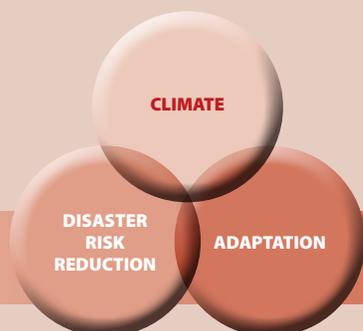


# Vulnerability, Risk Reduction, and Adaptation to Climate Change

## VANUATU



**GFDRR**  
Global Facility for Disaster Reduction and Recovery



## COUNTRY OVERVIEW

The archipelago nation of Vanuatu is located in the Melanesian region of the South Pacific Ocean between 12° and 23° north latitude and 166° and 173° east longitude, covering an expanse of approximately 1,300 kilometers (km). Eighty islands, covering a total land area of 12,233 square kilometers (km<sup>2</sup>) and an exclusive economic zone of 680,000 km<sup>2</sup> comprise the country. The largest of the islands, Espiritu Santo and Malekula cover 50% of the country's land mass and harbor the majority of Vanuatu's population. The country's economy is primarily based on small-scale agriculture, which provides a livelihood for two thirds of the population, while fishing, offshore financial services and tourism support the economy.

## Key Sectors

Agriculture/Food Security
Coastal Zones and Marine Ecosystems
Water Resources
Public Health

Source: Vanuatu's National Adaptation Programme

The isolated location, small land area separated by vast oceans, and the attendant challenges and costs of providing basic services make Vanuatu, like all Small Island Developing States (SIDS), extremely vulnerable to the adverse impacts of climate change. While climate change is an important source of risk to the future of Vanuatu, the country's ability to respond to these changes is hampered by its highly vulnerable socio-economic and ecological situation. Vanuatu is considered one of the poorest of the Pacific<sup>1</sup> and has been classified a Least Developed Country<sup>2</sup>, with per capita GDP of US\$1,276. Whilst

these are important indicators, they represent only one measure of vulnerability, which measures the ability to respond to changing climate risks, and in the case of Vanuatu, an extensive social network and traditional practices mitigate in some cases, the country's economic vulnerability.

According to the World Bank<sup>3</sup>, in 2008, the total population of Vanuatu numbered 234,000, of which approximately 25% lived in urban areas in and around the capital Port Vila, and Luganville. The remaining 75% of rural Ni-Vanuatu are subsistence farmers and fishermen, who make limited contributions to the country's GDP, and whose ability to meet their basic needs in light of a changing climate is being increasingly challenged<sup>4</sup>.

## PRIORITY ADAPTATION MEASURES

As with other Small Island Developing States (SIDS), the impacts of climate change<sup>5</sup> are already being felt across the Vanuatu archipelago, including sea-level rise, increased intensity of extreme events, and changes to agricultural productivity and water availability. In 2007 Vanuatu completed its National Adaptation Programme of Action, which outlined the most urgent and immediate needs with respect to climate change, and identified several priority sectors (see matrix, above). Several development challenges limit the country's ability to respond to climate variability and change including: 1) political instability and weak institutions, 2) unequal distribution of economic benefits gained from existing policies, 3) disparities in income distribution and access to basic services, 4) increased urban migration into temporary and makeshift settlements, and limited employment opportunities in urban centers, 5) limited and poor infrastructure, and 6) increased environmental degradation including deforestation, loss of topsoil, and deterioration of the quantity and quality of water supplies<sup>6</sup>.

<sup>1</sup> Vanuatu ranks 13<sup>th</sup> out of 15 Pacific Island Countries in terms of the Human Poverty Index (HPI) and 140<sup>th</sup> globally on the Human Development Index, both indicators of health, welfare and income, among others.

<sup>2</sup> The Least Developed Country categorization is a UN designation based on low indicators of socioeconomic development and Human Development Indices. However, this should not be viewed as the only source of vulnerability, as traditional and social networks are often a factor in mediating vulnerability.

<sup>3</sup> The latest figures available from the World Bank Data Center are from 2008, as of writing.

<sup>4</sup> UN Common Country Assessment for Vanuatu (2002).

<sup>5</sup> Including sea-level rise, increased intensity of extreme events, and changes to agricultural productivity and water availability

<sup>6</sup> UNCTAD (1991).

