Pacific Community
Communauté du Pacifique

Honiara Coastal Environment Baseline Assessment

Technical Report

gef

UNDP
Empowered lives.
Resilient nations

FAO
FIAT PANIS

UN environment programme

Pacific R2R
Ridge to Reef

Honiara Coastal Environment Baseline Assessment Technical Report

Prepared by

Dr. Edgar Pollard, Mr Robson Hevalao, Mr Danny Shadrech, Mr Andrew Taraha, Mr Ronnie Posala, Mr Stephen Moses & Mr Joseph Airahui

Pasifiki Local Consultancy Services, Solomon Islands

Pacific Community
Communauté du Pacifique

Suva, Fiji, 2021

Original text: English

Produced, reviewed by GEF Pacific International Waters Ridge to Reef Regional Project, Pacific Community (SPC), Suva, Fiji.

Layout and Design by Navneet Lal/Pacific Community (SPC)

Cover Image: Map Data ©2021 Airbus Maxar Technologies

Prepared for publication at SPC's Suva Regional Office, Private Mail Bag, Suva, Fiji, 2021

www.spc.int | spc@spc.int

Printed by Quality Print, Suva, Fiji, 2021

CONTENTS

ABBREVIATIONS

CBD	Central Business District
EMS	Environmental Management System
EIA	Environmental Impact Assessment
FAO	Food and Agriculture Organization
GIS	Geospatial Information System
GPG	Guadalcanal Provincial Government
HCC	Honiara City Council
ICMASP	Integrated Coastal Management and Adaptation Strategic Plan
ICM	Integrated Coastal Management
IWRM	Integrated Water Resource Management
IW R2R	Integrated Waters Ridge to Reef
MECDM	Ministry of Environment, Climate change, Disaster and Meteorology
MFMR	Ministry of Fisheries and Marine Resources
MHMS	Ministry of Health and Medical Services
MID	Ministry of Infrastructure and Development
MLHS	Ministry of Lands, Housing and Survey
MYCWP	Multi-Year Costed Work Plan
PET	Polyethylene terephthalate
R2R	Ridge to Reef
SIMA	Solomon Island Maritime Authority
SIPA	Solomon Island Port Authority
SIWA	Solomon Island Water Authority
SPC	Pacific Community
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme

EXECUTIVE SUMMARY

The Solomon Islands International Waters (IW) Ridge to Reef (R2R) project focuses on reducing environmental stress by improving watershed catchment management and sustainable land use. The Solomon Islands IW R2R Project is one of the 14 demonstration sites of the Regional IW R2R Project, a child project of the GEF Pacific Ridge to Reef Programme. The Programme is also called "Pacific Islands Ridge to Reef National Priorities – Integrated Water, Land, Forest and Coastal Management to Preserve Biodiversity, Ecosystem Services, Store Carbon, Improve Climate Resilience and Sustain Livelihoods". The Solomon Islands IW R2R Project aims to achieve the milestone targets which are intended to be an integrated catchment management plan and an integrated coastal management plan for the Mataniko Catchment. These plans and strategic polices will include catchment protection measures and measures conserving or protecting wetlands.

In 2020 the Solomon Islands IW R2R Project commissioned a consultancy to prepare a Honiara Coastal Assessment. This consultancy is expected to produce the outputs and deliverables necessary to achieve the intended outcomes, and the multi-year costed workplan Component 2 and Outcome 2 on "Pollution and Nutrient Sources and Environment Impact Identified and Management Measures Recommended". Consequently, a Coastal Impact Assessment is required as an initial task for IW R2R to undertake Honiara Coastal Environment Baseline Assessment (covering water quality & habitats). The Honiara Coastline Baseline Assessment presents the key results, highlighting brief descriptions of existing natural environment and anthropogenic development actions along the Honiara coast to ultimately guide policy and action.

There are four main studies[1] informing this report:

1. Ecological & Biological;
2. Bathymetry & Hydrography;
3. Water quality; and
4. A cumulative environmental impact assessment.

To develop this R2R assessment, information on cumulative coastal environmental impacts and related details were collected, collated, and written up to address the impacts of interactions between the environment, development activities, and the accumulation of impacts over time.

The Honiara coastal ecology baseline assessment was conducted in July-October 2020. A total sampling area of 15,000m² was covered in the study. Broad-scale and fine-scale assessment methods were employed to obtain descriptive information's and data sets of the coastal habitats, benthic communities, and marine biodiversity. The study provides the opportunity to collect baselines of key indicators relative to the water quality, ecology, and biology of coastal/ marine ecosystems along reef and non-reef areas along the Honiara City waterfront stretching from White River to Lungga. Literature reviews were also used to describe the relevant legal framework that guides the activities and placement of development along the Honiara coast.

The coastal reef conditions of Honiara are relatively poor. The survey results suggest dominance of algae overgrowth, sand and rubbles suggesting quality of water is polluted and contaminated with nutrient overloads. The coastal inshore waters of Honiara harbour offer a range of direct and indirect biological, social, economic, and recreational benefits particularly cash related activities. However, this is also linked to the urban centre being the main source for waste and pollution such as plastics.

[1] The four reports are published separately

The study results had shown a gradual increase of pollution and nutrients at the Honiara Harbour as a result from unplanned urban expansion and developments, change in land use, not buffered and uncontrolled runoffs. Authorities are battling to cope with the present urban expansion especially to mitigate and control adverse impacts to the environment. The hope to curve this challenge rests on proper coordination and collaboration at all levels and sector.

Honiara is a highly developed and built-up area and does not contain areas of high biodiversity value such as in other parts of Solomon Islands. The four main development types along the study area are:

1. Seawall, reclamation, and erosion control activities;
2. Building activities including both residential and commercial;
3. Fishing and recreation activities; and
4. Transport and wharf related activities.

The major relevant impacts of these developments include: coastal soil erosion, sedimentation and siltation, loss of flora and fauna, landform modification, waste and pollution and oil spill risk. The consultancy provides several baselines and information to establish the state of resources, habitats, and conditions of Honiara coastal areas. The results clearly demonstrate the extent and possible impacts of land-based activities, run-offs and discharges from point and non-point sources including the Mataniko Catchment. It is also clear that certain areas of Honiara waterfront are contaminated and with levels exceeding national standard thresholds.

The report recommends establishing a database to store, observe and manage developments and related information within Honiara. It is also recommended to use the technical reports and information from this consultancy to develop an integrated coastal management and adaptation strategic plan for the area.

INTRODUCTION

The GEF Pacific Ridge to Reef (R2R) Programme

The Pacific Islands National Priorities Multi-Focal Area GEF Pacific R2R Programme's goal is to "maintain and enhance Pacific Island countries' ecosystem goods and services (provisioning, regulating, supporting and cultural) through integrated approaches to land, water, forest, biodiversity and coastal resource management that contribute to poverty reduction, sustainable livelihoods and climate resilience". The Regional International Waters (IW) R2R Project is one of the child projects of the GEF Pacific R2R Programme.

The Regional IW R2R Project

The Regional IW R2R Project is executed regionally by the Pacific Community (SPC), based in Suva Fiji. The IW R2R Project is part of the larger 5-year (2015-2020) GEF funded Regional Pacific Ridge to Reef Program being implemented by UNDP, UNEP, and FAO, and SPC across fourteen Pacific Islands countries: Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Nauru, Niue, Palau, Papua New Guinea, Republic of the Marshall Islands, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu. The Solomon Islands IW R2R project is one demonstration site of the Regional IW R2R project.

