Solomon Islands Government
Ministry of Commerce, Industry, Labor and Immigration

Environmental Impact Statement Report

A full detail report of the Suava Economic Growth Centre Project, North Malaita, Malaita Province.

By
Wills Engineering & Associates

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Non-Technical Summary

The non-technical summary of the Environment Impacts Statement for Suava Bay Economic Growth Center (EGCP) is prepared in accordance to standard requirement for those who do not fully understand some of the technical information presented in the EIS report. The targeted audiences are policy makers and ordinary public who find the thematic reports highly technical. It is worth noting that some technical aspect of this report cannot be reduce or over simplified an effort not to diverge from the original intention of the report findings. This non-technical summary of EIS report should be read as summary other details would be obtain from reading the full technical report. The report takes time to spell out the purposes, approach and findings to produce a baseline environmental condition based on the assessments done on the ground. Besides, impacts and mitigation measures are highlighted under their respective sections. This report is recommended to be read in alignment with the detail technical section integrated in the EIS report.

The summary for all aspects of the report is in Exhibit 4 of the report.

Contents

Non-Technical Summary 1
List of Figures 5
List of Tables 6
ACRONYMS 7
1.0 Background Introduction 9
1.1 Background of the Development 9
1.2 Name, Address and contact details of the developer 10
1.3 Consultant Details and Address 10
1.4 Summary Description of the Project 12
2.0 Description of the Proposed Development 14
2.1. Plans and Technical Drawing of the Development 14
3.0 Policy, Legal and Instrumental Framework 16
3.1 International Regulatory Framework 16
3.2 National Policy, Legal and Regulatory Framework 18
3.2.1 Environment Policy 18
3.2.2 Solomon Islands Environment Legislation and Regulations 18
3.2.3 The Environment Act 1998 19
3.2.4 The Environment Regulations 2008 and Environment Guideline 2010 20
3.2.5 Protected Areas Act 2010 22
3.2.6 Wildlife Protection and Management (Amendment) Act 2017 22
3.2.7 Mines and Minerals Act (Amendment) Act 2008 23
3.2.8 Waters Resource Bill 2006 23
3.2.9 Fisheries Management Act 2015 25
3.3.0 Delimitation of Marine Waters Act 1978 25
3.3.1 The Town and Country Planning Act 1997. 26
3.3.2 Forests Resources Act 2004 27
3.3.3 Provincial Government Act 1997 27
3.3.5 Other Relevant Country-based Legislations 28
4.0 Location and Scale of the Prescribed Development 30
4.1 GPS Map on Location and Boundary 30
4.2 Zoning Controls 31
5.0 Description of the Environment 32

5.1 Built Environment 32
5.1.1 Traffic flow 32
5.1.2 Infrastructures 32
5.1.3 Waste Management 35
5.1.4 Water Supply and Sanitation 35
5.1.5 Jetty and Ports 36
5.1.6 Communication Infrastructures 36
5.2 Physical Environment 36
5.2.1 Weather, Climate and Natural Hazards 36
5.2.2 Topography and Landscape 41
5.2.3 Geology 42
5.2.4 Hydrology 43
5.2.5 Air quality 45
5.2.6 Surface Water and River Bed Sediments Quality 46
5.2.7 Groundwater 55
5.2.8 Coastal Marine Waters and Marine Sediments 55
5.2.9 Nitrate and Phosphate Levels of Surface Water, Ground water and Marine Water at the Site. 56
5.3.0 Offshore marine waters and sea floor sediments 56
5.3.1 Ocean Circulation 57
5.3.2 Soil 60
5.4 Biological Environment 60
5.4.1 Wetland Ecosystem 60
5.4.2 Mangroves Ecosystem 68
5.4.2.2 The Mangrove Fauna 71
5.4.3 Corals and Seagrass Habitats 72
5.4.4. Reef Ecosystem (shallow- deep). 79
5.4.5 Coastal Resources 95
5.5 Economic Components 95
5.5.1 Employment Sectors 95
5.5.2 Infrastructures Facilities 98
5.5.3 Land Use 103
5.5.4 Use of forest and other natural resources 103

5.6 Social Components 110
5.6.1 Population and Communities 111
5.6.2 Health Profiles of Communities 114
5.6.3 Institutions 116
5.6.4 Community Structures and Family Structures 118
5.6.5 Land Ownership 119
5.6.6 Types of common or individual rights on natural resources 122
5.6.7 Gender 122
5.7 Cultural Component, Including Non-physical Resources and Elements 126
5.7.1 Cultural Heritage 126
5.7.5 Unique Landscape 133
5.8 Health Component 134
5.8.1 Objectives and Scope 134
5.8.2 HIA Framework and Methodology 134
5.8.3 Gender and Cultural Considerations 159
6.0 Alternatives 171
7.0 Climate Change and Disaster Risk 172
7.1 Climate Change 172
7.2 Disaster Risk 173
7.2.1 Coastal Inundation and/ Or Erosion 173
7.2.2 Sea Level Rise 174
7.2.3 Cyclone 175
7.2.3 Extreme Rainfall and Flooding 176
7.2.4 Landslide 176
7.2.5 Earthquake 177
7.2.6 Tsunami 178
7.2.7 Volcano 179
7.2.8 Coastal Flood 179
8.0 Environmental Impact Assessment and Mitigation Measures 180
8.1 Methodology and Approach 180
8.2 Scope of the Assessment 180
8.3 Identification of Impacts**.** 181
8.3.1 Potential Impacts – Physical Environment 181

8.3.2 Potential Impacts – Biological Environment 184
8.3.3 Potential Impacts – Built Environment 186
8.3.5 **Social and Cultural Impact Assessment** 189
. 203
9.0 Summary of Environmental Management Plan 204
10.0 Conclusion and Recommendation 217
10.1 Conclusions 217
10.2 Recommendation 217
11.0 Works Cited 218
12.0 Annexes 220
12.1 EXHIIT 1: SUAVA GROWTH CENTRE SUB DIVISION PLAN AND DESIGN 221
12.2 EXHIBIT 2: MAPS 222
12.3 EXHIBIT 3: SOCIAL SURVEY AND DEMOGRAPHY DATA 223
12.4 EXHIBIT 4: NON-TECHNICAL SUMMARY 224

List of Figures

Figure 1: Zoning and Land Use for Suava Bay Project 15
Figure 2: Proposed Lot Allocation for Suava Bay Project 16
Figure 3: Zoning for Suava Bay Project {HANSEN, 2019) 32
Figure 4: Newly repaired Taba'a (bottom) and Kwai (top) Bridges 33
Figure 5: Lolu Primary School (Courtesy by G. Ganiau, September 2021) 34
Figure 6: Community response to Proper sanitation survey for 10 sample communities 35
Figure 7: Tropical Cyclone Pathways for Solomon Islands 40
Figure 8: Site Elevation Map 42
Figure 9: Average Temperature and Precipitation for the region 44
Figure 10: Air Quality for Oceania region 45
Figure 11: Air Quality Levels for 24hr exposure 46
Figure 12: The wind-driven surface ocean circulation. Driven by winds, the surface currents form the main subtropical. (Source: B. Delorme and Y. Eddebbar) 59
Figure 13: Illustration of the Meridional Overturning Circulation and its impact on the mean air-sea flux 59
Figure 14: Project Site Physical Environment Classifications 62
Figure 15:The types of fish species observed in the seagrass and coral reef ecosystems within the project area. 76
Figure 16: Mean cover (± SE) of coral genera and biotas. * Is a non-stony coral of the Order Scleractinia, includes soft corals, algae's and others 88
Figure 17: Mean density (Ind. ha^{-1} ± SE) of marine invertebrate species. 90

Figure 18: Fish families and total number of species observed. 92
Figure 19: Mean density (± SE) of fish families. 94
Figure 20:Figure 10: Mean density (± SE) per fish species. 94
Figure 21: Pie Chart of respondents -Reasons for fishing. 106
Figure 22.People with special needs. 112
Figure 23:Bar graph showing community to health survey conducted for 10 communities 115
Figure 24:Community response to Proper sanitation survey for 10 sample communities. 115
Figure 25: The Organisational Structure of KBT (personal Communication, G.Nunufana, sept 15 2021, Sulagwalu Village) 119
Figure 26: Land Determination History of the Project Site. (Personal communication, G.Nunufana, oct 12 2021, Sulagwalu village) 121
Figure 27: Community response on gender equality topic conducted for 60 households 123
Figure 28: Community response to gender training opportunities. 124
Figure 29: Community reactions on importance of gender considerations in the local Communities. 125
Figure 30: The five Regions of Malaita Province 127
Figure 31: IFC –HIA framework and methodology 135
Figure 32: Selecting an HIA Type 136
Figure 33: Slope Stability Profile for the Project Site 177
Figure 34: The Pacific Rim of Fire 178
Figure 35: Earthquake footprints for Solomon Islands 178

List of Tables

Table 1: Chronological Order of Suava Bay EGC events 13
Table 2: GPS Coordinates for the project site 30
Table 3: GPS Coordinates for the Back-fill area. 31
Table 4: Stratigraphy of North Malaita 43
Table 5: Physical parameters of surface water within project area 47
Table 6: WHO Water Quality Standards 49
Table 7: Physical parameters of marine waters and bottom water plus sediments (at 10m depth) collected at 3 different points with sampling points within project site 56
Table 8: Showing physical parameters of bottom sediments plus water at 5 -10m depth in the foreshore zone 57
Table 9: List of Hardwood species observed within the project area. 65
Table 10: Head count of fishermen from the 5 communities in around project site. 104
Table 11: Cultivation of 108
Table 12: Community response to gender training opportunities. 127
Table 13. Tribes and Language Profiles within the Suava EGC 132
Table 14: Typical Health Impact issues by Environmental Health Areas. 144
Table 15: Community Focused mitigation measures 146
Table 16: Environmental Aspects Register 154
Table 17: Environmental Health and Safety Mitigation Measures 161
Table 18: EMP for the Suava Bay EGC Project 204

ACRONYMS

ACRONYM	DESCRIPTIONS
ADB	Asian Development Bank
CEMP	Comprehensive emergency management Plan
CITES	Convention on International Trade in Endangered Species
CoL	Commissioner of Lands
CPC	Coral Point Count
DCGA	Democratic Coalition Government for Advancement
EAS	Elweens Architectural Services
ECD	Environment and Conservation Division
EEZ	Exclusive Economic Zone
EGCP	Economic Growth Center Programs
EIA	Environment Impact Assessment
EMP	Environmental Management Plan
ESIA	Environmental and Social Impact Assessment
FAO	Food and Agriculture Organization
FIFA	Federation Internationale de Football Association
GPS	Global Positioning System
HIV&AIDS	Human Immunodeficiency Virus & Acquired Immune Deficiency Syndrome
ICEDP	Industrial and Commercial Estate Development Program
IEE	Initial Environment examination
ITCZ	Intertropical Convergence Zone
MCILI	Ministry of Commerce Industry Labour and Immigration
MECDM	Ministry of Environment, Climate Change, Disaster Management and Meteorology
MEA	Malaita Education Authority
MHMS	Ministry of Health and Medical Services
MLHS	Ministry of Lands Housing and Survey
MMA	Marine Manage Area

MMERE	Ministry of Mines, Energy and Rural Electrification
MoU	Memorandum of Understanding
MPA	Marine Protected Area
MSME	Micro, small and medium enterprises
NEMS	National Environment Management Strategy
NGOs	Non-Government Organization
OIE	World Organization for Animal Health
PER	Public Environmental Report
PMO	Prime Minister's Office
PPE	Personnel Protective Equipment
PPO	Priority Policy Objectives
SBEGCP	Suava Bay Economic Growth Centre Project
SIDCCG	Solomon Islands Democratic for Change Government
SIG	Solomon Islands Government
SLR	Sea Level Rise
SME	Small and medium sized enterprises
SPREP	Secretariat of the Pacific Regional Environmental Programme
STIs	Sexual Transmitted Infection
SS	Sampling Sites
UNCBD	United Nation Convention on Biological Diversity
UNCCD	United Nation Convention to combat desertification
UNCLOS	United Nations Convention on the Law of the Sea
UNFCC	United Nations Framework Convention on Climate Change
UXO	Unexploded Ordinance
UVS	Upper Vertical Sampling
UPT	Upper Photographic Transect
VIP	Very Important People
WECS	Wills Engineering & Consulting Services
WHO	World Health Organization

1.0 Background Introduction

1.1 Background of the Development

The DCGA government, under its reform program for productive sector policy No.4.2.2.3 trade, commerce, industries and immigration mandated MCILI 14 priority policy objectives, in which industrial development division is currently implementing 6 Priority Policy Objectives (PPOs) in the country.

There are three development programs implemented under the Industrial Development Division National Project Office.

a) Private Sector and MSME Development Program - The project is proposing to implement seven (7) milestones to create an enhanced environment for MSME development in Solomon Islands.
b) Industrial and Commercial Estate Development Program (ICEDP) - This ongoing Government program aims to attract economic activities to established high production and business concentrated areas in the provinces where primary resources and production are already in place.
c) Economic Growth Center Programs (EGCP) - This is an ongoing program which aims to encourage the growth of economic activities in the rural areas and in the provinces where most of Solomon Islands' natural resources and populace are located.

EGCP is an ongoing program mandated under the Industrial Development Division from the Ministry of Commerce, Labor and Immigration of the Solomon Islands. The program targets four (4) sites in the country. 1. Suava Bay (Malaita), 2. Waisisi (Malaita), 3. Afio (Malaita) and 4. Allardice (Isabel). The ultimate aim was to encourage growth of economic activities in rural areas where most Solomon Islands' natural resources and populace located. To facilitate growth in rural and remote areas in the country, the National government plans to establish basic utilities at the growth centers. The growth centers would be a properly identified zone and demarcated areas, suitable for local business houses can use to enhance production and increase employment opportunities in the rural areas.

Therefore, Suava bay Economic Growth Center in June 2010 under Lilo led government was formally established when the National government of Solomon Islands through its responsible

ministry, MCILI signed a Memorandum of Understanding (MoU) with Kwanaái tribe and Malaita provincial government to pave way for government officials conducting ground work for the design of the project.

1.2 Name, Address and contact details of the developer

Developer's Contact Details

Name of Applicant: MINISTRY OF COMMERCE, LABOUR AND IMMIGRATION

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1.4 Summary Description of the Project

Geographically Malaita province comprises landmass of 4225 km^2; the island lies at the southern end of chain islands form the Solomon Islands group. It extends for between 8' 17'' and 9' 44''. Island of Malaita extend over 190 km long tip to tip with interior generally ragged mountain flanked by hills, plateaus narrow hill and coastal terraces with areas of valleys and swamps (Gideon Taitasi, 2019).

The Suava Bay Economic Growth Centre Project (SBEGCP), located in northern tip of the Island of Malaita. Geo-politically border between Lau/Mbaelelea and North Malaita Constituencies, Malaita Province and is owned by the Malaita Provincial Government. Malaita Provincial Government vision is to develop an Economic Growth Centre to promote economic development and local entrepreneurship. The intention is to acquire the 300sq km^2 of Customary land at Suava Bay, got it registered for development of the Economic Growth Centre.

The Solomon Islands Democratic for Change Government (SIDCCG) government has come to realize the bottle neck to the country's economic development and thus the policy direction to develop this scale of economic hub has the potential to advance direct investment at the provincial level.

It is on this understanding that Malaita Province in collation with the MCILI join in partnership to develop the Suava Bay into a special Economic Zone for Malaita province, especially the entrepreneurs of Lau/Mbaelelea and North Malaita constituencies.

MCILI believes that by turning Suava Bay into an Economic Centre or special economic zone, the people of Malaita Province, more specifically those from the wards 8, 9, 10, 11 & 12 of the North Malaita and Lau/Mbaelelea Constituencies will benefit from the following;

- Increase in foreign and domestic private sector investment
- Employment and income generation both direct (within the zone) and indirect through forward and backward business linkages with the zone
- Development of SME industries and other sectors requiring specific services or specialized infrastructure

- Skills upgrade and technological transfer to the province through foreign and domestic direct investments

The ultimate aim was to encourage growth of economic activities in the Suava and surrounding rural areas by utilizing their natural resources. For this project, the key components according to the Master Plan (see Exhibit 1) identified are;

1. Market House
2. Jetty
3. Shed
4. Ablution Block
5. Road Access
6. Parking Area
7. Landscaping

In the table below, shows the chorological order of the events and activities of the Suava Bay EGC.

Table 1: Chronological Order of Suava Bay EGC events.

Year	Activity	Status and cost attached
2010	• Suava Bay was considered a EGC by SIG • Consultation Work Start • Landowner Consultation • Signing of MoU/Good Will Payment	• SIG - NA • SIG • SIG and Kwana'ai tribe • SIG sign MOU with Kwana'ai tribe and Malaita provincial

		government.
2012	• Outright purchase of project area (10 Hectares).	• SIG made payment of 5.5 million to Kwana'ai tribe
2014	• First Acquisition hearing	• SIG
2017	• Road access to project site	•
2020	• Feasibility Study • Technical Studies • Second acquisition hearing for remaining two lots	•
2021	• Site Construction • Environmental Studies	• Exodus Construction • Wills Engineering & Associates

2.0 Description of the Proposed Development

2.1. Plans and Technical Drawing of the Development

In 2019, HANSEN Planning and Design had carried out the Suava Growth Centre Sub – Division Plan and Design Master Plans and Subdivisions for the site. See Master Plans and Sub-Division plans in Exhibit 1 of the annex.

According to the plans (HANSEN), a total of 73 land lots are subdivided and demarcated for the entire area. The current development and activities are mainly on plots for light industries and public service.

Figure 1: Zoning and Land Use for Suava Bay Project

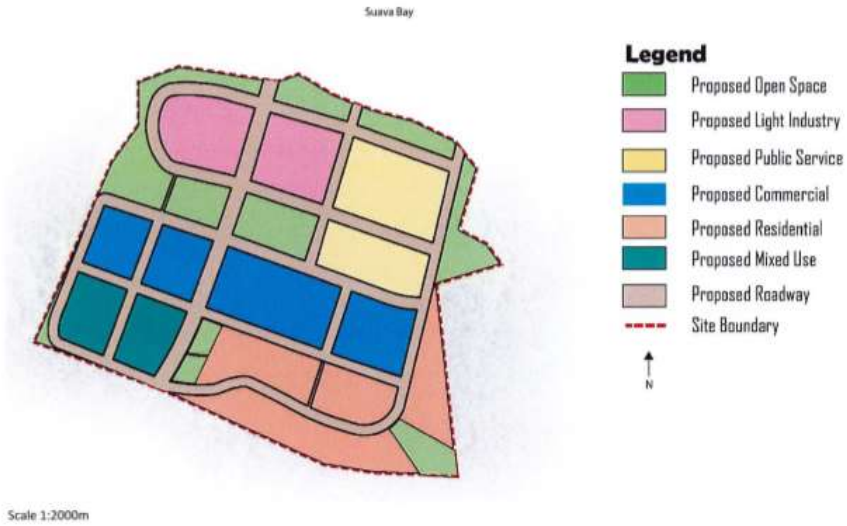
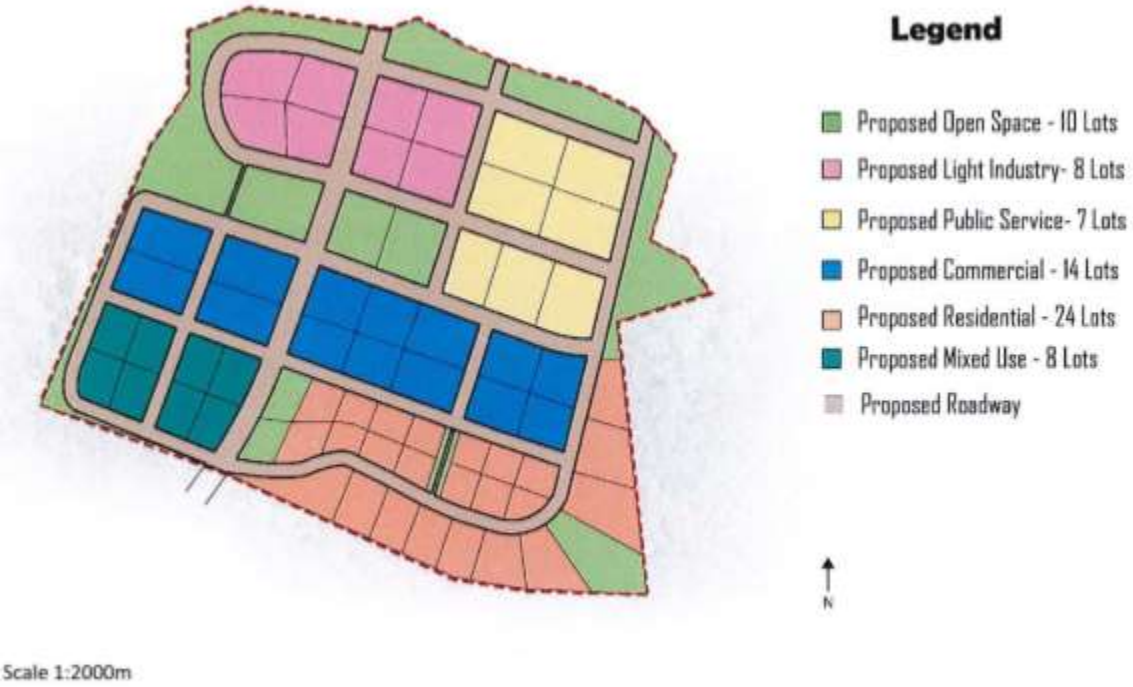


Figure 2: Proposed Lot Allocation for Suava Bay Project



3.0 Policy, Legal and Instrumental Framework

3.1 International Regulatory Framework

Solomon Islands is a signatory to a number of international agreements with environmental and conservation implications as well as for the protection, promotion and safeguarding of cultural heritage and traditional knowledge. These are presented in Exhibit 3.

a) Regional

- Pollution Protocol for Dumping. Ratified 1998. Prevention of pollution of the South Pacific region by dumping.
- Pollution Protocol for Emergencies. Ratified 1998. Co-operation in combating pollution emergencies in the South Pacific region.
- Natural Resources & Environment of South Pacific Region (SPREP Convention). Ratified 1998.

- Waigani Convention on Hazardous & Radioactive Wastes 1995. Ratified 1998. Bans the importation and the trans-boundary movement and management of hazardous wastes within the South Pacific region.

b) International - Chemicals, Wastes and Pollution

- Liability for Oil Pollution Damage. Ratified. Liability of ship owner for pollution damage.
- (Marine Pollution Convention (London). Ratified. Prevention of marine pollution by dumping of wastes.
- POPs Convention (Stockholm). 2004. Bans use of persistent organic pollutants.

c) International – Biodiversity

- (World Heritage Convention. Acceded 1992. Protection of sites of Outstanding Universal Values. (East Rennell Island is listed as a World Heritage site).
- Convention on Biological Diversity (UNCBD). Ratified 1995.
- Desertification (UNCCD). Acceded 1999. Agreement to combat desertification and drought.
- Cartegena Protocol on Biosafety. Acceded 2004. Protection of human health and the environment from possible adverse effects of modern biotechnology.
- Global Convention on Migratory Species
- United Nations Convention on the Law of the Sea (UNCLOS)
- Food and Agriculture Organization (FAO) Code of Conduct for Responsible Fisheries.
- Convention on Wetlands (Ramsar)
- International Council for the Exploration of the Sea Code of Practice on the Introductions and Transfers of Marine Organisms.
- European Inland Fisheries Advisory Council Code of Conduct and Manual of Procedures
- International Plant Protection Convention

d) International – Food and Animal Health

- FAO Code of Conduct for the Import and Release of Exotic Biological Control Agents
- World Organization for Animal Health (OIE)
- FAO/Network of Aquaculture Centres in Asia-Pacific Asia Regional Guidelines on Fish Health.

e) International – Climate

- Montreal Protocol. Acceded 1993. Phase out of substances that deplete the ozone layer.
- Ozone Layer Convention (Vienna). Acceded 1993. Protection of the ozone layer.
- Climate Change (UNFCC). Ratified 1994.
- Kyoto Protocol. Ratified 2003. Reduce greenhouse gases especially CO2 by an average of 5.2% by 2012.

f) International – Cultural

- World Heritage Convention. Acceded 1992. Protection of sites of Outstanding Universal Values. (East Rennell Island is listed as a World Heritage site).
- The Convention for the Safeguarding of the Intangible Cultural Heritage 2003
- The Convention of the Protection and Promotion of the Diversity of Cultural Expressions 2005.

3.2 National Policy, Legal and Regulatory Framework

3.2.1 Environment Policy

The National Environment Management Strategy (NEMS)1993, is the primary document for the environment policy in the country. It is outdated; however, it is an important document at present time in the absence of an environment policy. The MECDM launched the Climate Change Policy in 2012, on behalf of the Solomon Islands Government. The Policy highlighted steps government would take in helping the country and its citizens to exist and adapt to present imminent climate change and its impacts. The integration of climate considerations within the framework of the national policies guides the government and its partners to ensure that the people, natural environment and economy of the country are resilient and able to adapt to the predicted impacts of the climate change.

The Solomon Islands Environment Act 1998 establishes an integrated system of development control, environmental Impact Assessment, and pollution control (ECD, 2010). It complies with regional and international conventions and obligations relating to the environment.

3.2.2 Solomon Islands Environment Legislation and Regulations

Environmental impact assessment, management and protection in the Solomon Islands are governed under the Environment Act (1998) and the accompanying regulatory instrument, the

Environment Regulations (2008). The Ministry of Environment, Climate Change, Disaster Management and Meteorology (MECDM) are the institution that administers this Act. The Environment and Conservation Division (ECD) within MECDM implements the Environment Act and Environment Regulations, which stipulate the type of activities for which development consent, must be sought and which proposed developments require environmental assessment. The ECD is also the government agency responsible for reviewing and clearing development consent applications and environmental assessments on behalf of the government and is the agency responsible to manage the environmental compliance of all projects.