## CLIMATE BASELINE AND CLIMATE FUTURE

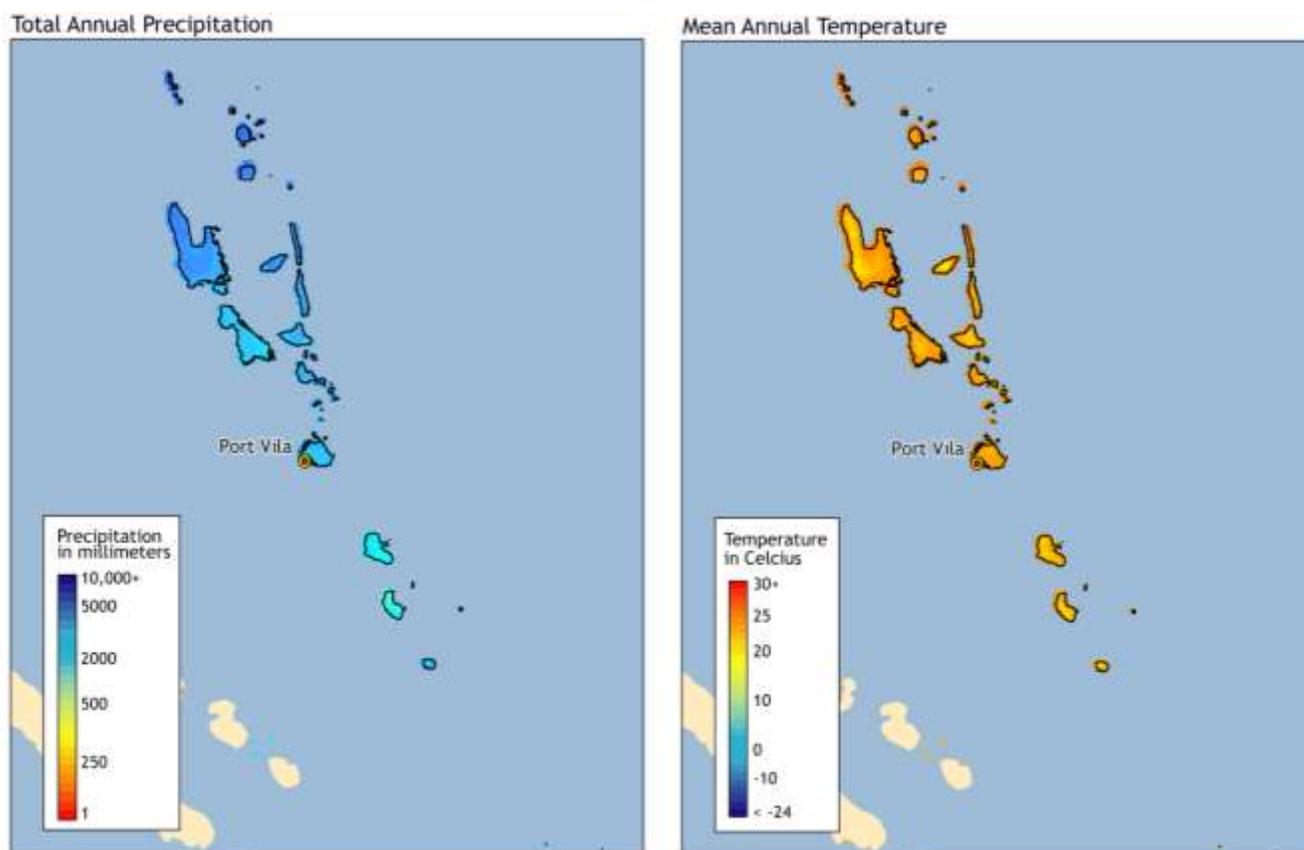


Figure 1: Annual Climate Baseline for the Republic of the Vanuatu<sup>7</sup>

Vanuatu's climate varies with latitude, from wet tropical in the northern islands, which receive over 4,000 millimeters (mm) of annual rainfall to the dryer subtropical in the southern extremes of the archipelago, where annual average rainfall measures at 1,500 mm. Average temperatures range from 21°C to 27°C, and unlike many of the Pacific island nations, seasonal temperatures in the capital city of Port Vila exhibit high variability with summertime highs exceeding 30°C and minimum temperatures often reaching below 20°C. Seasonal and interannual variations in climate are driven by changes associated with El Niño, which affect every aspect of the climate in the Pacific. Cyclones are common during the warm months of November to April, although two recent cyclonic events<sup>8</sup> were experienced outside of the traditional cyclonic season.

## CLIMATE BASELINE

- ➔ According to weather station data, mean temperatures in Vanuatu have risen by 0.5° to 1°C in the last half of the 20<sup>th</sup> century<sup>9</sup>. Mean temperatures across the South Pacific have increased by approximately 1°C since 1970, at an average rate of 0.3°C per decade. Temperatures appear to be increasing more rapidly in the southern reach of the archipelago. Recent evidence places temperature increases for the period of record in

<sup>7</sup> Worldclim 1960-1990 Averages. Robert J. Hijmans, Susan Cameron, and Juan Parra, at the Museum of Vertebrate Zoology, University of California, Berkeley, in Collaboration with Peter Jones and Andrew Jarvis (CIAT), and with Karen Richardson (Rainforest CRC).

<sup>8</sup> Cyclone Rita May 1991 and Cyclone Gina, June 2002

<sup>9</sup> "Pacific Warming Surprises Scientists", Institute of Water and Atmospheric Research, Taihoro Nukurangi, Auckland, New Zealand Asia Pacific Network for Global Change Research News Release, Nov. 11, 2001.

two weather stations (Efate and Baerfield; 1937 to 2007) at 0.46°C per year, a figure slightly below the global average increases projected.