In bringing together countries that face similar threats to fresh and coastal water systems, the Project aims to test the mainstreaming of ridge to reef, climate resilient approaches to integrated land, water, forest, and coastal management in the PICs through strategic planning, capacity building and piloted local actions. The Project is implementing a variety of practical approaches to safeguarding water systems and coastal habitats in the fourteen participating countries. The aim is to engage and support national governments and local communities in building a knowledge base to better understand the cause-and-effect relationship of 'whole-of-island' environmental degradation, and to develop the skills and systems to better manage these impacts.

Additionally, regional project activities focus on strengthening scientific understanding of the current state of priority coastal areas and support the development and endorsement of national and regional strategic action frameworks for Integrated Coastal Management and/or Integrated Water Resource Management (ICM/IWRM). These strategic action frameworks aim to meet the regional need for the mainstreaming of ridge to reef approaches in national development planning. The Project will also support strengthened national coordination for ridge to reef integrated land, water, forest, and coastal management, including climate change adaptation.

Solomon Islands IW R2R Project

The Solomon Islands IW R2R Project focuses on reducing environmental stress by improving watershed catchment management and sustainable land use. In 2020, the Solomon Islands International Waters Ridge to Ridge Project commissioned the Honiara Coastal Assessment consultancy. The demonstration site of the project is the Mataniko Catchment that runs through the centre of Honiara city and into its coastal and marine waterfront.

Honiara is the capital city of the Solomon Islands and situated on the central northern coast of Guadalcanal Island. Honiara was established as a town after WWII to take advantage of infrastructure developed during the war. During the early days of Honiara, the dominant coastline features were, river mouths and wharves with the main one being at Point Cruz. A key central feature of the Honiara topography is the Mataniko River which runs through the centre of the city. Honiara is the largest

city in Solomon Islands situated at the northwest coast of Guadalcanal Island. The city is known to have the population of nearly 100,000 due to rapid flux of migration from surrounding islands to access employment, health, and education. Honiara City is governed by Honiara City Council (HCC).

The Honiara coastline has been used for a range of activities from developments to recreational. Many coastal dwellers use it for fishing, swimming, kayaking and other activities for pleasure. Developments and important infrastructures are also built along the coast. There are a range of conflicting activities from dredging to land reclamation against natural coastal erosion and coastal inundation happening along Honiara coastal. This report will look at the existing sites and habitats along the coastal intertidal zone of the studied area, that house the environmental habitat for all the biota on the coastal shores. This report will also describe the legal context and discuss the major development actions and their impacts on the coastline of Honiara.

Purpose

This report highlights the key results and recommendations obtained from this consultancy which provides an up-to-date current state of the Honiara coastline. This summary and streamlined report links to the four technical studies namely: of ecology, bathymetry, water quality and a cumulative environmental impact assessment. It is expected that this streamlined report will benefit policy makers and inform decision making. The four technical reports provide an opportunity and reference for more detailed assessment and analyses to understand better the state of resources and habitats in Honiara coastal areas.

Project

The purpose of this Coastal Environment Baseline Assessment is to establish baselines on water quality and health of habitats and resources, and to identify indicators for monitoring into the future. The expected results of this baseline assessment consultancy, and future monitoring, will provide information on the nature and extent of environmental impacts arising from land-based activities, and to contribute to decisions on the overall acceptability of the Project, after the implementation of environmental mitigation measures. Marine and coastal habitats and their ecosystems suffer considerable harm due to coastal development, land-based pollution, development activities (construction and quarrying) and agricultural activities.

The major threats to management of these systems are:

- Land based and maritime pollution such as agricultural and industrial pollution, and pollution from sewage effluents from outfalls, have contributed to changes in species compositions and abundance in coastal areas;
- Development and coastal structures which result in changes in the coastline, such as reclamation which lead to fragmentation of major ecosystems e.g., where there is conversion of natural areas into agricultural and housing areas. In addition, dredging for harbor and waterfront development (example at Honiara Ports Area and Jetty and other land reclamation for businesses) and housing often leads to degradation of the coastal environment; and
- Degradation of the environment due to poverty and squatting by the removal of vegetation and related factors.

STUDY SITE DESCRIPTION

This consultancy work specifically focuses on the Honiara coastal areas along the Honiara Coastal waterfront from Lungga to White River, including Mataniko River which is the national IW R2R project area (map). This area covers the coastline of Honiara City, the capital and primary urban centre of the Solomon Islands, which may also be described as the most developed and modified marine environment in the country. The Solomon Islands International Water Ridge to Reef (IW R2R) project demonstration site is the Mataniko River Catchment. The collection and assessment of baseline data and information to establish the status of ecosystem goods and services in the Catchment was carried out some years ago. However, the initial study did not cover technical assessment of the coastal/ marine ecosystem.