3.2.3 The Environment Act 1998

The Solomon Islands Environmental Policy is vested in the Environment Act of 1998 which provides for the protection and conservation of the environment, through the establishment of the Environment and Conservation Division (ECD). The Environment Act 1998 makes provision for an integrated system of development control, environmental impact assessment (EIA) and pollution control, including

- Prevention, control, and monitoring of pollution, including regulating discharge of pollutants to air, water or land and reducing risks to human health, and prevention of degradation of the environment.
- Regulating the transport, collection, treatment, storage and disposal of waste and promoting recycling, re-use and recovery or materials in an economically viable manner.
- Complying with, and giving effect to, regional and international conventions and obligations relating to the environment; and
- Regulating discharge of pollution to the air, water and land.

The Act has four sections as follows:

Part I article 4 vests the Environment Act with considerable power which states that in the event of conflict between the Environment Act and other legislation, the provisions of the ENVIRONMENT Act shall prevail.

Part II establishes and defines the powers and role of the Environment and Conservation Division - which has since been re-established within the MECDM.

Part III establishes the requirements for environmental assessments, review and monitoring. There are two (2) categories of environmental assessments, namely Public Environment Report (PER) or if the development is shown to be such a nature as to cause more serious impacts, then the proponent is required to produce an Environmental Impact Statement (EIS) to MECDM. Activities that require assessment are described as Prescribed Activities and are included in the Second Schedule of the Act.

Part IV details requirements for pollution control and emissions (noise, odour and electromagnetic radiation) and requirements to permits for the discharge of waste. Article 49(2) requires that any vessels are not to discharge waste into the environment unless the vessel complies with prescribed discharge standards. Noise and interference with antipollution devices are covered under Article 50 (1) while restrictions and emitting unreasonable noise are covered in Article 51 (1).

Schedule 2 of the Act lists prescribed developments for which consent, accompanied by an EIA, are required.

All prescribed projects require a simple assessment through a "screening" or "scoping", procedure to see what form of additional assessment is required. Most prescribed projects require a Public Environmental Report (PER), while many major projects such as logging, large agricultural developments, mining, large scale tourism developments, and infrastructure projects will also need a second stage of appraisal (environmental impact assessment) which includes technical, economic, environmental and social investigations. All of these are to be presented in an Environmental Impact Statement (EIS).

After the screening of the proposal application and site visit(s) it is confirmed that the level of assessment for the proposed development requires an EIS. Several assessments have been carried out to prepare this EIS. Thus, it has been confirmed as being acceptable to the requirements of the Act. The project is required to comply with the Act to obtain development consent.

3.2.4 The Environment Regulations 2008 and Environment Guideline 2010

The requirements for the EIA are clearly stated in the Environment Regulations 2008 under the Act. The Environment Regulations establish the procedures for undertaking the environmental

assessment of any projects categorized as “Prescribed Activities”. The developer is required to first submit a Development Application following which the MECDM determines whether:

I. No further assessment is required; as such the Development Application is accepted.
II. A PER, (a PER is roughly equivalent to IEE (ADB Standard) and therefore this document also meets government’s requirements); or
III. An EIS where major projects are considered such as logging, large agricultural developments, mining and large-scale tourism developments and infrastructure projects. For an EIS, the developer will require to produce the following: (i) technical, (ii) economic, (iii) environmental and social investigations.

For the prescribed development after initial screening and scoping by the ECD it was concluded that an EIS (as per part (iii) above) will be prepared. Both the PER and EIS require Public Consultation to gather information from the local communities or residences of the area which the development will occur. After the consultation the EIS will be updated and submitted to ECD for review and approval. Following the review and approval by the director of ECD under the MECDM, a Development Consent will be issued either with or without conditions to the developer or in this case MCILI. The Environmental Impact Assessment Guidelines 2010 produced by ECD provide basic advice and guidance to government officers, planners, developers, resource owners on the environment impact assessment process (MECDM, 2010). It is also designed to administer the second schedule of the Environment Act 1998. The guidelines note the purpose of the EIA is to promote environmentally sound and sustainable development via identification of appropriate mitigation measures and to predict, avoid, minimize or offset the adverse significant environmental and social impacts of the development. It also describes the procedures needed to be undertaken including stakeholders in the EIA process and fees required for the type of development before obtaining the development consent approval. Granting of an EIA approval requires that a project must meet several criteria, including that the development will be carried out in way that is consistent with all relevant environmental policies and regulations, and has reasonable steps in place to minimize any risk of environmental harm. Solomon Islands do not have emission, water or air quality standards. While environmental standards are not provided in the Regulation, the MECDM usually uses internationally recognized standards such as the World Health Organization (WHO) standards for water and air

quality. While the Guidelines provide for licenses to discharge waste or emissions, the enforcement of these is problematic without defined standards.

3.2.5 Protected Areas Act 2010

The Protected Areas Act 2010 and Protected Areas Regulations 2012 establish procedures for the establishment and management of protected areas and to conserve and regulate biological diversity. Some key objectives of the Protected Area Act (2010) are as follows:

- to establish a system of protected areas or areas where special measures need to be taken to conserve biological diversity.
- to develop, where necessary, guidelines for the selection, establishment and management of protected areas or areas where special measures need to be taken to conserve biological diversity.
- to regulate or manage biological resources important for the conservation of biological diversity whether within or outside protected areas, with a view to ensuring their conservation and sustainable use.
- to promote the protection of ecosystems, natural habitats and the maintenance of viable populations of species in natural surroundings.
- to promote environmentally sound and sustainable development in areas adjacent to protected areas with a view to furthering protection of the protected areas; and
- to rehabilitate and restore degraded ecosystems and promote the recovery of threatened species, such as, through the development and implementation of plans or other management strategies.

In addition:

- Part 3 of the Act allows for the declaration, registration and management of protected areas.
- Part 5 of the Act prohibits any unauthorized bio-prospecting research in these areas except if given permission by the Advisory Committee.
- Part 6 provides for the appointment of inspectors to enforce the provision of the Act. There are sections throughout the Act that highlight fines and breaches of the Act.

3.2.6 Wildlife Protection and Management (Amendment) Act 2017

The Wildlife Protection and Management Act 1998 objective of the Act is to regulate the international trade of the country's wildlife resources including birds, reptiles, amphibians, mammals, insects, plants, and marine lives. This is to protect and conserve them for long term sustainability of the country's biological diversity. The Act was developed to meet the obligation

of Convention on International Trade in Endangered Species (CITES) signed by the government in year 2007.

3.2.7 Mines and Minerals Act (Amendment) Act 2008

The Mines and Minerals Act, deals with exploration and exploitation of mineral resources, and the regulation and control of mining activities. Part VIII of the Act which deals specifically with Building Materials is the most relevant part in terms of aggregate extraction. The Act requires that an application for a building materials permit be made to the Minerals Board who advises and recommends to the Minister if such a permit should be issued to an applicant. Applications made for a building materials permit specifies and meets certain requirements including name, address and nationality of applicant, a plan of the area targeted for extraction, a proposed plan for mining of the materials and other relevant information.

The Building Materials Permit issued specifies the name of the permit holder, the duration of the permit, and the quantity of the materials to be extracted. The permit includes many other conditions such as requirements for monitoring and reporting and consent and agreement with landowners. Application and permit fees apply in the whole process.

This Act establishes the regulatory system for all mining applications and licensing and provides the system to regulate and manage mining activities including the management and permitting process required for all alluvial mining (rock, gravel, and sand extraction). Construction materials for the construction of the Suava EGC must be sourced by the Contractor, in accordance with the guidelines and processes outlined in the Act. The Contractor will be required to provide a site extraction plan and the use of existing permitted quarries should take preference to the use of new locations.

3.2.8 Waters Resource Bill 2006

The Water Resources Bill 2006 has been prepared but has yet to go through parliament. If approved by parliament and gazette, it will become the Water Resources Act and will supersede the Rivers Water Act 1996. Its purpose is to:

(a) Provide for the integrated management of the water resources of the Solomon Islands.

(b) To promote the most efficient, fair and beneficial use of natural water.

(c) To ensure the natural water resources are available for the sustainable use for the benefit of all present and future Solomon Islanders.

(d) To provide for the protection of natural watercourses and water catchments.

(e) To provide for the control of activities occurring over or beside waterways or watercourses.

Under the Act, a Water Resources Advisory Board is required, whose function is to advise the Minister on matters pertaining to the Act and consult with the Water Resources Director on technical matters. The Director with his staff shall administer, manage and implement the Act accordingly so as to achieve the above goals.

This Act covers all water bodies, rivers and stream whether in registered or non-registered, public, private or customary land in Solomon Islands. The Ministry has the authority to control the use and development of all water catchments and riverbanks. Logging, mining and extraction of sand and gravel in water catchments, river banks and river beds may be restricted by the Ministry according to the requirements of catchment management and conservation.

The Ministry may also recommend to the Board under Section 21 to declare a water body such as a catchment, groundwater or flood control zone as a Water Control Area. If approved by the Minister, the area shall be gazette. If an area is declared so, then activities such as mining and extraction of gravel and sand are prohibited. Also one cannot construct, alter or remove or in any way impede or be likely to impede the flow or movement of surface water. This is very important clause as it may affect Kwai gravel extraction in the future if MCILI sees that the activity is not sustainable.

The Act also clearly states a development does not obstruct, divert or dam the river. If it's going to do so then it must make an application to the Ministry who upon receiving it will assess the request. If it agrees it will issue a license accordingly. Water for domestic use shall not require a license. As stated earlier though, this prepared legislation is still to be approved by parliament.

The Bill covers all water bodies, rivers, streams whether in a registered or non-registered, public or private or customary land in Solomon Islands. The Ministry of Mines, Energy and Rural Electrification (MMERE) has the authority to control the use and development of all water

catchments and riverbanks. Logging, mining and sands and gravel extraction in water catchments, riverbanks and riverbeds may be restricted by the MMERE according to the requirements of the management and conservation of the water resources.

The Bill clearly states that a development must not obstruct, divert or dam the river, if so, it must make application to the Minister who upon receiving the request will assess and if agree will issue a license accordingly.

3.2.9 Fisheries Management Act 2015

This Act provides the framework for marine, brackish and freshwater fisheries management, protection and development, including licensing of fishing vessels and processing plants. It also lists prohibited fishing methods and provides for the establishment of Marine Managed Areas (MMAs) and Marine Protected Areas (MPAs) and the preparation of coastal management plans. The Act regulates the utilization and conservation of marine resource and includes resources associated with estuarine and freshwater coastal river systems.

3.3.0 Delimitation of Marine Waters Act 1978

The Act makes provisions for the demarcation of the marine waters appertaining to Solomon Islands as the following:

- Archipelago: A group of islands, including parts of Islands, inter-connecting waters and other natural features which are so closely inter-related that such islands, waters and other natural features form an intrinsic geographical entity, and which has been declared by the Minister by Order published in the Gazette to be an archipelago.
- Archipelagic baselines: The baselines drawn under the provisions of subsection (2) of section 4.
- Island: A naturally formed area of land which is surrounded by and above water at mean high-water spring tides.
- Low-water line: The line of low water at mean low-water spring tides as depicted on the largest scale nautical chart of the area produced by any authority and for the time being held and used by the Minister responsible for marine affairs;

- Median-lines: A line every point of which is equidistant from the nearest points of the baselines from which the breadth of the territorial seas of Solomon Islands and of any opposite or adjacent State of territory are measured;
- Mile: The international nautical mile.
- Minister: The Minister responsible for Foreign Affairs.
- Territorial seas: The territorial seas of Solomon Islands as defined in section 5. (2) For the purposes of this Act, permanent harbour works that form an integral part of a harbour system shall be treated as forming part of the coast.

3.3.0.1 Exclusive Economic Zone (EEZ)

The EEZ of Solomon Islands comprises all areas or the economic zone of the sea which is at a distance of two hundred miles from the nearest point of the appropriate baselines.

The Minister may make regulations, in accordance with the rules of international law, for all or any of the following purposes:

a) Regulating the conduct of scientific research within the exclusive economic zone.
b) Regulating the exploration and exploitation of the exclusive economic zone for the production of energy from the waters, currents and winds, and for other economic uses.
c) Regulating the construction, operation and use of artificial islands, installations and structures within the exclusive economic zone, including, but not confined to, the establishment of safety zones around islands, installations and structures.
d) Prescribing measures for the protection and preservation of the marine environment of the exclusive economic zone; and
e) Providing for such other matters as are necessary or expedient to give effect to Solomon Islands rights and obligations in relation to the exclusive economic zone or are necessary to give full effect to the provisions of this Act.

3.3.1 The Town and Country Planning Act 1997.

This Act has potential to provide for the consideration of the environment sector for conservation of cultural and biodiversity areas. The Act applies to all urban areas (Capital city – Honiara and Provincial towns) and includes the management of land (all ownership), the management and planning functions for urban and rural areas including development. The objective of the Act is

to ensure that land is developed and used in accordance with proper polices and a high consideration of the people's welfare.

3.3.2 Forests Resources Act 2004

The Forests Act (2004) effectively replaces the Forest Resources and Timber Utilization Act of 1991 and governs licensing of felling trees and sawmills timber agreements on customary land, establishes State Forests and Forest Reserves and provides for the conservation of forest and its management.

This act applies to this proposed development, as there are some mature forest trees that have been identified growing in the site, which may be of significance to the Ministry of Forestry. It is recommended that when doing the clearing of shrub, make sure there are no felling of the trees that are worth seeking advice from the respective ministry. If in the event of any case that a tree has been cut but there is issue of agreeing on a fair price. Then the ministry of forestry rate will be used. The ministry has its own rate for the commercial trees and the measurement of the tree. This still applies, even the land is government owned, since the trees and properties on the land can be owned by different individuals.

3.3.3 Provincial Government Act 1997

The Provincial Government Act (1997) gives power to the Provinces to make their own legislation including for environment and conservation. Schedule 3 of the Act provides a list of activities for which the Provinces have responsibility to pass ordinances. One of the activities includes Cultural and Environment - protection of wildlife, coastal and lagoon shipping. The ordinances include:

- Trade and Industry - local licensing of professions, trades and businesses and markets.
- Cultural and Environment - protection of wildlife, coastal and lagoon shipping.
- Agriculture and Fishing - protection, improvement and maintenance of freshwater and reef fisheries.
- Land and Land Use - codification and amendment of existing customary laws about land. Registration of customary rights in respect of land including customary fishing rights. Physical planning except within a local planning area.
- Local matters - waste disposal.

- Rivers and Water - control and use of river waters, water pollution.
- Corporate or Statutory Bodies - establishment of corporate or statutory bodies for provincial services including those for economic activities.

3.3.5 Other Relevant Country-based Legislations

3.3.5.1 Safety at Work Act (1996)

The Safety at Work Act (1996) states that it is the duty of every employer to provide a safe workplace and to ensure the health and safety of employees under their control. This Act is linked to the Labour Act (1978) and the Safety at Work (pesticide Regulations (1983).

3.3.5.2 National Parks Act 1978

National Parks 1978 Establishes national parks and prohibits fishing and hunting in same without permit; establishes restrictions on activities undertaken within national parks; provides for appointment of park rangers.

3.3.5.3 Wild Birds Protection 1978

Wild Birds Protection 1978 Lists scheduled birds (incl. eggs and nests) for protection from being killed, wounded, taken or sold (including skin or plumage); establishes several bird sanctuaries; establishes strict hunting seasons for certain birds.

3.3.5.4 National Climate Change Policy 2012

In response to the impacts faced in country caused by Climate Change, The National Climate Change Policy was developed. The main focus of the policy was to strengthen the adaptive capacity of the country through adaptation measure and also taking appropriate mitigation actions to reduce global greenhouse gas emission. The policy give effect to vulnerable sectors under the NAPA such as Agriculture and food security, water supply and sanitation, human health, increase population, fisheries and marine resources, coastal protection, infrastructure, waste management and tourism.

Due to the absence of a management strategy and system in place, the Policy also alluded to the greenhouse gas emission in the country and encourages landfill management to include the opportunities to generate electricity from methane as an alternative energy source.

3.3.5.6 National Disaster Council Act 1990

The National Disaster Council Act establishes a National Disaster Council (Council) in Solomon Islands and confers certain powers upon the Council to deal with natural disasters. The functions of the Council shall be:

- to provide and render advice to the Minister on all matters relating to disasters;
- to approve and co-ordinate all activities necessary in regard to preparedness, response, and recovery;
- to assume full and complete control in operations connected with disasters; and
- To provide and render financial assistance to Committees.

The Act provides that a National Management Office will be established under the responsibility of the Minister with responsibility to administer the Act and to ensure that the national disaster plan and other related plans are periodically reviewed and updated.

3.3.5.7 Solomon Islands Emergency Powers (COVID-19) Regulation 2020

On 25th March 2020, Solomon Islands declared a State of Public Emergency (SOPE) under Section 16 of the Solomon Islands Constitution in response to Novel Coronavirus (COVID-19) world pandemic. The state of emergency SOPE was extended twice already and latest SOPE currently is enforced. Measures imposed under the period SOPE focused on controlling people's movement, closing borders, restricting movement of vessels and aircraft, allowing special funds to implement public safety measures, and to temporarily close public places. Some economic sectors, like informal food and betel nut markets in Honiara, were banned completely, whilst other sectors were subject to more limited restrictions. In July, despite no cases of COVID-19 corona virus yet being reported in Solomon Islands, the Governor General issued another state of emergency proclamation, which was endorsed by the National Parliament.

On 27th March, the Prime Minister issued the Emergency Powers (COVID-19) Regulations 2020 which listed a range of orders which were purportedly made to protect the country from the pandemic and to prevent the spread of virus if there were cases.

The Emergency Powers (COVID-19) Regulations was put in place to make orders to protect the country from the pandemic and to prevent the spread of virus. Emergency Powers (Covid-19) Regulations (No.2) 2020 was issued in May 2020 with extended powers to impose major restrictions on freedom of media. I and in July 2020, Emergency Powers (Covid-19) Regulations

(No.3) was issued and extended the state of emergency until 25 November 2020 for extension of SOE till November 2020.

The Regulation has 5 parts including: to it:

- Part 1 contains important definition and spells out the application of the regulation.
- Part 2 defines and lists the Prime Ministers Powers during the Covid-19 emergency period which is still currently active.
- Part 3 defines the appointments of the authorizing officers by the PM for the effective implementation of this regulation. It also specifies the functions and powers of the authorizing officers.
- Part 4 outlines the penalties in breach of the regulation.
- Part 5 contains miscellaneous maters. Here it identifies the Ministry of Health and Medical Services (MHMS) as the official authority for disseminating information related to covid-19 Emergency Powers (COVID-19) Regulations 2020 to the public on behalf of the government.

This has now placed Solomon Islands under a SOE until 25th November 2020.The CEMP and health and safety plan have incorporated preparedness and response measures on 16th June 2021 Page 48 and 16th March 2018 accordance with the Regulation and internationally accepted good practice, advice and guidance.

4.0 Location and Scale of the Prescribed Development

4.1 GPS Map on Location and Boundary

In Table 2 and Table 3 below is the GPS positions of the project area and current backfilling work completed on site. The location and boundary of the site is in the map shown in Exhibit 2A.

Table 2: GPS Coordinates for the project site

No	Name	Waypoints	
		Longitude	Latitude
1	Point 1	160.710547	-8.375307
2	Point 2	160.710362	-8.377724
3	Point 3	160.706894	-8.376868
4	Point 4	160.706874	-8.375309

5	Point 5	160.709801	-8.37386

Table 3: GPS Coordinates for the Back-fill area.

No	Name	Waypoints	
		Longitude	Latitude
1	CNR 1	160.709982	-8.375613
2	CNR 2	160.709773	-8.376003
3	CNR 3	160.708123	-8.375313
4	CNR 4	160.7083	-8.374918

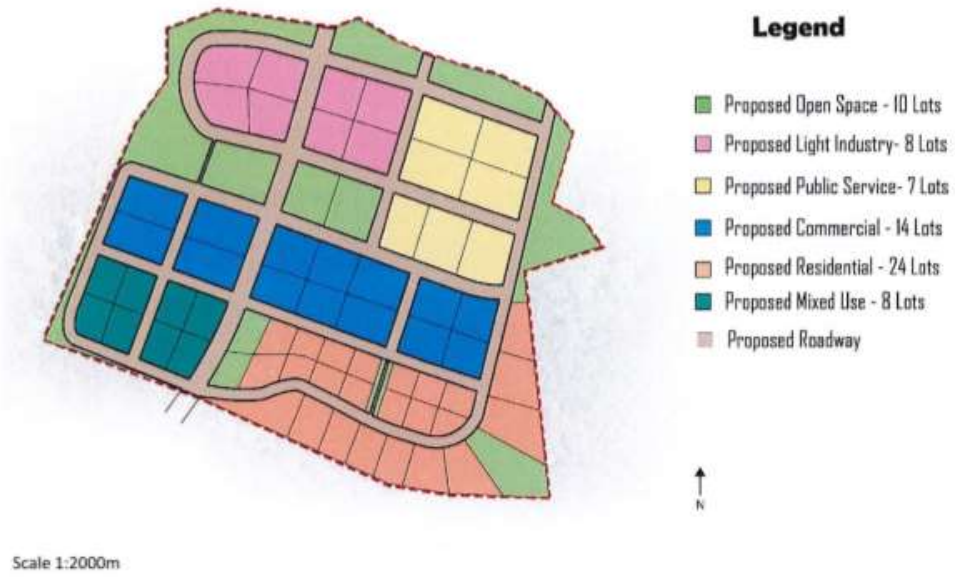
4.2 Zoning Controls

According to Industrial Development Division of National Project Office administered by MCILI. EGCP ear marked four sites under the program in the country. Three of the sites are located in Malaita is shown as in Exhibit 2B of the Annexes. The sites are follows;

1. Suava Bay EGC - North Malaita
2. Afio/Liwe – South Malaita
3. Waisisi – West Are'are
4. Auluta Basin – East Fataleka

For the Suava Bay Project, the zoning according to the master plan was in Figure 1 below;

Figure 3: Zoning for Suava Bay Project {HANSEN, 2019)



5.0 Description of the Environment

5.1 Built Environment

5.1.1 Traffic flow

Traffic congestion survey was conducted for a period of one week between hours of 6 am – 7 pm at Panama village along the northern route that runs from Auki to Fouia. The assessment was aim to establish a dataset that would able to describe the traffic volume and flow in the development site, to help understand how heavy the road usage was going to be. Both directional flows (East and West) were taken into consideration as part of daily count.

5.1.2 Infrastructures

Public infrastructures identified with in the assessment zone (i.e. from Taba'a –Kwai River) are mostly schools, Clinic, Road, Bridges, and Culvert. This section looks at formal and other infrastructures that made up of the built environment around Suava Bay EGC. Highlighting the significance of potential impacts and drawing measures to mitigate those impacts.

A. Roads, Bridges and Culverts

The only road access found in the area was the 88km ragged coronous (gravel) road from Auki to the project site. The road was constructed in year 1970s up by the Solomon Islands

government. The road suffered number of maintenance issue many times in the past by contractors in the country. Community people stated that road in north Malaita did not last for even two years after upgrading and maintenance by number of contractors in the past.

Recently in year 2017 Solomon Island government through MID facilitate the construction of a 1 km access road from the main road (Auki-Fouia road) to project site on the sea coast in Suava Bay.

The two bridges found in the locality is Taba'a and Kwai Bridge that has been upgraded after been damaged by flash flood some years back.

There are five (5) culvert system, four (4) found along the road from Taba'a to Kwai River and one (1) along the newly constructed road to the project site.

Figure 4: Newly repaired Taba'a (bottom) and Kwai (top) Bridges

B. Schools

There are two primary school and two early childhood education in close proximity of around 2 km to the project site, between Taba'a and Kwai River. Manafaeni Primary school registered and run by Seventh Day Adventist (SDA) authority which accommodate around more than 150 students and Lolu primary school enrolled around 100 children, registered and run under Malaita Education Authority (MEA).

Figure 5: Lolu Primary School (Courtesy by G. Ganiau, September 2021)

C. Clinic

There is only one health aid post (Matakwalao clinic) found in close proximity (less than 2 km) to the project site. Two registered nurse aid currently working at Matakwalao clinic and the clinic is supervised by a locally set up committee. On average more than 20 people turns up at the clinic seeking medical treatments each day. During most busy days more than 50 people turns up and during less busy days less than 10 people turns up at the clinic. The clinic catchment

population is more than 2000 people from around twenty (20) communities in ward Nine (9), Malaita province (D.Sammy, 2021).

5.1.3 Waste Management

The project has identified a site with the demarcated boundary for waste disposal. WECS has separately carried out a study on the site for suitability. It is anticipate that the site will use the same land fill methods at the Ranadi Waste Landfill.

Measures will be taken at the project site to ensure proper disposal of all wastes. A compost system will be created where organic waste will be disposed and later used for gardening and landscaping of the site. All recyclable materials will be sorted and sent for recycling. All other waste will be collected and disposed at an authorized waste facility.

5.1.4 Water Supply and Sanitation

There was no water and sanitation at the proposed project site according to assessment conducted in the month of September 2021. Development growth center of such nature requires proper water supply and sanitation systems to be in place before embarking on other developments on the site.

Water supply and sanitation within 3 km surrounding to the project site are described below:

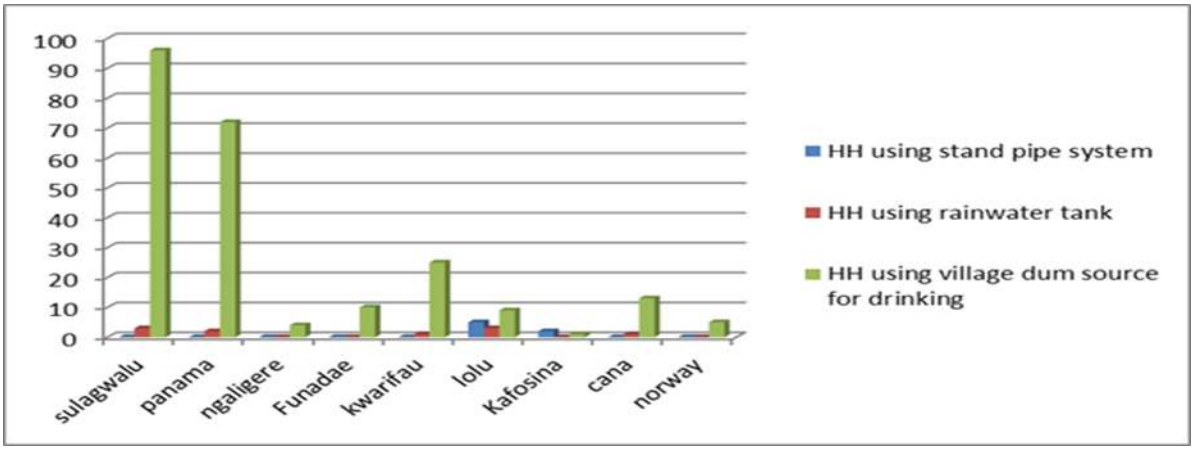


Figure 6: Community response to Proper sanitation survey for 10 sample communities

Nearly 80% of Sulagwalu and around 40% of Panama community recorded household using poured flash toilet system. Few household at Lolu, Cana and Norway are also using poured flash

whilst Ngaligera, Funadae, Kwarifau and Kafosina household mostly used open pit toilet system in their communities.