- ➔ Recent evidence suggests a tendency for wetter conditions during the dry season, as the frequency of heavy storms during this period have increased. This dynamic is most notable during La Niña periods.
- ➔ Measurements from the Port Vila SEAFRAME gauging station installed in 1993 have measured a +3.1 mm/year increase in sea level with monthly variations. When corrected for inverted barometric pressure effects and leveling, this trend is +2.2 mm/year<sup>10</sup>. On the other hand, satellite measurements in this area of the Pacific estimate sea-level increases of 8-10 mm/year, approximately three times the global average rate of increase. However, precise barometric-pressure corrected sea-level changes indicate a trend of +3.5 mm/year, while longer gauging records of less precision suggest a decreased sea level of -2.21 mm/year.
- ➔ Sea surface temperatures in the Pacific have increased between 0.6 to 1.0°C since 1910, with the most significant warming occurring after the 1970s<sup>11</sup>.
- ➔ The numbers of category 4 and 5 storms in the Pacific region have more than doubled when comparing their frequency and occurrence between 1975-1989 and 1990-2004.
- ➔ The numbers of hot days<sup>12</sup> and hot nights<sup>13</sup> have increased significantly across the Pacific.

## CLIMATE FUTURE

The climate science community sources a suite of models to inform decision makers on future climate. Among the most widely used are GCMs (Global Climate Models), RCMs (Regional Climate Models), and downscaling techniques (both empirical and statistical). GCMs are our primary source of information about future climate. They comprise simplified but systematically rigorous interacting mathematical descriptions of important physical and chemical processes governing the climate, including the role of the atmosphere, land, oceans, and biological processes.

Unfortunately single grid-cell values from GCMs are considered by the Intergovernmental Panel on Climate Change (IPCC) as the least accurate measure of projected changes, and the relatively spatial resolution of GCMs renders interpretation of climate change in small island nations difficult.

The following insights into a changing climate are thus derived for the Pacific region as a whole from a suite of GCMs used by the Intergovernmental Panel on Climate Change (IPCC) as well as emerging research where noted).

- ➔ The future of rainfall patterns across the Pacific region is a subject of continued debate, with models projecting +/-25% changes in rainfall. As of yet it is not possible to get a clear picture of precipitation change, due to large model uncertainties.
- ➔ While average annual and monthly rainfall changes are inconsistent across this region of the Pacific, recent evidence and model simulations point to a more frequent occurrence of El Niño weather patterns, bringing an increase in drought conditions along this region. These more frequent El Niño events are believed to be associated with climate change, although some disagreement exists within the science community on this point.
- ➔ More frequent El Niño events could also increase the intensity of tropical cyclones along the Pacific, with important implications for disaster management and response.
- ➔ Temperatures in the Pacific are projected to increase between 1.4 and 3.1°C
- ➔ Sea levels are projected to rise by the end of the century (2090-2099) by 0.35 meters (m) (0.23 to 0.47 m, although the spatial manifestation of this rise will not be uniform due to circulation changes and ocean

<sup>10</sup> Pacific Country Report, 2006. Sea Level and Climate: The Present State in Vanuatu.

<sup>11</sup> Folland, C.K., J.A. Renwick, M.J. Salinger, N. Jiang, and N.A. Rayner, 2003: Trends and variations in South Pacific Islands and ocean surface temperatures. *Journal of Climate*, 16, 2859-2874 and Folland, C.K., J.A. Renwick, M.J. Salinger, and A.B. Mullan, 2002: Relative influences of the Interdecadal Pacific Oscillation and ENSO on the South Pacific Convergence. *Zone. Geophysical Research Letters*, 29, 21-1-21-4

<sup>12</sup> Hot Days are defined as the temperature exceeded on 10% of days or nights in current climate of that region and season.

<sup>13</sup> Hot nights are defined as the temperature exceeded on 10% of days or nights in current climate of that region and season.

density. Recent work for Vanuatu using VanuaCLIM suggests sea levels are likely to rise by 100 centimeters (cm) under a worst case scenario for greenhouse gas emissions<sup>14</sup>.

- ➔ According to the IPCC's 4<sup>th</sup> Assessment Report, the effects of rising sea levels are "likely to be of a magnitude that will disrupt virtually all economic and social sectors in small island nations". In addition to these vulnerabilities, excessive dependence on foreign aid and remoteness make the country particularly vulnerable to climate variability and change.

Secondary impacts from the above changes in climate are discussed throughout this document, and include:

- ➔ Increased coastal erosion and loss of soil fertility.
- ➔ Saltwater intrusion into areas critical to sustaining food security.
- ➔ Damage to coral reefs and fisheries, including depletion of fish stocks.
- ➔ Loss of water quality and quantity.
- ➔ Less favorable growing conditions for certain important crops.

## CLIMATE CHANGE IMPACTS ON NATURAL HAZARD VULNERABILITY

### AT A GLANCE

According to a 1998 Commonwealth Secretariat Report, Vanuatu is one of the most vulnerable nations in the South Pacific. Hazards include droughts, floods, extreme temperatures, earthquakes (and tsunamis), and cyclones<sup>15</sup> (Figure 2).

- ➔ **Droughts** – Wet season rainfall provides the majority of water supplies to the smaller islands of Vanuatu. However, El Niño conditions in this part of the Pacific can shift rainfall patterns, causing significant decrease in rainfall and leading to drought conditions. Droughts are especially damaging in the more remote islands lacking sufficient rain-water harvesting/storage capacity<sup>16</sup> to withstand dry periods, as is the case with most of the southern islands. The El Niño event of 1997/98 was one of the most pronounced drought periods in this region of the Pacific, causing significant declines in agricultural productivity and exports. More frequent El Niño events could increase the intensity and occurrence of droughts, with important implications for disaster management in Vanuatu<sup>17</sup>. The country's National Adaptation Programme of Action notes the special vulnerability to drought conditions of the western region of Tanna, with significant impacts on both agricultural productivity and the important tourism sector.