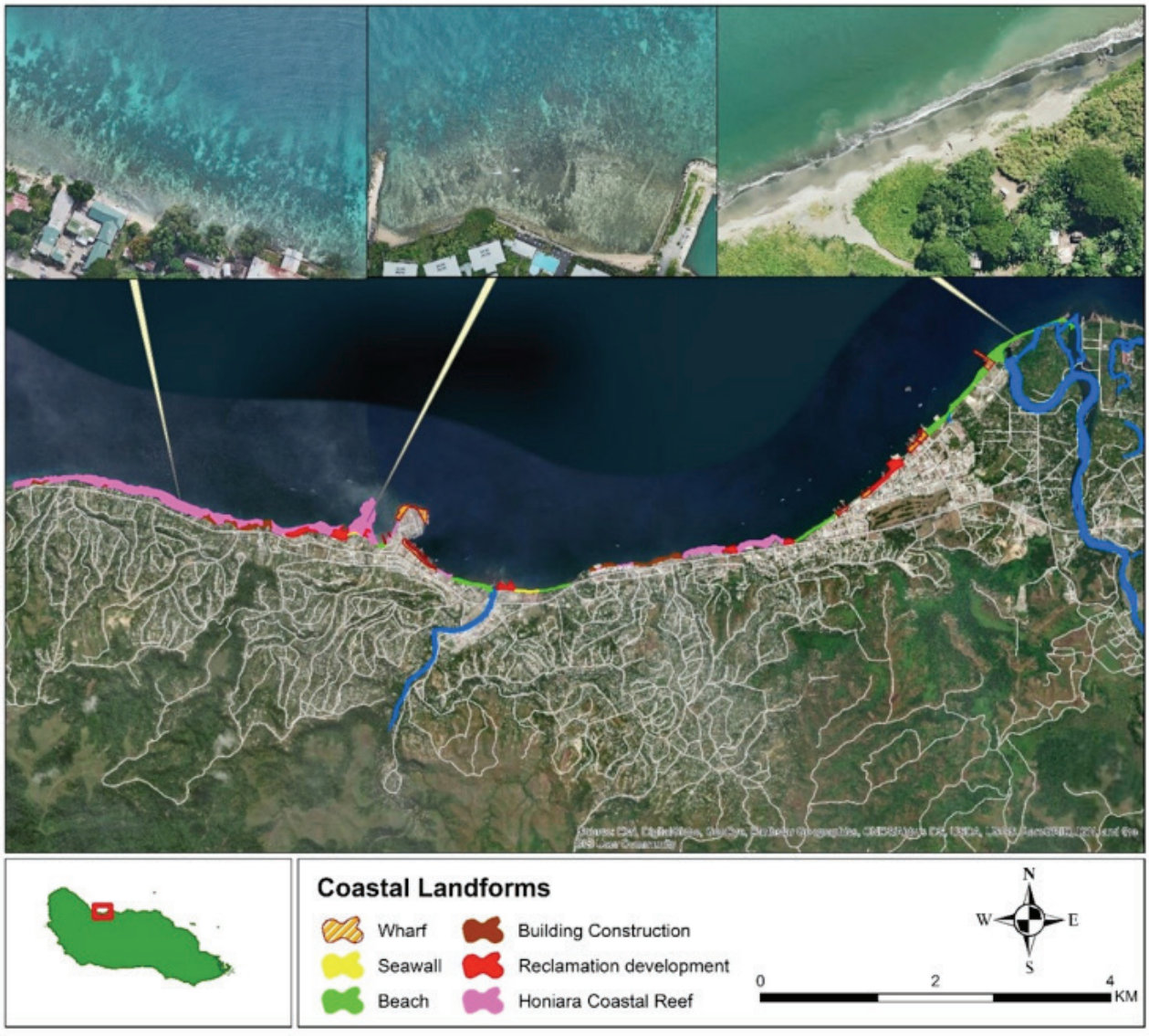

Figure 1: Map of Honiara coastline study site (Source: Pasifiki Hr Consultancy Services GIS specialist, 2021.)

General Environment

The Honiara coast does not possess the rich diversification of marine biology as seen in other parts of Solomon Islands. The only reef systems are located on the western half of the study area. The eastern half of the study area from the Ports to Lungga is dominated with natural and artificial coastal landforms. From the accumulation of coastal gravels and sand bars at the mouth of Mataniko River to the inclined patchy sand bars and exposed lime-reefs of Kukum area to the industrialized coastal black sandy beaches of Lungga. These landforms are shaped by natural phenomena such as incoming high-swells and waves from cyclones and king tides, and anthropogenic activities such as gravel and sand excavations, land removals and reclamations for the development of building infrastructures.

Physical Environment

The eastern part of Honiara is comprised mostly of dark igneous sand that has been washed down from Mataniko and Lungga River. These weathered black coarse sands are being transported by longshore drift eastward and get hurled up to form glassy-shinny beaches factored by strong high rising waves from king tides, storms and the daily rise and fall of moon tide. Most of these beaches can be found on almost the whole of east Honiara surfacing the coastal areas from high water mark to the low water mark. Only a few of patchy dark sandy beaches can be found on the western end of Honiara. In east Honiara, beyond the low watermark where the intertidal zone covers, there are not many reefs on the intertidal edges but only the exposed coral bleached reefs that turned spiky-cemented limestone found in front of Kukum coastal area through to Panatina coastal shores.

Down the western half of the Honiara coast, most of the shoreline were of molten rocks from pre-existing lava from the earliest eruption of Savo volcano. This is where all the coral reefs are currently found. Patches of black sandy beach are seen in pockets of spaces along the shoreline. These include pebbles and gravel beaches in front of white river shoreline. Coral reefs coverage and growth are relatively less dense compared to other areas in the country where there are little pressures of exploitation and impacts from other stresses like elevated water temperature and freshwater runoff. At the end of each coral reefs are drop-zones where the depth of the water cascaded down to a certain depth with canyons deeper to about 5-10 meters. The continental shelfs of the entire Iron Bottom Sound where Honiara is located has a slightly shallower depth in the eastern part from Port's area to Lungga which also contains the alluvial fans of both Mataniko and Lunga rivers.

Ecological Environment

The types of ecological habitats in Honiara coastal intertidal zones are dictated by the types of substrates or landform of the area. Sand is the dominant substrate, followed by boulders and dead corals, that results in Honiara marine benthic habitats to have relatively low ecological diversity. The western half of Honiara's reef flats does have additional marine life forms. The sub-massive and massive coral growth forms found here are mostly from the coral Family Poritidae, belonging to the genus Porites spp. 20 genera where nine familia of corals emerges was identified along the Honiara coastal waters with other common invertebrates including *Linckia laevigata, Holothuria atra, Diademasetosum, Niloticus niloticus, Acanthaster planci*, and *Tridacna maxima*. Also, 31 species of reef-fin fish were recorded to be dwelling on these studies reefs.

From all these fish species recorded, Pomacentridae was found to be the most dominant with diversifying species of 13 being identified. The other lesser dominant but still are common fish groups to be identified are Labridae, Chaetodontidae, and Acanthuridae. This still counts Honiara

coastal intertidal zones to be less populated and poorly established marine biological environment. Judging from the overall survey results, the Honiara coastal reef conditions appear to be in a very poor state.

The Mataniko river mouth marine environment seems to be dominated by sand and gravel. The washed debris, encompassing silt, clay and muddy bottoms are also seen on the surface of the seafloor at the river mouth.

HABITAT TYPES

Coastal Strand Forest

This area is adjacent to the ocean, defined as the areas from high water mark and inland. Consisting mainly of vegetation such as *Casuarina equisetifolia*, the Jackfruit (*Artocapus* spp), Coconut (*Cocos nuciferea*), bread fruit (*Articpaus artili*) and few nut trees (*Canarium* spp*, Terminalia* spp). Grasses include the genus *Batika* spp and the *Cyperus* spp, *Mimosa pudics*. This coastal vegetation acts as a buffer zone from the sea. Dominant fauna in this zone were mainly Fiddler and Hermit crabs. However, this habitat is significantly modified due to anthropogenic development which is potentially impacting on the abundance, distribution and diversity of local flora and fauna populations through habitat loss.

Coastal and marsh forest

Inland coastal forest which is relatively modified with the presence of human settlement and dominated by the invasive plants such as paper mulberry, *Broussonetia papyrifera*, the monkey pod tree, *Albizia spp.* and the African tulip, *Spathodea* spp. The only native plants observed were of the Koilo tree *Callophylum inophyllum* and *Metroxylon salomon*. Along the tree trunks were epiphytic plants such as the orchid, *Dendrobium* spp. and the ferns, *Asplenium nidus, Davalia solida*. Marsh forest is found at the edge of the Mamanawater village with the presence of some *Pandanus* spp and *Mariscus javanicus*. The *Sorghum halpense* (Johnson grass) plus other includes *Alocasia macrorrhizos* and the *Diplazium proliferum* which were present on shady, moisture and swampy areas. Some areas include the presence of the Paper reed grass (*Cyperus* spp.). This area is also used as depository area for human faecal waste and household rubbish.

