Cities and Climate Change Initiative

ABRIDGED REPORT

Honiara Solomon Islands

Climate Change Vulnerability Assessment

UNDP

UN-HABITAT
FOR A BETTER URBAN FUTURE

Cities and Climate Change Initiative

ABRIDGED REPORT

Honiara
Solomon Islands

Climate Change
Vulnerability Assessment

UNDP

UN-HABITAT

Honiara, Solomon Islands – Climate Change Vulnerability Assessment

First edition 2014

United Nations Human Settlements Programme
P.O. Box 30030, Nairobi 00100, Kenya
E-mail: infohabitat@unhabitat.org
www.unhabitat.org

HS Number: HS/026/14E
ISBN Number (Series): 978-92-1-132400-6
ISBN Number (Volume): 978-92-1-132615-4

DISCLAIMER

Cover Photo © Bernhard Barth

ACKNOWLEDGEMENTS

Funding for this report was provided by the United Nations Development Programme under Strengthening Environmental Management, and Reducing the Impact of Climate Change in Solomon Islands (SEMRICC), the Government of Norway, and the United Nations Development Account.

Principal Author:	Amillah S. Rodil
Contributing Author:	Maria Adelaida Antonette Mias-Cea
Reviewers:	Bernhard Barth, Sarah Mecartney, Valentine Thurairajah
Summarized by:	Maria Tomovic
Editor:	Maria Tomovic
Design and Layout:	Deepanjana Chakravarti
Special Thanks:	Department of Planning, Ministry of Lands, Housing and Survey, National Geographic Information Centre, National Disaster Management Office, Ministry of Environment, Climate Change, Disaster Management and Meteorology, Honiara City Council and United Nations Development Programme geographic information systems Consultants.

Foreword

It is widely recognised that small island nations of the Pacific region are the most exposed and sensitive to the impacts of climate-related and natural hazards. For Honiara, this vulnerability was particularly highlighted by the devastating floods of April 2014, which impacted many in our communities. Climate change, in combination with rapid urbanisation, means that the city of Honiara faces considerable challenges both now and into the future.

The first step towards enhancing the resilience of our city and its communities to current climate variability and future change is to better understand the key vulnerabilities that exist within the urban environment. This assessment, conducted as part of UN-Habitat's Cities and Climate Change Initiative, is a valuable resource that not only applies state-of-the-art climate science to the local context of Honiara, identifying some of the critical vulnerability hotspots; it also provides the necessary framework for guiding action that will assist us in adapting to climate change.

As climate change will impact all areas of our city, our adaptation responses will require joint action. Therefore, collaboration between different actors will be critical when dealing with such important and complex issues for our communities. We recognise that ongoing engagement processes will contribute to informing adaptation actions and help to shape a climate resilient and more liveable city in the future.

We, the undersigned, recognise the importance of this agenda for the city of Honiara, endorse this vulnerability assessment, and declare an ongoing commitment for the Planning for Climate Change process.

Hon. Alfrence Fatai	Hon. Andrew Manepora'a	Hon. Samuel Manetoali
Lord Mayor	Minister for Lands, Housing & Survey	Minister for Environment, Climate Change, Disaster Management, Conservation and Meteorology
Honiara City Council	Solomon Islands Government	Solomon Islands Government

From Left: Steve Likaveke, Lands Permanent Secretary Stanley Wale, Professor Darryn McEvoy, Hon. Minister Andrew Manepora'a, Honiara City Lord Mayor Alfrence Fatai, Moses Kaukui, Nicola Porter, Donald Kudu, Alexei Trundle

Source: Alexei Trundle May 2015

Contents

List of Figures

List of Tables

01

Introduction

The Honiara City Council Climate Change Vulnerability and Adaptation Assessment was developed in response to a request for assistance to UNDP and UN-Habitat by the Solomon Island Government through the Ministry of Environment, Climate Change, Disaster Management and Meteorology and the Ministry of Lands, Housing and Survey to implement key recommendations of the Solomon Islands National Development Strategy (2011-2020) and the National Climate Change Policy (2012-2017).

Given the Government of the Solomon Islands National Climate Change Policy directive, the main purpose of the vulnerability and adaptation assessment for Honiara is to provide national and local government decision makers and community leaders with information relevant to defining their adaptation priorities and plans, with the view of eventually integrating this into their regular programmes and budgets. The vulnerability and adaptation assessment will also provide guidance in identifying where and what critical actions are needed to effectively manage the unavoidable impacts of climate change.

The vulnerability and adaptation assessment is envisioned to form part of a larger strategic urban planning process where stakeholder involvement is essential. Involving a significant segment of the society right from the beginning of the assessment stage facilitates not only the gathering of more detailed information that may not be available from the local government, but also helps in interpreting data and information as it relates to the unique experiences of different segments of the society. The participatory nature of the vulnerability and adaptation assessment is expected to bring about broad-based decision making that increases the ability of local governments to mobilize effective local actions.

Figure 1: Planning for Climate Change

Source: UN-Habitat and EcoPlan

02

Overview of the City

Honiara is located on Guadalcanal the largest island in the country, measuring 160 kilometres in length and 45 kilometre wide at the centre. The island stretches from the northwest to the southeast with a mountainous spine parallel with, and close to the southern coast. Honiara is the capital city of the Solomon Islands and serves as its main transport hub and economic, political, and educational centre. It is located on the north coast of Guadalcanal with an area of 22 squarekilometres and a population of 64,609 (equivalent to 12.5 per cent of the country's total population) in 2009. Honiara has 12 wards and is the most densely populated area of the country with 2,953 persons per square kilometres. and the highest average household size (seven compared to 5.5 country average).

Honiara itself can be divided into two general geographical zones: the coastal zone, which forms a narrow alluvial plain varying in width from 120m on the east to about 1.7 kilometre on the west and the grassy foothills behind the coastal plain, which are incised by the Mataniko and White River and their tributaries.

Table 1: Summary of Area and Population Figures, Honiara, Guadalcanal and Solomon Islands (2009)

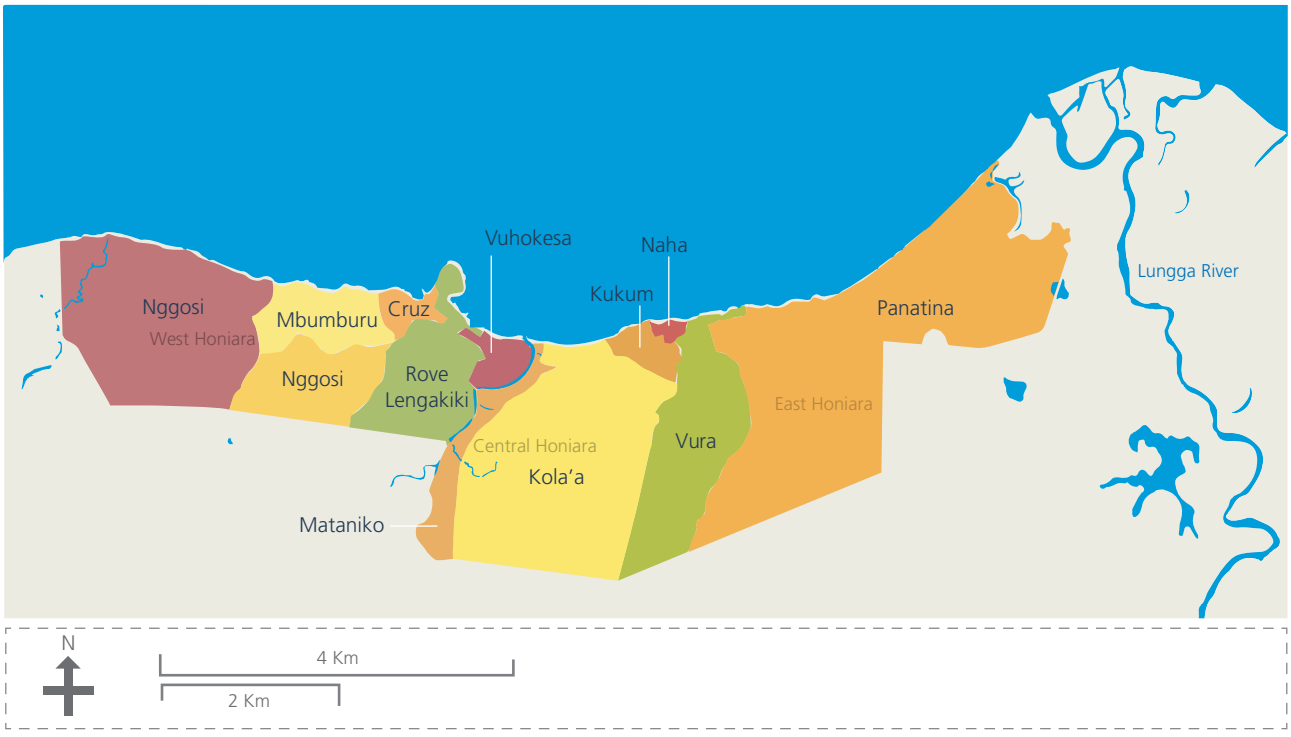
	Solomon Islands	Guadalcanal	Honiara
Area (sq.km)	28,336	5,336	22.73
Population	515,870	93,613	64,609
Average annual population growth rate (%)	2.3	4.4	2.7
Population density (no. of people/sq.km.)	17	18	2,953
No. of households	91,251	17,163	8,981
Average household size	5.5	5.4	7

Source: UN-Habitat

The Solomon Islands is a constitutional monarchy with three tiers of government: national, provincial and local. The sub-national government is made up of nine provincial assemblies and the Honiara City Council. The Council is headed by a mayor who appoints chairpersons to head the overall administration of the council's eight portfolios: education; land and planning; works and transport; trade and commerce; law enforcement; finance/administration; health and environment; and youth, sports, and women.

Given the responsibilities of the Honiara City Council, increasing their capacity in understanding the disaster and climate risks of the city is critical in order for them to have the ability to coordinate and partner with wider stakeholders in instituting programmes, projects and activities that would facilitate the city's resilience to the negative effects that climate change may bring.

Figure 2: Map of Honiara



Source: UN-Habitat

03

City-wide Vulnerability - Scoping Exposure, Sensitivity and Adaptive Capacity

3.1 Overview

Three key determinants of vulnerability; exposure, sensitivity, and adaptive capacity were analyzed during the assessment of Honiara City. The guiding definitions based on United Nations Framework Convention on Climate Change were used to frame the assessment process.

- **Exposure** is what is at risk from climate change (e.g. population, resources, property) and the change in climate itself (e.g. sea level rise, temperature, precipitation, extreme events, etc.).

- **Sensitivity** is defined as the degree to which a system is affected by the biophysical impact of climate change. It considers the socio-economic context of the system being assessed.

- **Adaptive capacity** is the ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences. The Intergovernmental Panel on Climate Change Third Assessment Report outlines that it is a function of wealth, technology, institutions, information, infrastructure and social capital.

Developing Adaptation Plans

The adaptation plans following the results of the vulnerability and adaptation assessment exercises were derived based on stakeholder consultations and dialogues where UN-Habitat's "City Consultation Process" was used. The process promotes a "values-based approach in planning" where the factors that the area values the most or deem highly important to their well-being were the core of action.

3.2 Exposure

The climate of the Solomon Islands is characterized by high and rather consistent temperature and humidity and, in most areas, abundant rainfall throughout the year. It is located on the north-facing slopes of Guadalcanal, which experiences a wet season during the northeasterly airstream period between December and April. Typically about 65 per cent of the 2,100millimetres mean annual rainfall in Honiara occurs during the 5-month wet season. In addition to heavy rainfall, temperature records across the country over the past decades show an increasing trend [1].

Additional exposure comes from a number of tropical low pressure systems that occur each year over the Solomon Islands. However, few of these develop into tropical cyclones. The average frequency of cyclone occurrence is between one and two per year. In terms of sea level rise, records in the Honiara tide gauge from 1994 to 2009 shows an increase of approximately 7.7 mm per year, while satellite data shows an increase of 8mm per year since 1993. This is more than twice the global average rise of 2.8 to 3.6 mm per year .

[1] Solomon Islands National Climate Change Policy 2007-2012

Flooding: Flooding in Honiara is usually caused by extreme rainfall during the months of December to April or heavy rain brought on by cyclones. About 44 per cent of the total population of Honiara is sensitive to flooding. The map below shows that even though the flood-prone area is larger beside the Lungga River, there will be more people affected by the Mataniko River because of the higher density of people. Compared to the rest of Guadalcanal, Honiara experiences less impact because about 80 per cent of the city's land area is situated on hills, and a relatively small area is exposed to flooding.