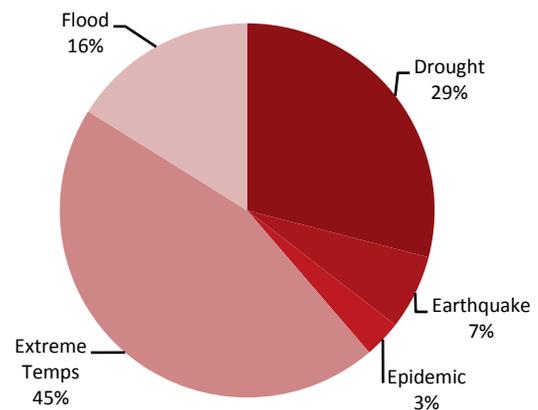


Figure 2: Average impacts of major natural hazards in Vanuatu

<sup>14</sup> Preliminary Climate and Sea Level Changes for Vanuatu through the application of SimCLIM for Vanuatu.

<sup>15</sup> GFDRR, the World Bank and SOPAC. Reducing the risk of disasters and climate variability in the Pacific Islands.

<sup>16</sup> Storage reservoirs can supply water for approximately 30-40 days without replenishment.

<sup>17</sup> USGS Scientific Investigations Report 2005-5098. Effects of the 1998 Drought on the Freshwater Lens in the Laura Area, Majuro Atoll, Republic of the Marshall Islands. <http://pubs.usgs.gov/sir/2005/5098/>

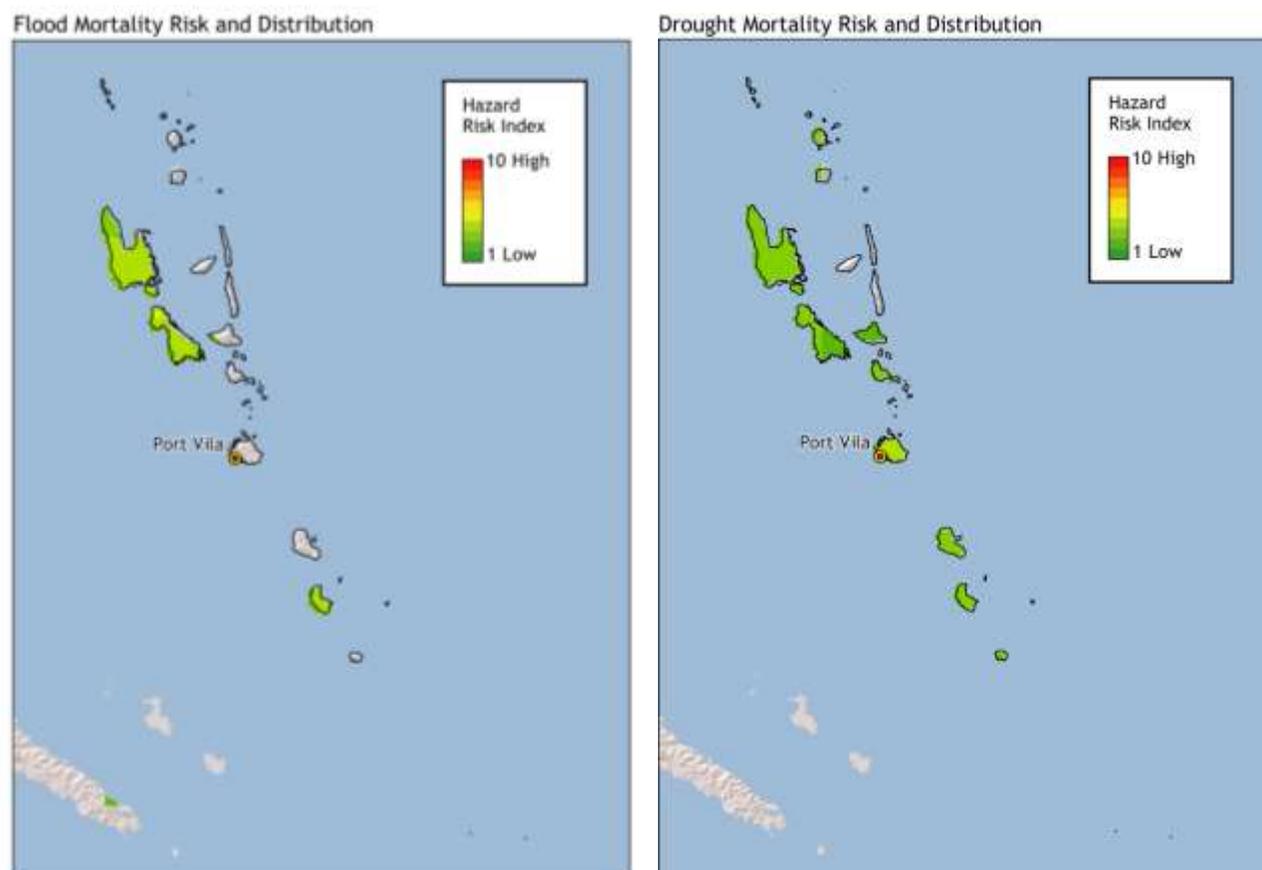


Figure 3: Mortality Risk and Distribution to Floods and Droughts across Vanuatu<sup>18</sup>