Riverine vegetation

This habitat is located along rivers and are dominated by the swamp sago, *Metroxylon* spp, giant swamp taro (*Crytosperma chamissionis*) with other areas of *Alpinia purpurata, Calophylum inophylum* with the edible freshwater spinach or Kangkong (*Ipomoea aquatic*). On the riversides, fallowed areas are dominated by *Glochidion* spp, *Cryptocarya spp* and *Ficus* spp, *Litsea* spp*, Annesijoa* spp*, Dysoxylum* spp*, Diplazium esculentum* and *Pseuderanthemum* spp. These patches of vegetation are significantly developed and occupied by informal human settlements. Many areas which were initially swampy but later reclaimed for commercial sites such as the Chinatown area. Listed are other common plants in this habitat; *Premna corymbosa* (tree), *Mikania micrantha* (vine/creeper), *Macaranga tanarius* (tree), *Merremia peltata* (Vine/creeper/climber), *Spathodea companulata* (tree), *Trema orientalis* (Shrub/small tree), *Calamus vestitus* (climbing palm/Lawyer cane) *Rhus taitensis* (tree), *Flagellaria gigantea* (herbaceous climber), *Pleomele angustifolia* (Shrub/Herb), *Desmodium umbellatum* (Shrub), *Morinda citrifolia* (Tree) and *Timonius timon* (tree).

Coral Reef

Generally, the Honiara coastal reef ecology is poor. Live coral cover decreases from west to east with dominance of dead coral rubbles, silt, sand, and mud with significant algae associated with various intrusion of high nutrients and runoff from anthropogenic developments. Natural stresses from elevated water temperature and wave action also contribute to poor coral cover. Honiara coastline is also exposed to strong westerlies and strong wave action. A total of 15 genera and 9 families of corals were recorded in the field expedition with dominance of invertebrates such as *Linckia. laevigata, Holothuria atra, Diadema setosum, Niloticus. niloticus, Acanthaster planci* and *Tridacna maxima*. The team also observed and recorded fish abundance consisting of 31 species, 20 genera and 9 families. Dominance for fish were mainly ray finned fish Family Pomacentridae followed by the wrasse Family Labridae. Main target fish for spear fishing is the Family Scaridae which is low in abundance. The study provides the opportunity to collect baselines of key indicators relative to the ecology and biology of coastal/ marine ecosystems along reef and non-reef areas along the Honiara City waterfront stretching from Kavare-White River to Ranadi Seafront.

Freshwater/Brackish wetlands

Within the Honiara catchment the main rivers flowing through the city at Lunga, Mataniko and the White River followed by streams at Ranadi dumpsite, Tobacco site, Kukum area, Mbokona, Point Cruz area and Rove. These rivers and streams contribute to the state of the Honiara coastline as waste are disposed through them. The water quality of these rivers and streams are poor due to the disturbed and polluted nature of the habitats. Most of the freshwater fish species concerned are edible and are highly fished in this rivers and streams. As this fish species are mostly live and their existence always requires water quality and access to the ocean, it is crucial for their recruitment and life cycles. Most of the fish are amphidromous or whilst others are catadromous at one part of their life cycle it must undergo an ocean pelagic larva. Unlike Salmon fish which migrates to their birth rivers, Solomon Islands freshwater fish recruits any rivers of where currents lead them to. The issues of invasive species are also prominent in these rivers and streams. For example, tilapia and mosquito fish is common in these rivers and streams especially on the areas. These areas also associated with increase population of cane toads and sign of other invertebrates such as snails.

Legal & Policy Context

The legal framework for the Honiara coastline is described below including major policies.

Institute	Mandate	Legal provisions for catchment management	Policy provisions	Ongoing efforts
• Ministry of Environment, Climate Change, Disaster Management and Meteorology (MECMD)	• Environment, impacts, management, protection, and conservation • Environment monitoring • Collaborate with MFMR and Ministry of Forestry and other line agencies and stakeholders	• Environment Act 1998 • Environment Regulation 2008 • Protected Areas Act 2010 • Wildlife Protection and Management Act 1998 • Management Regulation 2008	• Solomon Islands National Waste and Pollution Control Strategy 2017-2026 • National Environment Capacity Development Action Plan 2008-2012 • National Biodiversity Strategic Action Plan 2017-2021 • National Disaster Risk Management Plan 2010 • Solomon Islands National Plan of Action-CTI	• Ongoing monitoring and Honiara Coastal • Assess and support developments to manage and mitigate environment impacts • Collaborates with line agencies identify areas of high biodiversity and research • Encourages establishment of conservation parks • Wildlife Protection and Management Order 2014 • Wildlife Protection and management Order 2008
• Ministry of Health and Medical Service (MHMS)	• Establishes the environment health division mandated to monitor environmental health to ensure public health issues are managed.	• Environment Health Act 1990 • Environment Health (Public Health) Regulation 2006	• National Health Strategic Plan 2016-2020 • Role Delineation Policy for Solomon Islands • Multi-Sectoral National NDC Strategic Plan 2019-2023	• Environment health Officers are stationed in around all provinces. Coordinates public health monitoring • Improving of health infrastructures and services • Collaborate with international, regional, and national agencies • Vector borne (Malaria) disease programs and awareness

Institute	Mandate	Legal provisions for catchment management	Policy provisions	Ongoing efforts
• Provincial • Governments which include Honiara City Council (HCC)	• The Guadalcanal Provincial Government is a devolved agency of the Solomon Islands Government (SIG) to manage and controls its own affairs and environment	• Provincial Government Act 1997 – Devolution of powers for the province to make ordinance to manage and protecting their environment. • The Honiara City Bill 1999 • Implements the Town and Country Planning Act 1996	• Honiara Urban Resilience and Climate Action Plan 2016 • Ordinances process of consultation	• Lead agencies and collaborates with other state agencies and providing funding. • Monitoring of urban centres especially Honiara • Ongoing programs throughout all Provinces • Develop and enforce Ordinances
• Solomon Islands Water Authority (SIWA) trading as Solomon Water	• Pollution control and prevention	• SIWA Act • Section 7 (e) to provide, construct, operate, manage, and maintain buildings, works, systems and services for the conveyance, treatment and disposal of sewage, disposal of trade and industrial waste and other connected purposes.	• 30 Years Strategic Plan • 5 Years Action plan	• Develops a 30-year Strategic Plan to reticulate sewage and treatment systems in Honiara. • Water quality tests supporting monitoring
• Solomon Islands Ports Authority (SIPA)	• Ports services and a stakeholder on ports management	• Ports Act (Cap. 161)	• Standard operations plan for port managements (SOPs)	• Custodian for port services scheduling and management
• Solomon Islands Maritime Authority (SIMA)	• Navigation safety and pollution control	• Solomon Islands Maritime Authority 2018 • Shipping Act 1998 (Amendment) • Regulations to aid navigations, safety, and pollution control	• Implement international soft laws into national legislations	• Compliance and standards for the shipping industry