Figure 3: Location of Population Exposed to Riverine Floods

Source: Designed by UN-Habitat based on a map made by Dalton Hone, National Geographic Information Centre, Solomon Islands.

Storm Surges: A storm surge is an offshore rise of water associated with a low pressure weather system, typically tropical cyclones. Based on census data, the population at risk to storm surge is 286 households or 2,191 people, which is equivalent to about 25 per cent of the total population.

Strong Wind from Cyclones: Cyclones can bring in strong winds. The maximum wind speed for Honiara is about 75 miles per hour, with a 40 per cent chance that this number will be exceeded at least once in the next 50 years[2].

Sea Level Rise: The maximum projected sea level rise for Honiara is 0.6m by the year 2090. Based on rapid field assessment and community observation, in most areas, the coastline is receding due to the compound effect of storm surge, wave action, and sea level rise.

[2] Asian Development Bank. (2011). Pacific Catastrophe Risk Assessment and Financing Initiative. SOPAC, World Bank, ADB.

Climate Models and Summary of Projections

A recent report by the Pacific Climate Change Science Programme funded by the Australian Government analyzed up to 24 different global models of future climate based on three Intergovernmental Panel on Climate Change scenarios: Low (B1), Medium (A1B) and High (A2). The scenarios are linked to trends in global green house gas emissions and potential global mitigation actions[3] . The table below summarizes the predicted future climate of the Solomon Islands.

Table 2: Summary of the Predicted Future Climate of Solomon Islands

	Solomon Islands
Temperature change:	**(A1B scenario; PCCSP)** *2030:* 0.4-1.2 °C *2055:* 0.9 -1.9 °C *2090:* 1.5 – 3.1 °C
Precipitation change:	Average annual and seasonal rainfall projected to increase, however there is uncertainty in the projections (source: SIMS)
Sea level Rise:	**(A1B scenario; PCCSP)** *2030:* 5-14 cm *2055:* 8-30 cm *2090:* 19-58 cm
Extreme Events:	Less frequent cyclones but likely to be more intense or severe (category 4 & 5) with a projected 2 to 11% increase in maximum wind speed (PCCSP)

Source: UN-Habitat

3.3 Sensitivity

Section 4.2 summarized what the city is exposed to given climate change. This section focuses on the local risk effects of such changes. This process identified the "sensitivity" of people, places, activities, and institutions relative to their exposure to climate or weather related impacts/biophysical effects, and Honiara's environmental, physical, economic, and social systems.

3.3.1 Environmental Sensitivity

The environmental sensitivity of Honiara is assessed through an urban ecosystems approach. This means looking at how people, their activities, the built environment, and the natural environment interact and affect each other in specific places, and the biophysical impacts of climate change.

Coastal Plain: Most government facilities and commercial and industrial developments are located in Honiara's coastal plain, as well as a few small but densely populated villages. Development on the foreshore seems to be largely unregulated as many buildings and structures encroach on it. Inadequate waste collection has led to solid waste, particularly plastic waste, accumulating in deltas and beaches. An aging sewer system and a lack of proper toilets in many areas has lead to untreated sewage flowing directly into the sea. Aside from the pressures of urbanization, the area is also at risk to sea level rise, storm surges, coastal ero-

[3] Solomon Islands National Climate Change Policy 2007-2012

sion, and flooding. A rapid assessment of the coastline shows many areas with damage from past storm surges, and evidence of coastal erosion.

Hills: Grassy foothills occupy about 80 per cent of Honiara, and contain mostly residential developments of single detached houses. A number of informal settlements have sprung up in the past few decades, some of which have already encroached on customary land beyond the town boundaries. Increasing development and dwindling vegetation have led to soil erosion, affecting soil productivity, and increasing siltation and surface runoff to creeks and rivers, and the potential for flooding downstream. Residential development in catchment areas contaminates spring sources, particularly during heavy rain.

People living in the hills, particularly informal settlements, also face challenging conditions. Access is difficult because of steep slopes. Lack of secure tenure and challenging terrain constrain the delivery of basic services such as power, water, and garbage collection. Uncollected solid waste often ends up in creeks.

Lungga River Watershed: The Lungga River watershed covers a total area of 388 square kilometre and is one of the biggest water catchments in Guadalcanal Province. Impacts on the various catchments (upper, middle and lower) include landslides, erosion and sedimentation of the river and flooding [4].

(Top) Houses in Vavaea Ward,
(Above) Creek in Kola'a ward, Taken November 2012
Photo © UN Habitat / Amillah Rodil

(Left) Lungga River main channel
(Above) One of its downstream outlets, Taken November 2012
Photo © UN Habitat / Amillah Rodil

Mataniko River Watershed: Four wards are included in its catchment area: Kola'a, Mataniko, Vuhokesa, and Vavaea. Low-lying areas alongside the river are prone to flooding, in some areas up to 2m high. The coastal delta settlements are prone to flooding both from the river and storm surges/ high tides, as well as surface runoff from the hills. The relatively narrow floodplain means that roads and houses are built close

[4] Asian Development Bank. (2011). Vulnerability Assessment/ Adaptation Options: Solomon Islands. Asian Development Bank.

to the river's edge. River bank erosion, if allowed to continue, can affect these structures.

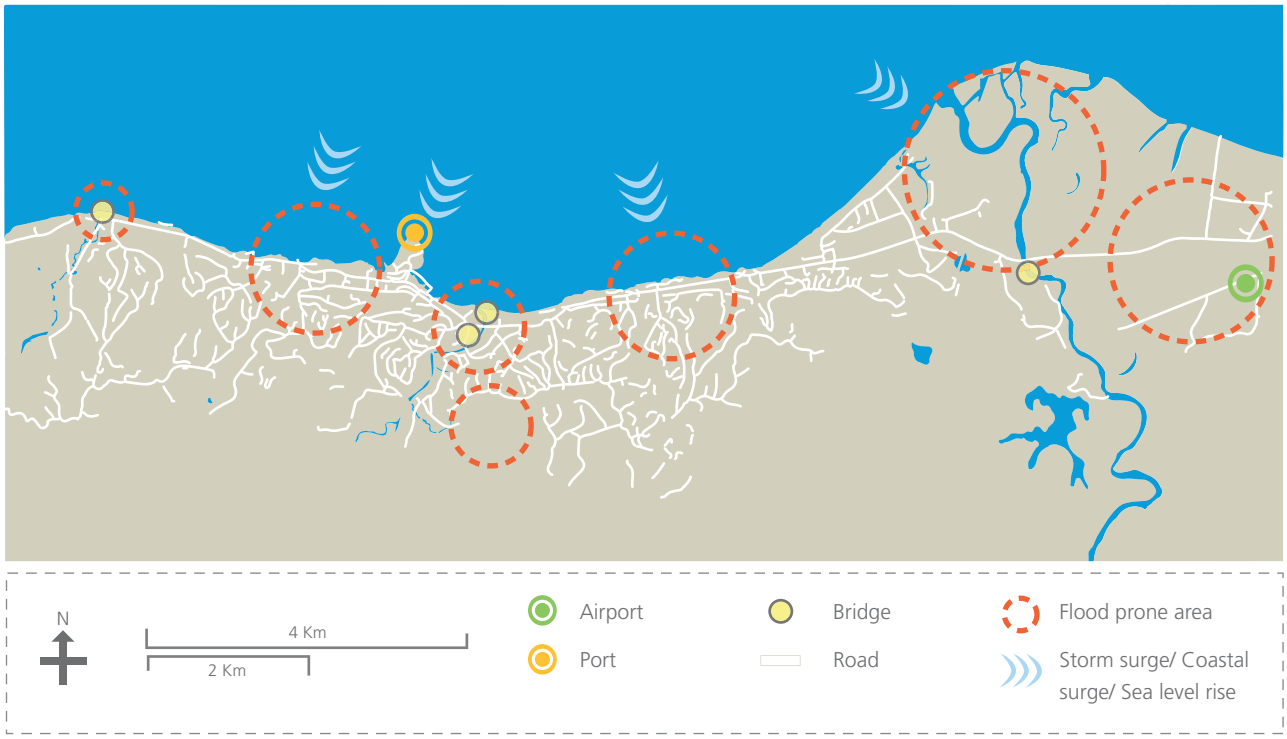
White River Watershed: White River is located in Nggosi ward, on the western edge of Honiara. Upstream is the main water source of the city, Kongulai spring, and its main gravity line runs along the river. It is also prone to regular flooding, with recent ones having damaged water pipelines.

3.3.2 Physical Systems Sensitivity

Mobility: Honiara is the main transport hub of the Solomon Islands, connecting it to other countries through its main airport, Henderson International Airport (now called Honiara International Airport), and the port at Point Cruz. Given its significance as a transport link, Its sensitivity to floods is a major concern

Additional transportation networks include the port, highways and bridges. The Honiara port is susceptible to storm surges; cyclones have damaged the wharf in 1952, 1967 (twice), 1972, and 1986. A main highway runs along the coastline and is sensitive to flash floods and storm surges. Bridges crossing Lungga, Mataniko, and White River are also vulnerable to river flooding. There is no alternative route by land so flooding (or any damage to bridges) can cut off land access to parts of the city and the rest of Guadalcanal.

Figure 4: Exposure & Threat to the Transport System



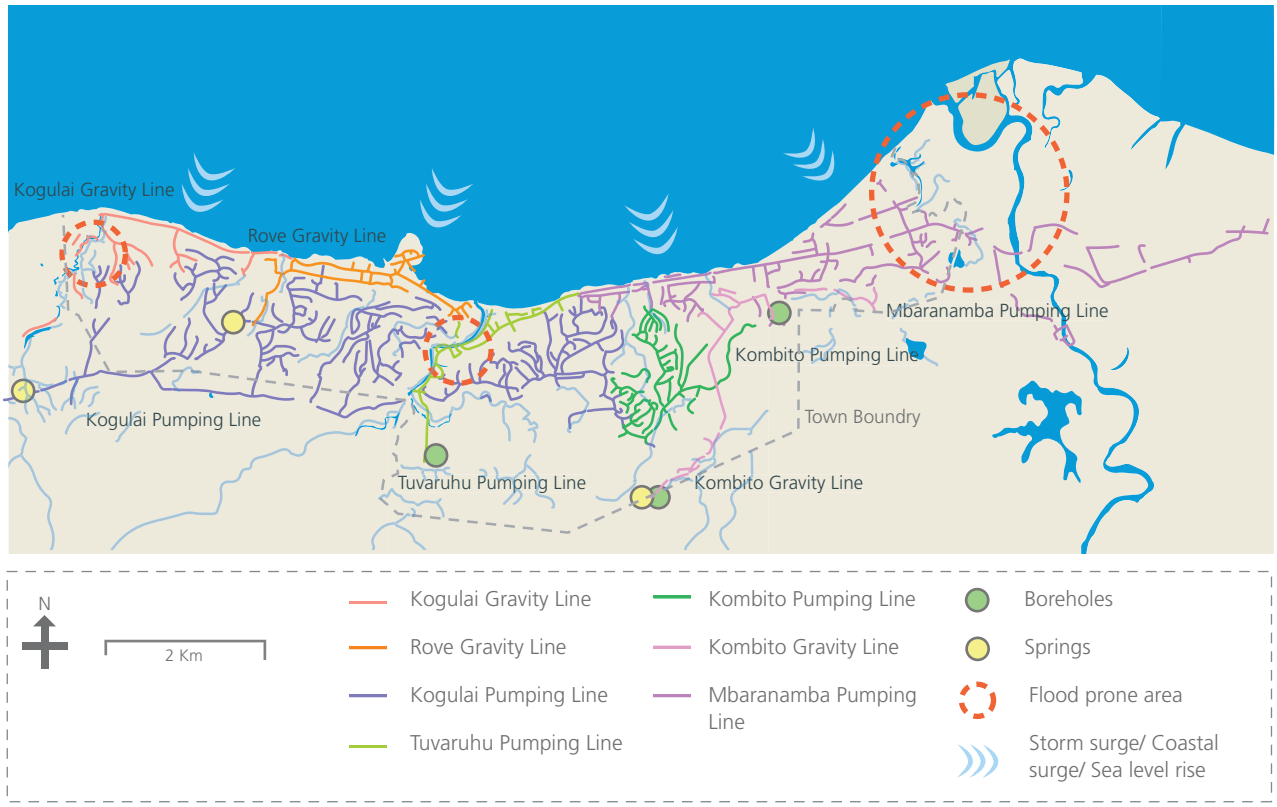
Source: Designed by UN-Habitat based on a map made by National Geographic Information Centre, Solomon Islands.