- ➔ **Tropical Storms and Cyclones** – The cyclone season in Vanuatu extends from November to April<sup>19</sup>. Between 1990 and 1999, Vanuatu experienced more cyclones than any other Pacific country, at an average of 2.6 annually. The most devastating cyclones in Vanuatu were Uma, in 1998, which caused an estimated US\$150 million in damage and 50 lives lost, and Prema, in 1993, which affected 20,000 people and caused an estimated US\$60 million in damage.
- ➔ **Earthquakes and Tsunamis** – Even though the impacts of sea-level rise along many of the country's islands are likely to be less pronounced than in other Pacific Island nations due to their higher elevations, the shoreline erosion caused by sea-level rise is already a significant problem in the coral atolls and small islands of the Torba and Malampa provinces. Sea-level rise compounds an already vulnerable environment that is subject to some natural subsidence as well as tectonic activity and shoreline changes with successive earthquakes and tsunamis. Vanuatu is prone to tsunamis and these have in recent years caused loss of life and property damage<sup>20</sup>. According to data from the SEAFRAME gauging station, seven tsunamis were recorded in Port Vila between 1993 and 2006<sup>21</sup>.

The impacts of natural hazards on Vanuatu are exacerbated by the development challenges outlined in the country's National Adaptation Programme of Action. These include:

- ➔ dispersed archipelago and mountainous terrain making administration, communications and operations costly and challenging;

<sup>18</sup> Columbia University Center for Hazards and Risk Research (CHRR) and Columbia University Center for International Earth Science Information Network (CIESIN).

<sup>19</sup> This season is also the hottest in this region of the Pacific Ocean

<sup>20</sup> Penama Earthquake and its associated tsunami killed 10 and affected over 23,000 people.

<sup>21</sup> Of these 7 tsunamis, one measured 90 cm (1999) and another 80 cm (2002).

- ➔ limited domestic market with little potential for economies of scale;
- ➔ increasingly competitive international markets for tourism and investment; and
- ➔ a social and cultural system with limited understanding and experience with business concepts and practices

## SECTORAL CLIMATE RISK REDUCTION RECOMMENDATIONS

Climate change and variability already have and will continue to affect Vanuatu. Vulnerability is a key factor that needs to be considered in identifying the differential impacts of climate. The most profound impacts of climate variability and change will be felt in the sectors discussed below: agriculture and food security, water resources, coastal resources, and human health.

### AGRICULTURE AND FOOD SECURITY

Unlike many of the island nations of the South Pacific, Vanuatu enjoys considerable land-based resources, fertile soils, and extensive (although declining) forests. Agriculture is one of the most productive sectors, providing for over 25% of the country's GDP. Copra and cocoa are the cash crops produced, with subsistence emphasis placed on taro and yams. Since much of the agricultural activities practiced across Vanuatu are rainfed, changes in rainfall patterns (including a greater portion of rain falling in intense events, and the increased intensity and duration of the dry season) severely impact agricultural production in the country. The impacts of climate change on the agricultural sector include reduction in crop yields and damage from cyclonic activity, increases in evapotranspiration, changes in growing seasons and reduction in water availability. There is also growing evidence of soil erosion and loss of soil fertility due to improperly managed deforestation and environmental degradation<sup>22</sup>. Adaptation activities identified for the agriculture sector in Vanuatu include:

- ➔ Switching to different cultivars.
- ➔ Improving and conserving soils.
- ➔ Enhancing irrigation efficiency and/or expanding irrigation.

### WATER RESOURCES

As with many other island nations, Vanuatu has uniquely fragile water resources due to its small size, lack of storage and limited freshwater lens<sup>23</sup>. Water shortages are common during the dry season. Water crises during El Niño-driven droughts are becoming increasingly common on smaller and more remote southern atolls that rely primarily on rainwater and have limited harvesting capacity. Increased sea-levels come with the threat of salt-water intrusion in the shallow fresh water lens, particularly in coastal areas and in areas where recharge rates are on the decline<sup>24</sup>. Hygiene and sanitation continue to be a concern, with the additional challenge of managing the sewage system without contaminating the ground-water lens. . Already, some of the country's freshwater lens has been contaminated with brine. A growing urban population makes meeting the needs of the population in the two main urban centers ever more challenging and urgent. Adaptation options in the water sector include:

- ➔ Increasing water supply by using groundwater, building reservoirs, improving or stabilizing watershed management, and desalination.
- ➔ Decreasing water demand through conservation measures, leakage reduction, dual water supply systems and economic development.
- ➔ Building flexibility into the water provisioning systems to address future climate change.
- ➔ Improving water management infrastructure and planning.

<sup>22</sup> SPREP. Pacific Adaptation to Climate Change Programme for Vanuatu. Report of In-Country Consultations.

<sup>23</sup> SOPAC 2007. Integrated Water Resources Management Programme's Diagnostic Report.

<sup>24</sup> Some of the country's freshwater lens has already been contaminated with brine.