Institute	Mandate	Legal provisions for catchment management	Policy provisions	Ongoing efforts
• Ministry of Lands, Housing and Survey (MLHS)	• Land related issue for waste and pollution	• Land acquisition under the Lands and Titles Act (Cap 133)	• Greater Honiara Urban Development Strategy and Action Plan	• There are land acquisition and recordings throughout the Solomon Islands
• Ministry of Infrastructure (MID)	• Infrastructure Development, roads, clinics, and hospitals etc.	• Infrastructure development and management which provides in the Acts; Road and Traffic Act and Shipping Act 1998	• MID Corporate Plan 2016-2020 • National Integrated Investment Plan	• Standardise and design building and infrastructure models for Mataniko area • Investment planning • SIG Procurement process • Develop regulations
• Ministry of Fisheries and Marine Resources (MFMR)	• Inland connectivity and aquaculture development	• Fisheries Management Act 2015 and other regulations • The Delamination of Marine Waters Act 1988	• Solomon Islands National Fisheries Policy 2019-2029 • MFMR Cooperate Plan 2020-2023 • MFMR Strategy (impending for publication) • Solomon Islands National Ocean Policy 2019	• Further translated into Fisheries Sector Policy • Fisheries Ordinance is underway for implementation
• International and local NGOs	• Skills and capacity development	• Support community manage natural resources according to government policy	• Government frameworks mentioned above	• Ongoing in the country
• Business houses within Honiara central business area	• Advocate communal rights and manage impacts of environmental activities	• Guadalcanal Environment and Planning Ordinance	• Stakeholder engagement for integrated management of environment	• Needs review and define roles with management measures

CURRENT DEVELOPMENTS

Historically, Honiara coastlines were opened to people for general use and in particular recreational areas are common. The western half of Honiara coastline from the National Ports area at Point Cruz right down to White River were used by the public mostly for recreational purposes including free swimming for pleasure along the shorelines, people walking along the coastal straits after the long day's work and many more. However, it was lately in the early 20s that the reviewing of Land ownership by the Ministry of Lands, Housing, and Surveying (MLHS) gave rise to the claiming of coastal land areas to as far as intertidal sea areas. This is where the closure of entry to coastal waters is becoming eminent and people are kept out of privately owned coastal areas or granted entry under strict supervision with initial entry fees paid.

The Honiara Local Planning Scheme 2015 that was developed under the collaboration between the MLHS and Town Council sets up some very important developments in the form of new physical buildings, land zonings and expansion of roads. Under this plan, the National Development Strategy 2016-2035 picked the specific development that pertains the improvement of Honiara City and further fastened it to their developed plans. For instance, the expansion of Kukum Highway Road, setting up and zoning of land areas for certain activities such as sports and recreations along from Henderson to Lunga River.

The Solomon Islands has an established Ministerial Government in the Ministry of National Planning and Development Coordination that looks at developments over the country from wider scope and zeroed down to provincial and urban areas. Under the National Development Strategy 2016-2035 the vision to 'improve the social and economic livelihood of all Solomon Islanders' captures all the aspects of life which includes looking at how to address the issues of development to make Solomon Islands a better place. This includes establishing developments to address hazard risk areas such as coastal communities, flood plain squatters, and areas prone to landslides.

As part of the national governments' plan on developing the Solomon Islands, the Guadalcanal Provincial Government (GPG) has enacted its plan on developing the eastern part of Honiara coastal land. According to the GPG's Henderson/Lunga Local Planning Scheme (2017-2022) it was proposed that a promenade will be constructed along the entire length of coastline from east Henderson right around to the river mouth of Lunga River.

Today, along the coastline from Lunga to White River there are various activities taking place. The Lungga coastline has been compressed and conjured with industrial activities. Wharves have been erected, timber milling companies pile their waste grains and dusts along the coastal pavement, wrecked vessels occupying spaces making the coastline like a haunted ghost town with marine vessel relics. Communities along the coastline also uses this part of the town as disposal grounds where they reluctantly dispose their rubbish. White river coastline has more residential buildings close to the lower water mark than at the Lungga – east side- of Honiara. The line of the upper watermark can be seen almost covering majority of the residential areas along the coastline.

Constructions for Business and Residential homes

The eastern part of Honiara as being said above is the industrial zone where you will find company's residential areas, warehouses, hardware's, timber milling industries, erected mini jetty's where company's vessels come to berth. In the central part of the city, timber, steel, and concrete houses clustered together in ridiculously confined spaces. There amongst these well-built houses is the traditional palm-leaves huts and homes largely prone to strong winds from storms. An example of this settlement is the fisheries coastal settlement. Further east, there are hotels built on reclaimed land and shops with owners renting out spaces for apartments.

Large concrete boulders are being erected acting as seawalls, protecting these business buildings and hotels from storm surge and high waves during high tide. Hospitals and marketplaces (Honiara Central market and Kukum market) are also within the vicinity of the upper water-mark level. On the western half, from Point Cruz to White River, most of the coastal buildings are hotels and residential homes.

Transportation, fishing, recreational, and other activities

The International wharf is located in Point Cruz Honiara Cargo vessels, tourist boats and other international carriers use this as a berthing place to offload and load cargoes, dispatch tourists and other exchanged activities that is required by the Solomon Islands Ports Authority. Other national vessels that serve nine of the provinces in the Solomon's uses the adjacent protruding jetties that are built for strength and endurance to serve the purpose of taking in and offloading passengers.

Locals also use the coastal waters as fishing grounds, and they have access to cast nets, gillnets, and hand line fishing for caching fish. There are also offshore fishing vessels who are targeting tuna, albacore and other pelagic fish who would use these waters as berthing places to deliver their catches for marketing. There is inter-island shipping which ferries passengers from Honiara to nearby islands i.e., Guadalcanal (surroundings), Ngella and Savo. The Yacht club sandy shore, Mamanawater (Mataniko waterfront), and Kukum Fishing village are used as berthing grounds.

There are certain locations used as recreational sites with the popular Children's Park right in front of the Rove Police Headquarter. This Park has accommodated varieties of activities that engaged teens keeping them active all day long. Other recreational activities that are also happening along the coastal waters of Honiara such as swimming, surfing, sport, boating, and diving were also allowed but under greater supervision with pre-entrance fees being paid.

Pollution and nutrient sources

Honiara city produces several wastes of all sorts. Households leached their wastes through designated septic pipelines that inter-connects with other households and release them straight through to the coastal waters. These waste pipeline outlets can be found in each corner of the Honiara shoreline. These household wastes are endangering the lives of coastal residents because their filtered chemicals, intoxicating liquids and other unwanted fluids are infiltrating and poisoning the fishes and other marine invertebrates caught and eaten by coastal residents, polluting recreational waters, and releasing toxic gasses to the air causing nausea and nasal discomfort.

There are other sources contributing to the accumulation of wastes along the coastal waters of Honiara. The primary sources are from households that discharge their waste into the ocean through the waste pipelines. This includes solid wastes, liquid wastes, and irregular and regular items. Vessels that depart to and from the provinces also discharge plastics, bottles, Styrofoam, and other non-biodegradable items.

Apart from waste that are being dumped along the coastal areas, other types of pollutants are from solid wastes such as damaged and rejected vehicle parts, metal items and others which makes their way through culverts and crevasse and finding their way to the shoreline. There are also wreckages washed inshore by cyclone, high waves, and strong winds.

Other sources are from either deliberate or carelessness by the vessels that will eventually spill petroleum gasoline or oil directly into the sea. There are specs of spilling oils along the domestic wharves that can be sighted with the naked eyes. Though minimal, these spilled oils will accumulate overtime and causes hazardous consequences to the ocean environment.

These wastes have detrimental consequences to the environment (reefs, lagoons, beaches, and land) that will directly have affected the tourism sector in polluting coastal areas that are supposed to promote healthy environment to foreigners.

