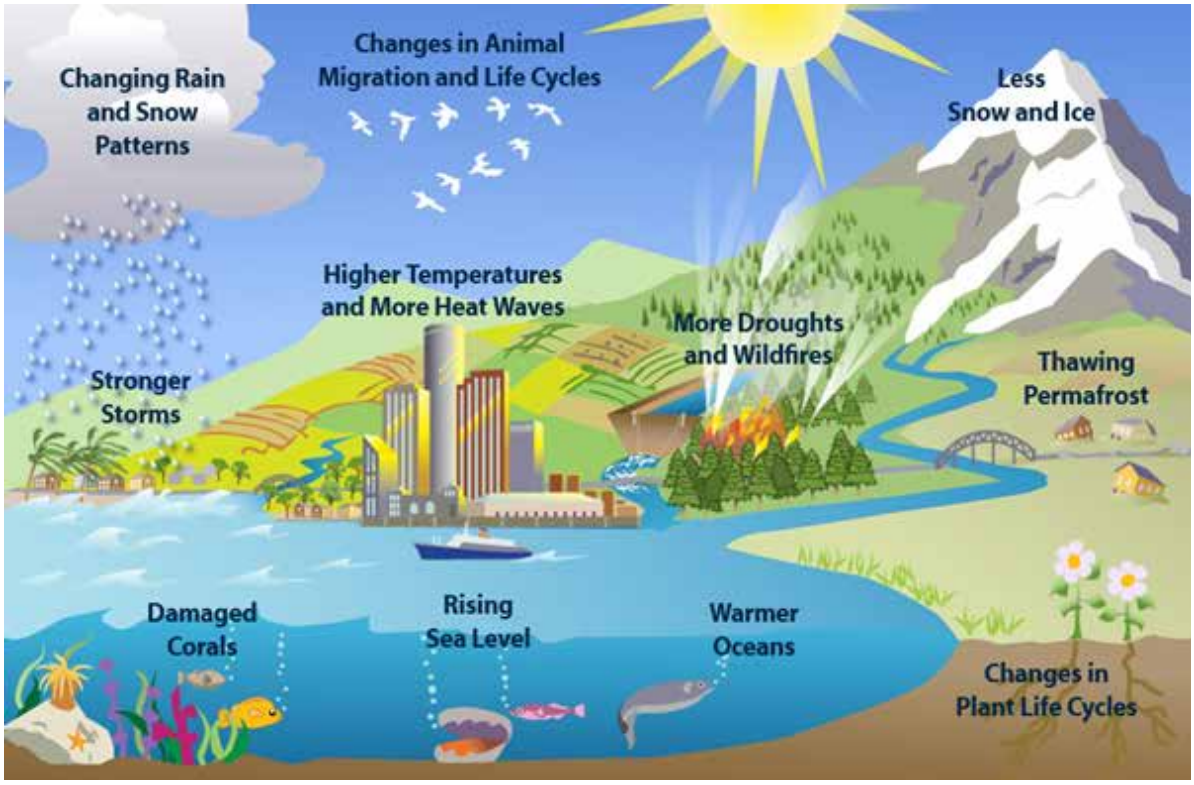


Figure A1.2: *Multiple effects of a changing climate (from http://www3.epa.gov/).*

Reducing greenhouse gas emissions is the key to reducing the severity of the impacts of global climate change. A major way these gases get into the atmosphere is when people burn coal, oil, and natural gas for energy. Greater use of renewable energy resources (including geothermal, sunshine, wind, and flowing water), and more efficient transport systems (particularly public transport) will make a major difference to the climate change problem.