- ➔ Altering system operating rules (e.g. pricing policies, legislation).
- ➔ Implementing integrated planning efforts involving rural landholders, provincial authorities, and departments of lands, agriculture, forestry, mines, water supply and environment or by legal or administrative restrictions on activities impacting water catchments.
- ➔ Improving management and maintenance of water supply networks to reduce waste will also reduce vulnerability in both urban and rural areas. This will require training in maintenance of taps, tanks and pipes and access to appropriate hand tools.
- ➔ Supporting extension initiatives that promote water conservation and moderate usage, while raising awareness on the importance of water resource management.

## COASTAL RESOURCES

Coastal resources harbor a critically important spawning habitat for a wide diversity of fish, many of which are critical to food security in coastal areas across Vanuatu. The country's extensive Exclusive Economic Zone (EEZ) supports a vibrant deep-water fish (tuna, snapper and related species) industry. While these fisheries currently contribute a small portion of the country's GDP, they represent a potentially growing market. Tuna fisheries are known for their sensitivity to changing sea surface temperatures. During the 1997/98 El Niño episode, the western Pacific experienced a clear decrease in catches<sup>25</sup>.

The coastal areas are also where a large majority of the country's population - and therefore livelihood activities and services - are located. Natural subduction, increasing incidence of inundation, land loss, and coastal erosion have led to the implementation of a retreat plan in the northern island of Tegua. Sand extraction, mangrove removal, and other economic activities are increasing the vulnerability of many coastal areas to storm surges and sea-level rise. This is of particular concern for the Torres Group, Mele on Efate Island, East-Ambae and the Shepherds Islands<sup>26</sup>. Adaptation options include:

- ➔ Protection through sea walls and beach nourishment; in some cases the best adaptation option is a limited retreat from the coast, while in others resettlement to other areas may need to take place.
- ➔ Implementation of an integrated coastal resources management plan.
- ➔ Conservation of inshore fishery resources to ensure continued availability as food for the rural population.
- ➔ Improvement of local distribution, storage and marketing facilities.
- ➔ Development of export markets and creation of the necessary infrastructure to support the overseas sale of catches that are surplus to local demand.

## HUMAN HEALTH

As with other Pacific Island nations, Vanuatu's public health sector is vulnerable to climate variability and change, particularly with regard to the increased incidences of nutritional deficiencies, and diarrheal and vector-borne diseases. Outbreaks of many diseases, including conjunctivitis, are common during droughts. There is also evidence that warmer water temperatures increase the risk of ciguatera poisoning, which is a major health hazard for those consuming reef fish in Vanuatu. Limited information is available on the extent and frequency of any health issues, let alone on those with a significant link to climate variability and change. However, increased temperatures, projected flooding, and anecdotal evidence on reduced water quality point to a potentially deteriorating condition in the health sector under a changing climate. Furthermore, addressing the impacts of climate variability and change on the health sector requires addressing issues of poverty, sanitation, nutrition and environmental degradation, all of which significantly hamper a community's capacity to adapt to vulnerabilities. Adaptation recommendations include:

- ➔ Limiting mosquito breeding sites by covering water containers or using alternative storage facilities.

<sup>25</sup> Amos, M.J. 2007. Vanuatu fishery resource profile. IWP-Pacific Technical Report (International Waters Project) no. 49.

<sup>26</sup> SPREP. Pacific Adaptation to Climate Change Programme for Vanuatu. Report of In-Country Consultations.

- ➔ Preventing mosquito entry to the country through stricter port controls and quarantine regulations.
- ➔ Preventing exposure to vector-borne diseases through improved house design and mosquito nets.
- ➔ Planting of shade trees to reduce heat stress.
- ➔ Awareness raising activities on the potential impacts of climate change on health, including projected changes in the outbreaks of water- and insect-borne diseases, as well as appropriate response mechanisms.

## EXISTING ADAPTATION FRAMEWORK/STRATEGY/POLICY AND INSTITUTIONAL SET UP

### AT A GLANCE

Vanuatu, like all Small Island Developing States (SIDS) has been identified as one of the most vulnerable to the adverse impacts of climate change. This vulnerability is also exacerbated by the fact that development activities have outpaced traditional conservation and coping practices, which, furthermore, have been limited by resources. While it is clear that climate impacts are already being felt across the country, a specific climate change focus has been missing from many of the current development activities. A number of institutions across the country are actively engaged in activities to address climate change, but additional work is needed<sup>27</sup>.

### INSTITUTIONAL AND POLICY GAPS

- ➔ The limited integration of climate change considerations into current development activities needs to be addressed by strengthening coordination among the country's relevant institutions. This includes improving the country's capacity for emergency preparedness and response at all levels.
- ➔ Responding to climate change requires that a significant effort is made to raise education activities and awareness regarding current and projected climate variability and change. Integrating climate change into formal education curricula as well as community awareness programs could help in meeting these goals.
- ➔ The technical and financial capacity of existing institutions needs to be augmented to address the needs of the country's more remote islands; in particular there is a need to adequately train and equip those responsible for addressing climate change risks, as well as those which will be tasked with managing new projects on climate change.
- ➔ Legislative policies and development activities need to take into account climate change. For example, existing infrastructure projects need to be properly climate-proofed to deal with projected climate risks.