Water Supply: The Solomon Islands Water Authority provides water to about 75 per cent of the 8,981 households in the city[5]. The rest get water through local spring sources, rainwater (stored in tanks), wells, and rivers/ streams. The Water Authority currently sources its water from a combination of groundwater and spring sources. Groundwater sources account for 40 per cent, while spring water sources account for 60 per cent of the total water provided to the city.

.

The water supply system is vulnerable to cyclones, flooding, storm surge/coastal erosion/sea level rise, heavy rain, and droughts. In addition, a number of issues plague the water supply system. Water shortage is normal, and about 25 per cent of the served population experiences low water pressure, resulting in insufficient water during the daytime[6] . The water system is also highly inefficient. Non-revenue water constitutes 40 per cent. This is water that the Wather Authorityis not able to charge for, due to pipe leaks and bursts, scouring of mains, leaking taps, leaking tanks, and illegal connections.

Figure 5: Hazard Exposure of Water System



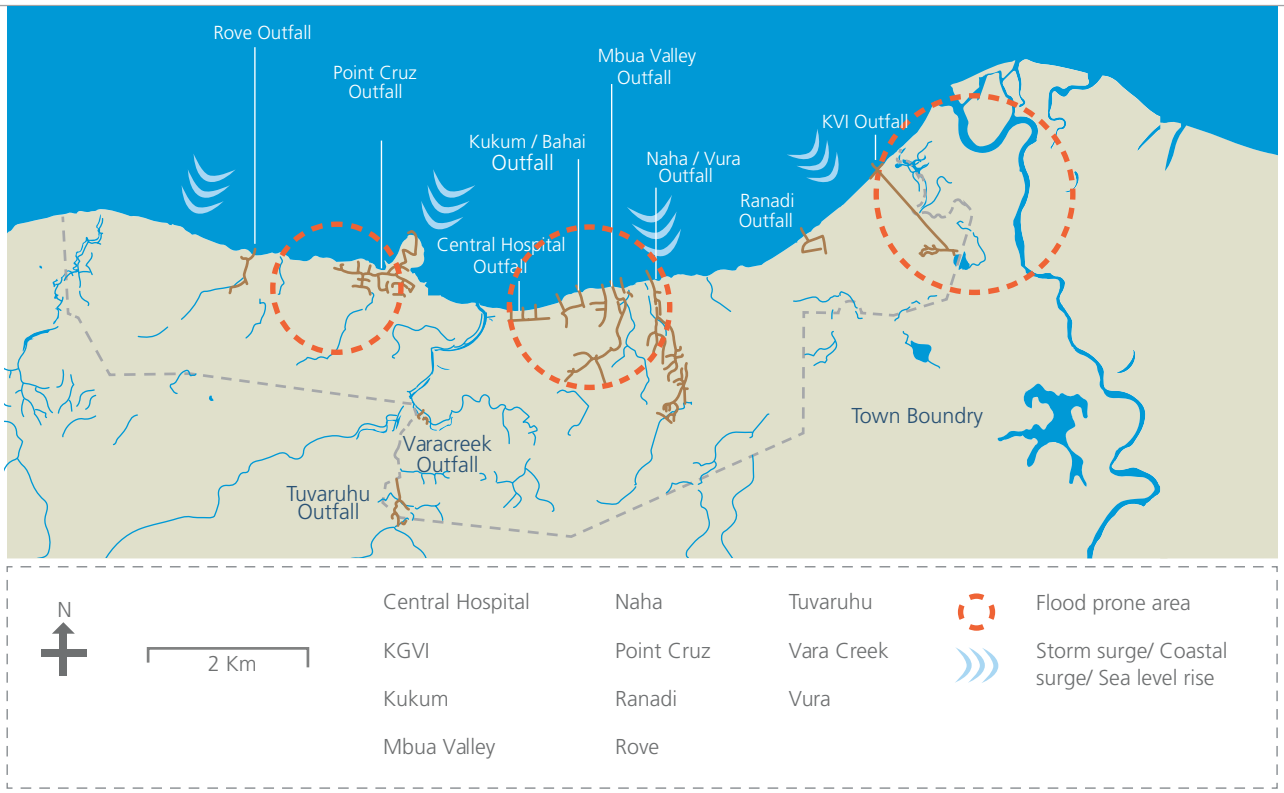
Source: Designed by UN-Habitat based on a map made by Brian Pitakia, National Geographic Information Centre, Solomon Islands.

Sanitation: About 30 per cent of Honiara is connected to a conventional gravity sewerage system managed by the Solomon Islands Water Authority. The rest use on-site treatment such as septic tanks, or no treatment at all. Census figures for type of toilet facilities indicate that about 18 per cent use pit latrines, 'other,' or 'none.' The existing system is inadequate and contributes to coastal and groundwater pollution. The sewerage system has 16 outfalls discharging directly into the Mataniko River and the sea (See Figure 6). The sewer lines are old, overloaded, and in poor condition.

[5] Solomon Islands Census 2009

[6] Sustainable Integrated Water Resources and Wastewater Management in Pacific Island Countries. (November 2007). National Integrated Water Resource Management Diagnostic Report. Draft SOPAC Miscellaneous Report 645.

Figure 6: Sewerage System Susceptibility to Floods and Storm Surge



Source: Designed by UN-Habitat based on a map made by Brian Pitakia, National Geographic Information Centre, Solomon Islands.

Energy: The Solomon Islands Electricity Authority provides the power supply for about 64 per cent of households in Honiara [7]. The Lungga Power station supplies Honiara's power supply with the support of a smaller station inside central Honiara.There is sufficient power capacity (of over 20MW) to meet the peak load in the city of 14MW on business days, but there is no reserve capacity. If one generator is out of service, load shedding has to take place, resulting in blackouts throughout the city

The biggest challenges in the power sector are a) weak utility resulting in low efficiency; and b) dependence on high cost diesel-fired electricity generation. Honiara's power is 100 per cent diesel-based [8] and about 80 per cent of the Solomon Islands Electricity Authority's operational costs are consumed by diesel fuel. All fuel has to be imported, amounting to 28 to 30 per cent of the country's total imports. The Solomon Islands have some of the highest electricity commodity prices in the world [9]. In the past, cyclones have brought down power lines, resulting in extended power outages. As it is projected that tropical cyclones would be stronger and more intense due to climate change, the power system for Honiara is likely to be impacted.

Residential Buildings: In Honiara and other urban/ rural centres, the most common form of housing is single story timber frame construction (46 per cent); 7 per cent of surveyed houses are of traditional construction, and 6 per cent are of poor construction. Buildings with traditional and poor construction are more likely to be sensitive to damage from climate change effects such as strong wind, storm surge, and flooding.

[7] Solomon Islands Census 2009

[8] World Bank. (2006). Project Information Document Concept Stage: Solomon Islands Sustainable Energy Project.

[9] Energy Profile Solomon Islands. (n.d.). Retrieved December 2012, from www.reegle.info: http://www.reegle.info/countries/solomon-islands-energy-profile/SB

3.3.3 Economic Systems

The Solomon Islands economy is susceptible to shocks from climate-related disasters due to extreme events. Based on historical and recent news accounts, economic losses from disasters usually stem from impacts on agriculture. During Cyclone Namu, oil palm, rice, cocoa and coconut plantations were severely damaged.

Service Sector: Honiara's economic base is dominated by the service sector, as the city is Solomon Islands' main commercial and administrative centre. The service sector in Honiara is at sensitive mainly due to the location of commercial activities on the coastal strip, which is vulnerable to storm surges and flash floods. Trade is also heavily dependent on transportation links which are exposed to extreme events. The sensitivity of power and water systems to disruptions from typhoons and floods also affects businesses and offices.

Tourism: The vulnerability to climate change of the tourism and hospitality industry is connected to the susceptibility of transport links, accommodation facilities, and tourist sites to climate hazards.

Agriculture and Fisheries: There are no large agricultural areas or commercial plantations within Honiara. But there are small-scale efforts by households who grow crops in backyard gardens, raise livestock, or fish. Climate change has been affecting agricultural productivity. Households engaged in agricultural activities have been adapting to reduced productivity by finding alternative sources of income, such as selling firewood from scrap logs. Families are also shifting to more service-oriented livelihoods. As Honiara urbanizes, it is likely that this trend will continue.

Table 3: Solomon Islands Production Value of Key Crops, 2009

Crop	Banana	Cassava	Cocoa	Coconut	Oil Palm	Rice	Sweet Potato	Taro	Yam
Production Value ($)			3,280,000	24,961,000	11,807,000	577,000	8,642,000	4,532,000	6,457,000
Production (Tons)	330	2,500	4,259	276,000	39,000	2,800	86,000	44,000	32,000
Area Harvested (Ha)	110	150	9,600	37,000	11,000	1,000	6,000	2,200	1,400
Yield (Hg per Ha)	30,000	166,666	4,406	74,594	170,909	28,000	143,333	200,000	228,571
Quantity Exported (Tons)			3,575	21,352	19,745				
Export Value ($)			5,591,000	6,542,000	13,974,000				
Unit Value ($ per Ton)			1,665	306	708				

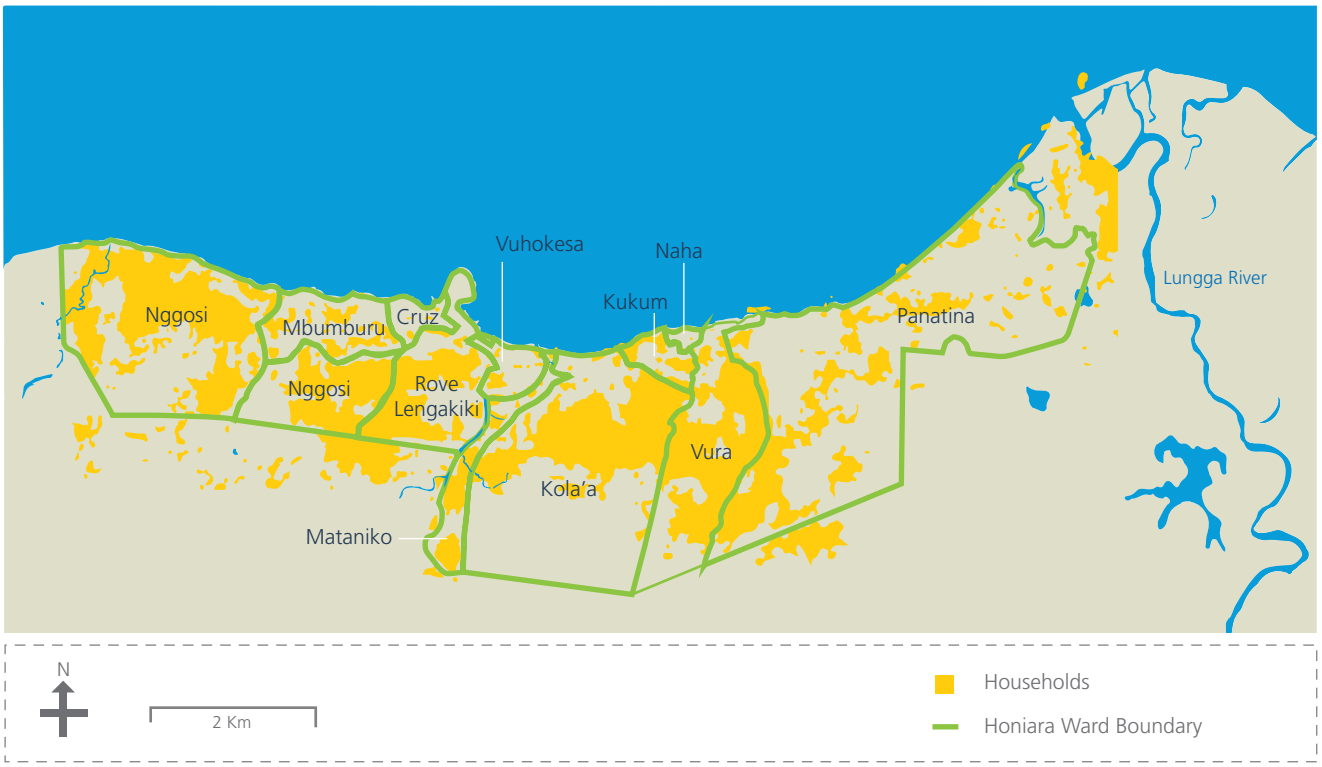
Source: UN-Habitat

3.3.4 Social Systems and Culture

The social conditions of the people in Honiara are critical factors in their sensitivity to climate change impacts, as they influence how people are able to adapt to changes and develop responses and action plans.