A2 – HAS THE CLIMATE OF THE SOLOMON ISLAND ALREADY BEEN CHANGING

The climate of the Solomon Islands has already experienced some changes over the last few decades. For example, annual maximum and minimum temperatures have increased in Honiara since 1951 by around 1.0 °C (Figure A2.1), and at both Honiara and Munda there have been significant increases in the annual number of warm nights and decreases in cool nights. In addition, the sea-level rise near Solomon Islands (measured by satellite altimeters since 1993) is around 8 mm per year, although some of this very high rise is likely attributable to natural variability. Also, ocean acidification has been slowly increasing in the Solomon Islands' waters over the last several decades.

But some aspects of the climate of the Solomon Islands are not changing. Data for Honiara since 1950 show no clear trends in annual or seasonal rainfall (Figure A2.1). Over this period, there has been substantial variation in rainfall from year to year, however, mostly related to the El Niño Southern Oscillation (ENSO) phenomenon (El Niño generally causes below normal rainfall in the Solomon Islands; while La Niña has the opposite effect).

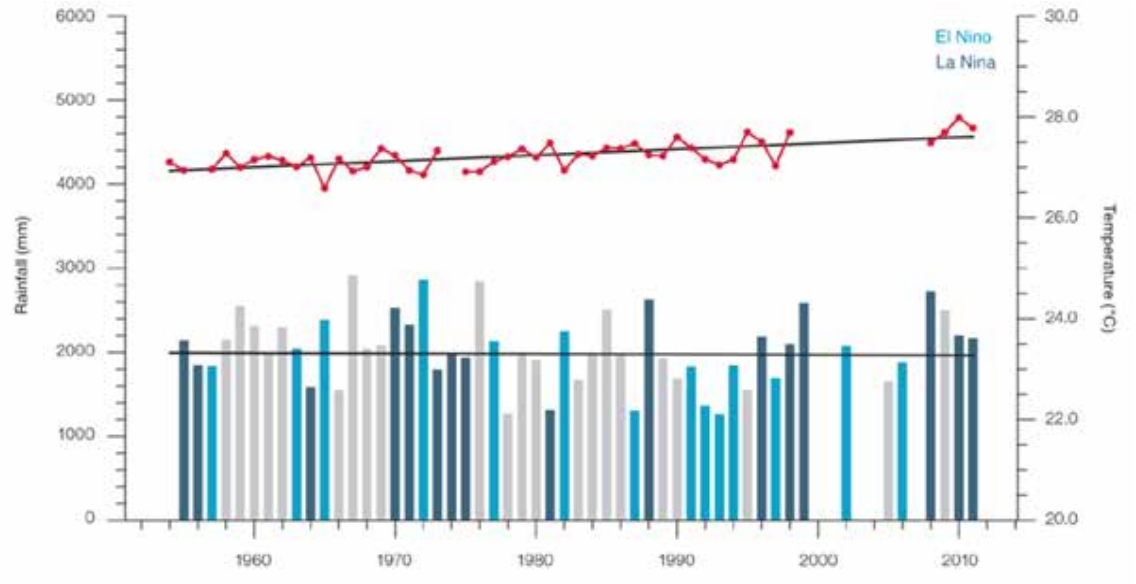


Figure A2.1: *Observed time series of annual average values of mean air temperature (red dots and line) and total rainfall (bars) at Honiara. Light blue, dark blue and grey bars denote El Niño, La Niña and neutral years respectively. Solid black trend lines indicate a least squares fit (from http://www.pacificclimatechangescience.org/).*

A3 – CLIMATE CHANGE MAPS AND DATA

The following maps were generated using the Royal Netherlands Meteorological Institute (KNMI) Climate Explorer tool *(http://climexp.knmi.nl/)*. All data for these maps are the model-average from the Coupled Model Inter-comparison Project (CMIP5) data archive, and are the same data used to derive the Intergovernmental Panel on Climate Change (IPCC) Climate Change Atlas *(http://www.ipcc.ch/report/ar5/wg1/)*.