The only two community that access water supply are Lolu and Kafosina. The rest are still using community dam source and rain water tank as indicated in the graph above.

5.1.5 Jetty and Ports

There are no jetty and port facilities within the development area except for a berthing passage at Matakwalao bay situated approximately less than a kilometer to the western side of the project site. Currently ships are using that passage for loading and backing loading of materials for Lau Baelelea passengers and project materials.

5.1.6 Communication Infrastructures

The nearest Telekom towers that its coverage reach Suava bay area are situated at Adaua and Maluu. Bmobile Company likewise had a better reception in and around the project site. Nearest towers in close proximity to the site are Adaua, Manaoba, Maluu and Mota. Refer to map. As such phone calls and internet service utilizing data packets are available. Telekom 3G network coverage is available at the site and to nearby communities.

5.2 Physical Environment

5.2.1 Weather, Climate and Natural Hazards

The climate information for Solomon Islands including Malaita where the project is located can be source from the Solomon Islands Meteorological Service Division web page www.met.gov.sb and a brief description of the climate profile for Solomon Islands is in this section.

A. Climate

The Solomon Islands, lying within 12 degrees latitude of the equator and more than 1500km from the nearest continent, has a climate typical of many tropical areas, being characterized by high and rather uniform temperature and humidity and, in most areas, abundant rainfall in all months. Rainfall is the least uniform of these climatic elements, as topographical effects cause significant variations between locations. The Islands, because of their low latitude, are less subject to the damaging effects of tropical cyclones than elsewhere in the Southwest Pacific, though cyclones still pose a serious threat each year.

B. Atmospheric Circulation

The weather and climate of the region can be explained largely by the seasonal movement and development of the equatorial trough; a belt of low pressure that migrates between hemispheres following the apparent movement of the sun, and the subtropical ridge of the southern hemisphere (a belt of high pressure typically located at about latitude 30 to 35 degrees south).

From about January to March the equatorial trough is usually found close to, or south of the Solomons, and this is a period of West to North-westerly monsoonal winds. The heaviest rainfall at most places also occurs at this time. The equatorial trough is in the Northern hemisphere from May to October and the Islands then lie within the region of the Southeast trade winds; the trades being the stronger and more persistent winds blowing out from the subtropical ridge towards the equatorial trough. These winds are moisture bearing, having had a long path over the ocean and heavy rainfall can also occur during the South-easterly season, especially on the windward side of the Islands. The transition months between the two seasons are marked by a greater frequency of calm winds.

Because of the low latitude of the Solomons, atmospheric pressure has only a small variation from month to month and, unlike places in temperate latitudes, records little change from day to day except when a tropical cyclone is in the area. The lowest mean monthly pressure (for Honiara for example) at 9 a.m is 1007.6 hpa in January, when the equatorial trough is in the vicinity, and the highest 1010.9 hpa in August. The decrease of pressure from 9 a.m. to 3 p.m. is part of an atmospheric tidal effect caused largely by the alternate heating and cooling every 24 hours.

C. Rainfall

The average annual rainfall is mostly within the range 3000 to 5000 millimeters with the majority of monthly rainfall amounts in excess of 200 millimeters. In most of the Solomon, the wettest months are during the Northwest monsoon season, with a tendency for reduced amounts during February when the equatorial trough is normally furthest south. Places on the southern sides of the larger islands also tend to have a rainfall maximum between June and September.

As there are no elevated rainfalls stations (with long-term averages) the effect of increasing rainfall with height above mean sea level is unrecorded. Depending on the local topography, rainfall could be expected to increase with elevation with a maximum at about 600 to 1000

meters level on windward slopes. It is possible that the heaviest average yearly rainfall could reach 9000mm at some elevated sites. The extreme falls seem to be confined to the transition months of December and April when the equatorial trough is migrating across the islands. Between these months, the Northwest monsoon tends to give frequent rain but with lesser daily amounts. Very heavy daily falls can also occur during the South-easterly season at places well exposed to the prevailing wind. For example, the heaviest daily fall recorded, 380mm at Auki in April 1970, accounted for more than 40% of the station's rainfall for that month.

D. Temperature

The main feature of temperature in the Solomon Islands is its uniformity, with seasonal variation extremely small, and little variation with latitude evident.

The range of average maximum temperature is approximately 2 degrees Celsius throughout the year. The range of minimum temperature is almost the same. The mean daily range of temperature (or diurnal variation) is about 7 degrees Celsius. The differing exposure of each station to the prevailing wind and the effect of local topography in causing a downhill flow of cooled air at night at some stations are the main reasons for the variation between stations.

Although no temperature data for elevated stations are given here, a decrease of mean monthly temperature (calculated as the average of monthly maximum and minimum temperatures) of about 2 degrees Celsius for each 300 meters of elevation has been found in many tropical areas of the Solomon Islands. The diurnal range of temperature tends to be greater at an elevated station than at a place near the coast.

E. Relative Humidity

This is a climatological element, which, like temperature, shows little seasonal variation in the Solomon Islands but has a marked diurnal fluctuation. The lowest values occur near the time of maximum temperature and would be slightly lower than the typical afternoon values.

F. Wind

The seasonal nature of the prevailing winds in the Solomon Islands has already been mentioned. East to Southeast winds are usual from May to October and, although not usually as strong as in

other Pacific regions further South or East, still have a large degree of constancy. The typical speed of the winds over the sea, free from the influence of the mountainous Islands of the region, would be about 30km/hr. Stronger Southeast winds occur at times, possibly blowing at more than 40km/hr for several days, when the subtropical high-pressure belt is stronger than usual in the South.

West to Northwest winds from about November to April is usually lighter than the Southeast trades and much less persistent.

In addition to the seasonal winds, there is also a strong diurnal wind pattern caused by the islands themselves and several effects contribute to this. Over land areas the wind speed tends to increase during the morning, reaching a maximum during the afternoon at about the time of the maximum temperature, and then dying away at night to become light and variable or calm. In coastal areas, the greater heating of the land during the day allows a flow of air from over slightly cooler sea, the sea breeze strength being typically 20 - 30km/hr. Conversely, at night a land breeze can occur because of the more rapid cooling of the land. The offshore breeze is much weaker than the sea breeze. Finally, where there is hilly or mountainous terrain, cool and relatively dense air can flow downhill at night as a katabatic wind. If this reaches the coast, it can combine with the land breeze effect to give an offshore wind as strong as 20km/hr in the early morning. All of these effects are important in the Solomons in determining the daily wind pattern at any particular location.

G. Thunderstorm

Thunderstorms are a relatively frequent occurrence over the large and more mountainous islands, building up inland on many afternoons and, if winds are favorable, drifting later towards coastal areas. Over the ocean, storms are more likely to occur in the night or early morning. There is a minimum of thunderstorm activity during the south-easterly season and a maximum from about December to March.

H. Tropical Cyclones

A number of tropical low-pressure systems occur each year over the Solomon Islands at times when the equatorial trough is in the vicinity, but few of these develop into tropical cyclones

associated, by definition, with winds of at least gale force - 34kts). The average frequency of cyclone occurrence is between one and two per year, tending to increase southward. Because the cyclones that do affect the Solomon Islands are usually in the early stage of their life cycle, they are relatively small. Nevertheless, they can cause serious damage to structures, crops, forests and local water supplies and have caused loss of life in the past.

The tropical cyclone path is shown in the map below. Taking the red colored sections is the highest exposure to the risks of cyclone. However, Malaita is located north of the path the tropical cyclone which can feel the impacts of cyclone but not in the high rated paths.

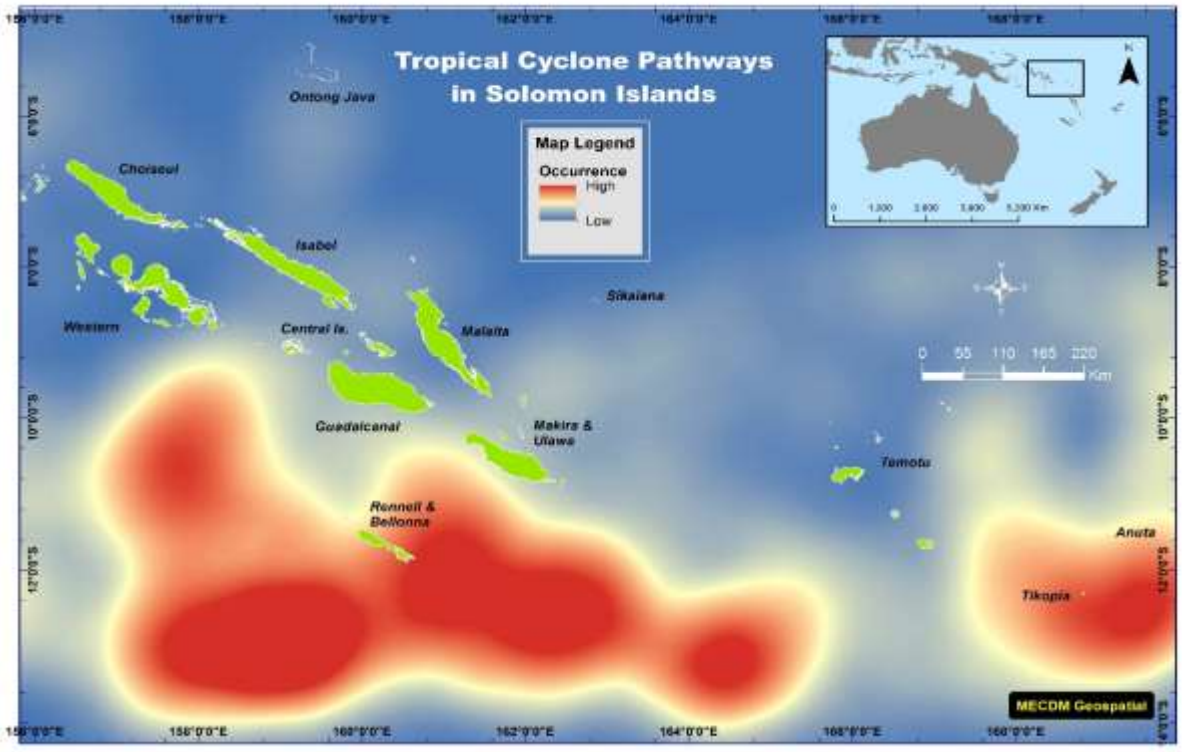


Figure 7: Tropical Cyclone Pathways for Solomon Islands

I. Strong Winds

These may be caused by the occasional tropical cyclone between November and April season, or thunderstorm squalls at any time of the year. A very intense cyclone would be rare but have winds of 200km/hr near its center.

The frequency of strong winds at places for which measured wind speeds are available is quite low. Strong winds (the speed averaging at least 39km/hr are likely on less than six days each year.

J. Fog

The occurrence of fog in coastal plain areas is quite unusual. Fog is likely to occur more often inland. In elevated valleys where it would be a common event overnight and in the early morning.

5.2.2 Topography and Landscape

The site is a low lying flat waste land south –North Slope of about 8.1% gradient at 21m above sea level to 0.2% at 2m above sea level. The main road run on the foot hills of the incised ridges in westerly from Kwaunasu'u to Upper Kwai River and extends at the bottom of the bay.

Generally, the site is situated on the 2m above sea level (ASL) and gently increasing its rise to about 60m on the main public road access as shown in the figure below.

Figure 8: Site Elevation Map

Vegetation covers of the site is mainly waste land predominantly mangroves, small shrubs and regrowth. The site was previously used mainly for planting swamp taro (Kakake) food security purposes before it was acquired. As a waste land, occurrences of surface run off during heavy rain was observed, which all surface water are pooled at the bottom of the foothill and spread into low lying area.

5.2.3 Geology

In General, the geology of North Malaita is classified under two major and oldest formations, the **Malaita Volcanics** which is dominant by extrusive basaltic lithology and the **Malaita Calcareous sediments**. These two formations hold the basis and oldest group which underlain the youngest and also the recent formations such as, Kwarae mudstone, Suafa limestone and rokera limestone are sighted. This sequence is the characteristic of "Pacific Province" (Coleman,

1965) of which Malaita is the major element in Solomon Islands. The tectonic settings in North Malaita can be summarised with the following stratigraphy and nomenclature outline below:

Table 4: Stratigraphy of North Malaita

GEOLOGY SUCCESSION	LITHOLOGY	AGE
Riverine and beach Deposits	ALLUVIAL TERRACE	< 20m Pleistocene to Recent
Rokera Limestone	CALCAREOUS	< 50m Pleistocene
Lau Limestone	CALCAREOUS	< 50m Pleistocene
Tomba Limestone	CALCAREOUS	> 100m Pliocene
Suafa Limestone	CALCAREOUS	750m Miocene - Pliocene
Haruta Calcisiltite		
Alite Limestone	CALCAREOUS	1,000m Upper Cretaceous - Eocene
Kwara'ae Mudstone	CHERT	< 100m Upper Cretaceous
Malaita Volcanic Group	BASALTIC	>1,000m Pre-upper Cretaceous

The formations are classified according to their age and groups. The oldest group are the Malaita volcanic group while youngest and recent formations are the Lau limestone and Rokera limestone. Therefore, the local geology of Suava is predominant by **Calcareous limestone**.

5.2.4 Hydrology

A hydrological assessment was carried out on the two big river systems namely Kwai and Taba'a rivers. It includes assessment of the potential impacts on the proposed fisheries growth center during both the construction and operational phases, outlines possible mitigation measures that will reduce the impact of the fisheries growth center on the hydrology of the watercourse. Changes in hydrology may have implications for fluvial geomorphology and water quality (SOPAC, 2007)

The intense sun and warm water of the equator heats the air in the ITCZ raising its humidity and making it buoyant. Below shows a graph (Figure 1) depicts of the recent Average temperature and Precipitation for North Malaita extracted from a Meteoblue. Earth works and construction activities on site must consider the weather pattern in order to mitigate and minimize any disruption of work due to effects the climate may cause.

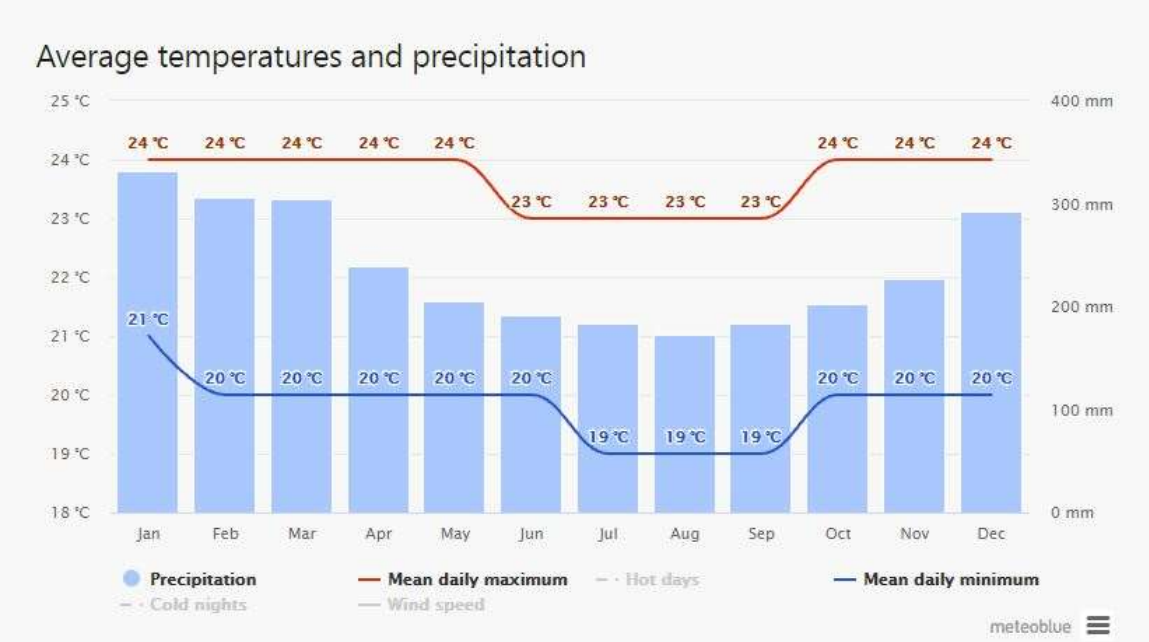


Figure 9: Average Temperature and Precipitation for the region

Suava Bay Rainfall is generally high, but with distinctive wet and dry seasons during the year associated with the trade winds and orographic effects, i.e. a localized effect imposed by the topography of the islands. The average annual rainfall is mostly within the range 1,500 to 5,000 mm on the larger islands, the total exceeding 8,000 mm on high peaks (IOH, 2015). In most of the Solomon Islands, the wettest months are November to April during the North-west monsoon season, with a tendency for reduced rainfall during February when the equatorial trough is normally furthest south.

Rivers are visible at the Suava Bay Catchment area due to this high rainfall pattern. There are two main rivers; Kwai River and Taba'a River (see Map, Exhibit 2). Other streams also flow into Kwai River and Taba'a River. Furthermore, these two main rivers can experience flooding during the wet seasons of the year. Rocks and debris are washed down into the rivers to the coastal areas. Communities living along the rivers are prone to this flooding every year.

5.2.5 Air quality

According to the 2020 World Air Quality Report IQAir report that was produce in 2020 for 106 countries. The report analyzes PM2.5 data reported by ground-level monitoring stations around the world, as aggregated through IQAir's air quality information platform. The study was done by comparing PM2.5 levels across the globe including Oceania.

The finding shows that Oceania is the world's cleanest region for annual mean air quality. However, this region is also susceptible to extreme short-term air pollution events, such as wildfires and dust storms caused by neighboring industrialized countries.

For Solomon Islands, it has not engaged in any massive industrial activities that will had adverse effect to air quality. Likewise, for the project site and surroundings, the air quality would be the same anywhere in the country.

Figure 9 and Figure 10 shows air quality for Oceania region and Air quality levels.

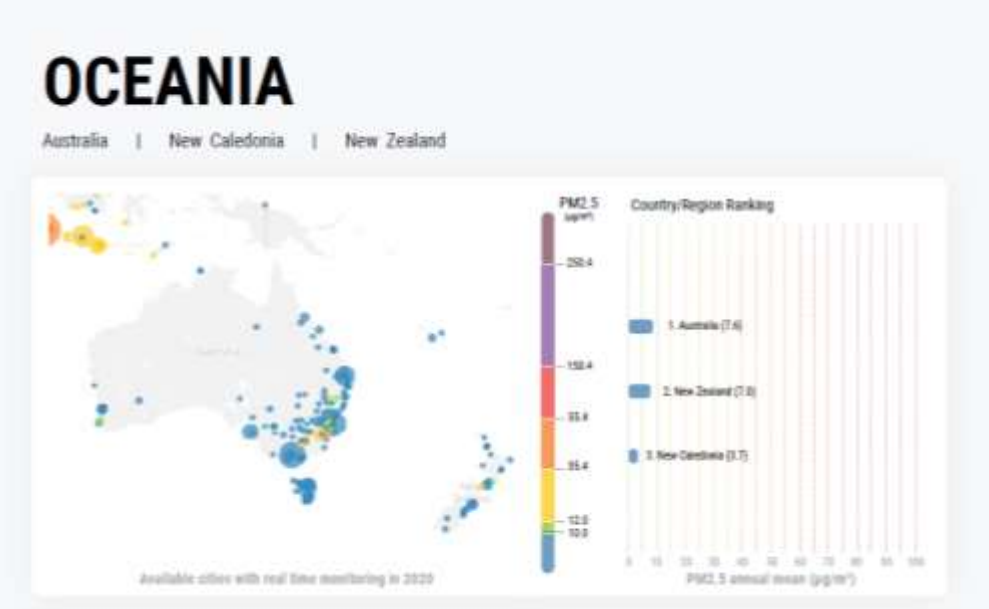


Figure 10: Air Quality for Oceania region

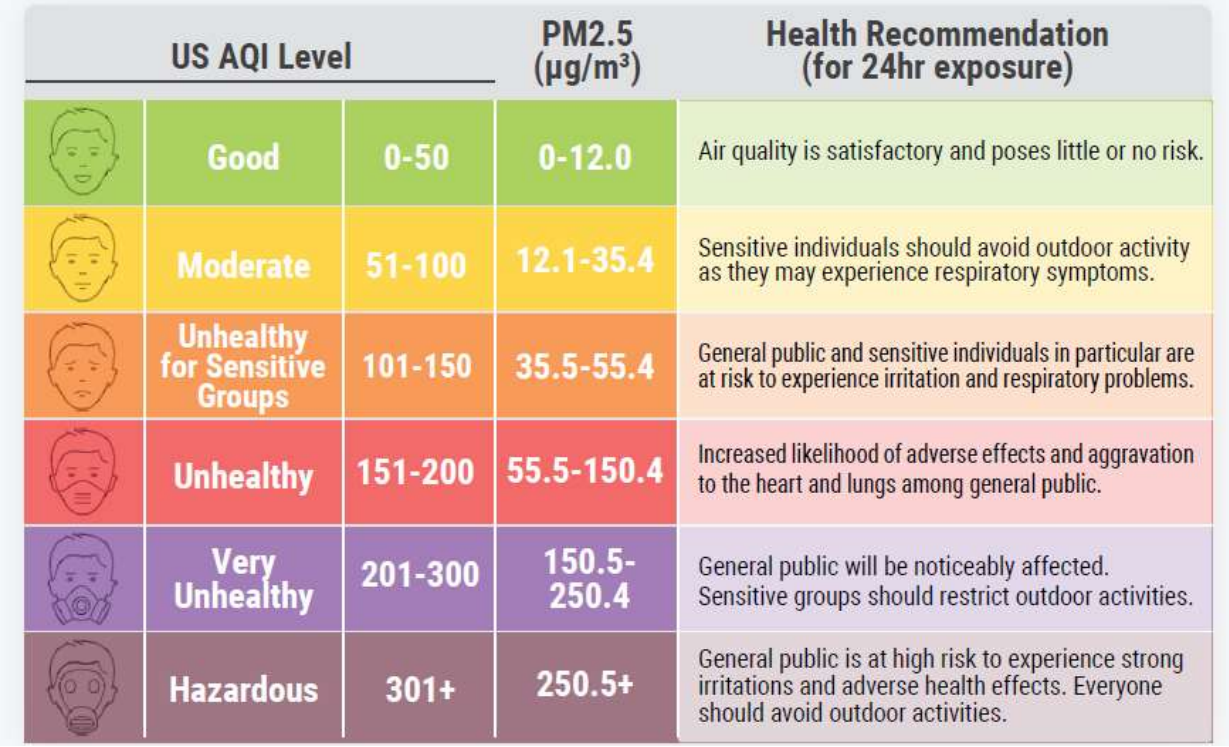


Figure 11: Air Quality Levels for 24hr exposure

Moreover, careful planning is required for during heavy construction works on soil and other materials emitting dusts, smokes and other hazardous particles and substances in the air.

5.2.6 Surface Water and River Bed Sediments Quality

North Malaita region has many rivers, streams, wetlands and other water bodies. From Manakwai in the West to Kolofe in the East there are about 8 rivers and also streams, lake and wetlands. Water quality parameters which are considered for baseline assessment in this environmental impact statement are provided in Table 5 below.

Sample collection and on-site analyses were carried out by the WECS staff on 24th September 2021 and water samples analyzed by Geochemistry Laboratory, Ministry of Mines, Energy & Rural Electrification. National Public Health Laboratory in 8th October 2021. The only exception was for nitrate and phosphate analysis which would be done by done later when arrangement is confirmed with MCILI.

A water quality assessment was undertaken for water sources from Taba'a, Kwai Rivers and streams within the project boundary. The surface waters within the project area are drained into a 1-meter depth drain constructed along the perimeter of the project area (approx. 10 hectares).

Ground water spring out at about mean sea level and drain into the drain from which water samples were collected for analysis and presented in this report.

Through visual observations, ground water actually is the swamp water that looks murky and has this typical muddy smell. This water is highly subjective to saltwater intrusion during high tide due to the low laying topography (approximately 1m above sea level) of the project area. Therefore, as per result table below the wetland water salinity measured ranging between 20 and 30 parts per thousand (ppt) makes it not recommendable for consumption as per WHO standards (Table 5).

Water samples were collected at sampling points along streams more than 100 meters from the coast line. At that distance, the salinity measured was similar to that of marine surface water (see Table 5 & 7 below).

For samples FW3A & FW4B showed a low measure of salinity due to moderating effect of the mangrove ecosystem in slowing down the flow of sea current inland during high tides. The water PH is recorded at 8 and 9 and with high levels of dissolved oxygen. This agrees well with high flow of water current as tide rushes inland bringing in seawater making the water more brackish.