Population Density and Urban Growth: Honiara has an average population density of 28 persons per hectare. The densest wards are Kukum (56/ha.), Matani-ko (53/ha), and Vavaea and Naha (47/ha.).There are neighbourhoods within these wards that may be four to five times the average density, as households tend to cluster together depending on topography and available land. Increasing population densities, particularly in hazard-prone areas, increases exposure to impacts. As less land is available, newcomers may be forced to settle in less than ideal places.

Figure 7: Location of Households (Census 2009)

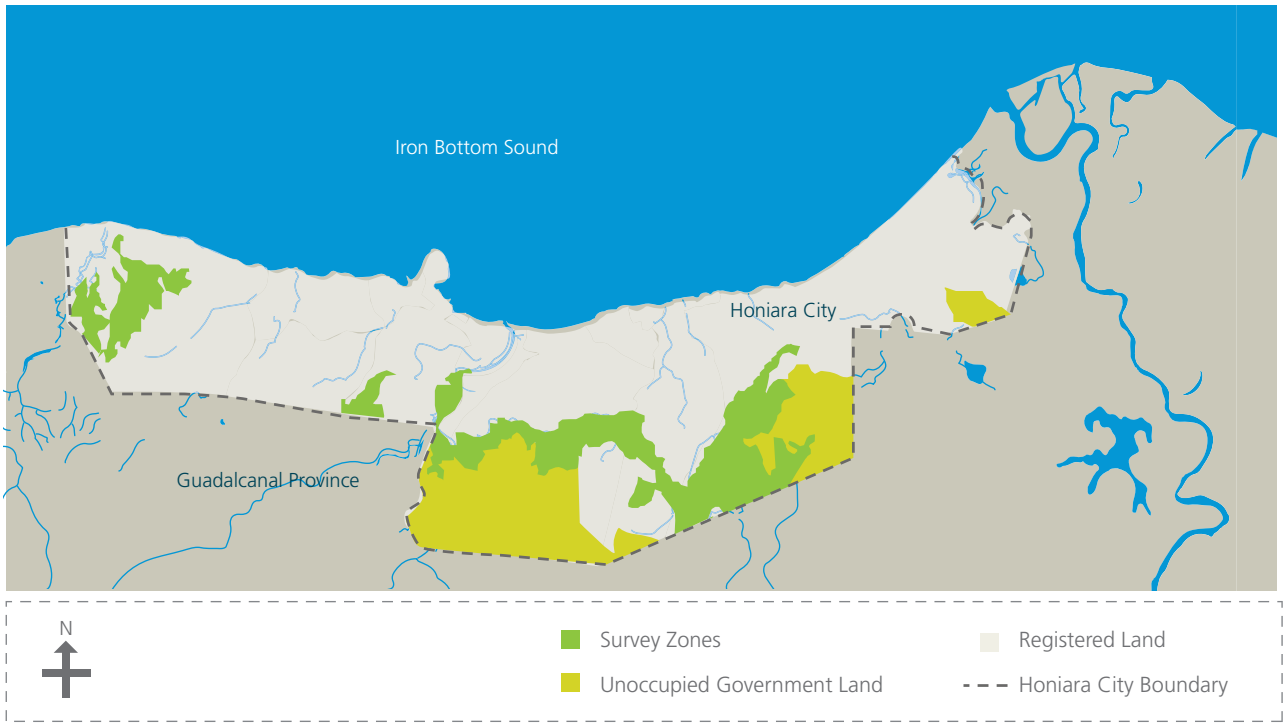


Source: Designed by UN-Habitat based on a map made by Samson Kanamoli, National Geographic Information Centre, Solomon Islands.

Poverty: About 32.2 per cent of the population in Honiara falls below the Basic Needs Poverty Line as computed by a UNDP study analyzing the 2005/2006 Household Income and Expenditure Survey. The poor in Honiara are more likely to be affected by primary and secondary impacts of climate-related hazards. Their limited spending capacity makes them less able to cope with rising prices of food and other commodities due to supply disruptions caused by climate-related disturbances. Furthermore, poor households in Honiara are likely to be located in informal settlement areas, some of which are situated in hazard-prone and ecologically sensitive areas such as coastal deltas, river floodplains, and steeply sloping hills.

Land Tenure and Informal Settlements: Approximately 35 per cent of Honiara residents (about 3,000 households or approximately 22,000 persons) live in 35 informal settlements within the city [10] [11]. Most informal settlements are located on the periphery of the city, with some already encroaching on customary land outside the city boundary. These informal settlements are vulnerable to climate change impacts because they are unplanned and often lack adequate facilities and services such as footpaths, power, sanitation, water, and garbage collection. Newer settlements are likely to be more vulnerable because these have mostly temporary or semi-permanent structures, and are built on land with steep slopes or on low-lying coastal and riverine areas prone to natural hazards.

Figure 8: Unauthorized Settlement Areas - Survey Zones



Source: Designed by UN-Habitat based on a map made by the Department of Planning, Ministry of Lands, Housing and Survey, Solomon Islands.

During the 1960s, the pre-independence administration tried to deal with settlers by issuing them temporary occupation licenses. The government also designated Temporary Housing Areas within which temporary occupations licenses may be granted [12]. As the number of settlers grew, successive governments stated that they would convert the temporary occupations licenses into a more secure form of tenure. But as the Solomon Islands economy grew and more people moved to urban areas looking for job opportunities, the governments stopped issuing the temporary occupations licenses. This made the policy issue of tenure conversion even more difficult, as most settlers do not have valid or even lapsed temporary occupations licenses [13].

[10] Likaveke, S. (2012). Honiara Participatory Slum Upgrading Inception Report.

[11] UN-Habitat. (2012). Honiara Urban Profile.

[12] Likaveke, S. (2012). Honiara Participatory Slum Upgrading Inception Report.

[13] Chand, S., & Yala, C. (2008). Volume 2, Chapter 5: Informal Land Settlements Within Honiara and Port Moresby. In Making Land Work. AusAID.

A survey in 2005 showed that fewer than half of the settlers ever held a temporary occupations license and only two per cent held a valid (up-to-date) temporary operation license. This partly explains why access to water and power is constrained in informal settlements, as a valid temporary occupations license is a prerequisite for the Solomon Islands Water Authority and the Solomon Islands Electricity Authority to connect their services.

Water and Sanitation: According to the 2009 Census, about 75 per cent of households in Honiara obtain drinking water from Solomon Islands Water Authority; the other 25 per cent use alternative sources of water for drinking such as household tanks, rivers/ streams, communal standpipes, unprotected wells, and communal tanks. About 54 per cent use private flush toilets while the other 46 per cent use shared flush toilets, such as private/ shared water sealed toilets, and private/ shared pit latrines.

Climate change impacts in the city would affect people's access to water, especially those sourcing it from rainwater tanks, rivers/ streams, and wells - in the event of drought or extended dry periods, water levels would recede while in longer rain periods water would be more prone to contamination due to increase water run-off. Although there are no published reports of groundwater sources being affected by salt water intrusion (most sources in Honiara are located in higher elevations), coastal erosion and storm surges exacerbated by sea level rise are reportedly damaging water supply lines located near the coast.

Power: About 64 per cent of households in Honiara are connected to grid supply from the Electricity Authority. Most households without electricity use kerosene lamps for lighting. Even with electricity, however, about 53 per cent of households still use wood/ coconut shells for cooking, while about 37 per cent use gas. Electricity use for cooking accounts for only about 4 per cent [14].

Waste Management: About 36 per cent of households in Honiara dispose of their rubbish through government waste collection. Others burn (23 per cent), dispose in their backyard (17 per cent), dispose in the river or stream (10 per cent), and bury (8 per cent). Improper waste management contributes to environmental pollution and the clogging of waterways, creating conditions that can be further exacerbated by climate change impacts.

Solid waste management collection point
Photo © UN Habitat / Bernhard Barth

Health: There are no studies in the Solomon Islands that link health and climate change as indicated by an increase in disease incidence. However, the people in the city are exposed to vector-borne and water-borne diseases, such as malaria and diarrhea, that can easily be exacerbated by climate change impacts.

Education and knowledge on climate change: Among the population in the city aged 12 and older, about 40 per cent have completed primary education, 35 per cent secondary education, and 13 per cent tertiary education. Six per cent have no completed school at all [15]. Consultations with communities reveal that people tend to have a good understanding of weather patterns, and natural hazards and their impacts. Some communities have retained traditional ways of predicting the weather. They also understand how increasing development can contribute to environmental degradation and can exacerbate impacts.

Social Capital: While urbanization tends to undermine these traditional structures, there are indications that strong social networks still exist in Honiara. The city has the largest average household size in the country, indicating that people often take on relatives into their abode when housing is not available. But

[14] Solomon Islands Census 2009

[15] Solomon Islands Census 2009

[16] Solomon Islands Census 2009.

despite these strong social networks, there is a lack of inclusionary and collective action/cooperation among the government, community leaders, and other stakeholders in disaster risk preparedness and other measures towards building risk resilient communities.

Children and youth: Children less than 15 years of age constitute 34 per cent of the population in Honiara, while the youth (15 to 24 years old) constitute 24 per cent. Together they make up 58 per cent of the population [16]. This is termed as a "youth bulge."

Many of the youth come from the provinces and are in search of jobs in Honiara, but the labour market in Honiara is unable to absorb the rapidly expanding youth population, leading to high levels of unemployment. High urban underemployment makes the youth population less able to cope with climate change impacts due to lack of income [17]. To help address this problem, the Government of Solomon Islands together with the World Bank introduced the Rapid Employment Project. Started in 2010, the project aims to provide training and work opportunities for vulnerable communities in Honiara, including youth.

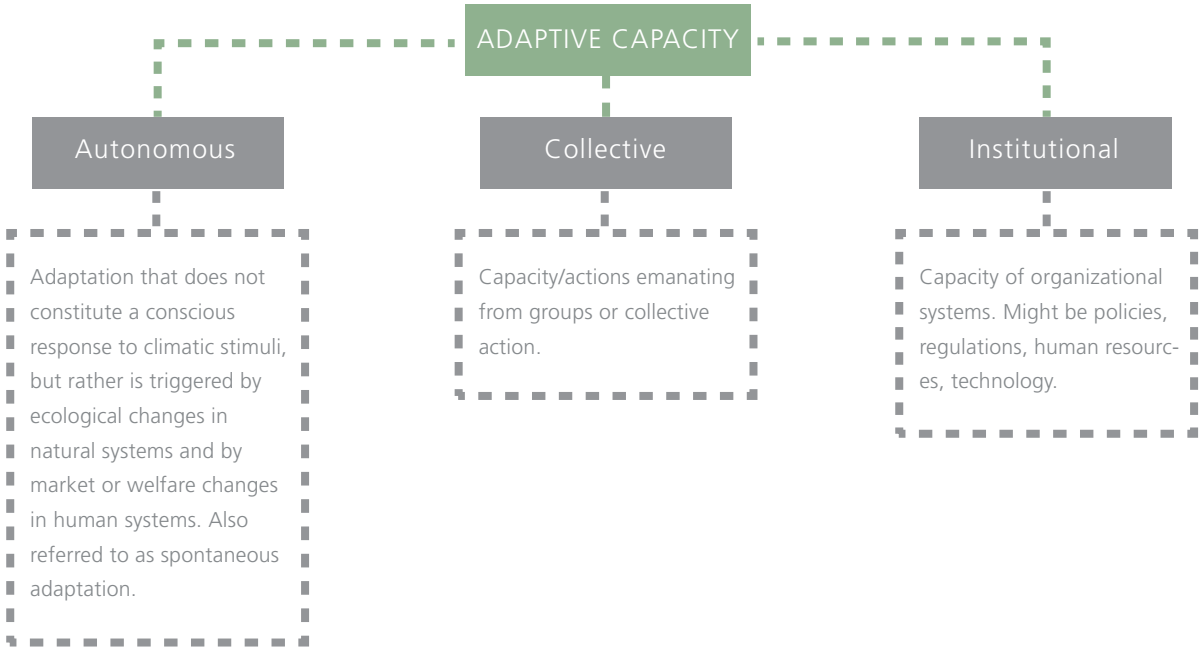
3.4 Adaptive Capacity

In a city consultation workshop held on November 28 2012, participants were asked the following questions:

(1) What should be present in the Honiara City Council so that natural disasters are avoided?
(2) If and when disaster strikes, what do families, communities and organizations need to recover and build back?