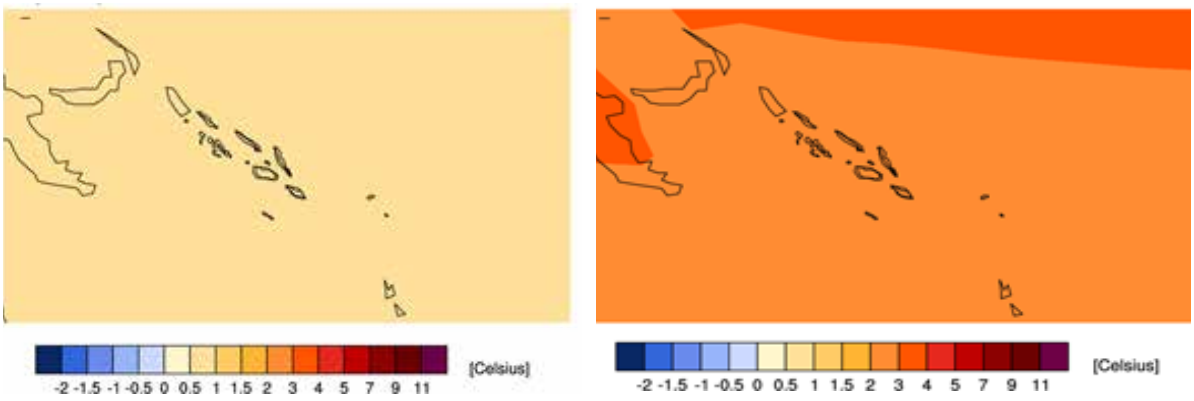


Figure A3.1: *Projected change in the mean annual temperature between 1986-2005 and 2081-2100, for RCP2.6 (left) and RCP8.5 (right) (from http://climexp.knmi.nl/).*

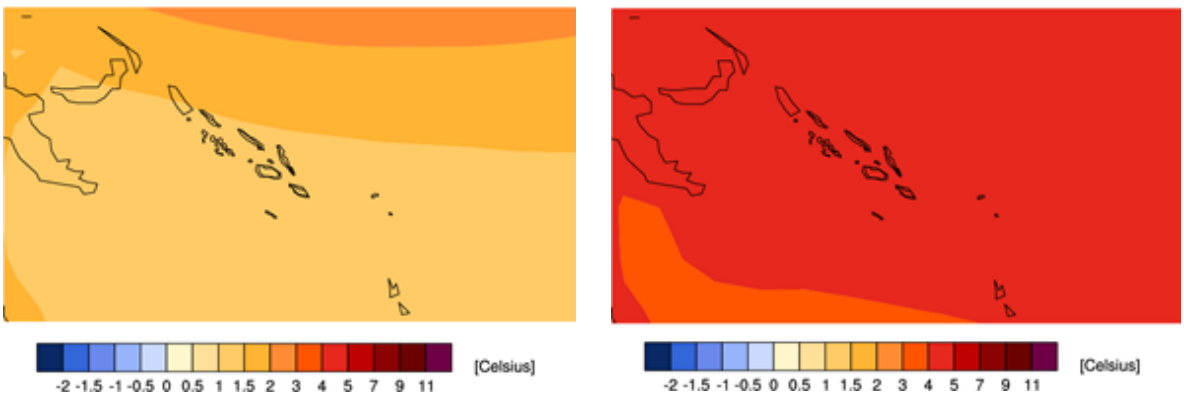


Figure A3.2: *Projected change in the 95th percentile mean annual maximum daily temperature between 1986-2005 and 2081-2100, for RCP2.6 (left) and RCP8.5 (right) (from http://climexp.knmi.nl/).*