Table 5: Physical parameters of surface water within project area

No.	Sample ID	GPS positions	PH	Total dissolved solid (Mg/l)	Salinity Ppt	Dissolved Oxygen in (Mg/l)	Dissolved Oxygen in %	Turbidity (Mg/l)	Temp. (Degree Celsius)
1	FW1A	S08 22 32.1 E160 42 37.7 Elv. 1m	8.77	31077	31.80	7.35	100	15	21.9
2	FW2A	S08 22 35.3 E160 42 37.4 Elv. 0m	9.00	30173	30.18	7.08	97.5	21	22.9
3	FW3B	S08 22 30.6 E160 42 25.3 Elv.3m	9.95	512	0.38	8.14	94.2	9	23.1
4	FW4B	S 08 22 32.8 E160 42 25.1 Elv. 1m	8.74	22345	21.7	7.00	94.2	14	22.6
5	FW5C	S08 22 33.4 E160 42 31.1 Elv. 12m	8.74	25279	24.76	6.93	95.0	13	23.4

NB. Noted that other chemical and biological parameters of the surface water will be collected and presented later due to limited resources and other challenges faced during time of data collection.

Table 6: WHO Water Quality Standards

Parameter	Description	Threshold level	Units	Threshold notes	Authority/Source
pH	A measure of the acidity or alkalinity of a solution.	6.5 - 8	pH	Recommended pH levels for safe drinking water.	Environmental Protection Agency, USA.
Biochemical Oxygen Demand (BOD)	Biological Oxygen Demand (BOD) is a measure of the oxygen used by microorganisms to decompose organic waste. If there is a large quantity of organic waste in the water supply, there will also be a lot of bacteria present working to decompose this waste. In this case, the demand for oxygen will be high (due to all the bacteria) so the BOD level will be high. As the waste is consumed or dispersed through the water, BOD levels will begin to decline. Nitrates and phosphates in a body of water can contribute to high BOD levels. Nitrates and phosphates are plant nutrients and can cause plant life and algae to grow quickly. When plants grow quickly, they also die quickly. This	1 - 2	ppm	Very good water quality	Center for Innovation in Engineering and Science Education (CIESE), Stevens Institute of Technology, Hoboken, New Jersey. http://www.k12science.org/curriculum/waterproj/bod/
		3 - 5	ppm	Moderately clean	
		6 - 9	ppm	Somewhat clean	
		100>	ppm	Very polluted with Organic waste	

	contributes to the organic waste in the water, which is then decomposed by bacteria. This results in a high BOD level.				
Chemical Oxygen Demand (COD)	**COD** or Chemical Oxygen Demand is the total measurement of all organic substances **in the** water that can be oxidized rather than just those resulting from microbial organic activity alone (as measured by BOD). COD is usually used in conjunction with BOD. Because COD is a measure of total oxygen. It is usually higher than BOD when measured together for the same water body.	<250	mg/L	This is the limit for water from effluent sources that can be used for irrigation	
Total coliforms and *Escherichia coli* for freshwater and *Enterococci* for marine waters	Total coliforms are not a health threat in themselves. They occur naturally in human intestine and in water bodies. Fecal coliform such as *E. coli* occur naturally in the human stomach. *An E coli level in particular is* used as an indicator of whether potentially harmful bacteria from fecal waste are present in the water or not. It should however be noted that E. coli cannot be used as an indicator for many other harmful pathogens.	0	MPN / 100ml of water	WHO recommends that drinking water should be 0 MPN/100ml of water.	https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations#Microorganisms

Nitrates	Nitrate is a plant nutrient that can stimulate algal blooms. It can also be toxic to humans and aquatic life at high concentrations.	0.06	mg/L	For aquaculture purposes for some fish (e.g. sensitive fish such as salmon).	https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations#Inorganic. US Public health service
		4	mg/L	Maximum concentration allowed in human drinking water	
Phosphates	Do not pose human health risks, however main concern is that it may stimulate algal blooms at high concentrations approaching 0.1 mg/L in large streams subsequently resulting in eutrophication that may lead to decline in water quality.	0.1	mg/L	<0.1 mg/L in large streams to prevent algal blooms	Wilkes University Center for Environmental Quality Environmental Engineering and Earth Sciences http://www.water-research.net/watrqualindex/index.htm.
		0.01	mg/L	<0.01 mg/L in small streams to prevent algal blooms.	

Dissolved Oxygen	This is a measure of the concentration of oxygen in water. Oxygen is Important for survival of aquatic animals. An important indicator of water quality. May be low in ground water.	0-2	mg/L	Not enough oxygen to support life. However, this may be typical of ground water.	Wilkes University Center for Environmental Quality Environmental Engineering and Earth Sciences http://www.water-research.net/watrqualindex/index.htm.
		2 - 4	mg/L	Only a few fish and aquatic insects can survive	
		4 - 7	mg/L	Good for many aquatic organisms	
		7 - 11	mg/L	Very good for most stream fish	
Turbidity	Turbidity is a measure of the cloudiness of water. It is used to indicate water quality and filtration effectiveness (such as whether disease-causing organisms are present). Higher turbidity levels are often associated with higher levels of disease-causing microorganisms such as viruses, parasites and some bacteria. These organisms can cause symptoms such as nausea, cramps, diarrhea, and	0.5 - 1	Nephelometric Turbidity Units (NTU)	Drinking water	https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations#Microorganisms Wilkes University Center for Environmental Quality Environmental Engineering and Earth Sciences

	associated headaches.				http://www.water-research.net/watrqualindex/index.htm.
Salinity	Salinity is a measure of the total salt concentration, comprising mostly of Na^+ and Cl^- ions as well as small quantities of other ions (eg. Mg^{2+}, K^+, or SO_4^{2-}). It is the total of all non-carbonate salts dissolved in water.	0	ppt	This is generally the levels in freshwater	Wilkes University Center for Environmental Quality Environmental Engineering and Earth Sciences http://www.water-research.net/watrqualindex/index.htm.
		1 - 35	ppt	Natural levels in areas where freshwater and salt mix. 35ppt is usually the levels in oceanic water.	
Total suspended solids (TSS)	Suspended solids include silt, stirred up bottom sediment, decaying plant matter, or sewage treatment effluent.		mg/L	No clear thresholds given. According to Canada Council for Ministers of Environment. Threshold is defined as maximum concentration above normal at any given	Wilkes University Center for Environmental Quality Environmental Engineering and Earth Sciences http://www.water-research.net/watrqualindex/index.htm.

				time.	
Total dissolved solids (TDS)	Dissolved solids in freshwater include soluble salts that yield ions such as Na^{+}, Ca^{2+}, Mg^{2+}, HCO_3^{-}, SO_4^{2-}, or Cl^{-}. If TDS levels are high, especially due to dissolved salts, many forms of aquatic life are affected. The salt acts to dehydrate the skin of animals and high concentrations of dissolved solids can add a laxative effect to water or cause water to have an unpleasant mineral taste.	50 - 250	ppm	Natural levels in water	Wilkes University Center for Environmental Quality Environmental Engineering and Earth Sciences http://www.water-research.net/watrqualindex/index.htm.
		25 - 500	ppm	Levels allowable in drinking water	

(Sources: Adopted from Ministry of Fisheries and Marine Resource - EIS Report, 2020)

5.2.7 Groundwater

Ground water (GW) was encountered at depths of 0.3m – 0.6m at the surrounding site and 2.1m at the Fill area. Furthermore, it should be noted that GW is also susceptible to various environmental and man-made factors, such as precipitation, nearby subsurface construction activities, changes in area drainage, landform and topography.

Water quality assessment was undertaken for groundwater within the project site. Since the prevalent landscape at project site is a coastal swamp and flatland the ground water is basically more saline near the coast and drops off as one moved inland. The physical water property showed high concentration of dissolved solids > 512ppm with murky color and strong muddy redolence. The ground water comes out on the surface to form the wetland ecosystem. Furthermore, after drainage work improvement on the area was done around 2017 by a local contractor, groundwater sprang out and collected into a 1-meter depth drain constructed along the perimeter of project area and hence had similar water quality properties as in Table 4. Therefore, ground water is not suitable for personal consumption but recommended for washing and other uses.

However, it is recommended that for drinking water bore hole must target aquafer at significant depth (greater than 2 meter).

5.2.8 Coastal Marine Waters and Marine Sediments

The coastal marine water span over mangrove forest, intertidal zone, fringing coral reef and offshore zone. The marine waters are subject to tidal movements and influx of freshwater from Kwai River and the surrounding wetland ecosystem. Three sample points were taken (MT1, MT2 and MT3) as tabulated on Table 7 below. Samples were collected during high tide at around 5PM in the evening. Obviously, marine water had high total dissolved solute (in Mg/L) because of inputs from gravel extraction from Kwai River for backing filling work conducted by Exodus Company limited.

Table 7: Physical parameters of marine waters and bottom water plus sediments (at 10m depth) collected at 3 different points with sampling points within project site

No.	Sample ID	GPS positions	PH	Total dissolved solid (Mg/l)	Salinity ppt	Dissolved Oxygen in (Mg/l)	Dissolved Oxygen in %	Turbidity (Mg/l)	Temp. (Degree Celsius)
1	MT1	S08 22 24.1 E160 42 29.4	8.04	31780	32	7.29	100	20	22.1
2	MT2	S08 22 23.8 E160 42 33.1	8.75	32370	33.5	7.09	97.5	12	22.1
3	MT3	S08 22 27.5 E160 42 37.6	9.02	32775	33.10	7.16	97.6	20	22.1

Similarly, surface sea water properties were observed in another EIS water sampling work conducted at another government project site in Aruligo, Northwest Guadalcanal, which showed an average salinity measure of 30ppt. Similar observations were also made for pH and dissolved oxygen (Mg/l) although slight variations in concentration measures for other physical and chemical parameters.

Unfortunately, there is slight delay in sampling work for heavy metals and other chemical parameters (BOD, COD, and Phosphate & Nitrate) will be conducted later. Intertidal zone frequently subjects to inputs of substances from inland areas and has the property to trap substances and convenient for sampling and monitoring work.

5.2.9 Nitrate and Phosphate Levels of Surface Water, Ground water and Marine Water at the Site.

Nitrate and Phosphate levels in freshwater and marine waters will be collected, analyzed and presented under this section. These two nutrients are well known for causing algal bloom in the aquatic environment given their limited presence in the marine environment. Nitrogen and Phosphorus are required by aquatic plants for growth and has been reported as the key limiting nutrients in most aquatic ecosystem (https://www.intechopen.com/chapters/64674).

5.3.0 Offshore marine waters and sea floor sediments

Offshore marine waters afore zone of the project area is subjective to mixing due to the active hydrographic flow within Suava Bay. According to Mr. William Billy and William Tiuside (Personal Interview, September 25, 9, 2021) aged fishermen, said the tide moves in anti-clockwise flow during low tide and clockwise during high tide within the bay. Moreover, a thorough hydrological and bathymetric studies of the bay would confirm this observation.

Analysis of water quality parameters including nitrate and phosphorus will be conducted later when needed resources are available. Also given the high dynamic nature of the environment, it is possible to collect water samples to test for E-coli and coliforms bacteria and hydrocarbon test. Samples will be collected, analyzed and insert into the final report for submission to MCILI.

Table 8: Showing physical parameters of bottom sediments plus water at 5 -10m depth in the foreshore zone

No.	Sample ID	GPS positions	PH	Total dissolved solid (Mg/l)	Salinity ppt	Dissolved Oxygen in (Mg/l)	Dissolved Oxygen in %	Turbidity (Mg/l)	Temp. (Degree Celsius)
1	BSW1	S08° 22' 05.0" E160° 42' 34.9"	8.80	11106	10.06	3.91	51.0	1443	24.2
2	BSW2	S08° 22' 14.9 E160° 42' 31.0	8.58	32170	14.00	4.19	56.0	276	24.3

The result showed that at 5-10m depth the salinity reduced to one third of salinity measure on the surface water sample (32ppt). Sediment influx due to gravel mining along Kwai river by a local contractor is obvious on the inshore and foreshore regions as recorded with high total dissolved solid (Mg/l) in Table 7 above.

There is still need to collect sediment samples at 10-meter depth and to be analyzed for heavy metal contents and other chemical parameters fitting for this EIS report as baseline for future development of wharf and other similar developments.

5.3.1 Ocean Circulation

Global ocean circulation can be divided into two major components: i) the fast, wind-driven, upper ocean circulation, and ii) the slow, deep ocean circulation. These two components act simultaneously to drive the MOC, the movement of seawater across basins and depths.

As the name suggests, the wind-driven circulation is driven by the prevailing winds, primarily the easterlies in the tropics and the westerlies in the mid-latitudes.

As the winds blow above the ocean surface, the upper ocean moves in a balance of frictional and Coriolis forces known as Ekman transport. This mechanism drives a net transport of

water that is perpendicular to the wind (to the right in the Northern Hemisphere and left in the Southern Hemisphere). This transport results in areas of divergence and convergence that lead, respectively, to upwelling (i.e. upward motion

Ocean circulation plays a central role in regulating climate and supporting marine life by transporting heat, carbon, oxygen, and nutrients throughout the world's ocean. As human-emitted greenhouse gases continue to accumulate in the atmosphere, the Meridional Overturning Circulation (MOC) plays an increasingly important role in sequestering anthropogenic heat and carbon into the deep ocean, thus modulating the course of climate change. Anthropogenic warming, in turn, can influence global ocean circulation through enhancing ocean stratification by warming and freshening the high latitude upper oceans, rendering it an integral part in understanding and predicting climate over the 21st century. The interactions between the MOC and climate are poorly understood and underscore the need for enhanced observations, improved process understanding, and proper model representation of ocean circulation on several spatial and temporal scales.

General patterns of the wind-driven circulation are shown in Figure 11 as a series of zonal currents (e.g. North Equatorial and South Equatorial currents), eastern boundary currents (e.g. California and Chile/ Peru Currents), and western boundary currents (e.g. Kuroshio Current and Gulf Stream) that form the subtropical and sub polar gyres.

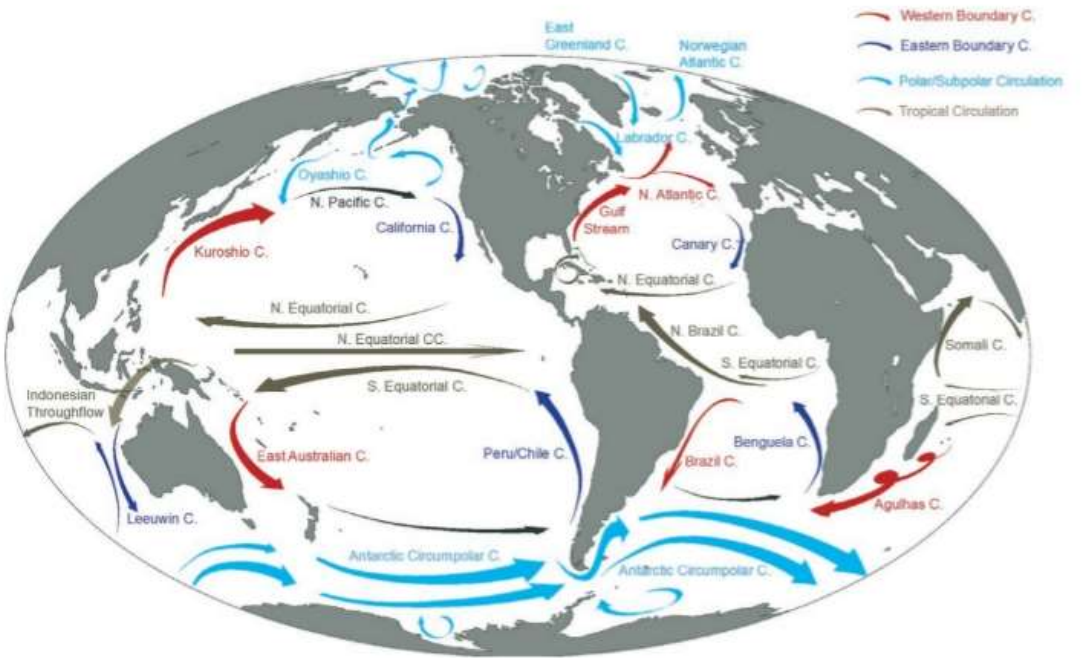


Figure 12: The wind-driven surface ocean circulation. Driven by winds, the surface currents form the main subtropical. (Source: B. Delorme and Y. Eddebbar)

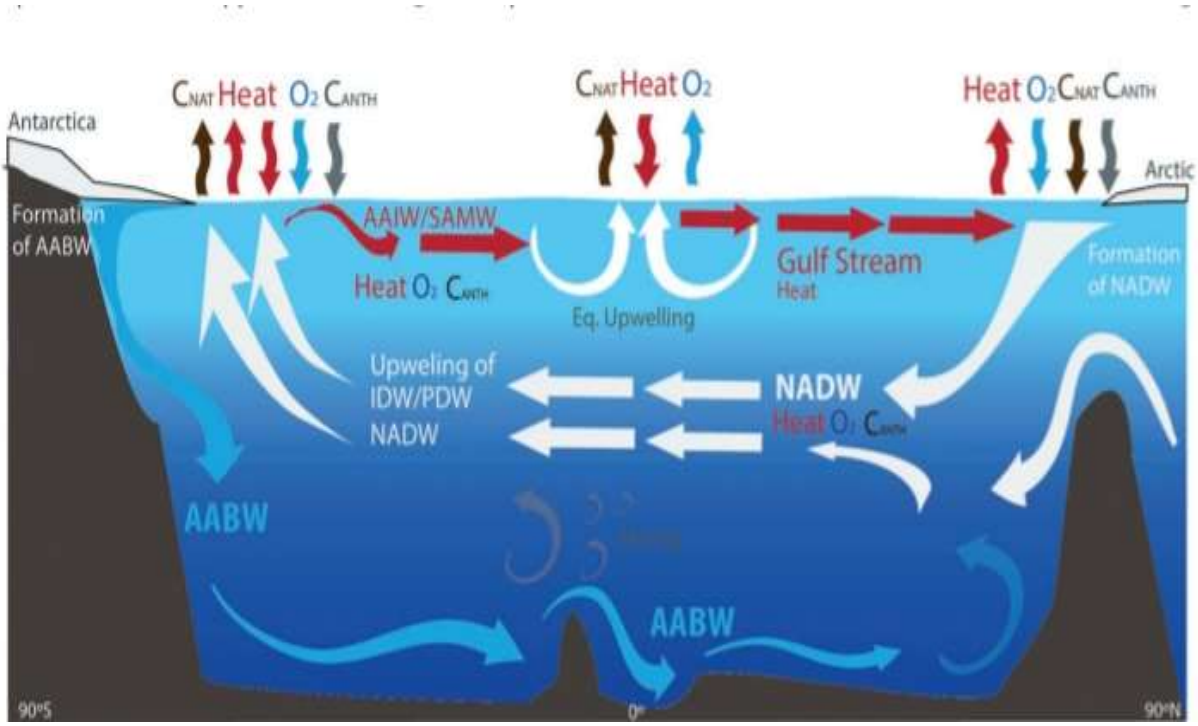


Figure 13: Illustration of the Meridional Overturning Circulation and its impact on the mean air-sea flux

5.3.2 Soil

According to the geotechnical investigation conducted for the site, the soils samples are obtained and tested in the MID Soil Laboratory Testing. The results of the soil descriptions of site can be found on page 22 – 27 of the Geotechnical Report in Exhibit 3 of the Annexes.

5.4 Biological Environment

5.4.1 Wetland Ecosystem

Wetland is a physical habitat that is inundated or covered by water at least for some time and supports flora best adapted to water saturated soil (Reece, Jane, Meyers, Noel & Urry, Lisa & Cain, Michael & Wasserman, Steven, & Minorsky, Peter, Jackson, Robert, Bernard and Neil, 2015)[1]. The wetland habitat at project site has high water saturation and during wet weather and spring tide fully inundated with water. Flora are those typical of wetland environment in the Suava bay in north Malaita region.

5.4.1.1 Wetland Ecosystem Flora and Fauna

i. Wetland Assessment

Terrestrial habitat of the project area was surveyed to identify the key fauna and flora present. Baseline inventory of vegetation and flora and fauna. Survey looks at vegetation composition and structure of each major environment type present in the project area (SPREP, 2014)[2]. Biodiversity assessment and environment status assessment. This will set a baseline to ensure change/stress caused by proposed development will be measured to determine impacts.

ii. Approach/ Method

Typical transect method would be used. Three Transect lines at 350m positioned at North to South direction in a longitudinal orientation at almost 100m apart. Quadrat 20m x 20m will be placed at 50m along the transect line and observation made and recorded. A control sample transects will be allocated at each end of transect line in nearby area undisturbed. For bird sampling, observations were made at stop(s) or intervals in the project area as per method described by Atherton and Jefferies, (2012)[3].

iii. Materials

[1] Reece, Jane B. & Meyers, Noel. & Urry, Lisa A. & Cain, Michael L. & Wasserman, Steven A. & Minorsky, Peter V. & Jackson, Robert B. & Cooke, Bernard J. & Campbell, Neil A. (2015). Campbell biology. Frenchs Forest, NSW: Pearson.

[2] Guidelines for undertaking rapid biodiversity assessments in terrestrial and marine environments in the Pacific / Brian Patrick – Apia, Samoa: SPREP, Wildlands, 2014.

[3] Atherton J. and Jefferies B. (Editors) 2012: Guidelines for Undertaking Rapid Biodiversity Assessments in Terrestrial and Marine Environments in the Pacific. SPREP. Apia, Samoa. 174p.

- 2x 100m Tape Measure.
- 1 x GPS
- Maps of Project area
- Bush knife
- Ropes/Nylon x 2 rolls
- Plastic clip-seal bags- collection of specimen
- Digital camera + batteries
- Plan identification card.
- Tape
- Torch + batteries
- Record Sheets

Key flora and fauna species recorded on data collection sheets for further analysis.

As depicted on Exhibit 2F and 2G of the Annexes above is the proposed project area boundary enclosed with red line. The total area is estimated around 10 hectares and located within the swamp or wetland area.

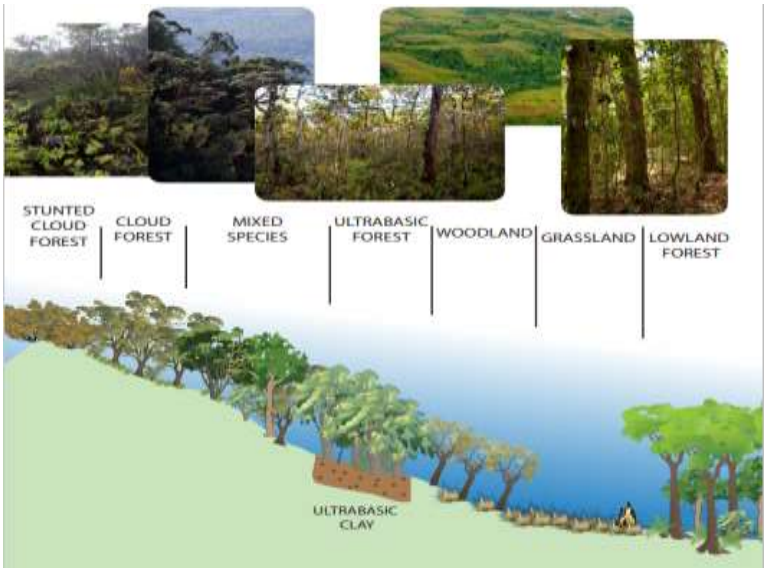
iv. Introduction

Solomon Islands has been known for its high species diversity and high levels of endemism to its terrestrial fauna and flora. The high level of biodiversity of plants includes around 4,500 species of plants, 3,210 of which are known to be native. The known plants are mostly made up of 2763 species of angiosperms (dicots and monocots), 22 species of gymnosperms and 367 species of *pteridophytes* (true ferns and fern allies). Even though plant diversity is high with endemism considered generally low 57% of palms, 50% of orchids, and 75% of climbing Pandanus species are considered endemic. Sixteen (16) species have been listed under the IUCN Red Data list as threatened. Several other species continue to be threatened. These include ebony, rosewood, rattan and some palms. The islands with the highest rate of endemism are Santa Cruz (Temotu) and Guadalcanal.

The main groups of flora include 340 species of ferns, 277 species of orchids, 33 species of palms, 26 species of other nuts (e.g., ngali nut, cut nut and alite nut), 20 species of *pandanus*, 14 species of *Eleocarpacae* trees, and 11 species of shrubs as sighted in EIA report prepared by Wendy M., Jaysie B., and Salome P., for Ministry of Fisheries and Marine Resources in 2020 for Aruligo Aquaculture development facility (Wendy M., 2020).

v. Description of survey area

The vegetation associated with the project site has been highly modified and completely cleared previously during site clearance work conducted by local communities in around 2016. Vegetation found within the project boundary are secondary regrowth which has naturally recolonized and patch of original forest in a Taboo site (S'08'22'34.9 E160*42'33'.9) present within project site.



According to the diagram, Kwatanaere project site can be categorized as LOWLAND Forest. More specific the project is located on a lowland but dominantly coastal swamp forest. Given the low level above sea level this forest is highly subjective to salt water intrusion.

Figure 14: Project Site Physical Environment Classifications

Source: Diagram adopted from Lavery TH., Pikacha PG., & Fisher DO. 2016.

The project site was previously a natural coastal flat land fragmented into swamps, creek, streams, mangroves and coastal forest. The location was used for gardening by the nearby residents who grew Sago palm, sweet potatoes, bananas, cassava and other fruits and vegetables (Figure 4). Flora species which occur within the area are listed in Table 8, all of these species are common species which also occur within the Suava Bay and areas near the project site.

vi. Terrestrial Flora

It was observed during this assessment that all the main groups of flora such as angiosperm, gymnosperm, ferns, bryophytes and fungi have been observed at the project site. These groups are typical of a tropical coastal and or swamp forest in the main bigger Islands of the Solomon Islands. Such observation colludes well with findings by Lavery at el which

described typical features of a lowland forest across Solomon Islands. Hence, the flora most common in the project site are presented in this section.