Answers to (2) reveal that there is growing awareness and knowledge in the city government of climate change and its impacts. But the City Council admits it lacks technical capacity and the resources to respond. Answers to (1) reveal that basic necessities and the community unit are important for families; for communities and organizations, a higher level of technical and financial capacity to plan and assist/ implement projects is needed.

Figure 9: Adaptive Capacity Definition



Source: UN-Habitat

[17] Noble, C., Pereira, N., & Saune, N. (2011). Chapter 6: Honiara, Solomon Islands. In Urban youth in the Pacific: increasing resilience and reducing risk for involvement in crime. Suva, Fiji: UNDP Pacific Centre: PIFS.

3.4.1 Autonomous Adaptation

Autonomous adaptation is defined as adaptation that does not constitute a conscious response to climatic stimuli, but rather is triggered by ecological changes in natural systems and by market or welfare changes in human systems. It is also referred to as spontaneous adaptation. Basic necessities (money, food, shelter, clothing) and access to essential services were identified in the city consultation as needed by families to adapt.

Table 4: Indicators on Basic Necessities and Services

	Indicator	Figure
Access to basic necessities	Percent below Basic Needs Poverty Line	32%
Access to water	Percent covered by piped water	75%
Access to sanitation	Percent with private flush toilets	54%
Access to power	Percent covered by electricity supply	64%
Access to waste disposal	Percent covered by government waste disposal	36%

Source: UN-Habitat

The data above indicates that about 30 to 40 per cent of the population in Honiara will have difficulty adapting due to lack of basic necessities and services. Based on field observations, community focal group discussions, and census data, families adapt to the lack of these through the following measures:

Table 5: Autonomous Adaptation Measures to Lack of Basic Necessities and Services

	Autonomous Adaptation Measures
Lack of access to basic necessities	- Diversifying income sources - Women seek additional sources of income through employment or selling goods - Fuel collection - Gardening, livestock-raising - Change in diet (rice-based)
Lack of access to water	Sourcing from local springs and streams, rainwater collection, sharing with other households
Lack of access to sanitation	Toilets over water, shared toilets, use of streams and sea
Lack of access to power	Kerosene lamps, solar, own generators

Lack of access to waste disposal	Dumping on streams or sea, burying, burning
Flooding	Houses on stilts, livestock pens on stilts, evacuation to higher areas
Storm surge	Houses on stilts, evacuation to higher areas (including boats and nets)
Cyclone winds	Stronger construction (concrete and wooden houses, tin roofs)
Coastal erosion	Self-reclamation and self-built sea walls from coral/ gravel, movement inward or transfer to higher ground, gabions (usually for commercial developments)

Source: UN-Habitat

3.4.2 Collective Adaptation

Collective adaptation is defined as capacity/actions emanating from groups or collective action. The city adaptive capacity assessment identified that there are notable community/ neighbourhood leaders such as chiefs, elders, teacher's and women's groups who can quickly organize people in the event of a hazard occurrence. The Ward Development Committee and councillors were also identified as being community/ neighbourhood leaders.

In the city, women account for 47 per cent of the total population. Generally, women are more vulnerable to climate variability and disasters than men because they have less access to resources, are victims of gendered division of labour and are the primary caregivers to children, the elderly and the disabled even during disaster events.

Community-based women's groups are key assets that hold the potential for strengthening the role of women in developing resiliency to climate change. The National Women's Policy has provided a positive basis for systematic action by promoting linkages between women and women's groups, spelling out different roles and functions for the various groupings, and identifying priority objectives for women's development [18]. These are possible frameworks and mechanisms for involving women and making them key actors in promoting climate change resiliency.

3.4.3 Institutional Adaptation

National Level

Climate change policy: Assessments, policies, and plans are in place for climate change action at the national level. In the past 10 years, the Solomon Islands Government has taken significant steps to begin implementing climate change adaptation and mitigation actions. These include:

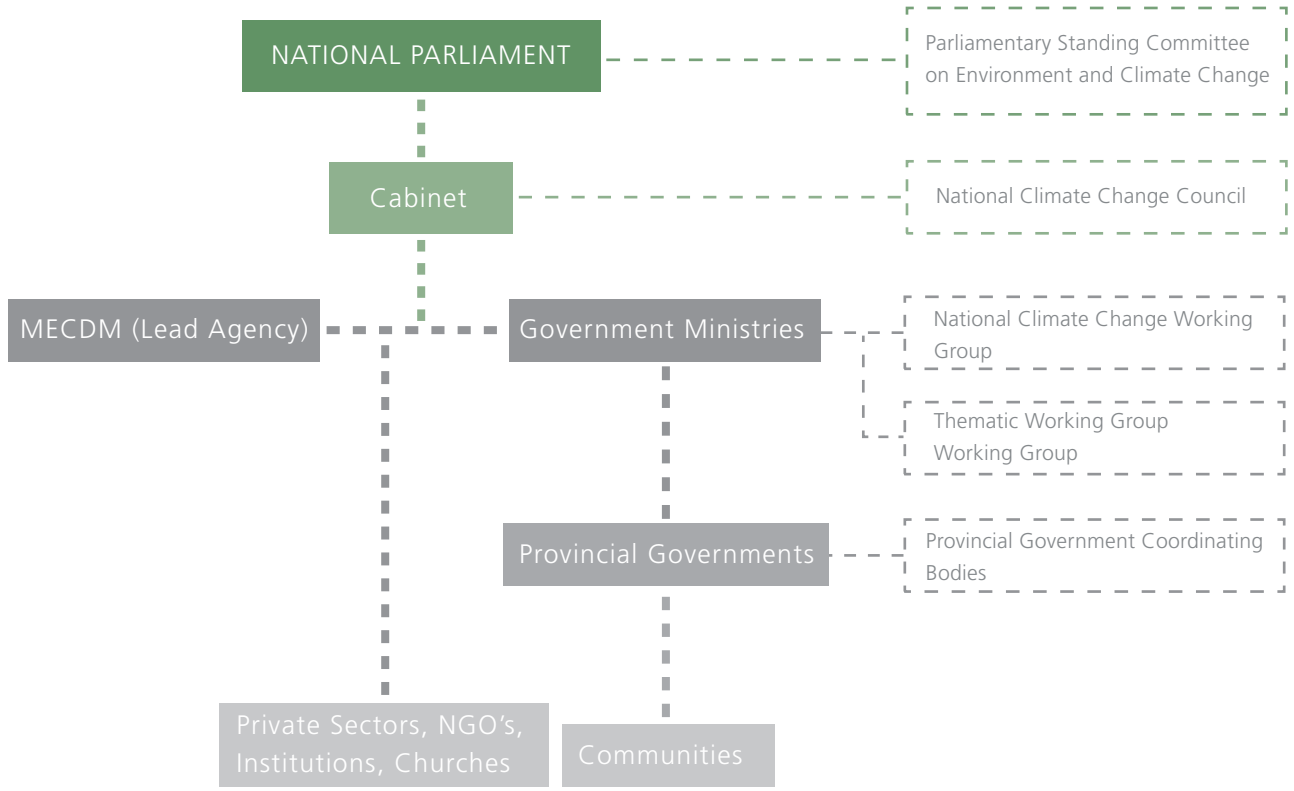
- National Adaptation Programme of Action
- Solomon Islands Second National Communication to the UNFCCC
- National Disaster Management Strategy and a Renewable Energy Framework
- Solomon Islands National Development Strategy: 2011-2020
- National Climate Change Policy for 2012 to 2017

The National Climate Change Policy for 2012 to 2017 provides a national strategic framework for the country to address the challenges that climate change brings. The Climate Change Division of the Ministry of Environment is the lead government agency tasked to lead, guide and coordinate national programmes and actions addressing climate change.

The policy also provides for the establishment of a National Climate Change Council to oversee the implementation, coordination, monitoring and evaluation of national climate change policies and strategies, and a Climate Change Working Group to provide inter-agency and inter-stakeholder coordination for the implementation of the policy.

[18] Pollard, A. A. (2003). Women's organizations, voluntarism, and self-financing in Solomon Islands: a participant perspective. Oceania .

Figure 10: Institutional Arrangements for the Implementation of the Climate Change Policy



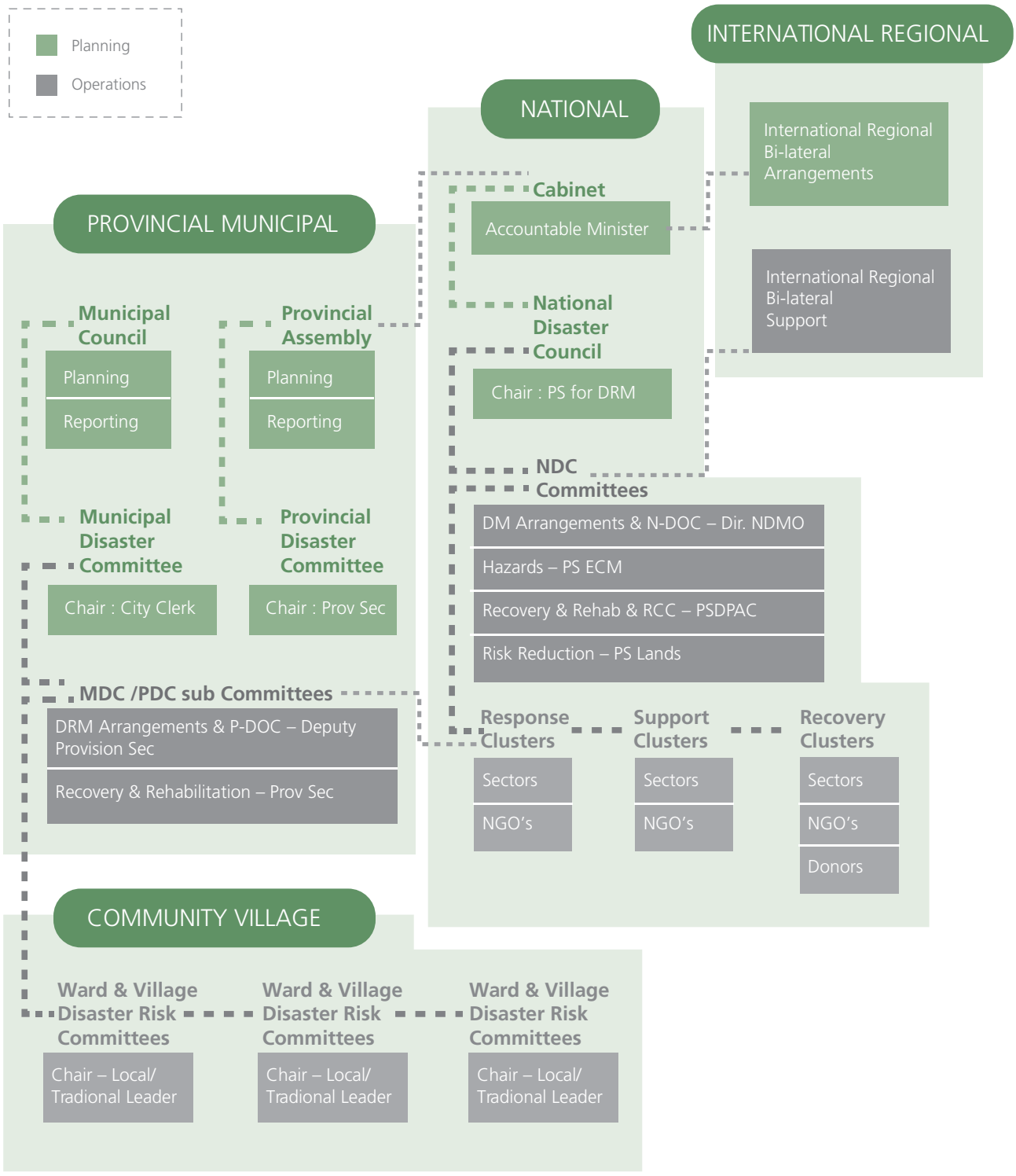
Source: UN-Habitat

Disaster risk management policy: The National Disaster Risk Management Plan 2010 provides for the establishment of institutional arrangements for the Solomon Islands Government to address disaster risk management within the country. It includes both disaster management arrangements for preparing for, managing, and recovering from disaster events and institutional mechanisms for addressing disaster risk reduction, including climate change adaptation. Arrangements are addressed at the national, provincial, and local levels. Figure 11 below details the overall institutional framework.