### ADAPTATION

#### Ongoing Efforts— At a Glance

<i>Vulnerability Reduction</i>	<i>Description of Project</i>
SPC/GTZ Regional Programme on Adaptation to Climate Change in the Pacific Island Region (ACCPiR)	A GTZ led project on climate change adaptation for the South Pacific, which is implementing activities identified as critical in Vanuatu's National Adaptation Programme of action including introducing climate-resistant crops, breeding extreme weather- adapted livestock, developing community land-use plans, trialing new agroforestry and soil stabilization methods, and undertaking innovative climate adaptation education programmes. The three pilot sites are Pele Island (North Efate), Teouma community (South Efate), and Hasevaia community (South Santo).

<sup>27</sup> Reducing the risk of disasters and climate variability in the Pacific. GFDRR Regional Stock Take for the East Pacific Region.

Pacific Islands Climate change Assistance Programme (PICCAP)	A multi-country regional enabling activity project funded by the GEF, implemented by UNDP and executed by SPREP to assist participating countries to prepare their initial communications under the UNFCCC.
Capacity Building for Development of Adaptation Measures in Pacific Islands Countries (CBDAMPIC)	Enabled Vanuatu to relocate a village community from the coastal zone affected by sea-level rise coastal erosion, and flooding from storm surges to an in-land location.
Vanuatu Climate Change Adaptation Project (VCCAP)	A project established to improve and strengthen capacities and capabilities of rural communities to adapt to the adverse impacts of climate change consistent with its sustainable development policies.
Developing a Rural Urban Transport Linkage Road Map	A project to identify investment opportunities in rural feeder and provincial roads to complete gaps in the network, particularly in areas with tourism and agricultural production potential. A plan for rural–urban transport linkages will be developed with the Ministry of Finance and Economic Management and other ministries, as required.
Improvement of the Sarakata River hydroelectric power station Improving community-based emergency preparedness	Provides for the installation of a new 600 kilowatt (kW) hydraulic turbine generator at the Sarakata River hydroelectric power station The project mainly aims to build capacity of communities and local organizations to prevent, prepare for, and respond to disaster, within Vanuatu's National Adaptation Programme.
Improving Access to Energy Services for the Communities of Futuna and Aneityum Islands Using Wind Technology	A project to improve self-reliance through the delivery of renewable energy and affordable related services using wind technology by promoting environmental awareness of the population, and to give the people of Futuna and Aneityum Islands control over their energy distribution, operation and maintenance.
Increasing Resilience to Climate Change and Natural Hazards	1) Mainstreaming climate change adaptation (CCA) and disaster risk reduction (DRR) at national, provincial, and community levels; 2) Strengthening capacity in planning for CCA and DRR; and 3) Implementing climate resilience measures in targeted sectors.

### Studies

Preliminary Climate and Sea Level Changes through the Application of SimCLIM	Preliminary climate change and sea-level rise results that will form the background for the country's SNC reporting to the United Nations Framework Convention on Climate Change (UNFCCC).
South Pacific Sea Level and Climate Monitoring Project	A programme that sets up high resolution monitoring stations in eleven island countries to measure the relative motions of land and sea at each station.

### GFDRR Interventions

Comprehensive Disaster Risk Management Programme for the Pacific	This programme takes stock of overall DRM situation in the country, fleshes out its main DRM needs and presents indicative new program areas and projects for GFDRR funding.
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## RESEARCH, DATA AND INFORMATION GAPS

Vanuatu, like all small island states, faces a unique set of challenges in dealing with climate variability and change. While a number of climate change and adaptation activities are ongoing, the country's official communications to the United Nations Framework Convention on Climate Change (UNFCCC) and the Government's Priorities and Action Agenda 2006-2015 point to significant research, data, and information gaps that will need to be addressed in light of projected changes in climate.

### RESEARCH GAPS

- ➔ Community risk assessment and participatory risk assessment methodologies should be promoted with a direct link to appropriate activities and planning at the sub national and local levels.

- ➔ An often ignored research gap is understanding what's needed (particularly at the community scale) to build the socio-economic capacity to adapt and to manage disaster risks. Indeed, a better understanding of the differential nature of vulnerability within the country's high-risk geographic regions is needed. Analyses of sector impacts must be complemented by social, economic and political assessments of vulnerability and resilience<sup>28</sup>.
- ➔ Water supply and demand studies need to be conducted across the country. A limited understanding of how water supplies will be impacted by rising temperatures hampers response to climate change in the water sector.
- ➔ Modeling of storm-surge zones, taking into consideration possible sea-level rise. Planning mechanisms can subsequently be used to direct all new investments in infrastructure, housing construction, and agriculture outside this zone to minimize vulnerability, reduce repair costs and decrease disruption to economic activities.
- ➔ Detailed assessments of climate change impacts and risks across a variety of sectors are required in order to develop sound response strategies, in particular focusing on food security, water resources, and coastal resources.
- ➔ Almost no work has been done to downscale climate models to individual islands. Realistically, it may not be possible to derive more accurate climate change information due to the small size of these islands; however, more work needs to be done to address the "island dilemma". New information should be made available in an accessible, credible, and useful format at the island scale.
- ➔ Establishing a robust observation network is a critical first step towards addressing potential cyclone risks.
- ➔ Overall applied research assistance is required to properly establish an island-specific and robust baseline from which to gauge projected changes and impacts.
- ➔ Comprehensive vulnerability maps identifying the locations of high vulnerability could support disaster planners in preparing communities for worst case impacts as well as in helping local communities take an active role in identifying appropriate response mechanisms.