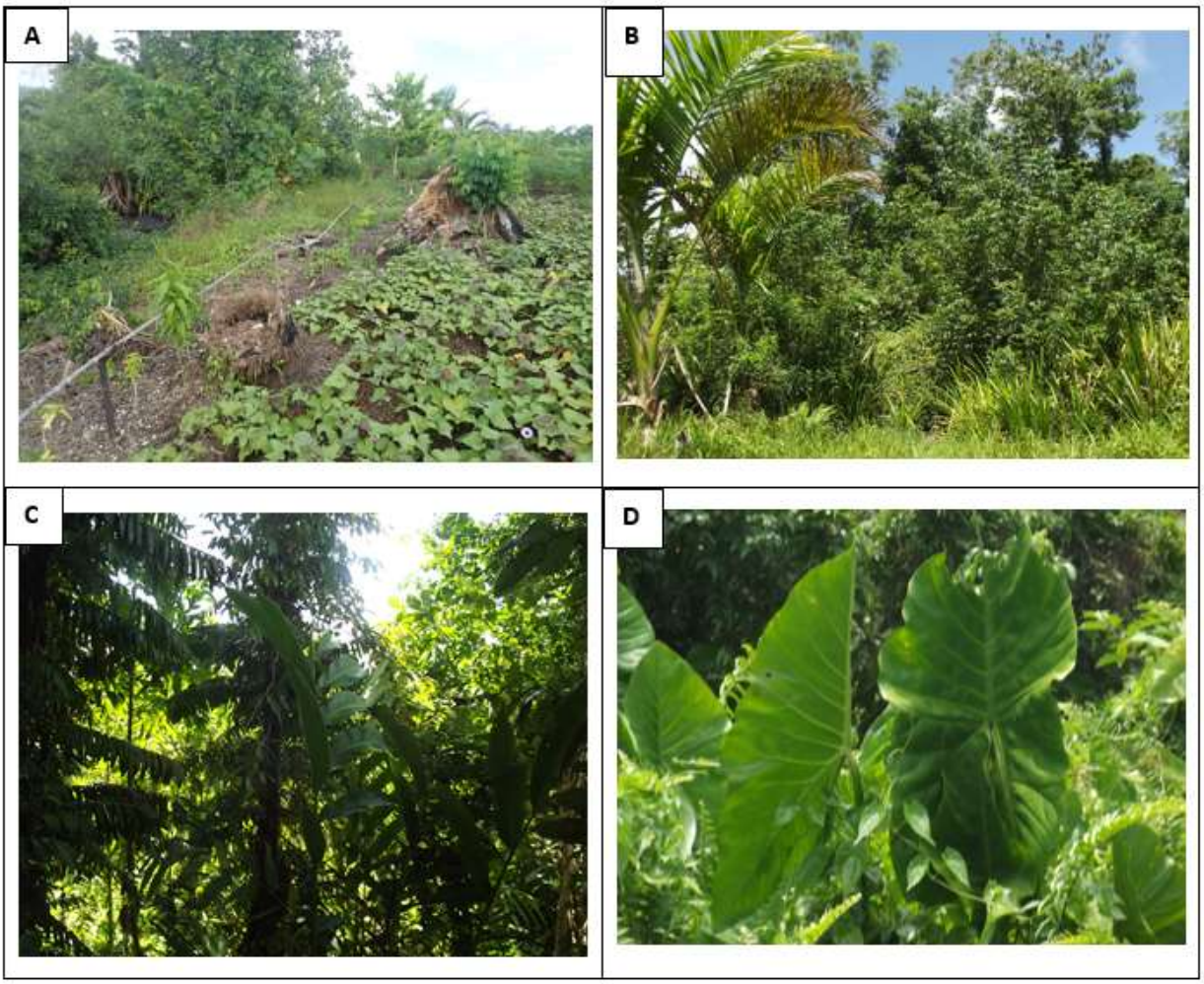


Plate 1: Typical Vegetation growth within the project site

Notably there is no IUCN red listed species observed within the project area. Species observed are typical of any coastal swamp ecosystem in North Malaita. In fact, the local resources owners regard the land as waste land that is the reason why they decided to sell it to the Solomon Islands government. According to Mr. William Tiuside, the swamp area was primarily used for swamp taro gardening, provision of timber, firewood, medicinal ingredients and many more. The stable food in Suava Bay area is swamp taro (*Cyrtosperma merkusii)* as shown on Plate 1B above. This agrees with observation by Ministry of Agriculture and Fisheries country technical report to FAO international technical conference on plant genetic resources in 1996, which listed swamp taro as one of the stable food crop in Solomon Islands. Such provision of basic environmental goods and services will be disrupted when the project is implemented on the ground.

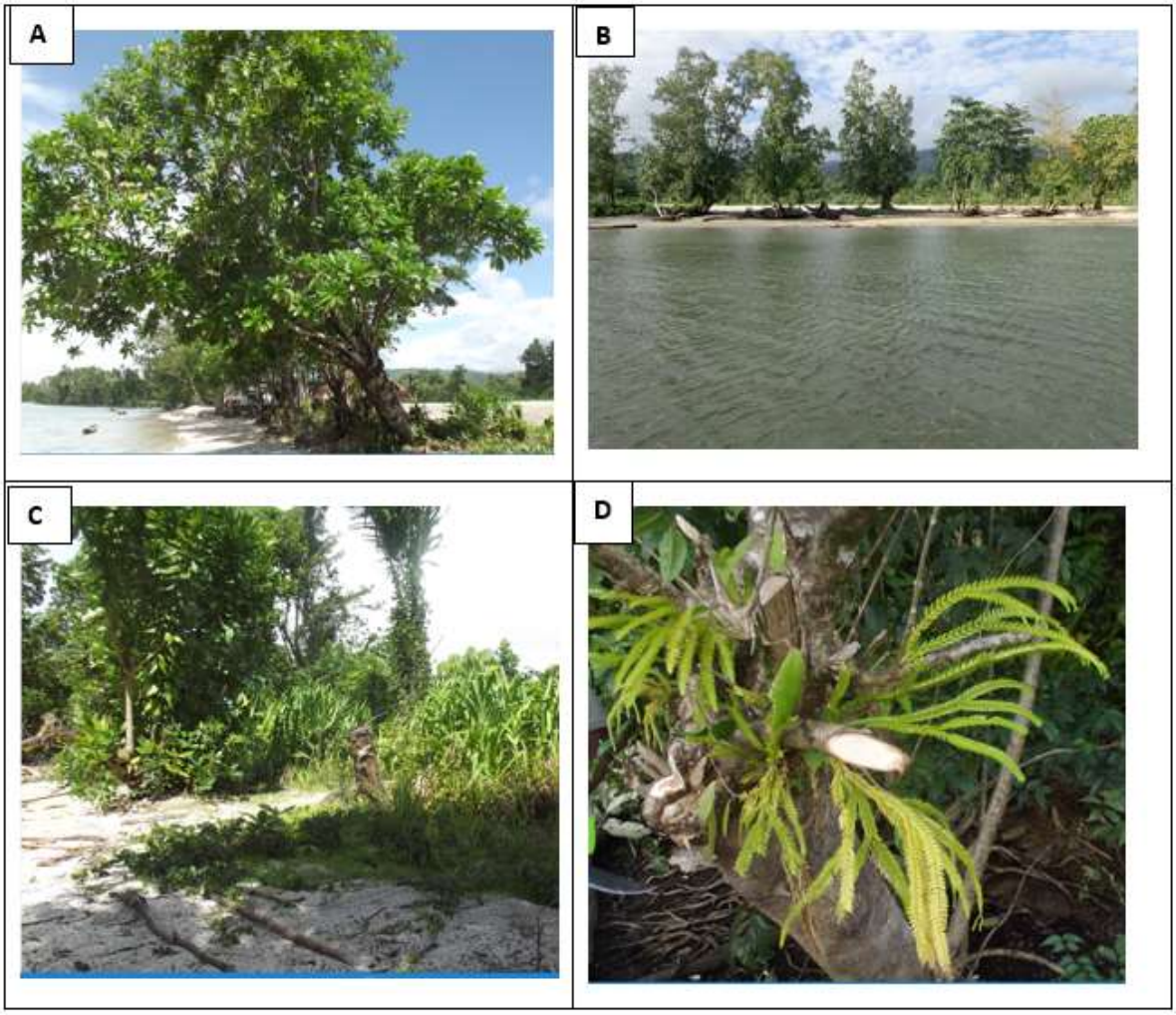


Plate 2: Typical Coastal vegetation associated within the project area.

Plate 2 above shows the common coastal flora typical of the project site and coastline on the southern coast of Suava Bay in North Malaita. Most of the plant species are endemic and their roles in provision of environmental services such as control of coastal erosion is prominent. The trees are found only within 10 meters from high water mark. The typical trees include *Terminalia sp, Intsia bijuga*, *Callophyllum inophyllum, Morinda citrifolia and Knema globularia*. Other flora species such as coastal pandanus, ferns and epiphytes (See Plate 2D). Thus, the environmental goods and services that these plants provide are predicted to be altered by the proposed Suava ECG development earmarked for the project site.

Table 9: List of Hardwood species observed within the project area.

No.	Scientific name	Local Name	T1	T2	T3	Mean Count	Control	Common Uses
1	*Intsia bijuga*	U'ula (Koila)	0	1	2	1	2	Timber/Medicine
2	*Terminalia catappa*	Alite (Coastal nut)	0	2	7	3	1	Timber & Medicine
3	*Callophyllum inophyllum*	Dadaku	0	1	10	4	2	Timber & Medicine
4	*Artocarpus altilis*	Kekene/Breadfruit	1	3	0	1	0	Timber & Medicine
5	*Knema globularia*	To'o	0	1	5	2	0	Timber & Medicine
6	*Canarium sp.*	Ngali nut	1	1	0	1	0	Timber & Food
7	*Pometia sp.*	Akwa	0	0	0	0	4	Timber & Medicine
8	*Terminalia brassii*	Baule	0	0	1	0	2	Timber & Medicine
9	*Euglencia sp.*	Ririgwa	0	1	0	0	0	Timber & Medicine
10	*Terminalia Sp.*	Liki/ Rosewood	1	1	1	1	1	Timber & Medicine
11	*Morinda citrifolia*	Kikiri/ Noni	1	1	1	1	1	Timber & Medicine
12	*Angiosperm*	Mamfua	2	1	1	1	1	Timber
13	*Alstonia scholaris*	Aitonga/ Milk pine	0	3	1	1	1	Timber & Medicine
14	*Vitex*	Vata/Vasa	3	0	0	1	3	Timber

According to table 8 above there are about 14 species of tree found within the project area (10 ha) within the fragment of primary forest (Taboo site) and secondary forest. Trees with girth (cm) more than 1 meter is found on the coastline and within the taboo site where they are preserved during the initial site clearance work by the community in around 2014. Further inland within 10 hectares have been cleared and currently dominated by secondary regrowth vegetation. The only preserved site was a taboo site (S'08'22'34.9 E160*42'33'.9) and regarded as the control site for the sampling activity for wetland ecosystem. It is believed that all flora and fauna of the taboo site should be highly representative of the original flora and fauna of the whole project site in pristine state.

Table 9: Plant species observed within the project are during the survey work.

No.	Scientific name	Local Name	T1	T2	T3	Mean	Control	Common uses
1	*Hibiscus tiliaceus*	Fakatho/Coastal Hibiscus	0	8	2	3	0	Firewood/building
2	*Alpania Sp.*	Kwaikwai	12	14	2	9	9	Wrapping
3	*Acrostichum Specisum*	Rata	4	10	0	5	1	waiving
4	*Pandanus (small) .sp.*	Tasisi/Pandanus(Small)	15	38	5	19	8	Waiving/wrapping
5	*Morinda Catafolia*	Kikiri/Noni	4	4	1	3	0	Medicine/ firewood
6	*Angiosperm*	Fula	1	1	0	1	1	Firewood
7	*Angiosperm*	A'ata	6	17	2	8	83	Medicine
8	*Angiosperm*	Aisiko	0	3	0	1	1	Medicine
9	Pandanus (big) sp.	Mata/Pandanus	3	2	5	3	8	Waiving
10	Metroxylon sp.	Sago palm(Sao)	28	2	0	10	1	Building/food
11	Unknown	Oko	1	1	0	1	0	Building
12	*Rhizophora Macronata*	Koa wane	0	1	0	0	0	Food/building/firewood
13	*Cocos nucifera*	Niu/Coconut	1	1	3	2	1	Food/Copra
14	*Palm Sp*	Beibei (Palm tree)	0	1	0	0	0	Medicine
15	*Areca catechu*	Ageru/betel nut	1	1	0	1	0	Food
16	*Ficus Septica*	Adami	2	1	0	1	0	Medicine
17	*Unknown*	Fuaga	0	0	0	0	2	Medicine
18	*Calamusholl rungii*	Kwakwale/Rattan	1	1	0	1	1	Building
19	*Piper betle*	Ofa kwasi	0	2	0	1	15	Food
20	*Angiosperm*	Faleadai	2	1	0	1	0	Medicine
21	*Acalypha siamensis*	Isisu/shrub tree	3	1	0	1	0	Building/medicine

22	*Syzygium malaccense*	Malay apple/kabarai	1	2	0	1	1	Food/medicine
23	Cyrtosperma johnstonii	Kakama/swamp Taro	20	0	0	7	0	Food
24	*Lygodium circinnatum*	Ridi	10	15	0	8	5	Building
25	*Acrostichum Speciosum*	Iri/fern	48	1	5	18	5	Medicine
26	*Ipomoea batatas*	Kumara/Sweet potato	61	0	0	20	0	Food
27	*Manihot esculenta*	Kaibia/ Cassava	10	0	0	3	0	Food
28	*Pouteria maclaycma*	Dulafa	1	1	1	1	1	Medicine/ food
29	*Hibiscus rosa-sinensis*	Hibiscus	2	0	0	1	0	Floral
30	*Plectranthus scutellarioides*	Akatha	5	3	0	3	0	Medicine/floral
31	*Barringtonia asiatica*	Fuu/Sea poison tree	0	0	2	1	0	Medicine/firewood
32	*Angiosperm*	Odou	0	0	1	0	0	Carving/building
33	*Mangifera indica*	Takari/ Mango	0	2	2	1	0	Food/building
34	*Fagraea crenulata*	Cabbage tree	0	0	6	2	0	Medicine/firewood

Tree species listed in Table 9 above were ones grown in the project area since its formation till human intervention to development. There are about 36 species which if combined to ones listed on Table 8 summed up to about 48 species ranged from fruit trees and crops regarded as important producers and sources of food to various consumers in the wetland ecosystem. Those flora species listed above are samples of vegetation types that will be permanently destroyed from the Wetland ecosystem by site preparation and improvement works during construction phase of the project.

vii. Fauna of the Wetland Ecosystem

The terrestrial fauna of Solomon Islands is extremely diverse, probably with a greater diversity of land animals that any other Pacific Island country and has a high level of endemism according to UNDP report in 2002. Fauna consisted of 223 species of birds (173 residential terrestrial species and 50 other species of shore/sea birds and visitors) including 19

species that are globally threatened, 52 mammals, 61 species of reptiles (25 endemic), and 17 species of frog according to FAO (https://www.fao.org/fi/oldsite/FCP/en/SLB/profile.htm).

The method used to survey the fauna encompassed intense search for organisms in square quadrat (5m x 5m) along a 50 meter transect line at 10m intervals. The increased in quadrat size is to account to sparse distribution of fauna within project area. Fauna observed at the wetland community include green lizard, hermit crab, land crab (*Scylla sp*), moths, butterfly, and wide range of insects. Birds are observed through direct observations up in the canopy and this include wagging tail, black Heron, red Pygmy parrot, green Pygmy parrot and Yellow neck pygmy Parrot, Eagle (*Haliatus leucoglaster*), *Cacatua alba*, White-headed Fruit Doves (*Ptilinopus eugeniae*) and small flying fox.

It was prominent that data collection happened during day time and diurnal fauna highly likely to be observed. Nocturnal species were not observed physically exempt their trails such as foot prints and feeding remains.

Plate 3: Examples of fauna (A- *Cacatua Alba*, B-*Corucia zebrata*, C-*Sesarmops imperator*) found in the proposed site during the survey.

There are no IUCN red listed species observed in the project area. Survey was conducted after initial site clearance work conducted in around 2014 and wetland ecosystem notably on secondary stage of succession and regrowth of flora and hence fauna. The predictable risk impact by the project is during construction phase and this will permanent change of wetland ecosystem into a mini economic growth center.

5.4.2 Mangroves Ecosystem

Mangrove ecosystem is located on the western end of the project site. This vital ecosystem has been servicing the local populace of fauna and flora for the last centuries well before this development is proposed for this area. The environmental services include coastal protection, habitats to good number of fish, insects, birds, mullocs, plants and primary productivity.

Local communities as per interview with Mr. William Tuside, echoed that the mangrove provides building materials, food (edible fruit), shell fish gleaning, mud crab, spear fishing and medicinal uses (Date 21st September 2021). Similar observations were made by Molea and Vuki, 2008[4], described that Lau people (saltwater people) usually gleaned the mangroves and coral reefs for subsistence purposes.

5.4.2.1 Mangrove Flora

According to Dukes pers Comm, 2013 (in Albert and Schwarz, 2013) there were about 29 confirmed mangrove species in Solomon Islands and mostly found on dense forested areas in Malaita, Guadalcanal, Western Province, Choiseul and Isabel Province. In the same report, for Malaita province, mangroves were found in Lau Lagoon, Langalanga and Maramasike Passage. The project area locates within Lau lagoon so hence this observation. There were four mangrove species observed and *Rhizophora mucronata* being the most abundant species followed by *Avicennia marina* and frequently found in dried and boundary zone between wetland and terrestrial ecosystems. *Bruguiera gymnoraiza* species is the edible mangrove that local people usually gathered for food and marketing from the mangrove ecosystem (**see Plate 5**). *Scyphiphora hydrophyllacea* (see Figure cy) is the least abundant and only grow in certain parts of the mangrove forest.

The forest structure can be clearly seen on Plate 4. This means the mangroves observed came from three families namely Avicenniaceae (Avicennia marina), Rhizophoraceae (*Bruguiera gymnoraiza* & *Rhizophora mucronata*) and Rubiaceae (*Scyphiphora hydrophyllacea).*

[4] Molea, T., Vuki, V., 2008. Subsistence fishing and fish consumption patterns of the saltwater people of Lau Lagoon. SPC Women Fish. Inf. Bull. 18, 30–35.

Plate 4: Cross sectional view of the mangrove forest profile at project site.

Markedly, human activities in the forest are apparent and this can be seen on Plate 4 (above). During survey team came across group of women gleaning for crustaceans (bivalves and mud crab) and picking mangrove fruit for food (Molea et. al., 2008).

Type of mangrove fruits of commonly observed in the mangrove forest was shown in the Plate 5 below. *Bruguiera g*. compose the dominant species in the top canopy followed by *Rhizophora m*. and then the shrub mangroves such as *Scyphiphora h* see Plate 6.

Plate 4*: Bruguiera gymnoraiza* (A) edible fruit and *Rhizophora mucronata* fruit (B).

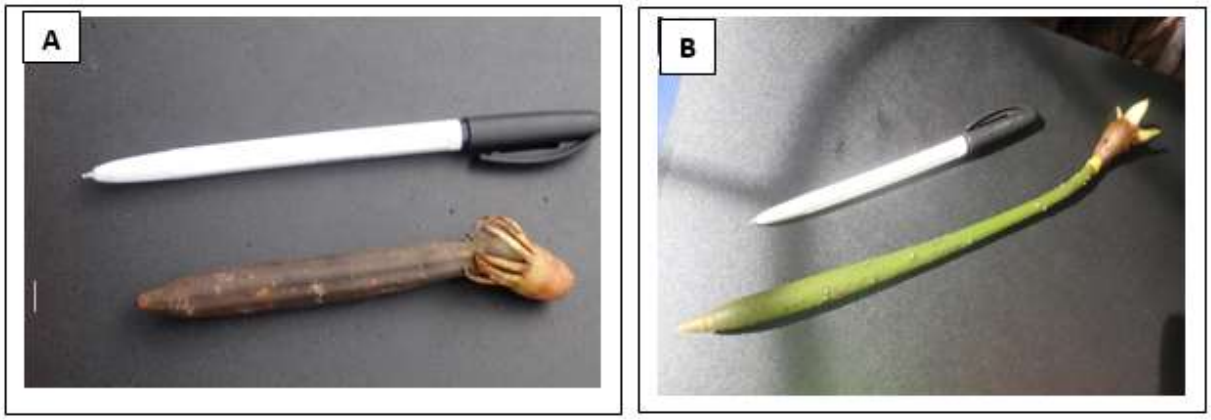
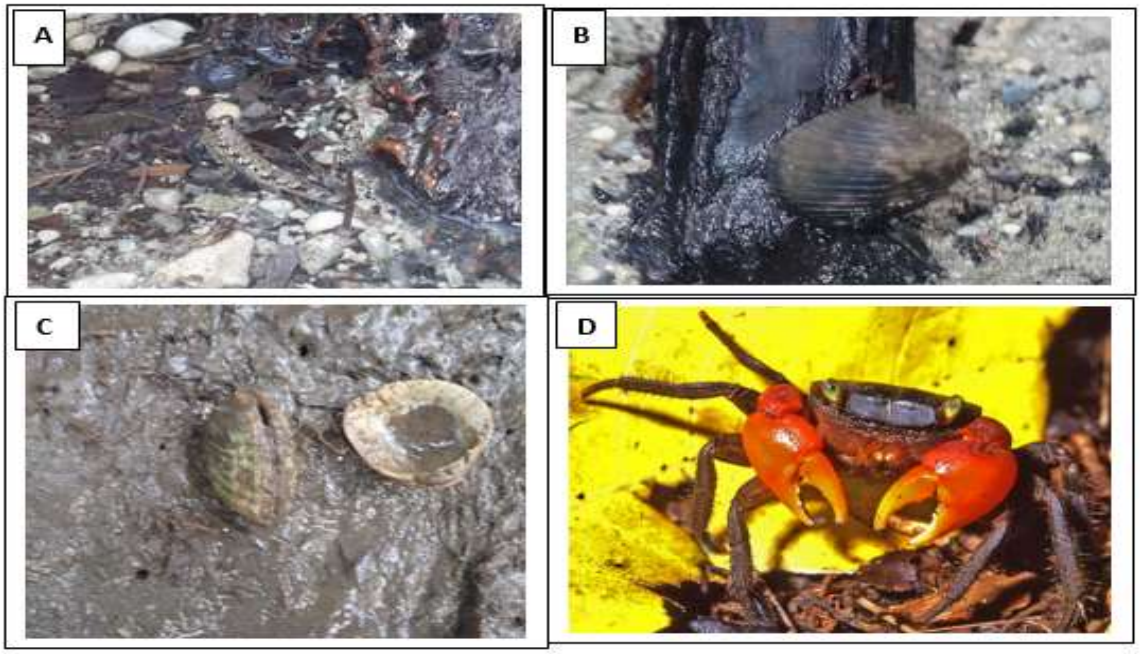


Plate 5: Red mangrove Scyphiphora h., which only grows to height of about 3m more or less shrub like species in the mangrove forest.

5.4.2.2 The Mangrove Fauna

Fauna inhabiting the benthic part habitat of the mangrove community is not properly surveyed. Survey work only done on fauna living on the surface. Mangrove forest is home to many birds, insects and other invertebrates. Fauna such as mangrove crab (*Scylla serrata*), small mangrove snails, mangrove oyster and mangrove mud shells (McKenzie, Campbell and Lasi, 2006). Herons, Yellow neck parrot and eagles are birds observed during the survey work in the mangrove forests. Mangroves have played a key role in sustaining coastal communities and thus conservation considerations must be taken on board at this stage (Albert and Schwarz, 2013)[5]. In the same article, it was observed that mangrove fruit constituted a main source of protein (food) to coastal communities along the Maramasike Passage in South Malaita. The same observation also seen in the Suava Bay in North Malaita which will be hosting the economic growth Center at Kwatanaere.

Plate 6: Below shows the common fauna observed in Mangroves forest



There is no IUCN red listed flora or fauna observed in the mangrove ecosystem durinf this survey assessment on 21st to 24th September 2021.

[5] Albert, J.A. and Schwarz, A.J. (2013) Mangrove management in Solomon Islands: Case studies from Malaita Province. CGIAR Research Program on Aquatic Agricultural Systems. Penang, Malaysia. Policy Brief: AAS-2013-14.

5.4.3 Corals and Seagrass Habitats

5.4.3.1 Method and Approach

Assessment method was adopted from a survey report sea cucumber (Kalo, Rosalie, James, John, Paul, David, and Ian, 2014)[6], transect and visual observation method differentiated by habitat types. A diver dived (began) at deeper end of transect then swim along a 50m transect and collect data at 10m interval within a 1-meter square quadrant. Record were taken of every fish encountered on the way using an underwater camera. Data was filtered and presented in table at the end of survey using relevant record sheet.

This method applied to coral distribution in the study area. A Diver swim along transect and capture every coral observed and takes GPS position for mapping work. Key focus groups are mullocs, corals and reef fishes. Minor habitats in this study were seagrass and coral reefs (shallow).

5.4.3.2 Materials and Equipment

[6] Kalo P., Rosalie M., James T., John L., Paul T., David F., and Ian B., (2014) Solomon Islands sea cucumber resources status and recommendations for management. Ministry of Fisheries and Marine Resources, Secretariat of the Pacific Community (SPC), Noumea, New Caledonia.

- Tape measure (100m)
- Scooper gear set (8 x oxygen bottles, fin, glass etc…)
- Water proof record sheet
- Water proof camera
- OBM boat
- Empty bottles (1.5 L)
- Coil nylon (test 30)
- Water proof Torch
- Species ID card for tropical species- SPC/WorldFish
- Note book
- Pencil/biros

5.4.3.3 Introduction

Seagrass provide shelter and food for diverse community of fuana from tiny invertebrates to large fish, plants, crabs, turtle, marine mammals and birds. Seagrass also provide vital services and goods to people in the local communities. Given the close location to Kwai River in the east and the geomorphological feature of the land, entrapment of sediments build a long sandy and silty flat area suitable for sea grass growth. Seagrass extend from intertidal flat to subtidal right to coral reef at the tip of the fringing reef.

The foreshore area comprised of these common types of habitats seagrass, silt, live coral and encrusting corals situated on a fringing around the project area at Kwatanaere, on Kwana'ai land in Suafa Bay, North Malaita.

This assessment focus on groups of organisms used to assess conditions of the environment and in this case the different aquatic environment present at the project site. Sampling targets Fish species, benthic macroinvertebrate (Insects, snails, crayfish worms) periphyton, amphibians, macrophytes (aquatic plants) and birds (United States Environmental Protection Agency (EPA), 2011)[7]. Survey assessment takes into account all factors affecting different organisms inhabiting the seagrass and coral habitats (shallow reef).