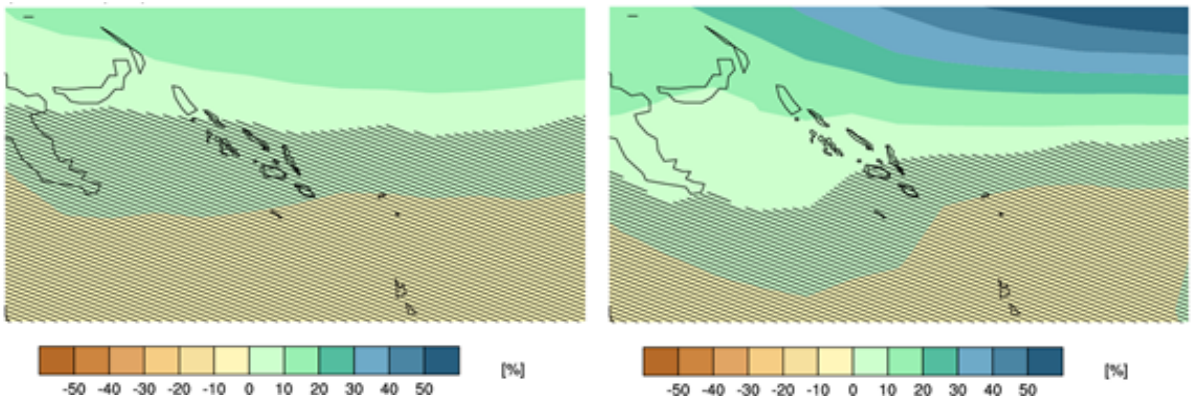


Figure A3.3: *Projected percent change in the mean annual precipitation between 1986-2005 and 2081-2100, for RCP2.6 (left) and RCP8.5 (right). The hatching represents areas where the signal is smaller than one standard deviation of natural variability (from http://climexp.knmi.nl/).*

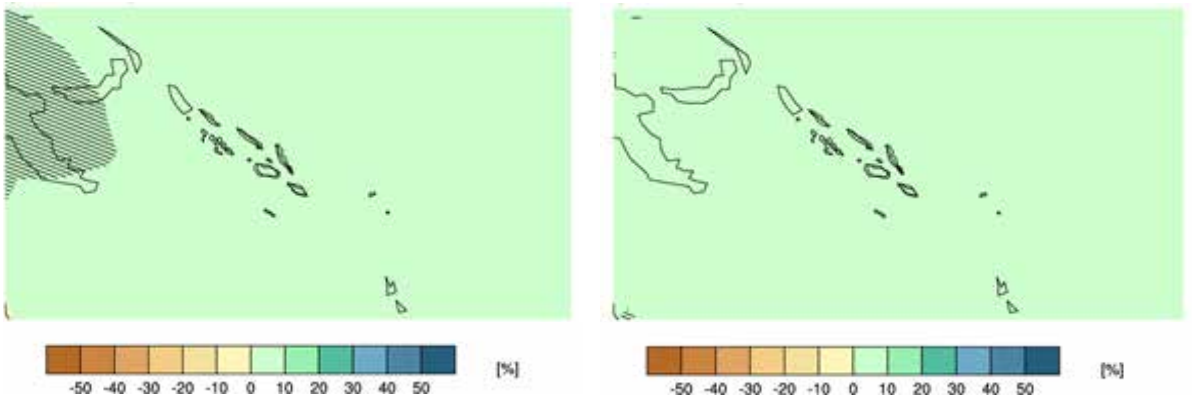


Figure A3.4: *Projected percent change in the mean annual evaporation (evaporation, transpiration and sublimation) layer between 1986-2005 and 2081-2100, for RCP2.6 (left) and RCP8.5 (right). The hatching represents areas where the signal is smaller than one standard deviation of natural variability (from http://climexp.knmi.nl/).*