In addition to that, Lunga and Mataniko river mouth have also accumulate many types of rubbish from the sandy shores right upstream. Logs, tree branches and twigs, land mounds from uprooted-tree bottoms, and dirt of all types are getting washed and deposited by flash flood or from heavy rainfall originating upstream.

The western half of Honiara coastal zones where most of the hotels and business-operating buildings are situated have produced collectives of rubbish of similar kinds with the likes of bottles, cans, plastics and even the famous in town - kasu gas bottles for cooking. All these trashes are getting washed down the drains during the heavy rain. The Rove police compound coastal fronts and White River streams are clogged with these multi-types of pollutants.

IMPACTS OF COASTAL DEVELOPMENT

This section will describe the potential direct, indirect, and incremental effects on the environment including the socio-economic setting by the observed current and potential major developments along the Honiara coast.

Seawall and reclamation and erosion control activities

Potential direct effects of seawall, reclamation and erosion control activities are the modification of natural coastline habitats including the flora and fauna. This may result in the loss of species, ecosystems as well as areas for socio-economic use. However, the creation of these developments can also result in the creation of new, habitats and spaces for socio-economic use. Potential indirect effects of seawall, reclamation and erosion control activities are the modification of coastal currents and beach flows which in turn can affect species such as fish through loss of habitat. Potential incremental effects of seawall, reclamation and erosion control activities are the eventual creation of new habitats and species. These may be beneficial to people or may result in further stress of alien or foreign species establishment. Ultimately, however, coastal protection and reclamation activities should result in the enhancement and protection of current coastline and result in increased socio-economic activities.

Building construction activities both residential and commercial

Potential direct effects of building construction activities (residential and commercial) are the modification and loss of the natural environment, habitat, and species. However, constructing these buildings will result in the creation of socio-economic use space. Potential indirect effects of building construction activities (residential and commercial) are the modification of the wider coastal environment and eventual loss of habitats and species. An indirect change is that the socio-economic activities in this space will be lost such as fishing sites. Potential incremental effects of building construction activities (residential and commercial) are the reduction of biodiversity, abundance and diversity, and the creation of a new built-up niche which may favour invasive species. These activities will lead to a domination of built-up space to support socio-economic activity in the long-term.

Fishing & Recreation activities

Potential direct effects of fishing and recreation activities have a potential negative impact for fishing area along the coast of Honiara where it is important to the coastal communities. The increase in the number of vessels coming in and out of the area, will also disturb their fishing activities. These communities will also be disturbed by the current development along the coastal. The fishermen from the coastal settlements along Honiara stated that they are reliant on coastal zone for fishing for food and sales for small income. Therefore, if these fishing areas are disturbed by the current and future development along the coastlines, there is a potential impact for fishermen and coastal communities of Honiara to experiences scarcity of marine resources. Potential indirect effects of fishing and recreation activities are pressures on coastal zone of Honiara that related to infrastructure construction, waste, and sewage. There is a high possibility for negative impacts which include habitat fragmentation, water pollution, and spill waste accidently entering the water and poisoning the marine species that may lead to serious human health implications. The social impact of infrastructure construction, waste, and sewage on the coastal ecosystem is that it will affect the coral, fish and living organism which the people are depending on. Potential incremental effects of increased fishing and recreation activities will be the reduction of fishes due to overharvesting and potentially increased traffic and pollution from more recreational users of this space.

Transportation and wharf activities

Marine transport is one of the major components of the transport sector in the country. The marine transport is vital, but there are a lot of activities that may lead to the environmental impact from ships. The general condition of the domestic shipping fleet is poor, and many coastal ships are old. As a result, these local vessels failed the existing safety standards set by the Solomon Islands Maritime Authority (SIMA) and with that they provide poor reliability of the services. In addition, there is also a high possibility for the oil, bilge and motor fuel leakage, gasoline and diesel oil leakage from these ships that will pollute the water. The waste production and noise generated from large ship engines will also have an impact on the coastal ecosystem.

Potential direct effects of transportation and wharf activities are pollution. In port environments, there are a lot of activities that may lead to water pollution such as loading and unloading petroleum products, pumping ashore fuel from larger vessels to tank farms and transport trucks, cargo handling equipment, ships maintenance and modification (accidental discharge of oil and spill of chemicals into the sea), stormwater runoff from port parking lots to the coast.

Sources of noise can be individuated in port areas in the following three main areas: passenger car and heavy vehicle (trucks) road traffic (the most important one), goods movement (from machinery), noise from traffic rail movement in port and surrounding areas. There is a potential impact for all the industrial activities in ports to cause environmental pollution and wastes and noise generation. Potential indirect effects of transport and wharf related activities include coastal pollution from shipping, particularly around harbours and wharves, and the sites of wrecks; disposal related waste from transport, industrial effluents, sewage, urban and river runoff, natural seepage, offshore oil production and destruction of landscapes because of poor operating practices at quarries and on construction sites. As the environment is important to the economy of the Solomon Island, there is a need to mitigate potential negative impact of development. Potential incremental effects of increased transportation and wharf related activities will increase pollution and the potential for a major disaster such as oil spill. Increase traffic will also have a detrimental effect on the natural wildlife and environment.

RELEVANT IMPACTS AND MITIGATION ACTIONS

These are potential negative implications or impacts from the previously mentioned major developments. This section continues to align the effects and risks under each specific development activity under a major impact. These major relevant impacts are coastal soil erosion, sedimentation and siltation, loss of flora and fauna, landform modification, waste and pollution and oil spill risk. Outlined is a list of management and mitigation actions to help monitor and mitigate risks and effects from the described impacts. These actions are to be undertaken to safeguard the natural environment of the study area. The application of these mitigation measures will ensure that the coastlines, the backshore areas, the foreshore areas, the intertidal zone areas with the natural environment are fully protected amidst the ongoing needs for coastal development by proponents from Lunga River point to White River-river point on Guadalcanal Island in Solomon Islands.

Coastal Soil Erosion

One of the major impact likely to occur is the coastal bleach or soil erosion. Modified coastlines can result in soil loosening its compactness and encourages soil erosion into the coastal water. Lack of proper drainage can also further exacerbate the problem and can lead to flooding in the area, whenever there is a high-intensity rainfall event. Though most coastal developments consider and mitigate against coastal erosion, these activities can also exacerbate and transfer impacts to adjacent sites. Extraction of gravel and sand along the coast would result in the direct loss of the coastal beaches. Additionally, with the impact of climate change and sea-level rise this would enhance the erosion rate on the beaches. Management, monitoring, and mitigation actions include:

- Establish guidelines and monitor coastal developments
- Develop erosion control or sea wall development minimum standards
- Limit work or movement in high-risk areas
- Limit substrate extraction along coastal areas
- That all seawall designs and other civil works requirements must be approved by the Ministry of Infrastructure Development, the Ministry of Environment, and the Honiara City Council Planning Board before actual construction.
- Wave breakers must be installed at 20m - 30m out in the off-shore area to reduce the impact of wave energy on the shoreline by hitting the seawalls.
- The seawalls must be designed according to the gradual slopes in the intertidal zone area along the coastlines.
- Additional wave breakers such as huge rocks must be stationed at the toe of the seawall to avoid direct impact of wave intensity and overtopping during cyclonic seasons and bad weather.
    - Environmental fines shall be imposed by the responsible authorities if seawall damage has determined major environmental impacts on the surrounding coastlines.
    - Strictly no excavation is to be allowed on any coastal reclamation sites along the coastlines of the study area. Otherwise determined by a national approving entity.