5.4.3.4. Algae and Seagrass Observations

Plate 7: Picture of seagrass habitat during low tide.

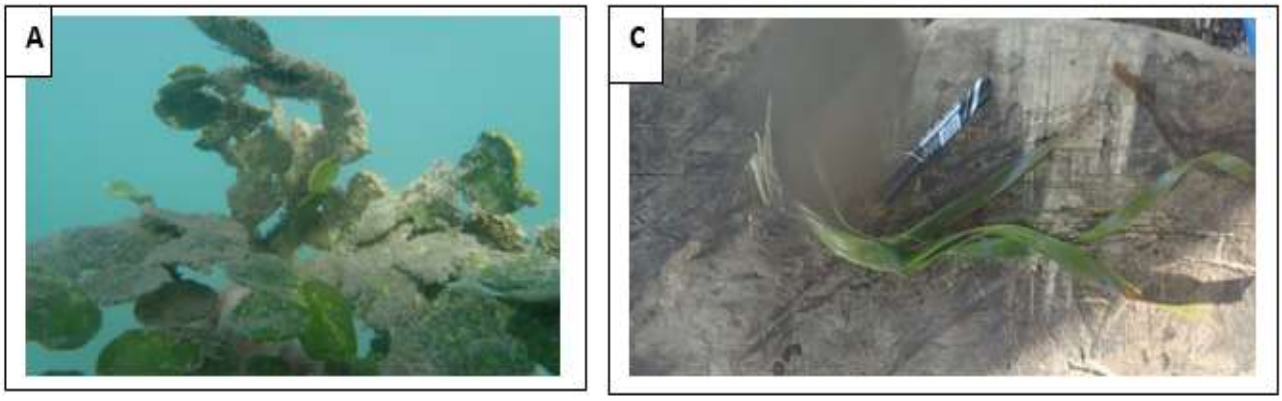
Seagrass habitat on the foreshore flat of the project area. Seagrass cover almost 99 percent with smaller patches of bare sand, silt and corals (live/dead). There are 3 common seagrass species observed like *Padina sanctae crucis, Hallmeda taenicola* and *Enhalus acoroides. Enhalus a.* is observed to be the most dominant species as per quadrant cover (1 meter square).

It was observed that *Enhalus acroides* of the Hydrocharitaceae family is the most dominant species estimated about 90 percent cover. Similar observation had been made by McKenzie,

[7] United States Environment Protection Agency, Biological assessments Key terms and concepts (2011). Retrieved from https://www.epa.gov/environmental-topics/water-topics

Campbell and Lasi, 2006[8] during the Solomon Islands Marine Assessment on the Western end of Suava Bay.

Plate 8: Pictures of common algae and seagrass observed like *Hallmeda taenicola (A)* and *Enhalus acoroides (B).*



In Table 4 and Plate 8, other biotas observed were four families of algae which comprised four genera (one genus per family), including two species of seagrass (*Enhalus acoroides* and *Halophila ovalis*) representing the family Hydrocharitaceae. These are other biotas that were observed inhabiting the benthic zones within the study sites, especially in the coral reef slopes and shallow reef areas.

Table 4: Algae and seagrass occurrence

Algae	
Family and Genera:	
1) Caulerpaceae	a) Caulerpa spp.*
2) Halimedaceae	a) Halimeda spp.
3) Dictyotatceae	a) Padina spp.
4) Sargassaceae	a) Sargassum spp.
Seagrass	
Family and Species: Hydrocharitaceae	
1) Enhalus acoroides*	
2) Halophila ovalis	

[8] McKenzie, L., S. Campbell and F. Lasi. 2006. Seagrasses and Mangroves. In: Green, A., P. Lakoni, W. Atu, P. Ramohia, P. Thomas and J. Almany (eds). 2006. Solomon Islands Marine Assessment: Technical report of survey conducted May 13 to June 17, 2004.TNC Pacific Islands Countries Report No 1/06.

5.4.3.5. Fish Diversity and Abundance

Fish were surveyed along a 50m x 5m transect which was fixed parallel to the shoreline. There were 2 transects being sampled using underwater visual census (UVC) methodology as described by Albert et. al. 2013.

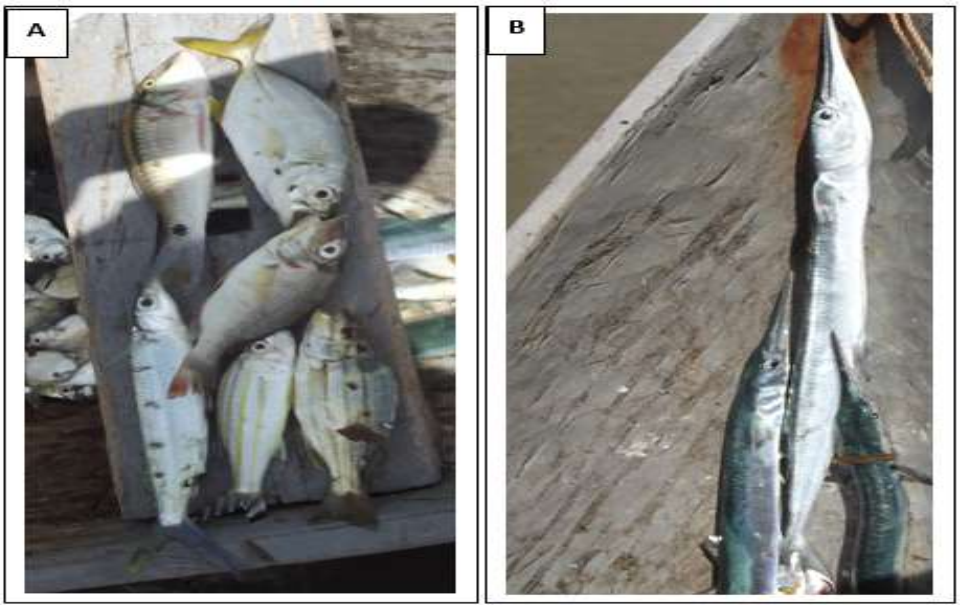
Figure 15:The types of fish species observed in the seagrass and coral reef ecosystems within the project area.

No.	Local names	Scientific names	Mean Counts	Comments
1	Kalua (Mullet)	*Liza macrolepis*	130	
2	Romaa	*Scomber japonicus*	80	
3	Muu (rabbitfish)	*Siganus canaliculatus*	45	Most popular fish
4	Maua (Parrot fish-white)	*Hipposcarus longiceps*	14	
5	Buma	*Selar crumenophthalmus*	150	
6	Suru (sweetlips)	*Lethrinus atkinsoni*	10	See Figure (A)
7	Tafuirada (Sniper)	*Lutjanus ehrenbergii*	1	
8	Magali (Parrotfish-green)	*Scarus spinus*	12	Coral reef
9	Mamula (Travely)	*Gnathanodon speciosus*	3	Golden travely
10	Bonito/Thau	*Euthynnus affinis*	1	
11	Ununu	*Strongylura incisa*	1	
12	Kossa (parrotfish black)	*Scarus psittacus*	12	
13	Dalala (Mackerel)	*Decapterus macarellus*	50	
14	Abuni	*Lutjanus adetii*	1	
15	Wawaeto (Hound needlefish)	*Tylosurus crocodilus crocodile*	5	See Plate 10 (B)
16	Mela (blueback fusilier)	*Caesio teres*	15	
17	Lifatange	*Choerodon anchorago*	20	See Plate 10 (A)
18	Shark (blacktip reef shark)	*Carcharhinus melanopterus*	1	
19	Soldierfish (Alulu)	*Myripristis violacea*	2	
20	Rindo/Mangrove jack)	*Lutjanus argentimaculatus*	2	

Over the year decades' local fishermen used the seagrass and coral reef for fishing and sustenance of livelihood. The fish species targeted were listed in table 10 above;

There are about 25 species (families) of fish observed during the assessment conducted for seagrass and coral habitats on 22nd September 2021 within the project site. The fish species enlisted were the common species fishers caught for family consumptions and trade in the local markets at Kwatanere, Matakwalao, Silolo, Mathaua and Malu'u to name a few. Indirectly, these are the common types of fish inhabiting the coral and seagrass habitats. According to Mada. T (Personal Communication, September 23, 2021) her husband used to fish in the project area for the last 20 years till today and she confirmed sweetlips, hound needlefish, iron fish and parrotfish are the common fish her husband used to catch by gill net fishing. Other species such as tuna, pacific mackerel, scad, kefa (*Sardinops sagax)* are seasonal species that are migratory and only fished one or twice every year. This observation was further confirmed by Festus. F (Personal Communication, September 25, 2021) a fisherman from Bibisu, of Suava Bay.

Plate 9: Pictures of common species inhabiting seagrass and coral ecosystem.



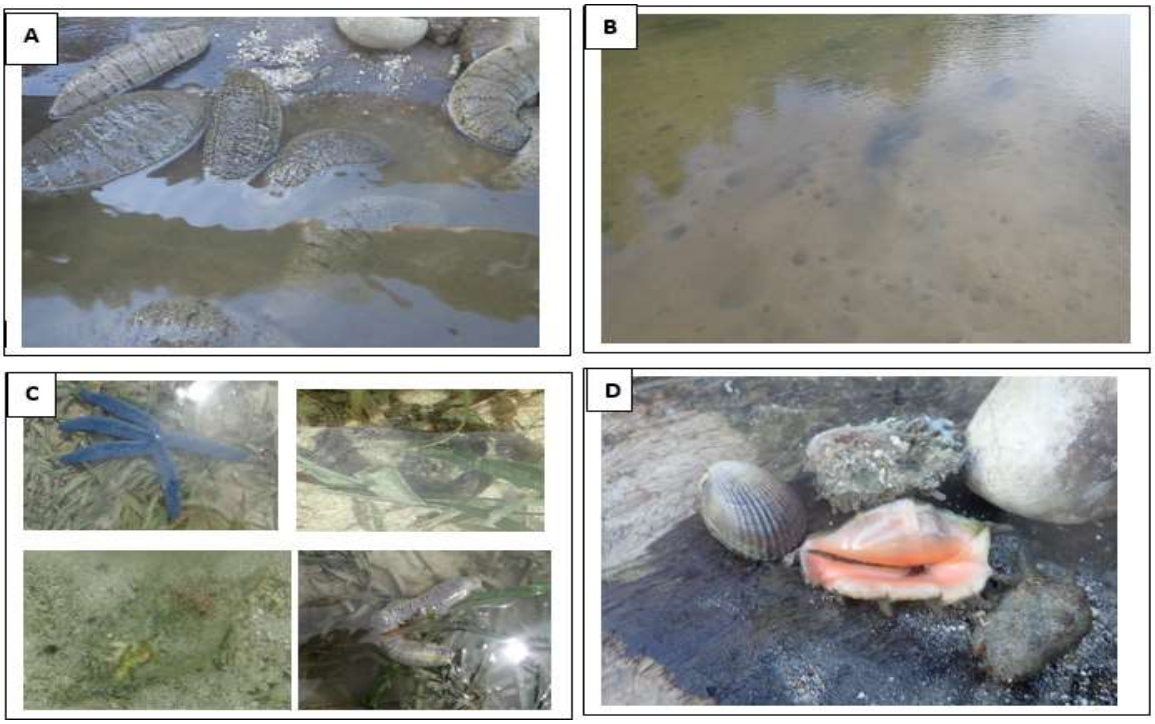
5.4.3.6 Invertebrate Diversity and Abundance

Observations were made in 1m square quadrants along 50m transect. Results were recorded and summarized below (see Plate 11). Blatantly, survey work was conducted during the open

period of sea cucumber fisheries. Because of this effect, seagrass habitat had been significantly fished for sea cucumber and habitat quite disturbed by human activities.

Note, the dominant sea cucumber species found was *Holothuria scabra (see Plate 11-A)* and other species like *Synaptidae, Stichopus horrens, Holothria atra, Holothuria coluber, Actinopyga mauritiana and Actinopyga caerulea.* Other invertebrates include echinoderms and gastropods such as *Linckia laevigata Tripneustes gratilla, Enchinometra mathaei, Conus leopardus (kolo), Cypraea tigris, Nerita albicilla, Lambis lambis (kweretani) and Tectus niloticus (Oho-sifala)* were observed and interestingly in niches conformed to their ecological distinct adaptations.

Plate 10: Pictures of invertebrates of the seagrass/coral habitats.



5.4.3.7 Coral species found within the intertidal zone and shallow reef slope of project site.

The copra species observed within seagrass and shallow coral reef areas were presented in this section. Coral occurrence in terms of family and genera were recorded based on how frequent it was observed during sampling work.

Table 10: Coral families and genera occurrence.

Zooxanthellae Scleractinia			
Family	**Genus**	**Family**	**Genus**
1) Pocilloporidae	**a) Poscillipora**	**5) Faviidae**	**a) Favia***
	b) Seriatopora*		
2) Acroporidae	**a) Acropora**	**6) Trachyphylliidae**	**a) Trachyphyllia***
	b) Montipora*		
3) Agariciidae	**a) Pachyseris**	**7) Poritidae**	**a) Porites**
			b) Goniopora
4) Fungiidae	**a) Fungia**		

Most of the soft corals observed were found on dead corals and in crevices. Distributed is skewed towards the shallow reef to reef slope (2-4m). As depth (m) increases the presence of corals decreases due to change in substrate types from consolidated rubbles or high complexity to sand and silt at the deeper end (>5m).

Table 11: Anthozoa and Soft Coral occurrence.

Class: Anthozoa (Non-Scleractinia)
Order : Alcyonacea
1) Tubipora
Subclasses: Octocorrallia, Hexacorallia, etc. (Soft Corals)
1) Lobophyton spp.
2) Sea anemone*

Ten genera representing seven families of the stony corals (Order: Scleractinia) were recorded in the study. The family Pocilloporidae, Acroporidae and Poritidae records two genera each whilst a single genus was recorded for the others (Agariciidae, Fungiidae, Faviidae and Trachyphylliidae). Non-Scleractinia corals recorded includes Tubipora, Lobophytum and Sea anemones (see Table 10). These are close relative to corals.

5.4.4. Reef Ecosystem (shallow- deep).

Four sampling stations were distributed amongst the deep offshore (10m) and the reef slopes and the shallow reef areas, covering a total sampling area of 3,200m². Each sampling station (SS) consists of two transect replicates conducted at 2m-12m depth; fish assessment (UVS) was conducted at 4m width along each 50m transect replicates. The invertebrates, benthic and coral assessment was conducted at 2m width along each replicate. Photographic sampling (UPT) and films were also collected at every sampling station for thorough desktop review of

data and species verifications – the identification of fish and coral species. The statistical analysis of benthic and coral cover was supported by the Coral Point Count with Excel extension (CPCe) software, supplemented by the Coral Finder BYO Guide in the classifications of coral families and genera. Opportunistic SCUBA dives also supported in the classification of reef assemblage profiling and in developing a species list of corals, marine invertebrates and fish fauna that is inclusive of sites that are not captured within the sampling station coverage.

5.4.4.1. Survey Coverage

A total of 3,200m² of sampling area was covered in the marine ecology assessment. The detailed descriptions of Sampling Station (SS) locations, site description, coordinates and the total sampling area per biotic and abiotic parameters selected for the marine ecological study were provided in Table 12.

Table 12: Summary of survey coverage in the shallow to offshore environment.

Location/Site	Sampling Station ID (SS)	Site Description	Number of replicates	Start point (r1)		End point (r2)		Fish: Total Sampling Area (m²)	Invertebrates: Total Sampling Area (m²)	Benthic/Coral: Total Sampling Area (m²)
				Latitude	Longitude	Latitude	Longitude			
1) SUAVA BAY PROJECT SITE : OFFSHORE AREA	a) SS1	Deep Offshore area, Approximately 500m from the shoreline, to over a 1km of white sandy bottom, clear visibility (6m); average depth 10m.	2	08° 22' 05.0"	160° 42' 34.9"	08° 22' 03.2"	160° 42' 31.1"	400	200	200
	b) SS2	Deep Offshore area, Approximately 500m from the shoreline, to over a 1km white sandy bottom, clear visibility (6m); average depth 10m.	2	08° 22' 05.4"	160° 42' 35.4"	08° 22'.15.3'	160° 42' 29.6"	400	200	200
2) SUAVA BAY PROJECT SITE: SHALLOW REEF AREA	e) SS3	Shallow reef slope, Approximately 320m from the shoreline, live and dead corals are present, visibility 4m; average depth 6m.	2	08° 22' 14.9"	160° 42' 31.0"	08° 22' 17.8"	160° 42' 32.8"	400	200	200
	f) SS4	Shallow reef area, Approximately 300m from the shoreline, algae and halimeda are present, low visibility <1m; average depth 2m.	2	08° 22' 23.7"	160° 42' 33.4"	08° 22' 20.8"	160° 42' 35.7"	400	200	200
		Total:	12					1,600	800	800

5.4.4.2. The Dominant Habitats

As shown in Exhibit 2A, the Economic Growth Centre project area is located within Suava Bay in north Malaita. Six dominant habitats had been identified within the study area.

1. Fringing coral reefs (Shallow reef areas)
2. Silt and sandy bottom (Deep offshore areas)
3. Mangrove forest
4. Seagrass meadows with mud flats
5. Estuarine water
6. Freshwater drainage (Catchment areas)

This section of the marine ecology baseline assessment is focused on the marine habitat and the coastal resources which may be impacted due to the development of the Economic Growth Centre, which includes the development of a seaport within the project site.

5.4.4.3. Coral reef assemblages and benthic communities

The deep offshore areas (average depth of 10m) are dominated with sand which extended from approximately 500m, from the shallow reef slope areas, to a kilometer into the bay. The results in Figure 2A and 2B had shown that sand accounts for almost 100% in mean cover for both sampling stations (SS1 and SS2), having the mean % cover of 99.64% ± 0.09 and 99.77% ± 0.16 respectively. Other substrates observed were the seagrass species *Halophila ovalis* and sponges, however they were sparsely distributed in smaller patches in limited areas and had yielded a mean cover less than 1% in both sampling stations (Plate 12).

The sandy bottom of the offshore areas offers very little, or no hard substrates for coral recruitment and other marine flora to settle and populate which resulted in a barren deserted habitat offering very limited support for the formation of a much diverse and complex benthic community structure. The hollow mounds and burrows amongst the sandy sea floor suggests that this habitat may have host a number of cryptic and sand-burrowing lifeforms, though none was observed during the study.

The shallow reef slope, Figure 2C, records a much higher and diverse benthic community structure though the reef complexity was low in most areas and moderate in few areas where the shallow crests (<1m) are located. Live coral cover was highest in the reef slope area with a total

mean cover of 9.88% ± 0.40, and consisting of a much diverse coral growth forms. The seven coral growth forms observed were branching (6.09% ± 1.69) which is the most common, followed by tubipora and foliose (>2%). Other growth forms (Acropora branching, massive, submissive and mushroom) were much less common and accounts for less than 1% in mean cover.

Silt was much dominant in the shallower reef areas (including the reef slopes) where high presence of algal life forms (Algae, macro algae, Halimeda, etc.) was also observed, Figure 2D and shown in Figure 5. A number of freshwater outlets were distributed along the shoreline of the project area which may have contributed in distributing silt and sediments in these areas. Overall silt mean cover range in over 44% to 55% within these areas, as indicated in SS3 and SS4.

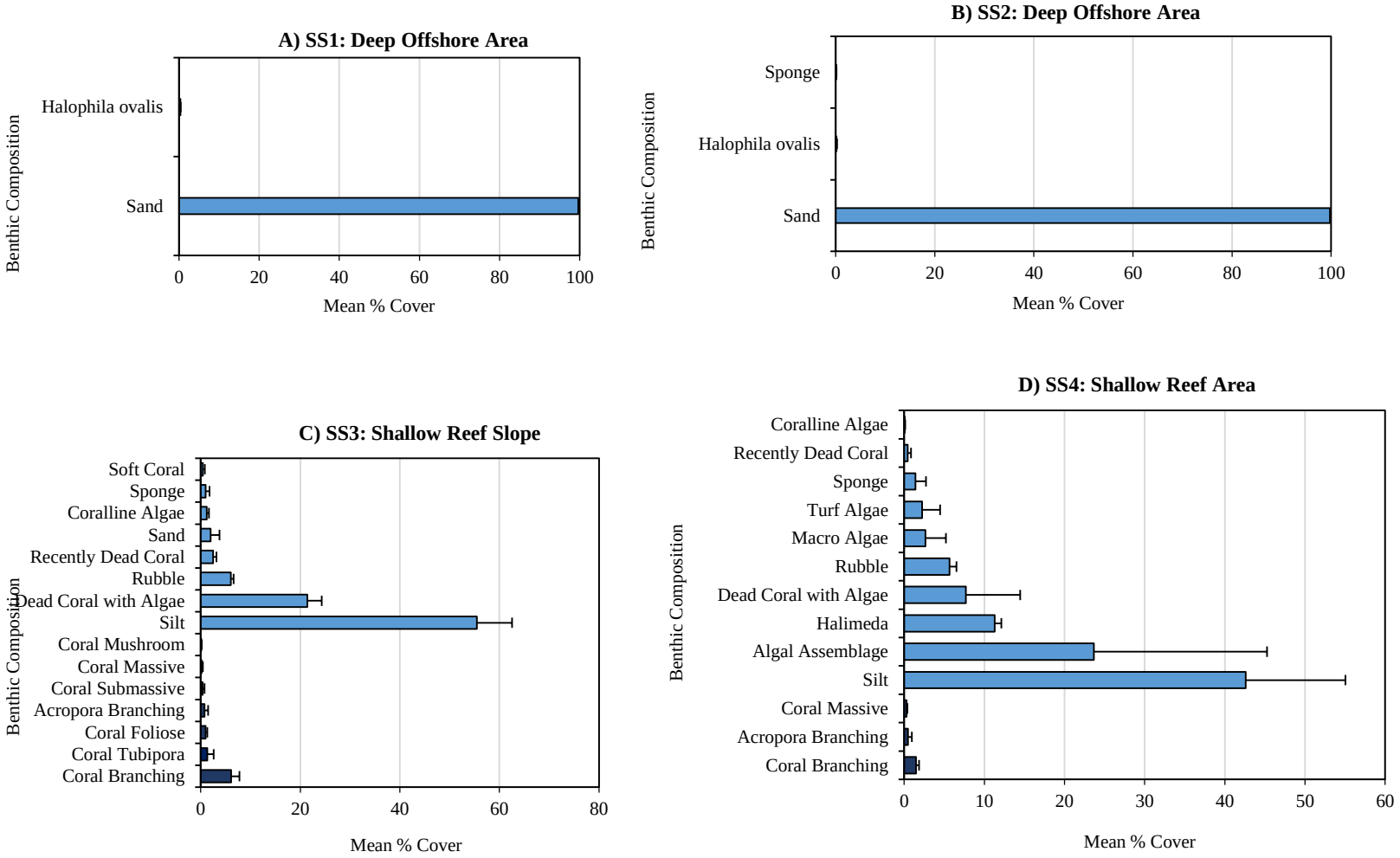


Figure 5: Mean cover (± SE) of benthic substrates in the offshore and shallow reef area sampling stations.

Plate 13: The sandy bottom of the deep offshore area. Right image shows seagrass species of *Halophila ovalis* which are present in small abundance within this habitat.

Plate 14: The shallow reef slope (Left: SS3) and shallow reef areas (Right: SS4); silt, branching corals, massive corals, dead corals with algae and Halimeda are shown in these images.

5.4.4.4. Coral diversity and abundance

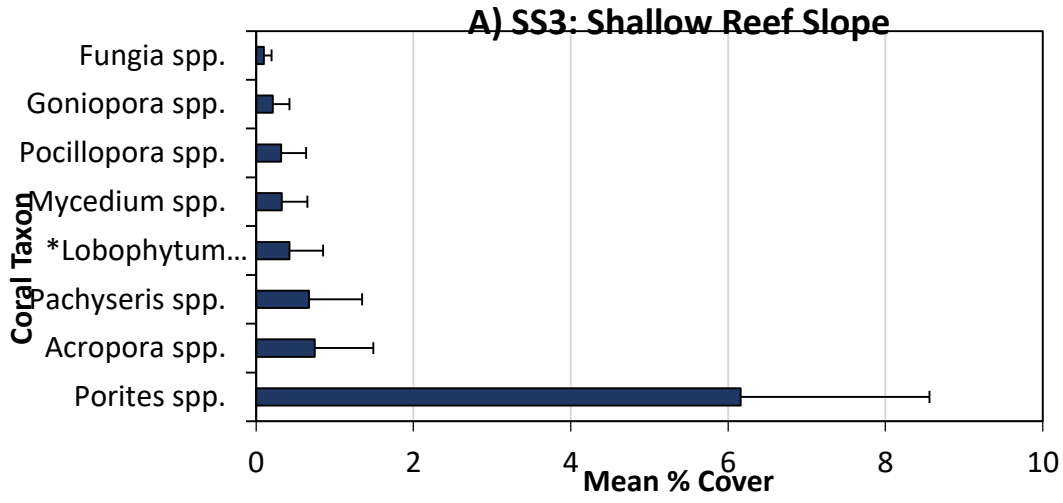
Ten genera representing seven families of the stony corals (Order: Scleractinia) were recorded in the study, see Table 2. The family Pocilloporidae, Acroporidae and Poritidae records two genera each whilst a single genus was recorded for the others (Agariciidae, Fungiidae, Faviidae and Trachyphylliidae). Non-Scleractinia corals recorded includes Tubipora, Lobophytum and Sea anemones (Table 3). These are close relative to corals.

In Table 4, other non-coral biotas observed were four families of algae which comprised four genera (one genus per family), including two species of seagrass (*Enhalus acoroides* and

Halophila ovalis) representing the family Hydrocharitaceae. These are other biotas that were observed inhabiting the benthic zones within the study sites, especially in the coral reef slopes and shallow reef areas.