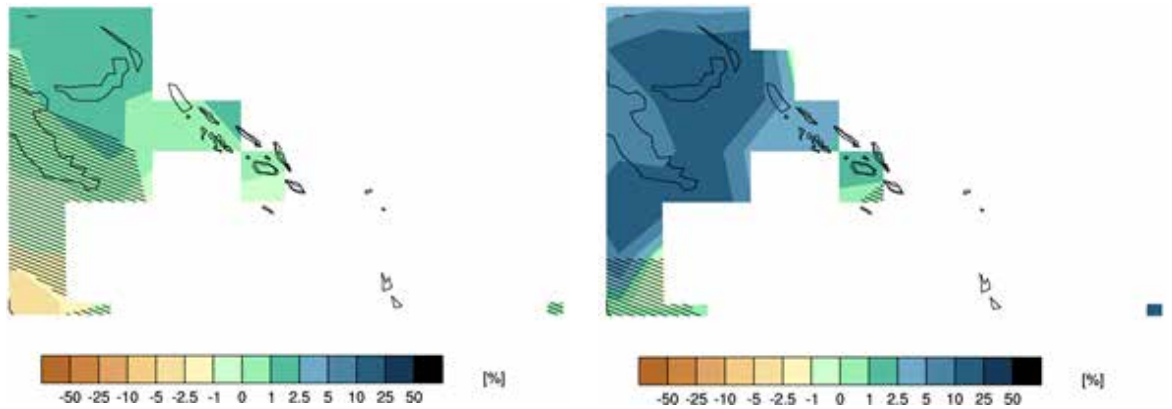


Figure A3.5: *Projected percent change in the mean annual moisture content in the soil layer between 1986-2005 and 2081-2100, for RCP2.6 (left) and RCP8.5 (right). The hatching represents areas where the signal is smaller than one standard deviation of natural variability (from http://climexp.knmi.nl/).*

From Figures A3.1 and A3.2, it can be seen that the increase in the average daytime maximum temperature for the warmest five percent of years is projected to be around twice as much as the increase in the mean temperature, meaning the change in very warm years is likely to be disproportionally greater than the change in the average years.

Also, Figure A3.5 shows a general (but small) increase in mean annual soil moisture content over the country, in response to a slightly greater percent increase in annual rainfall (Figure A3.3) compared to evaporation (Figure A3.4). This is consistent with the conclusion in Section 1.2 that drought frequency is projected to slightly decrease. It should be noted however, that the projected change in rainfall for the Solomon Islands is mostly within one standard deviation of natural variability, indicating that confidence in the climate change "signal" is not high.

From Figures A3.6 and A3.7 it can also be seen that in general, specific humidity is projected to increase (i.e. a moister atmosphere) and downward solar radiation at the surface is likely to decrease (i.e. cloudier conditions).

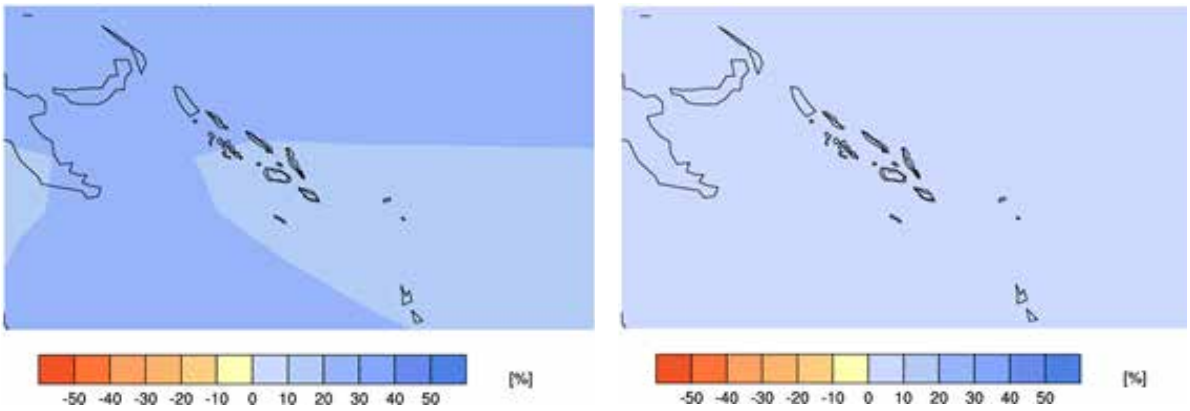


Figure A3.6: *Projected percent change in the mean annual specific humidity between 1986-2005 and 2081-2100, for RCP2.6 (left) and RCP8.5 (right). (from http://climexp.knmi.nl/).*