The National Disaster Council is the strategic decision making body for committing resources and priorities and advising cabinet during a disaster. It is also responsible for the overview of disaster events and the management of international, regional, and bilateral support arrangements for disaster risk management. The national disaster management office (National Disaster Management Office) functions as the secretariat of the council and is responsible for the coordination, development, and implementation of disaster risk management. Provincial/municipal governments such as Honiara are required to establish the provincial/ municipal disaster committees as well as ward and local arrangements for disaster management and risk reduction. Each provincial/ municipal disaster committee is supposed to prepare their own disaster risk management plan.

Village Disaster Risk Committees are to be established at the village level, associated settlement level or where appropriate. Villages, families, and individuals within a Village Disaster Risk committee provide disaster planning including local arrangements for early warning, managing response to disasters, and for addressing hazard and risk reduction issues (including climate change).

Figure 11: Institutional Framework for Disaster Risk Management



Source: UN-Habitat

Climate Change Initiatives by National Ministries: Various ministries have begun to implement climate-change related projects via external funding from various resources. The table below lists some of these ongoing projects:

Table 6: Climate Change Related Projects by National Ministries

Ministry	Initiatives/ Projects	Partners
Ministry of Environment, Climate Change Metereology, and Disaster Management	Mapping of land and forest cover on Geographic Iinformation Systems to monitor climate change and land use on the islands, through the project "Strengthening Environment Management and Reducing the Impact of Climate Change ".	UNDP, Pacific Islands Applied GeoScience Commission, Ministry of Agriculture and Livestock
Ministry of Lands, Housing and Survey	Honiara ward profiling incorporating climate change.Honiara climate change vulnerability and adaptation assessment	UN- Habitat, Honiara City Council
Ministry of Infrastructure Development	Incorporating climate change considerations in its projects since 2008. New roads and bridges under the Solomon Islands Road Improvement Project are now designed to consider risks.	Asian Development Bank, Governments of Australia and New Zealand
Ministry of Agriculture and Livestock Development	Planning promotion of urban gardening in Honiara, under the "Strongem Waka lo Communiti fo Kaikai" project, which aims to strengthen the ability of communities in Solomon Islands to make informed decisions and manage likely climate change driven pressures on food production and management systems.	UNDP, Ministry of Environment, Climate Change, Disaster Management and Meteorology
Ministry of Aid Planning and Coordination	Prioritization of investment projects with climate change as criteria. Includes projects in Honiara	Asian Development Bank

Source: UN-Habitat

Honiara City Council

The city goverment, as the provider of policies, framework, and services that facilitate functionality in local systems and process in time of economic and natural distress, is deemed to be the core of the overall adaptive capacity of the city. The Honiara City Council has limited jurisdiction in some priority sectors for climate change action, where national government ministries are taking the lead. There are however some key areas where it already plays or can play a significant role, such as land use planning and regulation, business regulation, construction and maintenance of feeder roads and small infrastructure, waste management, promotion of health and sanitation, and public information and education.

Table 7: National Adaptation Programmes of Action Priorities and Ministries/ Honiara City Council Departments with Relevant Mandates

National Adaptation Programmes of Action Priorities (as outlined in the National Climate Change Policy)	Ministries/ Honiara City Council Departments with relevant mandates
Increase the resilience of food production and enhance food security to the impacts of climate change and sea-level rise	Ministry of Agriculture is in charge of food security and agriculture-related projects. The City Council had a role in the former Supsup Garden programme funded by UNICEF.
Increase the resilience of water resources management to the impacts of climate change and sea-level rise	Water resources management is under the Ministry of Mines and Energy and Solomon Islands Water Authority. However regulation of land use around catchment areas within Honiara is within the City Council's jurisdiction.
Improve the capacity for managing the impacts of climate change and sea-level rise on human settlements	Planning and regulation of settlements within Honiara is within Honiara City Council jurisdiction with support from the Ministry of Land, Housing and Survey.
Increase the capacity of health professionals to address adverse impacts of climate on human health	The Ministry of Health and Medical Services is in charge of fielding health professionals with the City Department of Health and Medical Services supporting the implementation of ministry programmes.
Promote climate change education, awareness and information dissemination	The Ministry of Education is in charge of schools supported by the Honiara City Council Department of Education. There is no office in the City Council dedicated to public information. According to the 2012 National Disaster Risk Management plan, responsibility for public awareness and training is with the Disaster Management Arrangements Committee chaired by the National Disaster Managemet Orgaisation, while making hazard information available is the responsibility of the Hazards Committee chaired by the Ministry of Mines. The Municipal Disaster Committee, when formed, should also have its own Disaster Management Arrangements sub-committee with the same mandate.
Better manage impacts of climate change on waste management	Honiara City Council is in charge of waste management, but this function has been outsourced and not monitored adequately. There is no national or city policy yet on waste management.
Increase the resilience and enhance the adaptive capacity of coastal communities, socio-economic activities and infrastructure	Planning and regulation of settlements is within Honiara City Council jurisdiction with the support of Ministry of Land Housing and Survey, but major infrastructure is within the Ministry of Infrastructure Development. Smaller infrastructure is under the Honiara City Council Department of Works.
Improve the understanding of the effects of climate change and climate variability, including El Nino-Southern Oscillation, on the inshore and tuna fishery resources	Fisheries is under the Ministry of Fisheries and Marine Resources.

Climate proofing of key infrastructure to risks including sea-level rise.	Key infrastructure is within the jurisdiction of the Ministry of Infrastructure and Development.
Integrate climate change adaptation strategies and measures into tourism planning and development.	Tourism is under the Ministry of Culture and Tourism. There is no dedicated office within HCC for tourism. Business establishments including hotels, etc. are regulated by the city.

Source: UN-Habitat

By looking closely into the institutional structure of the Honiara City Council, the key and critical departments ready to be partnered with relative to climate change adaptation and mitigation actions are the following:

Table 8: Key Honiara City Council Departments Relative to Climate Change Adaptation and Mitigation

Department	Goals (HCC Corporate Plan, 2010 – 2012)
Health and Medical Services	This department aims to provide a range of services to promote and improve the health and quality of life of the people of Honiara. Its specific goals under the Honiara City Council Corporate Plan are: - To provide functional and effective Health Clinics; - To reduce the incidence of malaria in the city; - To ensure a healthy environment within the city; - To improve community education in health related issues; - To develop a strategy for public toilets throughout the city; - To support the establishment of additional hospital and medical facilities/ services within the city, especially to cater to the needs of women and children.
Physical Planning and Building Services	This department aims to ensure physical development is provided in a manner conducive to the welfare of the people who live and work in Honiara, while enhancing and/ or protecting the physical, natural and cultural environment. It also regulates the safety and amenity of buildings within the city through compliance with the Council Building Ordinance and the Honiara Planning Scheme 2008. Its specific goals under the Honiara City Council Corporate Plan are: - Ensure all new buildings in Honiara City have a Council approved building permit; - Ensure Honiara is an effectively planned city; - Provide support to the operation of the Town and Country Planning Board in ensuring all developments are in compliance with the Honiara Planning Scheme; - To continue to improve the performance and standards of the Honiara City Council building and planning regulation by review of relevant legislation, ordinances, systems, procedures, and resources.

Works	This department aims to deliver a high quality range of services and infrastructure to the community and to the council. Its specific goals under the Honiara City Council Corporate Plan are: Upgrade remaining health clinics; Improve the standard of council buildings and infrastructure; Improve the physical image of the city; Continue to improve waste management practices; Recognize the need to provide a range of services to all sectors of the community (business, government, residential) and to all geographical areas of the city.
Youth, Sport and Women's Affairs	This department aims to engage with youth and women to facilitate their greater and more equitable participation in the community. Its specific goals under the Honiara City Council Corporate Plan are: To proactively work with youth and women's groups to enhance participation; Engage with other stakeholders to form a whole of city strategy on youth and women's affairs.

Source: UN-Habitat

Honiara City Council Implementation of Climate Change and Disaster Risk Management Plans: One of the policy directives in the National Climate Change Policy is to undertake risk reduction and vulnerability assessments of urban settlements in Honiara. This vulnerability and adaptation assessment is part of Honiara City Council's effort to implement this directive. Apart from this vulnerability and adaptation assessment, the Honiara City Council has made no explicit efforts yet to implement the national climate change policy, as the national plan is also yet to have a clear programme and funding apart from externally funded projects implemented by specific ministries.

04

Vulnerable People, Places and Sectors

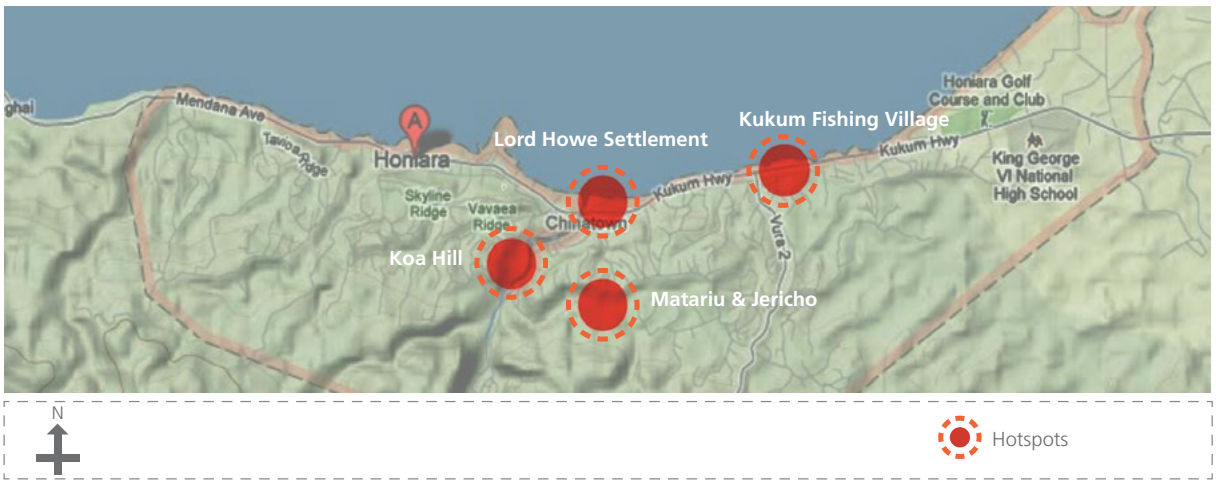
This section profiles four selected climate change hotspots based on community focal group discussions, census data and rapid assessment. This profiling aims to validate climate change projections and its impact on the people, places, and systems within the selected areas. It indicates how the community has adapted to these changes/ impacts and what they think they need so they can adapt in the future. The criteria for selecting these four hotspots were hazard exposure, population vulnerability, and type of ecosystem. These profiles should be considered as an initial snapshot of the community situation subject to further validation and study.

Table 9: List of Profiled Hotspots

Community	Ward and Location	Ecosystem
Koa Hill	Vavaea Ward (beside Mataniko River)	River floodplain/ ridge/valley
Kukum Fishing Village	Vura Ward (coastal beside Kukum Highway)	Coastal plain
Lord Howe Settlement	Mataniko Ward (beside the river and coast/ Mataniko delta)	River delta
Matariu and Jericho	Kola'a Ward	Ridge and valley

Source: UN-Habitat

Figure 12: Map of Profiled Hotspots



Source: Base map from Google Maps

4.1 Koa Hill

Koa Hill is part of the watershed of Mataniko River and Vavaea Ward. It is a low-lying area prone to flooding, one of the most densely populated areas in the city, and it is also an informal settlement. According to the 2009 Census, Koa Hill has 1,166 people, with 601 men and 565 women. It has an area of approximately 16 hectares with a population density of 71 persons per hectare. The census data also shows that livelihoods are mainly urban-based/ service-oriented.

Exposure and Sensitivity

The low-lying area of Koa Hill is prone to flooding, while the steep slopes are prone to soil erosion. According to community focal group discussions, flooding usually occurs during the following instances: 1) when tide is very high, water will flow back through smaller creeks and drains; 2) a combination of some rain and high tide; 3) intense rainfall upstream; and 4) intense rainfall on site lasting from half a day to three days.