5.4.4.5. Coral species composition and abundance

Figure 4A and 4B represent the mean composition (%) of coral genera and biota recorded within the sampling stations in the coral reef slopes (SS3) and the shallow reef areas (SS4). Both sampling stations in the offshore area (SS1 and SS2) was excluded as no coral was observed. The general trend in Figure 3C and 3D had shown that coral branching was the most common in these areas. These are mostly the genus *Porites* spp. which accounts for the highest mean cover (6.16% ± 2.40) relatively, especially in the reef slopes. Followed by *Acropora* spp. and *Pachyseris* spp. which accounts for a little less than 1%. Other genera were much less than 0.5%. *Anacropora* spp. tend to be more common moving further inshore, growing amongst the algae dominated substrates, where silts and high turbid water column had much influence.



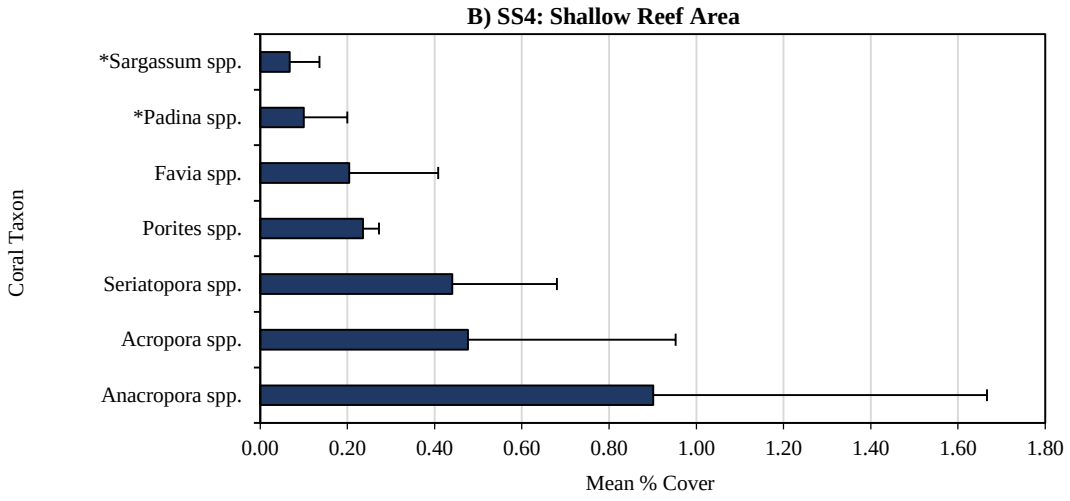


Figure 16: Mean cover (± SE) of coral genera and biotas. * Is a non-stony coral of the Order Scleractinia, includes soft corals, algae's and others

5.4.4.6. Invertebrate diversity and abundance

i. Invertebrate species list

Four species representing five families of marine invertebrates were observed during the study (Table 5). All of these species have been recorded in the shallow reef slope and the shallow reef areas. None have been sighted in the offshore areas. All the species observed in the study sites were very common in most reef habitats and were classified 'least concerned' or 'not evaluated' by the IUCN.

Table 13: List of marine invertebrate species observed in the study and their conservation status.

Scientific Name (Family, Genus, Species)	Common Name	Status (Endemic, Native, Introduced)	Conservation Status (IUCN)
Diadematidae			
Diadema setosum	Sea Urchin	Native	Least Concerned
Echinothrix caramarix	Banded Sea Urchin	Native	Not Evaluated
Holothuridae			

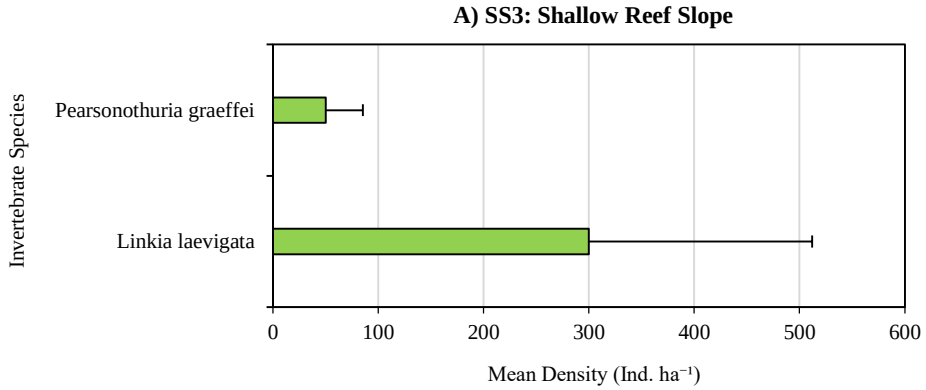
Pearsonothuria graeffei	Flowerfish	Native	Least Concerned
Ophidiasteridae			
Linkia laevigata	Blue Starfish	Native	Not Evaluated
Ostreidea			
Lopha cristagalli	Corkscomb Oyster	Native	Not Evaluated

Source: www.iucn.org/redlist

ii. Invertebrate species composition and abundance

A total of 13 individuals of marine invertebrates were counted. *Linkia laevigata* accounts for the highest in total count (6 individuals) and consist of the highest mean density (Plate 16A) of 300 individuals per hectare (Ind. ha^{-1}). However, they are distributed amongst the reef slopes where the water column was less turbid. None was observed in the shallower reef areas. Urchins (*D. setosum* and *E. calamarix*) were also common, and records the second highest in total count, as indicated in (Plate 16 B).

Field observations had noted that the shallow reef areas within the vicinity of the study sites (the project area) was frequently been visited by a number of local fisherman from the surrounding areas during the day and at night. These are fisherman in dugout canoes who have been collecting sea cucumbers (mostly juveniles) amongst the shallow reef and mud flats over a consecutive period of time. As such, this may have resulted in the very low number of marine invertebrates observed within these areas, especially for sea cucumbers. A single individual of the sea cucumber species *Pearsonothuria graeffei* was observed in the reef slopes.



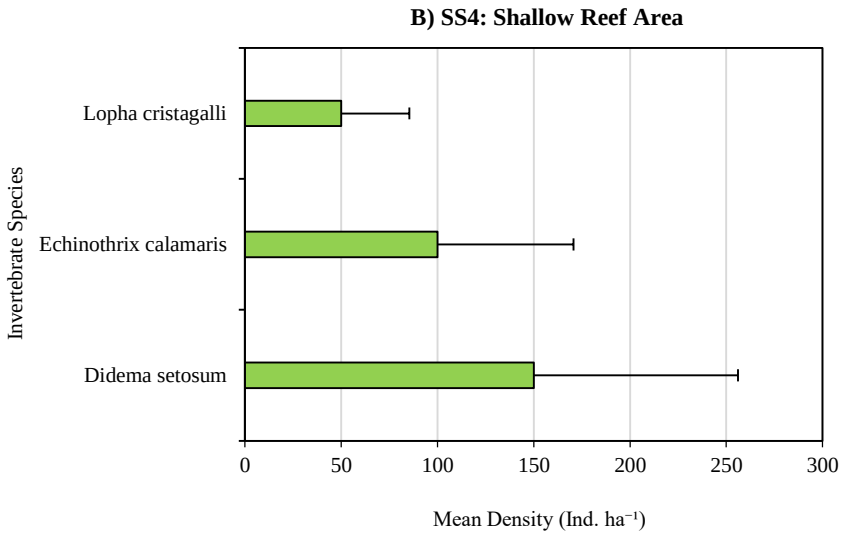


Figure 17: Mean density (Ind. ha^{-1} ± SE) of marine invertebrate species.

5.4.4.7. Fish species diversity and abundance

i. Fish species list

Twenty-two species representing nine families of fish was recorded in the study table 14 below. No fish was observed in the deep offshore areas, including the shallow reef areas where turbidity was high. All fish data were obtained from the shallow reef slopes. The family Pomacentridae accounts for 11 species which is the highest in total species count; followed by Apogonidae, Gobiidae and Labridae having two species each. Other families constitute of a single species each. Table 14 illustrates species richness per family of fish.

The fish fauna of the Solomon Islands consists mainly of fish associated with coral reefs. Gobiidae being the most abundant family in terms of number of species (Allen, 2006) was in adequately studied due to its very small size and cryptic behavior; the UVS method would be inefficient as fish sample collection equipment were required.

Table 14: Fish species observed in the study and their conservation status.

Scientific Name (Family, Genus, Species)	Common Name	Status (Endemic, Native, Introduced)	Conservation Status (IUCN)
Apogonidae			
Apogon neotes	Larval Cardinalfish	Native	Least Concerned
Cheilodipterus quinquelineatus	Fivelined Cardinalfish	Native	Not Evaluated
Blennidae			
Ecsenius prooculis	Striped Blenny	Native	Least Concerned
Chaetodontidae			
Chaetodon vagabundus	Vagabond Butterflyfish	Native	Least Concerned
Gobiidae			
Amblygobius nocturnus	Nocturn Goby	Native	Least Concerned
Exyrias bellisimus	Beautiful Goby	Native	Least Concerned
Labridae			
Coris caudimacula	Spottail Coris	Native	Not Evaluated
Labroides dimidiatus	Bluestreak cleaner Wrasse	Native	Least Concerned
Lutjanidae			
Lutjanus fulvus	Blacktail Snapper	Native	Not Evaluated
Mullidae			
Parupeneus multifaciatus	Manybar Goatfish	Native	Least Concerned
Nemipteridae			
Scolopsis ciliatus	Whitestreak Monocle Bream	Native	Least Concerned
Pomacentridae			

Amblyglyphidodon curacao	Staghorn Damsel	Native	Least Concerned
Chromis ternatensis	Ternate Chromis	Native	Not Evaluated
Chrysiptera parasema	Goldtail Demoiselle	Native	Not Evaluated
Neopomacentrus nemurus	Coral Demoiselle	Native	Not Evaluated
Pomacentrus aurifrons	Goldhead Damsel	Native	Not Evaluated
Pomacentrus adelus	Obscure Damsel	Native	
Pomacentrus brachialis	Charcoal Damsel	Native	Not Evaluated
Pomacentrus grammorhynchus	Bluespot Damsel	Native	Not Evaluated
Pomacentrus moluccensis	Lemon Damsel	Native	Not Evaluated
Pomacentrus nigromanus	Goldenback Damsel	Native	Not Evaluated
Neoglyphidodon nigroris	Yellowtail Chromis	Native	Not Evaluated

All the fish species observed in the study were common in the Indo-Pacific region and were listed as 'not evaluated' or 'least concerned' by the IUCN. These energetic little fish are an evident part of every coral reef community. Approximately three-quarters of the 321 known species are found in the Indo-West Pacific (Allen *et al.*, 2003).

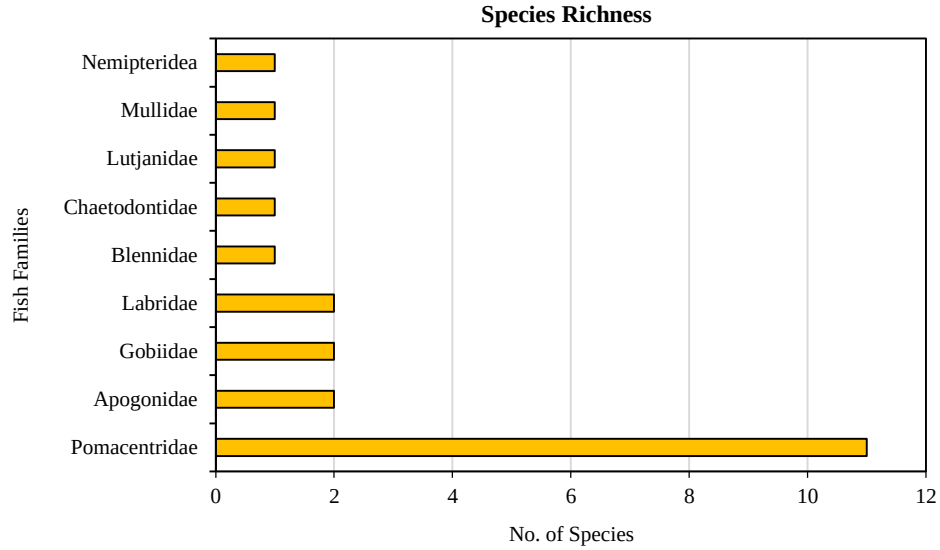


Figure 18: Fish families and total number of species observed.

ii. Fish species composition and density

A total of 122 coral reef fishes were counted on the shallow reef slopes. Pomacentridae accounts for 68.85% of the total fish counted which is the highest; Apogonidae followed by and consist of 15.57%. Other fish families account for 1% to less than 4% of the total fish count. The four most common species observed in the study were *Pomacentrus aurifrons*, *Pomacentrus pavo*, *Neopomacentrus nemurus* and *Cheilodipterus quinquelineatus*. These small coral fish species are adapted to the reef, silt and algae habitat and records the highest occurrence in terms of individual counted per species.

In Figure 8, the general trend in fish density among the reef slope. Pomacentridae, the dominant fish family consist a mean density of 2,100 ± 1,484.94 ind. ha^{-1}, followed by Apogonidae and Labridae with 475 ± 335.87 ind. ha^{-1} and 100 ± 70.71 ind. ha^{-1} respectively. Other fish families consist of mean densities of 50 to 70 ind. ha^{-1}. See Figure 9, the detailed mean density per species.

The occurrence of two large key food fish species was low, and were juveniles of *Parupeneus multifaciatus* and *Lutjanus fulvus*. The overall result indicates a lower fish count and diversity. The most sheltered sites typically have a much depleted fish fauna, particularly those that are associated with heavy siltation.

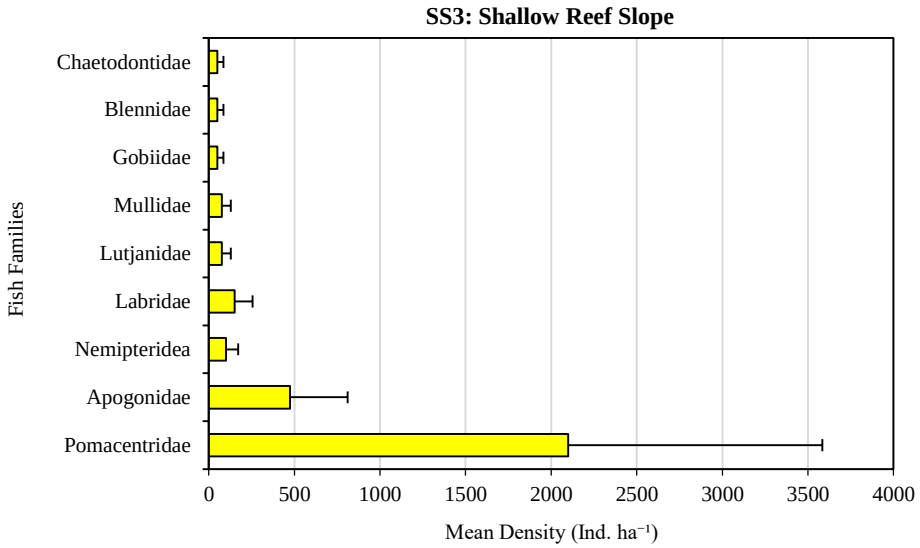


Figure 19: Mean density (± SE) of fish families.

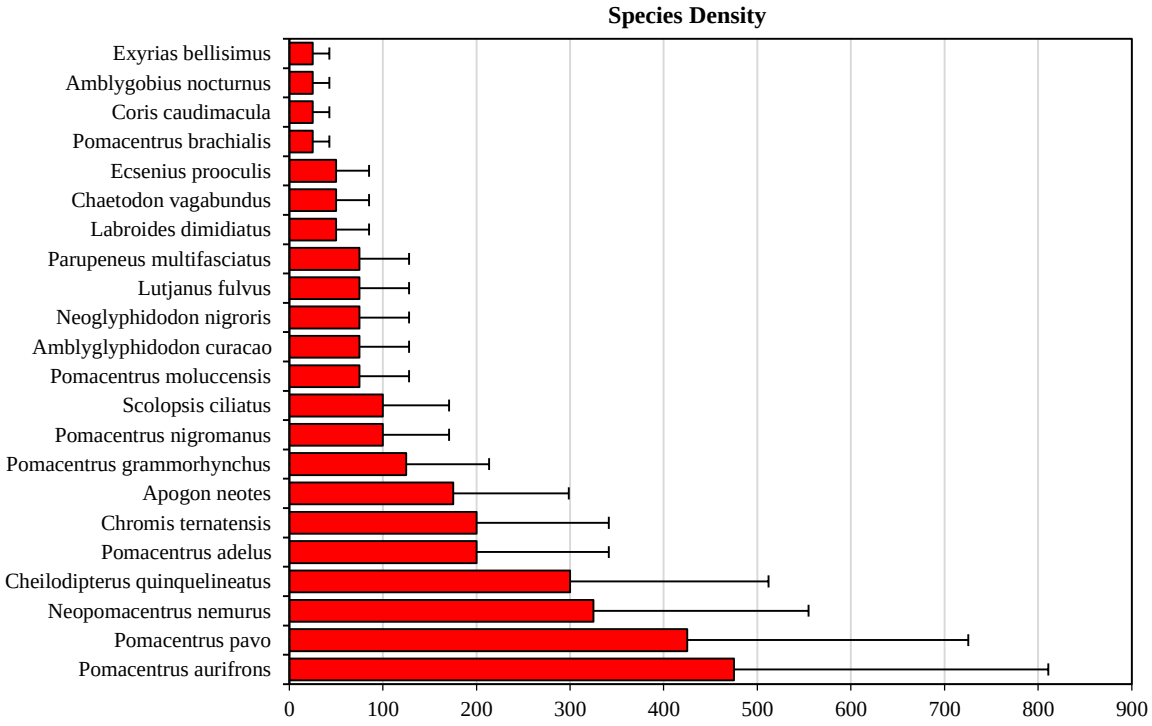


Figure 20:Figure 10: Mean density (± SE) per fish species.

5.4.5 Coastal Resources

The coastal resources commonly used since ancestral times were sand and gravel. The project site contained high quality black sand and gravel. Another vital aspect for the coastal resources include free access of local fishers (both men/women) to glean the seagrass and coral reef for invertebrates, fish and mangroves. The intertidal zones and coral reefs are used by both fishers from Suava Communities and mainland communities around Sulagwalu and Matakwalao as fishing ground according to Calisto. L (Personal communication, September 21, 2021). Project site is currently used as coastal market place usually happen on Tuesday's and Thursday's every week at 2PM. The predicted user resource conflict is the access to fishing ground during construction and operation phases of the project.

5.5 Economic Components

The economic impact assessment report describes the economic environment of Suava bay economic growth center through studies conducted in communities existed in close proximity to the growth project site. Expected under the EIS report, the focus is particularly made on the employment sectors, economic infrastructure facilities, land use, use of forest and natural resources, fisheries sector, agriculture, tourism and other minor industrial activity found within the area.

Assessment has been conducted in communities situated between Taba'a and Kwai River. Refer to map of communities that are part of the assessment above. A total of 10 communities with more than 200 household/families existed around Suava bay. The survey was conducted through household survey, community consultation, key informant interviews and observation.

It further describe potential economic opportunities and the risks that face native communities based on the nature of economic proposed activities expecting to occur at the project area.

5.5.1 Employment Sectors

A. Background

Focusing on rural communities in close proximity to the Suava bay EGC, employment sectors can be described using two broad categories, i.e. formal and informal sector of employment. Consideration are given to these two employment sectors which impacted both

formal “cash” and informal “subsistence “economy in rural Solomon. According to 2009 census data subsistence economic activities dominated labor force in rural context.

Although most of productive and non-productive sectors are important for formal and informal or subsistence production, community members stated they engaged in both sectors, both for cash demand and daily survival in the communities. According to the assessment conducted many people engaged mostly in subsistence production pattern. Subsistence farming is a form of farming in which nearly all of the crops or livestock raised are used to maintain the farmer and the farmer’s family, leaving little, if any, surplus for sale or trade. An economic condition typical to preindustrial agricultural people throughout the world traditionally practicing subsistence farming.

B. Types Employment Sectors

Formal employment is when employees are assigned with a contract stating clearly terms of engagement, benefits and duration of employment. In contrast informal employment refers to employment that does not involves any bidding contractual agreement.

Below table outline two types of employment sector i.e. productive and non-productive sector of the rural communities around Suava Bay EGC.

i. Productive sector.

Table 15: Summary of labor force that involves in primary production or extraction of raw resources.

Employment sector	Type of work	Comments/Remarks
	Copra production	Subsistence production – done on household basis - informal
	Coconut oil-crushing mill	Subsistence production – done on household basis (minor value adding activities) - informal
	Cocoa production	Subsistence production – done on household basis (selling of wet and dry beans)- informal
	Kava production	Recently introduced crop, however already falls under the subsistence production system in the communities. –

Agriculture Sector		Informal
	root crop production	Subsistence production- done on HH Basis – selling surplus at local market centers. - Informal
	Vegetables/fruits production	Subsistence production –done on HH basis – selling surplus at local market centers- Informal
	Livestock production	Subsistence production- done on HH basis – selling when need cash - Informal
	Bettle-nut production and selling	Subsistence production – done on HH basis – done by few members of the community- informal
Fish & Marine Resources Sector	Fishing	Subsistence production – done on HH basis – selling surplus when need cash - informal
	Beche demer harvesting	Subsistence production – done on HH basis – harvesting when lifting ban in the country - informal
	Harvesting of Other marine resources	Subsistence production - done on HH basis –selling when need cash
Forestry Sector	Trees planting/selling	Subsistence production- done on HH basis- selling when need cash
	Timber milling	Subsistence production – done on HH basis

ii. Non-productive Sectors

Table 16: Labor force that involves in secondary or service industry in rural setting.

Employment Sector	Type of work	Comments/Remarks
Government Public Services	Teaching	Full-time Government workers- for schools
	Nursing	Full-time Government workers – Matakwalao aid post
Construction Services	Building construction	People engaged on short term to construct buildings in the community
	Road maintenance/civil work	People within the community also engaged in road work (community labor) and recruited with company that carried out backfilling at Suava bay EGC.
Private Business Services	Transport	Few individuals own transport service within the communities
	canteens	Number of village members run small store/canteen in the community
	Fuel depot	Fuel depots run at a small scale in the village by certain individuals and group
	Community union work	Youth groups, women's group and certain individual offered labor services in the community.
	Cake making and minor Value adding activities	Other members of the community engaged in minor value adding activities such as cake making, dying and sawing cloth etc.

5.5.2 Infrastructures Facilities

Economic infrastructures in placed is presented in two broad categories that entail formal and informal nature. Refer to table below with list of infrastructures under its respective categories. Formal infrastructures are facilities that are government owned, legally

established, budget mandated, and has the potential to spin economic activities within its catchment zones when fully functioned and utilize. On the other hand, informal economic infrastructures whilst it has the capacity to spin economic activities at scale in rural communities; it has a weak governing system, not registered, not mandated under a well-established financial system and operates on an ad-hoc basis.

Table 17: Formal and informal infrastructure facilities established in communities next to the project site.

Formal Infrastructures	Informal Infrastructures
1. Road access	1. Locally established Market centers
2. Bridges and culverts	2. Copra drying facilities/business
3. Schools	3. Cocoa drying facilities/business
4. Clinics	4. Stores and Canteens
5. Economic growth center land filled site	5. Coconut Crushing Mill
6. Communication infrastructures	6. Community Accommodations

A. Formal Infrastructures

Formal infrastructure identified with in the identified study zone are road access, bridges, schools, clinics, communication facilities and the economic growth center.

i. Road Access

Suave bay economic growth center had a government registered road access that links with the Auki to Fouia North Malaita road. Refer to site map for details. It took approximately 88 kilometer meters from Auki to panama where it meets the access road to Kwatonaere growth center and took about 1 kilometer to the growth center. There is another possible access that leads from Taba'a Bridge to Matakwalao (the old colonial admin site) a coastal access to the project site. However the coastal access requires improvement, an alternative route to the project site.

ii. Bridges and Culverts

The growth center zone is located between Taba'a River and Kwai River. Hence the site can be possibly access by the two bridges (Kwai and Taba'a bridges). It is about 2 km from growth center to Taba'a Bridge and more than 2 kilometer from the site to Kwai River. There are 5 culverts within the reach of Taba'a and Kwai River and to the project sites. Taba'a Bridge had been recently upgrade using iron materials whilst Kwai Bridge is still in its worst condition, currently reconstructed and upgrade by Novocava Company LTD.

iii. Schools

Within 3 - 4 kilometer surroundings of Suave bay economic growth center, there are three primary school facility, and 4 early childhood schools. See table below.

Table 18: Summary of education infrastructure within Project area.

School	Distance to and from project site	Type	Authority
1. Manafaeni	Less than 1 kilometers	Primary and early childhood	SDA
2. Lolu	Less than 3 km	Primary and early childhood	Provincial authority
3. Kwarifau	About 4 km	Primary and early childhood	SDA
4. Ngongore	About 2 km	Early childhood	Yet to be registered
5. Loina Primary school	About 3 km	Primary education	MPG

iv. Health Facilities –Clinic

The Solomon Islands health network is made up of National Referral Hospital, provincial hospitals, area health centers, rural clinics and nurse aid post. According to WHO 2019 observation report, most provinces in the country have access to at least one level of health facilities based on the size and distribution of population. Malaita in particular province had various health networks existed on the Islands. It begins with Kilufi and Atoifi as provincial hospital. Towards the northern side there is Maluu known as area health center, Fauambu, Arao, Foodo, Gwaiau, Fulifoe, Matakwalao, Adaua, Kolofi can be either categorize as rural clinics or nurse aid post. (Refer to map of medical services available in Northern region)

The nearest clinic to the EGC is the Matakwalao Nurse Aid-post located less than two kilometers from the project site. Refer to Map.

v. Communication Infrastructures

Refer to map indicating bmobile and Telekom towers nearest to the EGC site.

B. Informal Economic Infrastructures

The following are the identified informal infrastructures found within close proximity to the EGC: local market centers, copra and cocoa dryer facilities, stores or canteen, coconut crushing mills and community accommodation facilities.

i. Local Market Centers

There are two nearby local market centers existed near to the EGC project site or within 3 kilometer boundaries of Suava bay economic growth center. Kwatanaere market which used to be at the EGC site has been relocated few meters away from the growth center location to the eastern end, and Kwaunasu market, situated around 2.5 km beyond Tabaa Bridge along the main Auki road access.