## DATA AND INFORMATION GAPS

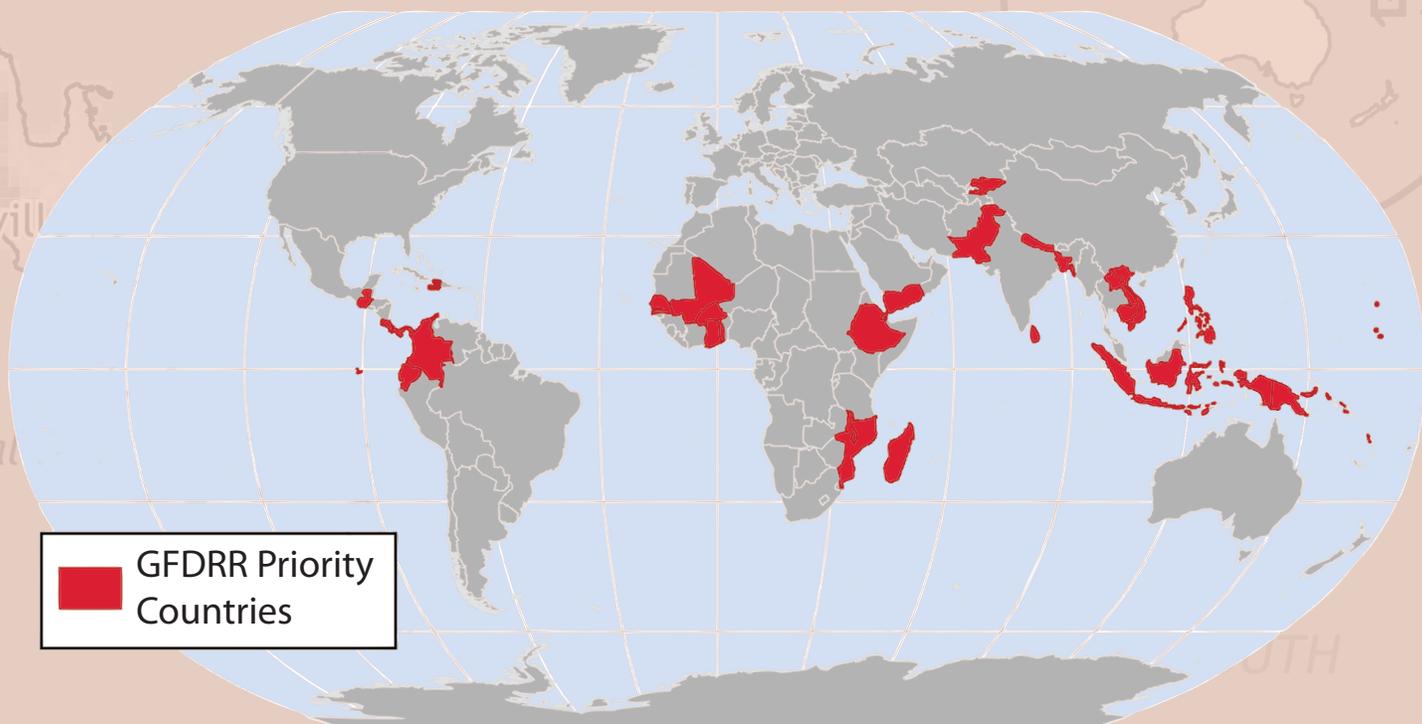
Vanuatu faces many challenges in addressing climate change risks, including insufficient resources and lack of institutional capacity as noted above. Additionally, lack of specific information and data on current and future vulnerability and risks across the country hamper the country's ability to respond to current and future climate risks. Among these are the following:

- ➔ Improving the country's meteorological services, including restoring and upgrading the basic infrastructure and operations, putting in place an appropriate local capacity-building program to improve scientific/technical staff resource levels and to upgrade skills, and building climate change issues into national development plans.
- ➔ Addressing sea level and storm surge risks will require the use and interpretation of the information that is coming out of the South Pacific Sea Level and Climate Monitoring Project, listed above.
- ➔ The use of existing Meteorological Information is limited to specific agencies, and this information needs to be tailored to decision makers across a wider series of sectors, including water resources management.

<sup>28</sup> CARE. Making National Adaptation Plans Work for the Poor. Malawi Case Study.

# Climate Risk and Adaptation Country Profile

This Country Profile (<http://countryadaptationprofiles.gfdr.org>) is part of a series of 31 priority country briefs developed by the Global Facility for Disaster Reduction and Recovery (GFDRR) as part of its Disaster Risk Management Plans. The profile synthesizes most relevant data and information for Disaster Risk Reduction and Adaptation to Climate Change and is designed as a quick reference source for development practitioners to better integrate climate resilience in development planning and operations. Sources on climate and climate-related information are linked through the country profile's online dashboard, which is periodically updated to reflect the most recent publicly available climate analysis.



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