Loss of Flora and Fauna

The Honiara coastline has had much disturbance since WWII and a lot of disturbance to the habitats and species both on land and in the water system have occurred. Which is why the current biota of flora and fauna is much heavily reduced than its original natural state. However, if developments continue, the loss in marine biodiversity will likely continue. Management, monitoring, and mitigation actions include:

- Conduct biodiversity assessments to record key and threatened species
- Establish protection or managed marine areas
- In any coastal development along the coastal areas of the study site, an Environmental Impact Assessment must be authorized by a national approving entity such as the Ministry of Environment to determine the level of biological and ecological data that are available for the coastal site before proceeding to construction.
- Excavation limits and site clearance limits for any approved coastal development must have official consent by the Ministry of Environment and other approving entities before actual works can proceed onsite.
- Sites along the coasts which have rare flora and fauna species must not be disturbed.

Landform modification

The land clearing and seas shore reclamation are likely to have some negative impact on its immediate surrounding through modification of natural landforms. The landfill works are potentially harmful to the coastline, with possible consequences to adjacent areas. The likelihood of these areas losing their shape, behavioural characteristics and composition can be considered major. With the currents, prevailing wind direction and wave actions which act as the controlling and forcing mechanisms in coastal landforms, the behavioural characteristic of coastal landforms is compromised through developments, assisted by the absence of any littoral drift. This will be a long-term impact though it is expected to be localized in spatial scale. Management, monitoring, and mitigation actions include:

- Establish limits for construction and modification such as extent of development past high tide mark
- Retain set percentage of natural coastal from being built-up.
- Responsible authorities must limit all commercial quarry activities along the main rivers within the study sites.
- Restrictions on excavation level of inland areas for residential and commercial developments such as on slopes and hilltops must be done by responsible ministries and stakeholders to avoid heavy runoffs with high sedimentation loads during rainy seasons. This will eventually end up in the water bodies in rivers and streams where they shall be transported and deposited along the coastlines of the study site. Such huge loads of sedimentation have the potential to change landforms.
- Avoid riverbank, stream bank and coastal excavation.
- Installation of buffer zones on coastal construction sites to avoid coastal erosion.

Waste and Pollution

Solid waste management is a challenge not only for Honiara but, the country at large and this is underpinned by the fact that relevant agencies are inadequately resourced in terms of funding support, ineffective legislation, and poor planning, amongst others. Poor waste management practices have detrimental consequences for the environment (reefs, lagoons, beaches, and land), which in turn can affect the tourism industry. It is anticipated that solid wastes through the likely sources of metals, plastics, papers, and domestic household wastes such as discarded food and other biodegradable materials will continue to be a major issue. It is a common occurrence for PET bottles, aluminium cans, biodegradable wastes to be haphazardly discarded, where commercial and household activities are located. Management, monitoring, and mitigation actions include:

- Set guidelines, monitor waste, and implement fines to offenders Carry out Honiara Coast Clean Up Campaign
- Mass awareness on proper waste disposal.
- Installation proper urban sewerage piping system.
- Imposing of heavy fines on perpetrators who do unlawful waste discharge along the coastal area.
- Responsible authorities must strictly enforce litter bylaws.
- Proper monitoring and certification of all commercial, industrial, and residential waste management plans.
- Government to provide more subsidies to business houses who are involved in recycling of used and old manufactured products.
- Encourage more tree planting along the coastal areas of the study site.
- Impose high tax on business houses that imports plastics, cans, and rubber products.
- Carryout frequent inspection on all seafood products that are sold in the central market and other food outlets.
- Impose huge fines on ship owners for their boat wreckage along the coastline of the study area.

Oil Spillage Risk

Fuel and oil leaks are a potential impact that is possible in the future of the Honiara coast as a major port. The oil spillage can be detrimental to the aquatic biodiversity due to its toxicity to biota. Key sources of potential oil spills are from large marine vessels and the fuel depot. Management, monitoring, and mitigation actions include:

- Set minimum standards to reduce probability of oil spill disasters occurring in the vicinity
- Effective enforcement of environmental law, maritime and fisheries laws on pollution by responsible authorities.
- In the event of oil spillage, experts must be hired to do the clean-up tasks.
- Effective monitoring of all fuel stations, manufacturing industries and machineries to minimize the level of engine oil leakages.
- Ensure all manufacturing industries which are near the coastal area have a properly sealed treatment plant. This is to avoid release of oil and toxic substance into the environment.

RECOMMENDATIONS

Context

Like any other capital cities elsewhere, Honiara city is home to more than 70,000 people in the country and relying primarily on rivers and ecological systems for their subsistence or commercial use and comfort. The Solomon Islands R2R IW Project demonstration site is the Mataniko Watershed Catchment, which runs right through Honiara from the highest ridge to the sea. The discharge from the river run along the entire Honiara coastal and waterfront areas. The results of this consultancy provide an opportunity to establish baselines as basis for future monitoring, but also equally important, allows improved understanding of the current state of the general environment from point sources and along the Honiara coastal areas.

Generally, the majority of Honiara development of constructions of roads, buildings, bridges, homes, hotels, factories, and subsistence fishing occur at the coastal zones, and with combined terrestrial-aquatic areas revolving around a land-sea interface. Such areas face many environmental and management challenges and impacts that arise in terrestrial locations that stretch from lower coastal areas to upper and higher areas of the ridges and mountain range. There are also challenges and impacts that tend to arise in open ocean areas, and those inherent to coastlines, such as the impacts of 'land-based sources of marine pollution'. In Honiara, many existing semi- or fully commercial enterprises and their routine activities are likely to produce cumulative impacts. The number and intensity of impact in our ocean is continually increasing and management of these impacts appear to be failing to keep pace. It is difficult to account for the cumulative effect of multiple impacts co-occurring in space and time and interacting together.

For example, some marine mammals such as dugongs are becoming less frequently seen in waters of the Solomon Islands, and even less frequently seen in coastal waters of Honiara. These marine mammals are sensitive to pollutants that enter the coastal environment because of human activities. However, in the Solomon Islands, there are environmental legislations and policies that commonly require project proposals to account for and mitigate cumulative environmental impacts. For instance, the current Ocean Policy developed and gazette, it is now a legal policy document that help with management approaches to marine resources in the country and ensure they are followed through and enforced.

From a practical perspective, successful 'integrated' management of coastal areas in Honiara require an understanding of the environmental impacts arising from each of the relevant activities occurring in coastal waters and areas (e.g., shipping, port development, waste disposal, fishing, aquaculture, etc.). Information on cumulative coastal environmental impacts and related details will be generated and written up into an EIA, along with assessments on water quality and habitats such as wetlands and coral reefs, which will form part of the IW R2R Coastal Environmental Baseline Assessment and consultancy. They are covered under this consultancy and with the study site extending from White River to Lungga River which also include the Mataniko River, which is primarily covering the whole of Honiara Sea front. The consultancy will also address the impacts of interactions between activities, and the accumulation of impacts over time.