Table 10: Koa Hill Summary

Access and key community facilities	Housing	Access to Water and Sanitation	Power	Waste disposal
People either walk down through steep foot trails from the main road on the ridge or cross the Mataniko River via makeshift floating rafts	Mostly houses on stilts. (some near the water's edge)	75 % use shared pipes for washing water.	75 % do not have power, using kerosene lamps	Government trucks cannot come in and collect waste.
	Sago palm found is used by some to build houses.	43 % use shared water sealed toilets.	21 % have electricity connection	60 % dump their waste into the river/ stream
		10 to 20 households share one toilet.	3% use solar.	26 % burn them
		Toilet outfalls into open drainage.	Services such as water and power cannot come in because most not registered temporary occupation license holders	14 % either bury or dump the waste in their backyard.
		Bathing and kitchen grey water directly into open drainage canals.		
		Waste from pig pens directly into the open drainage.		

Source: UN-Habitat

Figure 13: Flood Prone Area of Koa Hill

Source: Satellite map from Google Maps

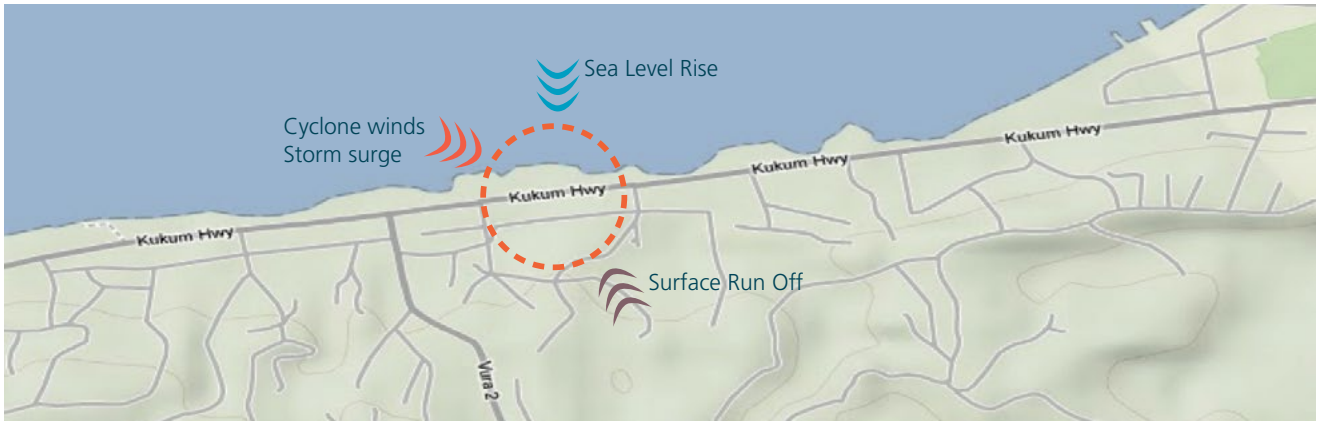
4.2 Fishing Village

Fishing Village is a community living on the coastline just beside the Kukum Highway east of Honiara. It is located in Vura Ward, with an area of about 4 hectares and a population of 463 with 227 men and 236 women. It has a density of 115 persons per hectare and an average household size of eight [19]. The Fishing Village is exposed to storm surges and sea level rise, as well as some flooding from the surface runoff from the hills.

The coastline exhibits signs of coastal erosion from previous storm surges, wave action, and sea level rise.

Traditionally the village depended on fishing for livelihood, but census figures show that households maybe shifting to other sources of income. Among those in the labour force, 32 per cent produce goods for sale, 16 per cent work for the private sector, 10 per cent are self-employed, 6 per cent do unpaid family work and 4 per cent work for the government.

Figure 14: Fishing Village Location and Hazards



Source: Base map from Google Maps

[19] Solomon Islands Census 2009

Table 11: Fishing Village Summary

Access and key community facilities	Land Tenure and Housing	Access to Water and Sanitation	Power	Waste disposal
Easily accessible	Easily accessible	Most of the houses are connected to Water Authority	72% have power 24 % still use kerosene lamps	More than half of the households have their waste collected by government waste collectors
Hosts the Fishing Village market	Hosts the Fishing Village market	74 % use piped private connections for washing		36 % dispose of their garbage in the sea.
		24 % shared connections		
		59 % shared water sealed toilets		
		26 % flush private toilets		

Source: UN-Habitat

Exposure and Sensitivity

Storm surges have had the most impact in the area. The worst damage was during cyclone Glenda in 1967, when the whole village was destroyed. After 1967 cyclone shelters were built uphill; eventually these shelters became a formal subdivision and a logical extension of the village.

Sea level observations: Focal group discussion participants observed that the sea at the edge of the reef in front of the village has become shallower than before due to the deposition of corals by cyclones and silt from floods. They also observed that the coastline has been receding.

Food security: According to the community focal group discussions, one of the significant issues for them is the depletion of fish catch. Inadequate income from fishing affects their food security, since they are now more dependent on the market compared to before. Sourcing food in a market system is challenging due to increasing prices.

4.3 Lord Howe Settlement

The Lord Howe Settlement is located at the delta of the Mataniko River and is part of Mataniko Ward. It

Drainage canal *(Left)* serving as toilet outfall and connecting to a larger creek *(Right)* which flows out to the Mataniko River, Taken November 2012

© UN Habitat / Amillah Rodil

has an area of 2.8 hectares with a population of 631 - 295 men and 336 women. It has a population density of 223 persons per hectare, the highest among the hotspots studied. It has 76 households with an average household size of 8. Among the labour force (12+), 41 per cent do unpaid family work, 19 per cent are employed by private employers, 9 per cent are employed by the government, and 9 per cent produce goods for sale.

Table 12: Lord Howe Summary

Access and key community facilities	Settlement pattern	Housing	Water and Sanitation	Waste disposal	Power
Bounded by the Matanikо River on the west, a creek on the south, the National Referral Hospital on the east, and the sea on the north	Most tightly packed with houses spaced closely together	Mixed construction: some have concrete posts, wooden walls, and tin roofs with sturdy construction, while some are more makeshift	57 % get drinking water from a communal tank, suggesting rainwater use	Almost all the households in the area throw their waste into the sea.	74 % are connected to the power grid and use it as main source of lighting
Three main access points	Settlement has encroached into the property of the National Referral Hospital		20 per cent get it from the Solomon Islands Water Authority		
			Washing water is done mainly through piped water (50 per cent private, 49 per cent shared)		
			75 % say they have no toilets		
			Sea is likely used for those who have no toilets.		

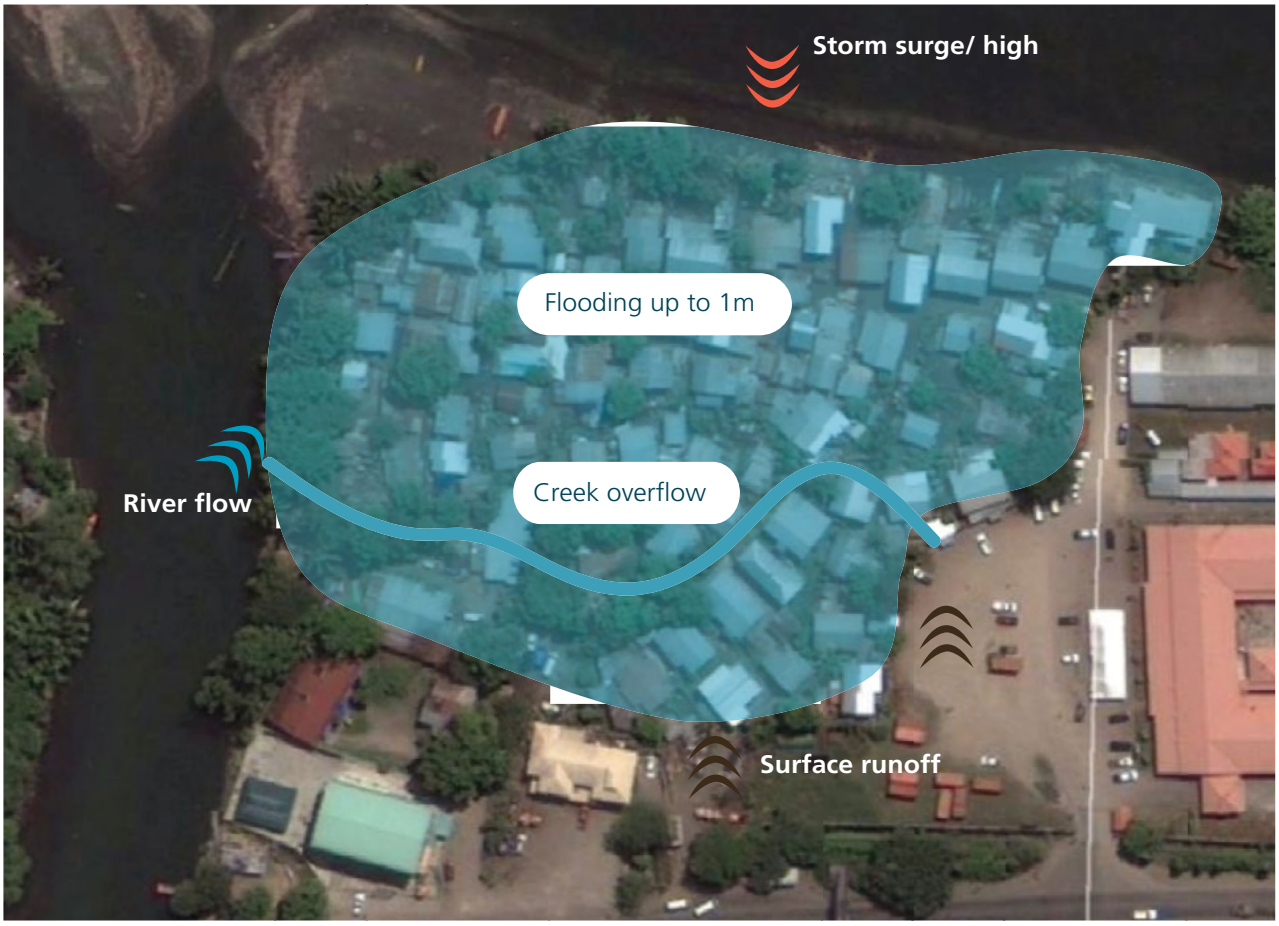
Source: UN-Habitat

Exposure and impacts

The Lord Howe Settlement is exposed to storm surges, sea level rise, coastal erosion, and flooding. Flooding occurs in the area because of a number of factors: overflow from the river and creek, storm surges, surface runoff from higher areas, and high tide which hinders the water from flowing out. Flooding impacts on the community include increased difficulty in access (mainly because of creek overflow), muddy areas, worsening sanitation, and skin diseases. Fishermen also say that it makes fishing difficult because visibility is affected.

The coastline in the area is receding due to a combination of wave action, storm surges and sea level rise. The houses have also been moved in response to the receding coastline. With no more space to expand, the settlement is being hemmed inward.

Figure 15: Flood Prone Area, Lord Howe Settlement



Source: Satellite map from Google Maps

4.4 Matariu and Jericho

Matariu and Jericho are located in Kola'a ward, and are two among the designated temporary occupation license areas/ informal settlement areas in the city where unemployment is high and access to basic services is constrained. Kola'a ward is second among the wards with the highest number of unemployed people (about 1,500 in the 2009 census). It was chosen mainly due to the availability of a connection with the community leaders. Thus this case should be seen more as an example of a typical temporary occupation license area in the hills rather than the most vulnerable area.

Exposure and sensitivity

The community is not exposed to major riverine flooding, but experiences minor flooding from streams. High temperatures, extreme rainfall, and cyclone winds also affect the community. Residents recall that during Cyclone Namu, roofs of leaf houses were blown off and some trees were uprooted. The area experiences less rainfall than before, but when it rains, it is extreme. Heavy rainfall causes streams to overflow. Based on community observation, the flood level in the creeks has been getting higher. They attribute this to the increase in the number of people living in the area, dwindling vegetation, increase in surface runoff and erosion. Since the streams cut through the site, they inevitably inundate shallow crossings and cut off

access to other areas for a few hours.

According to the community focal group discussions, common health problems in the area include malaria, diarrhea, and diabetes. The lack of nearby health stations makes it difficult to obtain health services. Residents say they have inadequate food consumption, consuming mostly rice, noodles, and tea/ coffee. They associate this diet to the incidence of diabetes.