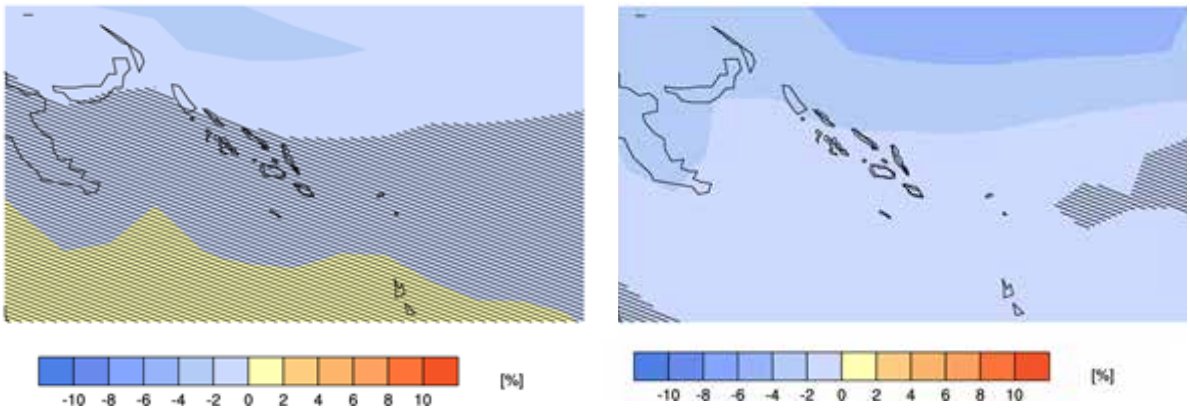


Figure A3.7: *Projected percent change in the mean annual downward solar radiation at the surface between 1986-2005 and 2081-2100, for RCP2.6 (left) and RCP8.5 (right). The hatching represents areas where the signal is smaller than one standard deviation of natural variability (from http://climexp.knmi.nl/).*

A4 – CCVA EXPOSURE AND GENDER SURVEY

DATE _____

AGE _____ GENDER _____ SPECIAL NEEDS _____ OCCUPATION _____ VILLAGE _____ VILLAGE ZONE _____

CCVA EXPOSURE AND GENDER SURVEY

Over the next 12- 24 months...

1 **Sea-level rise**

How likely is sea-level rise will affect you?

Very unlikely ☐ *Unlikely* ☐ *Possible* ☐ *Likely* ☐ *Almost certain* ☐

How much of an impact would sea-level rise have on you?

Insignificant ☐ *Minor* ☐ *Moderate* ☐ *Major* ☐ *Disastrous* ☐

2 **Abrasion -- Erosion of the coastline**

How likely is abrasion will affect you?

Very unlikely ☐ *Unlikely* ☐ *Possible* ☐ *Likely* ☐ *Almost certain* ☐

How much of an impact would abrasion have on you?

Insignificant ☐ *Minor* ☐ *Moderate* ☐ *Major* ☐ *Disastrous* ☐

3 **Salt-water intrusion** *(Water in wells, agriculture, construction and infrastructure becomes brackish)*

How likely is salt-water intrusion will affect you?

Very unlikely ☐ *Unlikely* ☐ *Possible* ☐ *Likely* ☐ *Almost certain* ☐

How much of an impact would salt-water intrusion have on you?

Insignificant ☐ *Minor* ☐ *Moderate* ☐ *Major* ☐ *Disastrous* ☐

4 **High Winds**

How likely is high winds will affect you?