Challenges

This study was undertaken more on desktop reviews and collate existing data in consolidating a baseline report for the Honiara coastal environment. Most of data used in this study are from the existing documents that related to Honiara coastal Assignment. The availability and sources of data, compilation and analysis and other external commitments always plays a role in hindering the progress and completion of our report. Time period for data verification and monitoring is another factor as more time is needed to collect data, verify them before writing up the report. This is to fully represent the situation, environment of study with spatial and temporal information needed.

Lessons learned

- There is also a need to develop air quality standards and monitoring system and implementing emissions regulations for industries. Monitoring emissions from air, land and sea transport and regulation developed and enforced is also important as well.
- We have learned that currently there is no national database of information on coastal change a locally available. Some of the information on an eroding coastline is only available through EIA reports. Visual interpretation is very important to use to identifying coastal change. Analysing of coastline changes in Honiara is conducted by using multi-scale and multi-temporal remote sensed imagery and GIS.
- Enhance public awareness and understanding of climate change and global challenges likely impacts on Honiara coastal. While public awareness about the importance of Honiara costal ecosystem and waste management area needed.
- Nutrient levels are low but increasing at a rate that indicates activities and development within Honiara.
- Wet and dry season of Solomon Islands affects water quality
- Sewage outfalls contributes to the water quality of the Honiara Coastline
- Ambient measurements help to determine poor water quality that can harm the flora and fauna of the Honiara coastline
- Continuous monitoring of water quality monitoring by the Ministry of Environment, Climate Change, Disaster Management and Meteorology (MECDM) gives progressive data for Honiara Coastline and other water bodies affecting the ocean.
- Development surrounding the Honiara coastline is expanding and lacks impact assessments for proper location of infrastructures
- Lessons learnt from this report writing is that teamwork is always essential in whichever works of life someone engaged into. Dedication and commitment are another. Someone must show commitment through faithfully devoted his time towards the completion of this report.
- After this report, there should be a monitoring work needs to be done. As our islands are constantly changing with changing coastal morphology, the current situation as being described in this report will not be valid in few years' time, therefore a monitoring study for future changes will be needed.

Follow-up recommendations

- By reducing the complexity of the negative impact that affect the Honiara costal, there is a need to design an integrated coastal management and adaptation strategic plan (ICMASP) for the greater Honiara coast to be managed by the HCC.
- After this report, there should be a monitoring work needs to be done to assess the current status of Honiara Coastal ecosystem during a longer period of time into the past and future.
- Identify and establish of Environmental Protection/Green Zones for control of runoffs.
- Hydrology analysis for developments especially when doing impact assessment.
- Identify areas for sediment control sumps before directly dispersed into water bodies.
- Identify areas for waste and sewage disposal.
- Improve sewage system in Honiara City.
- Review building standards to include water control mechanisms or systems.
- Work with Solomon Islands Water Authority (SIWA) trading as Solomon Water, Honiara City Council (HCC) and Guadalcanal Province Government to work on legal frameworks for Honiara Coastline management plan.
- Strengthen monitoring and awareness of results with business houses for consideration and auctioning.
- Develop a mechanism or communication portal for reporting of environmental incident.
- Review existing legislation to empower CBD authorities do monitoring and monthly checks.

CONCLUSION

There are 2 main conclusions from this study, 1) a database to store, observe and manage developments and related information within Honiara and 2) for a development of an integrated coastal management and adaptation strategic plan for the area.

There is no reliable information on coastline change trends that will help identify the basis to support development and assistances in proper land used. Currently there is no national database of information on coastal change locally available. Some of the information on an eroding coastline is only available through EIA reports. Visual interpretation is very important to use to identifying coastal change. Analysing of coastline changes in Honiara is conducted by using multi-scale and multi-temporal remote sensed imagery and GIS. As population continues to grow and infrastructures development expand this will result in increasing pressures to the coastal ecosystem, which it shows that there is need for accurate information regarding coastline change for years. Information on the rates of erosion and accretion is important to predict the future coastline position for different years by using remote sensing imagery and GIS. The absence of coastline change data will also have a negative effect on development and communities settled along the coastline but if this information is available it will help in developing coastal planning.

There is a need to design an integrated coastal management and adaptation strategic plan (ICMASP) for the greater Honiara coast to be managed by the HCC. This ICMASP will involve all key stakeholders and provide avenues to managing environmental impacts and risks associated with development in Honiara. Solomon Island Port Authority management also needs to develop and implement an environmental management system (EMS) to monitor the operation of Honiara Port to ensure that it complies with international good practices. There is also a need to develop Air quality standards and monitoring system and implementing emissions regulations for industries. Monitoring emissions from Air, land and sea transport and regulation developed and enforced is also important as well.

REFERENCES

Abraham Eke - Kukum Sea Front Commercial Center Public Environment Report. 2015. Telios Corporate and Consultancy Service. Honiara, Solomon Islands

Delimitation of Marine Waters Act 1988. 1988. Available at: https://www.ffa.int/node/1893 (Accessed: 1 August 2020).

Environment Act 1998. 1998. Available at: http://www.paclii.org/sb/legis/num_act/ea1998159/ (Accessed: 1 August 2020).

Fisheries Management Act 2015. 2015. Available at: http://www.paclii.org/sb/legis/num_act/fma2015193/ (Accessed: 1 August 2020).

Honiara Water Quality and Resilience Framework Report- Pollution & Nutrient Sources. 2017. Centre for Environment, Fisheries and Aquaculture Science (Cefas). Suffolk, United Kingdom.

Land Reclamation and Construction of Storm Water Drainage at Rove Sea Front. 2019. Hoasiuhu Francis, Joseph Airahui. Honiara, Solomon Islands.

National Development Strategy 2016 to 2035. 2016. Ministry of Development Planning and Aid Coordination. Honiara, Solomon Islands.

Protected Areas Act 2010. 2010. Available at: http://www.paclii.org/sb/legis/num_act/paa2010157/ (Accessed: 1 August 2020).

Ridges to Reefs Conservation Plan for Solomon Islands. 2010. Johnathan Kool, Tom Brewer, Morena Mills, Robert Pressey. ARC Centre of Excellence for Coral Reef Studies, Townsville, Australia.

Solomon Islands State of Environment Report 2019. 2019. Secretariat of the Pacific Regional Environment Programme (SPREP). Apia, Samoa.

Solomon Islands Ecosystem and Socio-Economic Resilience Analysis and Mapping (ESRAM), Volume 3: Honiara. 2018. Secretariat of the Pacific Regional Environment Programme (SPREP). Apia, Samoa.

Solomon Islands: Honiara Urban Profile. 2012. United Nations Human Settlements Programme (UN-Habitat). Nairobi, Kenya.

Solomon Islands: Waste management and pollution control strategy 2017-2026. 2016. Secretariat of the Pacific Regional Environment Programme (SPREP). Apia, Samoa.

Town and Country Planning Act 1979. 1979. Available at: http://www.paclii.org/sb/legis/consol_act/tacpa293.rtf. (Accessed: 1 August 2020).

Wildlife Protection and Management Act 1998. 1998. Available at: http://www.paclii.org/sb/legis/num_act/wpama1998317/index.html (Accessed: 1 August 2020).