Table 13: Matariu and Jericho Summary

Access and key community facilities	Housing	Access to Water and Sanitation	Waste disposal	Power
Through steeply sloping foot paths from the main road on the ridge Through a dirt road on the valley Difficult access is identified by the residents as one of their major problems.	45% houses in the area are still made of traditional materials in their roof Different types: there are houses with concrete posts, wooden walls, and tin roofs, traditional leaf houses, and those made of makeshift materials.	70% main source of water for drinking is Solomon Islands Water Authority (shared pipes) Washing water-39 % used shared pipes Streams in the area are also a significant source of water 50 % use a private pit latrine 27 % use water sealed private toilets 13 % use shared pit latrines	Government waste collection is virtually zero 70% burn their garbage	11% are connected to the grid 84% use kerosene lamps for lighting

Source: UN-Habitat

05

Identifying Key Adaptation Options

This chapter presents a list of adaptation options that were obtained from community focal group discussions and the city consultation.

Adaptation Options from Community and City Stakeholders

Table 14: Adaptation Options by Sector

Sector	Community Ideas	City Consultation Ideas
Information/ Education	Increase awareness and information on disaster risks and climate change	-
Community Preparation	Community organization/ preparation need to learn to work together. For example, working with women's groups and local churches on disaster preparedness.	-
Disaster Preparedness	Evacuation plans and committee to oversee evacuation	Provide evacuation centres
Planning/Land Tenure/ Housing	- Resolution of land tenure - Physical planning - Reblocking - Open space for recreation - Relocation	Strengthen and enforce development control
Livelihood	- Livelihood Support - Some families don't have enough boats/ need more boats - Small retailing (e.g. loans for buying and selling of goods) - Fisheries department to create fish aggregating device to attract fish - nearer the coast so fishermen don't go out very far.	Formulate food security and conservation policies
Water & Sanitation	- Access to piped water (SIWA or improved local system) - Boreholes/ pumps for water - Proper toilets	-

Infrastructure	- Improvement of access (road/ paths or bridge) - Proper drainage - Seawall - River bank and flood protection/ raising the area	Inventory of infrastructure hotspots; identify needed infrastructure for vulnerable areas; formulate climate resilient infrastructure programmes
Education	Study hall	- Improve quality of buildings and facilities - Improve/ increase education facilities, quality education
Agriculture	Land must be fertilized so that more food can be grown	-
Health		- Establish alternative hospital facilities in less vulnerable areas - Formulate measures along coastal areas to minimize impact of erosion and sea level rise (for hospital) - Provide training for identified communities for pilot projects to address health issues

Source: UN-Habitat

Table 15: Adaptation Ideas by Location

Location	Community Ideas	City Consultation Ideas
River, ridge and valley (e.g. Koa Hill)	- Increase awareness of disaster risk and climate change - Community organization/ preparation - Evacuation plans and committee to oversee evacuation - River bank and flood protection/ raising the area - Open to possible relocation if land is available - Improvement of access (road/ paths or bridge) - Access to piped water (through either the Water Authority an improved local system) - Proper drainage - Sanitation (proper toilets) - Resolution of land tenure	-
Ridge and valley (e.g. Matariu and Jericho)	- Physical planning - Formalization of land titles - Better access into the community - Fertilized land for better food production - Boreholes/ pumps for water - Information on climate change	-

Coastal (e.g. Kukum Fishing Village)	- Livelihood Support - Some families don't have enough boats/ need more boats - Small retailing (e.g. loans for buying and selling of goods) - Fisheries department to create fish aggregating device to attract fish – nearer the coast so fishermen don't go out very far.	- Establish alternative hospital facilities in less vulnerable areas - Formulate measures along coastal areas to minimize impact of erosion and sea level rise (for hospital)
River delta/ coastal (e.g. Lord Howe Settlement)	- Physical planning/ reblocking: present crowded conditions need to be addressed with a more organized layout of houses - Relocation. Residents understand that reblocking will likely affect some houses and some might need to be relocated to add more space. - Better access. The bridge going to the area gets inundated during flooding events, thus people would like more reliable access to the settlement. - Proper drainage to help reduce flooding and improve sanitation; - To avoid flooding, residents suggested raising the ground level - Creating a seawall to further protect the coastline from erosion. - Community facilities for youth (open space for recreation, volleyball area, study hall).	-
All locations	-	- Improve quality of buildings and facilities (education) - Increase education facilities, quality of education - Strengthen and enforce development control - Provide training for identified communities for pilot project to address health issues - Formulate food security and conservation policies - Provide evacuation centres - Hire qualified technical people to do design, plan and construction of infrastructure services - Inventory of infrastructure hotspots; identification of needed infrastructure for vulnerable areas; formulate climate resilient infrastructure programmes

Source: UN-Habitat

Assessment of Adaptation Options

The table below shows the possible ministries/ city departments who can be in charge of specific adaptation options and the possible constraints and opportunities in implementation.

Table 16: Relevant Ministries/ City Departments per Adaptation Option

Sector	Adaptation Options	Who Can Be In Charge?	Comments
Disaster Preparedness	- Disaster preparedness plan & implementation - Evacuation plans and committee to oversee evacuation - Evacuation maps displayed in hazard-prone areas - Provision of evacuation centres Increase awareness and information on disaster risk and climate change - Community organization/ preparation - Better communication - Better warning system installed	City Disaster Committee, National Disaster Management Office, Ward/ Village Disaster Committees	Further assessment is needed to obtain a baseline on city preparedness. Indications so far are that evacuation is mainly autonomous/ informal and not based on government plans; there is already some level of knowledge of disaster risks, but little on climate change; communities are not yet formally organized. The city disaster risk management plan is currently being formulated and should address some of these issues.
Planning/Land/ Housing	- Strengthen and enforce development control - Resolution of land tenure - Physical planning - Reblocking - Open space for recreation - Relocation	City Physical Planning Department, Ministry of Lands, Housing and Survey	The Planning Scheme needs to be reviewed and updated so that appropriate development controls can be enforced to reduce risk. Lack of land tenure has become a road block for further development, thus should be resolved first or together with physical planning and upgrading. If there are households willing to be relocated then relocation plans should be initiated and available land identified.
Livelihood/ Food Security	- Formulate food security and conservation policies - Land must be fertilized so we can grow more food - Livelihood support for fishermen - Some families don't have enough boats/ need more boats - Small retailing (e.g. loans for buying and selling of goods) - Fisheries department to create fish aggregating device to attract fish - nearer the coast so fishermen don't go out very far.	Ministry of Agriculture and Livestock, Ministry of Fisheries	There are planned initiatives for urban gardening support under the Ministry of Agriculture and Livestock; there is opportunity for development/ improvement of urban gardens in areas where physical planning is going to be done so that space can be allotted. Further study is needed on the state of fisheries near Honiara, proper support to fishermen, and the viability of putting up fish aggregating devices.

Water & Sanitation	- Access to piped water (the Solomon Islands Water Authority or improved local system) - Boreholes/ pumps for water - Proper toilets	Solomon Islands Water Authority, Works Department, Health and Medical Services Department	In some areas, land tenure and access needs to be resolved so the Solomon Islands Water Authority can come in. Coordination with Physical Planning and the Ministry of Lands, Housing and Survey should be done. In cases where the Solomon Islands Water Authority is not able to come in, the improvement of local water sources can be considered. Almost half the households (around 4,000+) in Honiara don't have private flush toilets. Addressing this would be a major undertaking, and resources have to be put in – for education, construction and sludge treatment.
Infrastructure	- Inventory of infrastructure hotspots; - identify needed infrastructure for vulnerable areas; formulate climate resilient infrastructure programmes - Improvement of access (road/ paths or bridge) - Proper drainage - Seawall - River bank and flood protection/ raising the area	Ministry of Infrastructure and Development, Works Department, Physical Planning Department, Ministry of Lands, Housing and Survey	The rapid employment project currently has small infrastructure projects such as footpaths and Jacob's ladders. These need to be harmonized/ coordinated with physical plans and access to water and power services. The Ministry of Infrastructure and Development is currently concerned with infrastructure in the provinces; not much new infrastructure is planned within Honiara. Further study is needed on the necessity of seawalls/ river bank protection and whether it may be possible to apply "soft" measures rather than hard infrastructure.
Education	- Study halls for communities - Improve quality of buildings and facilities - Improve/ increase education facilities, quality of education	Ministry of Education, Department of Education	These ideas mainly focus on improving education in general, which can contribute to adaptive capacity. Education on climate change/ disaster risk however can also be incorporated into school curriculums so it's not just a function of national disaster management office.

Health	- Establish alternative hospital facilities in less vulnerable areas - Formulate measures along coastal areas to minimize impact of erosion and sea level rise (for hospital) - Provide training for identified communities for pilot project to address health issue	Ministry of Health, Health and Medical Services Department, Ministry of Infrastructure, Works Department	The ideas mainly focus on the relocation or protection of the existing hospital. Further study needs to be made on the vulnerability of other health facilities and if there are underserved communities with regards to health services. Health needs to be linked to proper water and sanitation facilities – health goals can be achieved if proper water and sanitation is present.
Environment	- Preservation & protection measures (tree planting, mangrove, ban plastic bags)	Ministry of Environment, Honiara City Council	Areas where tree planting and mangrove protection need be identified. The banning of plastic bags can be an ordinance by the Honiara City Council.

Source: UN-Habitat

06

Recommendations and Conclusions

The following is a summary of recommendations according to the initial objectives of the study:

- **The updating/ improvement of the Honiara City Council Local Planning Scheme**

o Capacity building and awareness raising for Honiara City Council Local Planning; Board and Department of Physical Planning;
o Refinement of hazard maps through further scientific assessment and community validation;
o Identification of protected areas/ no-build zones;
o Flood overlays with additional regulations;
o Coastal and river easements.

- **The updating/ improvement of the Honiara City Council Corporate Plan. The following should be strengthened and related projects integrated into the city's programmes:**

o Disaster preparedness (baselining, awareness raising, early warning and evacuation plans, emergency response, evacuation facilities, village-level readiness);
o Updating of local planning scheme and physical planning especially for vulnerable areas;
o Improvement of local water sources and sanitation (toilets);
o Small infrastructure (paths, Jacob's ladders, small bridges);
o Environmental management (protection of existing resources, waste management).

- **"Participatory Slum Upgrading Project" (Phase 2) ward profiling exercises are currently being conducted by UN-Habitat, together with the Ministry of Lands, Housing and Survey. The results of the vulnerability and adaptation assessment (particularly exposure and level of vulnerability) can also be used as criteria on which areas to prioritize for slum upgrading. The project can contain a number of components that can be implemented together with other partners, such as the following:**

o Resolution of land tenure/ relocation where feasible;
o Physical planning and reblocking;
o Improvement of access through small infrastructure (paths, Jacob's ladders, small bridges, drainage);
o Improvement of water and sanitation (provision by the Solomon Islands Water Authority, improvement of local water sources, toilets, wastewater management);
o Protective infrastructure/ environmental management (e.g. river and coastal erosion control, other damage mitigation measures);
o 'Model' urban gardens;
o Livelihood support.

Having a number of components that will be implemented by different departments and government agencies requires a formal coordination mechanism to be able to harmonize all these efforts. At the ward level, it can be the Ward Development Committee while at the national/ city level it can be an Inter-agency Committee for Slum Upgrading.

UN-Habitat's Cities and Climate Change Initiative promotes enhanced climate change mitigation and adaptation in developing country cities. This document is an initial output of the Cities and Climate Change Initiative activities in Honiara, Solomon Islands. This abridged report is based on the report titled: "Honiara, Solomon Islands – Climate Change Vulnerability Assessment" funded by the United Nations Development Programme under Strengthening Environmental Management, and Reducing the Impact of Climate Change in Solomon Islands (SEMRICC), the Government of Norway, and the United Nations Development Account.

Starting with a brief background of the city, this report addresses Honiara's climate change situation from a climate risk perspective that focuses on hazards, vulnerabilities, and the adaptive capacities of the city. Following the insights gained from clarifying the climate change challenges, the report proposes the key sectors for climate change adaptation and mitigation measures in Honiara. It finally recommends updating and improvement of the Honiara City Council Local Planning Scheme, and updating and improvement of the Honiara City Council Corporate Plan.

HS Number: HS/026/14E
ISBN Number (Series): 978-92-1-132400-6
ISBN Number (Volume): 978-92-1-132615-4

UN-HABITAT

United Nations Human Settlements Programme
P.O. Box 30030, Nairobi 00100, Kenya
E-mail: infohabitat@unhabitat.org

www.unhabitat.org