Very unlikely ☐ *Unlikely* ☐ *Possible* ☐ *Likely* ☐ *Almost certain* ☐

How much of an impact would high winds have on you?

Insignificant ☐ *Minor* ☐ *Moderate* ☐ *Major* ☐ *Disastrous* ☐

5 **Tropical Cyclones**

How likely is tropical cyclones will affect you?

Very unlikely ☐ *Unlikely* ☐ *Possible* ☐ *Likely* ☐ *Almost certain* ☐

How much of an impact would tropical cyclones have on you?

Insignificant ☐ *Minor* ☐ *Moderate* ☐ *Major* ☐ *Disastrous* ☐

6 **Water Scarcity**

How likely is water scarcity will affect you?

Very unlikely ☐ *Unlikely* ☐ *Possible* ☐ *Likely* ☐ *Almost certain* ☐

How much of an impact would water scarcity have on you?

Insignificant ☐ *Minor* ☐ *Moderate* ☐ *Major* ☐ *Disastrous* ☐

7 **Extreme Rainfall**

How likely is extreme rainfall will affect you?

Very unlikely ☐ *Unlikely* ☐ *Possible* ☐ *Likely* ☐ *Almost certain* ☐

How much of an impact would extreme rainfall have on you?

Insignificant ☐ *Minor* ☐ *Moderate* ☐ *Major* ☐ *Disastrous* ☐

8 **Too little rain (Drought)**

How likely is too little rain (drought) will affect

Very unlikely ☐ *Unlikely* ☐ *Possible* ☐ *Likely* ☐ *Almost certain* ☐

How much of an impact would too little rain (drought) have on

Insignificant ☐ *Minor* ☐ *Moderate* ☐ *Major* ☐ *Disastrous* ☐

9 **Terrestrial erosion -- caused by flooding**

How likely is it that you will be affected by terrestrial erosion caused by flooding?

Very unlikely ☐ *Unlikely* ☐ *Possible* ☐ *Likely* ☐ *Almost certain* ☐

How much of an impact would terrestrial erosion, caused by flooding have on you?

Insignificant ☐ *Minor* ☐ *Moderate* ☐ *Major* ☐ *Disastrous* ☐

10 **High temperatures -- caused by the sun**

How likely is it that you will be affected by high temperatures (e.g. heat of the sun)?

Very unlikely ☐ *Unlikely* ☐ *Possible* ☐ *Likely* ☐ *Almost certain* ☐

How much of an impact will high temperatures, caused by the sun, have on you?

Insignificant ☐ *Minor* ☐ *Moderate* ☐ *Major* ☐ *Disastrous* ☐

11 **High temperatures -- of the sea**

How likely is it that you will be affected by high temperatures of the water (eg. coral bleaching)?

Very unlikely ☐ *Unlikely* ☐ *Possible* ☐ *Likely* ☐ *Almost certain* ☐

How much of an impact would high sea temperatures have on you?

Insignificant ☐ *Minor* ☐ *Moderate* ☐ *Major* ☐ *Disastrous* ☐

12 In your household who is responsible for fetching freshwater for the family?

Husband ☐ *Wife* ☐ *Son* ☐ *Daughter* ☐ *Others* ☐

13 Which family member uses water the most?

Husband ☐ *Wife* ☐ *Grandparents* ☐ *Son* ☐ *Daughter* ☐ *Others* ☐

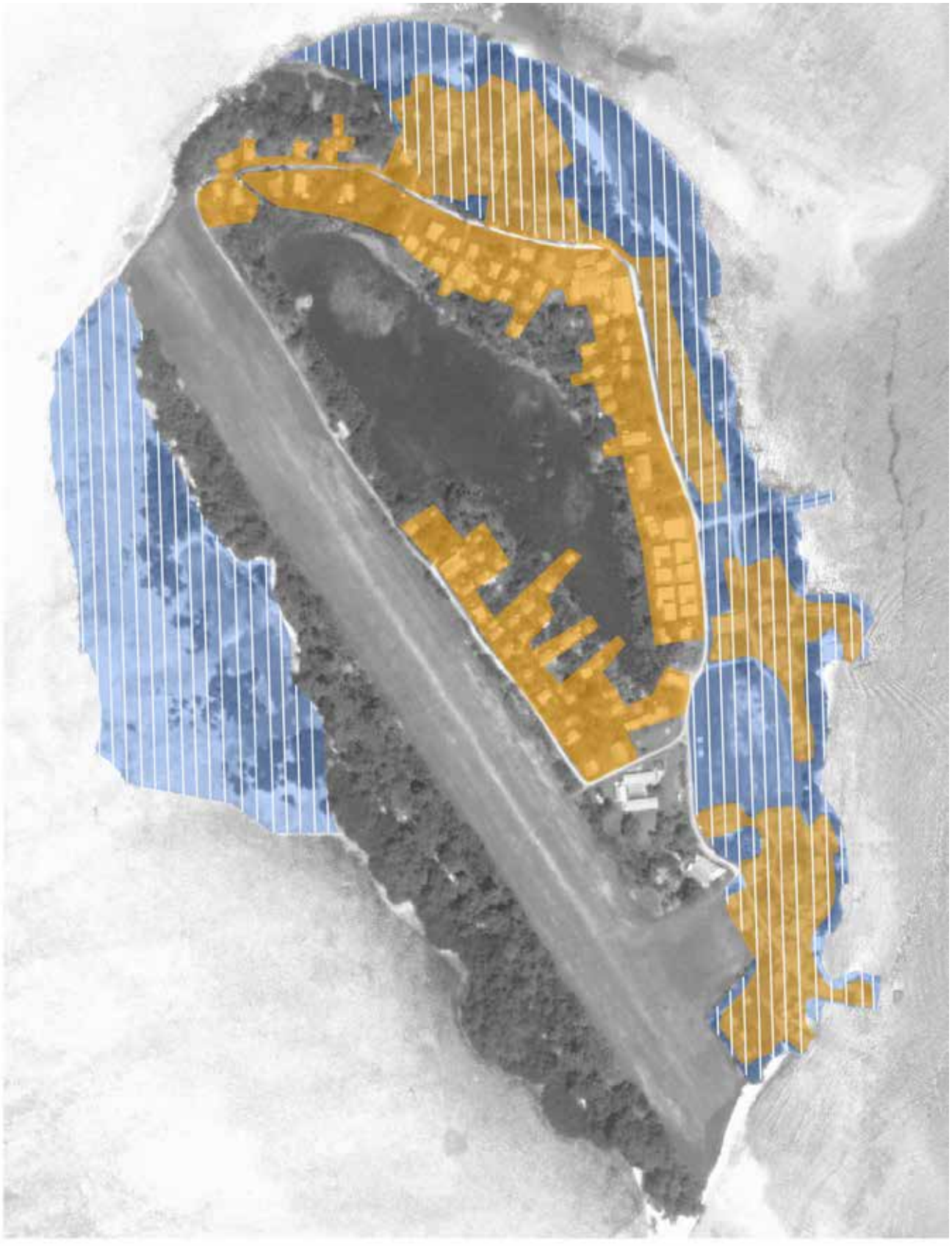
14 In times of water shortage, who takes decisions about managing water?

Husband ☐ *Wife* ☐ *Fater / Father in Law* ☐ *Mother/ Mother in Law* ☐ *Others* ☐

15 What strategies do you use to manage water during scarcity?

☐ *Water storage in a tanker*
☐ *Avoid misuse/overuse of water*
☐ *Participate in community well project*
☐ *Buy water*
☐ *No idea (my wife / husband does)*
☐ *Others*

A5 – TARO VULNERABILITY MAP




gef
UNDP
Empowered lives.
Resilient nations.