Plate 15: Market at Kwatanaere showing women selling their garden produces,

Plate 16: Market Stalls at Kwatanaere, Project site

Assessment conducted at Kwatanaere market on three (3) different market days revealed on average more than 300 people turns up at the market during market days. Population attending market days would expect to increase during charismas and holiday seasons as seen in the past. People from Baelelea, Lau and Toabaita arrived at the market as observed during market days. Garden crops and vegetables are normally supplied by bush or inland populace, fish and other marine resources by Salt-water or Lau speaking people and store items by coastal people or community living close to market centers.

ii. Other Informal Infrastructures

The pie-chart below illustrate % of other informal infrastructures found within the study area (from Taba'a –Kwai River).

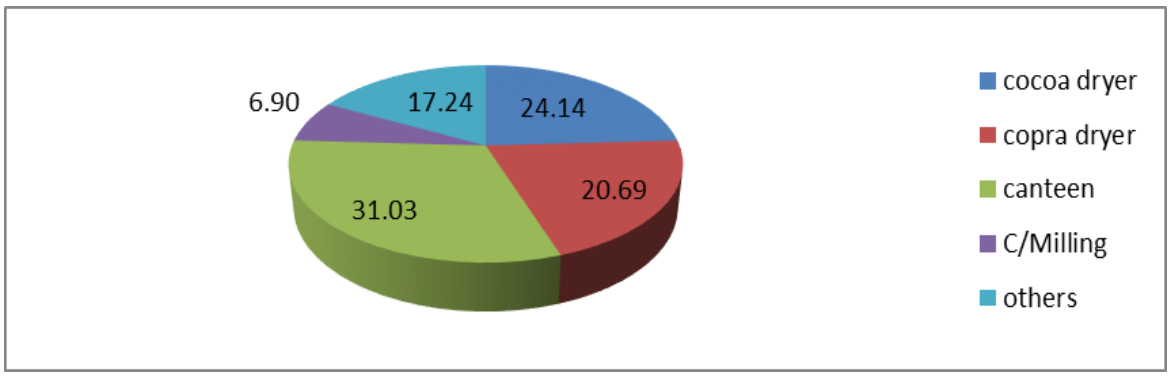


Figure 11: Pie Chart showing small to medium informal sector at project site.

More than 30% of informal facilities identified are canteens. More than 20% are copra and cocoa dryers infrastructures, with 17% others that includes road venders, mostly bettle-nut stall and fuel depot.

5.5.3 Land Use

Kwatonaere (Suava bay Economic growth center) project site has been commonly known for its swampy soil type with the type of vegetation found therein. Consultation with local community members reveals number of activities that had been practiced on that particular site in the past. Focus group discussions with tribal elders are summaries in table format below;

Table 19: Focus group consultation outcomes with elders and community leaders on land use.

Past land use	Contemporary and recent land
Planting of swap taro called kakama in local dialect used for consumption. A disaster crop for most communities in and around Suava bay area.	Less swampy soil Near to the coast, are used for planting of coconut trees, potato and cassava.
Planting/preserving of sago palm for local building materials especially for house flooring, waving sago leaf for roofing and sago leaf used for house walling.	Houses are also built on the cost of Kwatanaere by fishers for fishing purposes and to live near next to Kwatonaere market.
Preserving of female mangrove trees for its fruit for consumption	
Running stream are preserve for harvesting of inshore/offshore marine resources such as crabs, fishes, ell fish etc.	
The site was also used for burial site during the days of the arrival of Christianity – *refer to Faualimango tabu site discussed under cultural section of this EIS report*.	

5.5.4 Use of forest and other natural resources

5.5.4.1 Fisheries

Fisheries constituted a vital role on the livelihood of both mainland people and coastal people (also referred to as saltwater people) (Molea et. al., 2008). According to data collected fisheries activities comprised of simple gleaning by women to offshore fishing solely by men. The fishes caught (small scale fisheries) primarily used for family consumption and the

surplus sold at the nearby community markets or bought directly within in the village (Hardy, Béné, Doyen, and Schwarz, 2013)[9].

Survey has been conducted to collect and analyze information on fisheries sector in and around 6 local communities in Suave bay area. Obviously, fishing is a common activity for most coastal communities within Suave bay vicinity. Due to time and resources limitation, the survey target fishermen from 6 communities to collect feedbacks from them. The survey targets at least a minimum of 5 individual fishermen per fishing community to be part of the interview. It is important to note that four of the communities participated in the fisheries assessment are from Lau speaking group, who are known for most of fishing activities taking place in Suava Bay. The communities are Hadadaitolo, Faufanea, Warigifau and Gwango. These communities are not part of the social assessment conducted as part of this EIS.

Table 10: Head count of fishermen from the 5 communities in around project site.

Fishing communities	No. of fishermen	Comments
Hadadaitolo	28	Fishers use gill netting
Faufanea	30	Gill netting-most common
Warigifau	33	Gill netting
Gwango	35	Gill netting/ Hand and line
Sulagwalu	21	Handline, spear gun diving and gleaning
Panama	22	Gleaning, hand line
Total Number of Fishermen	169	

Thirty (30) of the fishermen from the 6 community participated in the fisheries assessment. At least 5 fishermen from each of the identified communities are asked during the assessment. Their responses are described in the following graphs below.

[9] Hardy, P.-Y., Béné, C., Doyen, L., Schwarz, A.-M., 2013. Food security versus environment conservation: A case study of Solomon Islands' small-scale fisheries. Environ. Dev. 1–19. doi:10.1016/j.envdev.2013.04.009

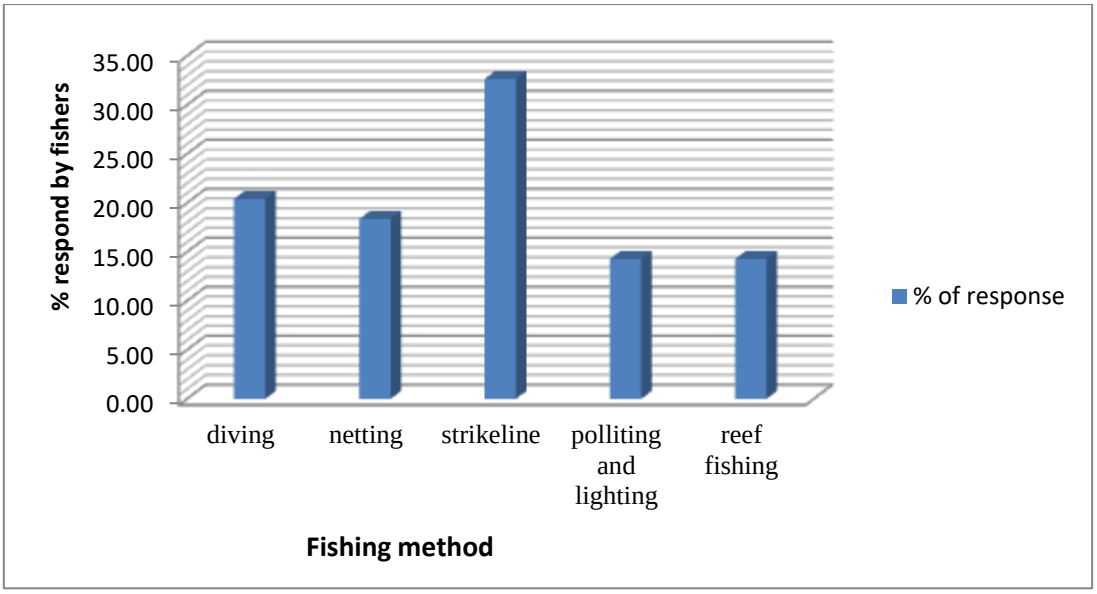
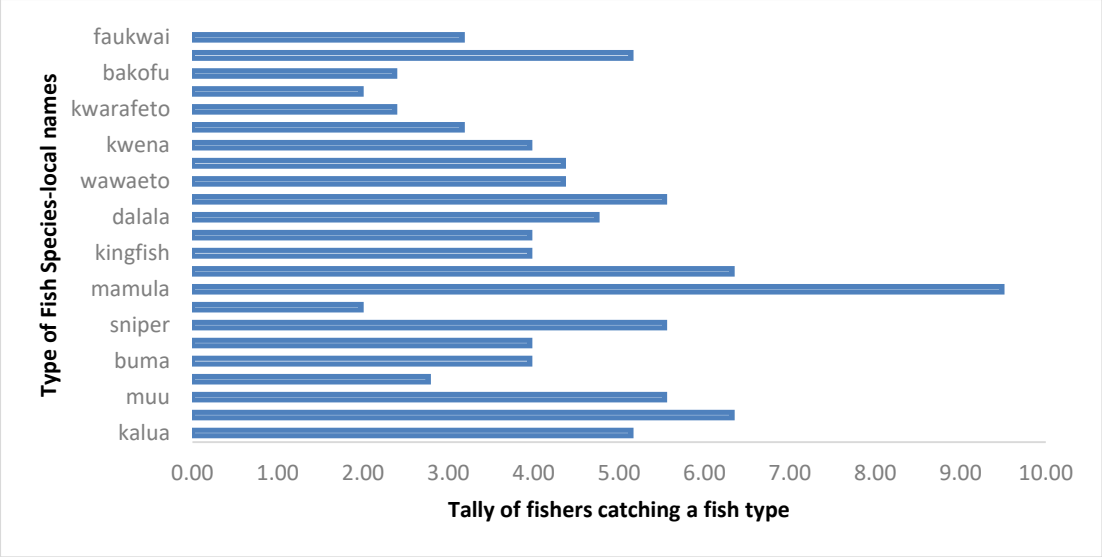


Figure 12: Common Fishing Method practiced by fishers.

Common type of fish method (techniques) by fishermen at Suava bay fishing zones according to fisheries survey conducted.



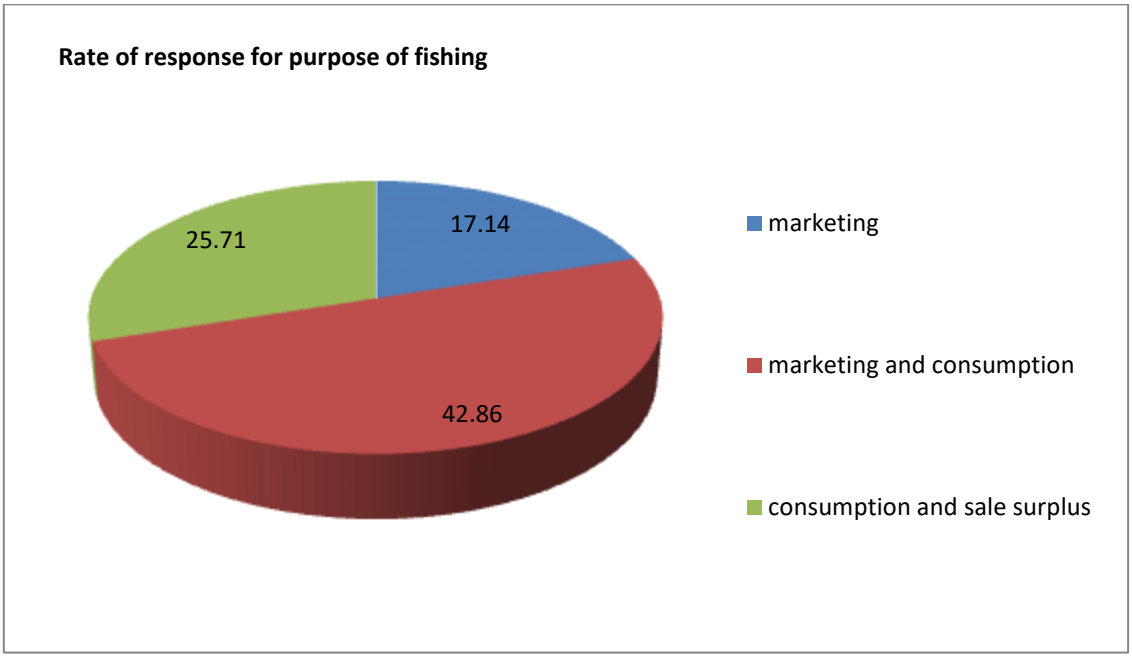


Figure 21: Pie Chart of respondents -Reasons for fishing.

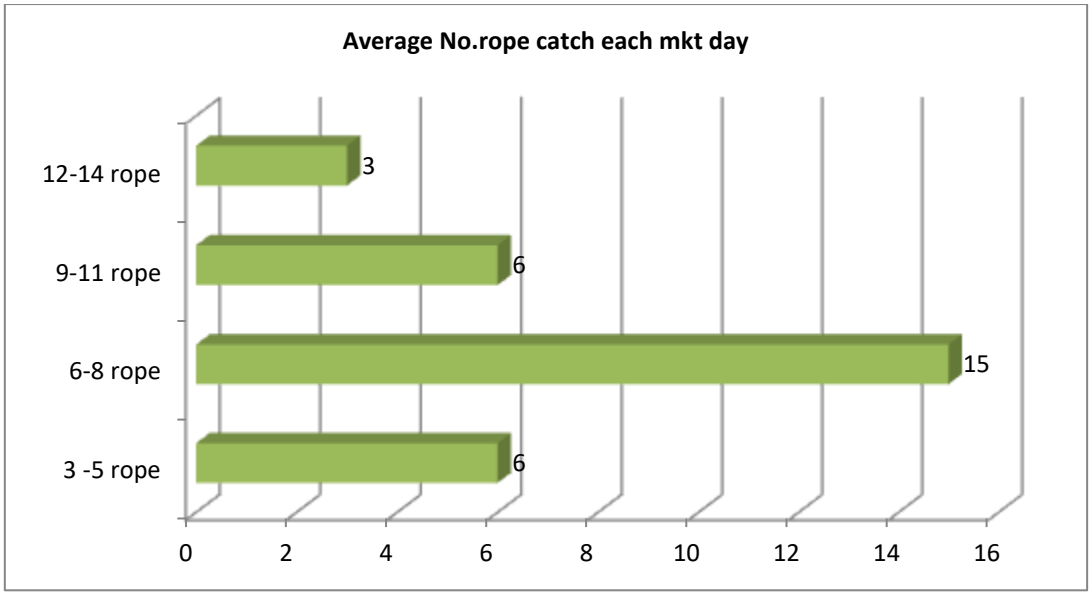


Figure 15: Fish Quantities (in ropes) sold at market

Local fisheries assessment indicated more than 40% of fishermen involved in fishing purposely for marketing and consumption, more than 25% their primary fishing purpose is for consumption and they only sale surplus and 17% purposely engaged in fishing for marketing.

Figure 8 above illustrated average rope of fish catch and sold during market days. Around 15 people stated their average catch per market day is 6 -7 rope of fish each fishing time per market day.

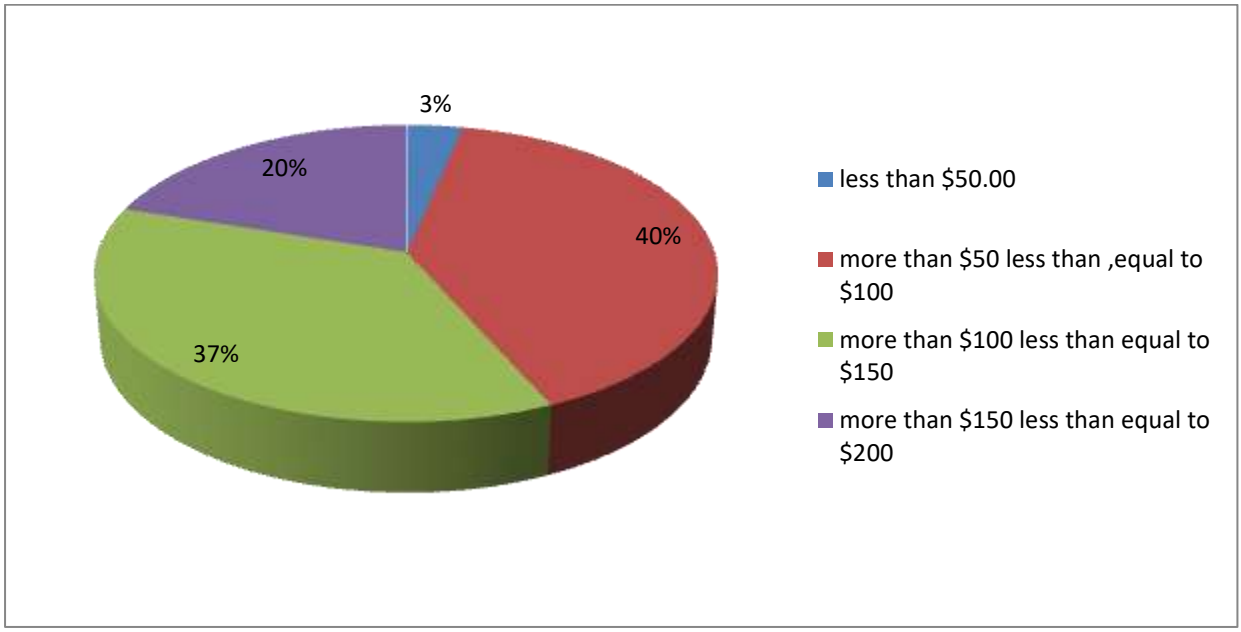


Figure 16: Chart of Fish Sales during market day

According to survey work a fisher earned during each market day, 40% majority stated that they earned more than $50.00 less than or equal to $100.00. On average fishermen earned around $100 each market day which is equivalent to 6-8 rope @ $10-$15 per string price at Kwatanaere market, reflecting response described in pie-chart above, illustrating number of rope sold per fishermen per market day. A string on average contains 4 to 5 fish depending on the species and size with estimated weight equivalent to kilogram. For high value fish species, a string is valued at $30.00 per string when supply of fish is low and price can drop to $10-$15 per string when supply is high. So how much a fisher earned depends on factors affecting demand and supply of fish at the local markets.

5.5.4.2 Agriculture

According to community survey and observation rural dwellers living close to the project site are all subsistence farmers. A typical situation for every community living in rural Solomon Islands. Cocoa and copra remains the two most common cash crop produce by most households in the communities. Besides, many families engaged in producing more than one agricultural products mostly on primary production basis either for consumption or selling of surplus in their communities or at nearby local market center.

Table in fig below outline information collected during community consultation at Sulagwalu, of types of agricultural products produced by rural members for consumption and selling when there is a need for cash. Indicating what produce, method of production, common selling price and point of selling.

Table 11: Cultivation of

Categories	**products**	**Method of production**	**Common buying and selling price**	**Point of selling**
Introduce crop	Coconut	young coconut	$1 and $2	Village and nearby market
		Green copra	$1.5 per kg	village
		Dry copra	$3.5 per kg	Auki
		oil	Fermenting/heating	Village/Maluu/Auki
	Cocoa	Wet bean	$3. Per kg	village
		Dried bean	$9.50 per kg	Auki
	Rice	Polished rice	$10.00 pkt	Village and market

	Kava	Dried	$150 per kg	LKB Auki
Livestock	Local pig	Raised in built huts and fences	Depends on size, ranges from $300 for piglets and matures $800 - $3000	Village and nearby communities
	Duck	Fences and free ranch	$50 -$100	Village
	Local chicken	Fences and free ranch	$30 - $60	village
Other local crops	Taro	Shifting cultivation and organic farming	$10 heap (5-6 tubers) $15 heap (8-12 tubers) $20 heap (10 -15 tubers)	• Village • Nearby markets • Maluu • Auki • Honiara
	Potato	Shifting cultivation	$10 heap (10 tubers) $50 -$ 100 (20 kg bag)	• Village • Nearby market
	King Taro (kakake/kakama)		$5-$10 per bottom	• Maluu
	Long taro (Edu)		$50-$100 per long taro	• Village • Auki • Honiara
	Hongkong Taro (Fionatana)		$10 heap (8-12 tubers)	• Villagr • Nearby markets
	Yam		$150-200 per 20kg bag	• Auki • Honiara
Vegetables	Slippery cabbage		$5 parcel	• Village • Nearby mkt • Maluu
	Chinese cabbage		$5 parcel	• Village • Nearby mkt • Maluu
	Egg plant		$ 5 parcel	• Nearby Market
	Tomato		$2 heap	• Nearby

	&pepper/Shallot			market
Fruits	Pawpaw		$1 - $5	• Village • Nearby market
	Banana		$2-$5	• Village • Nearby market
	Guava, cut-nut, Nalinut, peanut, bettle nut, mango etc		$.5 cent and up	• Village • Nearby market

In a survey conducted for 60 household in the ten (10) communities in close proximity to the project site reflected more than 95% of families raised income from agricultural activities.

5.5.4.3 Tourism

There are no major truism business established with in the locality of the project site. However as observed during the assessment, Suava bay has some potential for tourism business activities.

5.5.4.4 Other industries

5.6 Social Components

This assessment report seeks to describe the baseline conditions of social elements of the surrounding communities existed in close proximity to the economic growth center site. The report will highlight the finding of study conducted in ten (10) communities that exist between Taba'a and Kwai River in North Malaita. Noted, there are many communities that exist beyond Taba'a and Kwai River, except they are not part of the study due time factor and resources to conduct assessment.

The survey was conducted through household survey, community consultation, field visit and key informant interviews and observation.

Social and cultural survey team, photo taken at Hakakae heights in Kwana'ai land. (Photo taken by George Ganiau)

5.6.1 Population and Communities

Table 19: Illustrating 10 Communities Population Profile by Male and Female.

No	Name	Total HH	Total Male	Total Female	Total Population
1	Manafaeni	12	25	22	47
2	Sulagwalu	65	170	173	343
3	Panama	56	135	146	281
4	Funadae	10	17	17	34
5	Kwarifau	27	79	66	145
6	Ngaligera	3	9	7	16
7	Lolu	26	69	57	126
8	Kafosina	2	8	7	15
9	Cana	22	51	58	109
10	Norway	4	8	6	14
Total		227	571	559	1130

According to data collected and designated in fig 5.6.1 (a) above, there were more than 200 household, with a population of more than 1000 people. Through which more than 50% are male and around 49% are female. Sulagwalu members made up of around 30% of the population followed by panama community at nearly 25% of the population. The three least populated communities are Norway, Kafosina and Ngaligera, all with a population of around 1% in relation to the total population of the ten (10) communities.

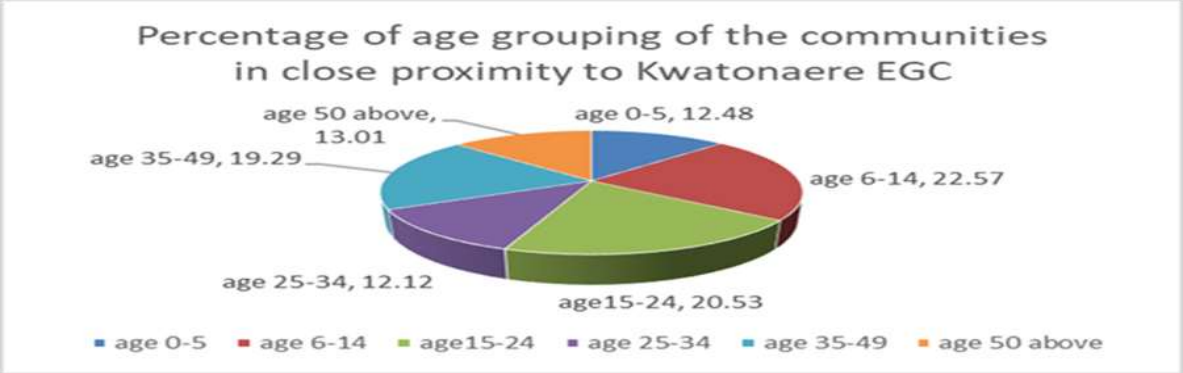


Figure 17: Pie-Chart illustrating percentage of age grouping of 10 studied communities

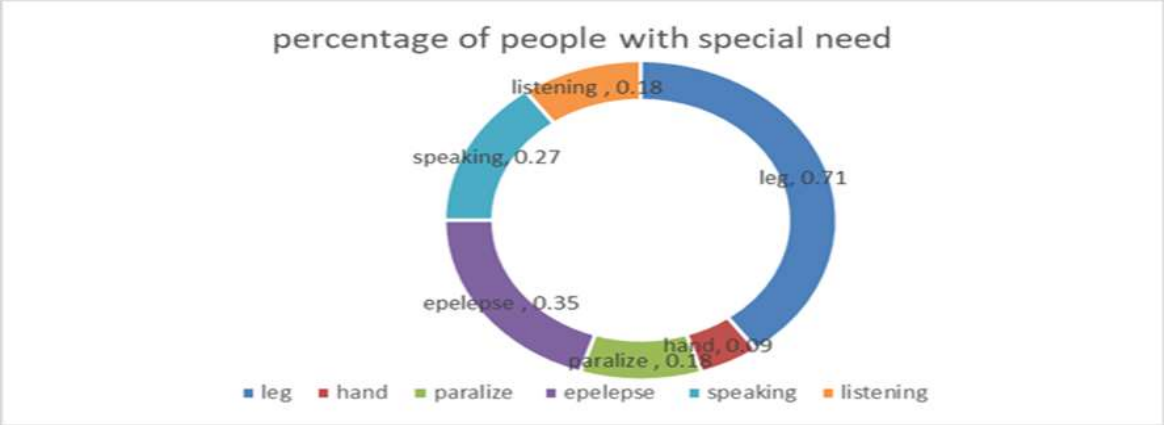


Figure 22.People with special needs.

Indicated in fig 18 (b) above, more than 1% of the total populations are people living with special needs. People with leg disability or impairment rated high at 0.71% followed by people with epilepsy at 0.35 and speaking impairment with 0.27, whilst listening impairment and paralyze hand at 0.1 percentages.

A. Employment and Unemployment.

This study considers employment as being formal and informal. Informal employment is when employees' are not subjected to national labor legislations, income taxation, social protection or entitlements to certain benefits and formal employment are when employees relationship to the job is bided by a sign contract subjected to national labor legislation

The study finds out 94% of active and working population of age 25 - 49 is formally unemployed only around 6% are formally employed. Health and education are the only two source of formal employment existed in community situated in close proximity to the project site.

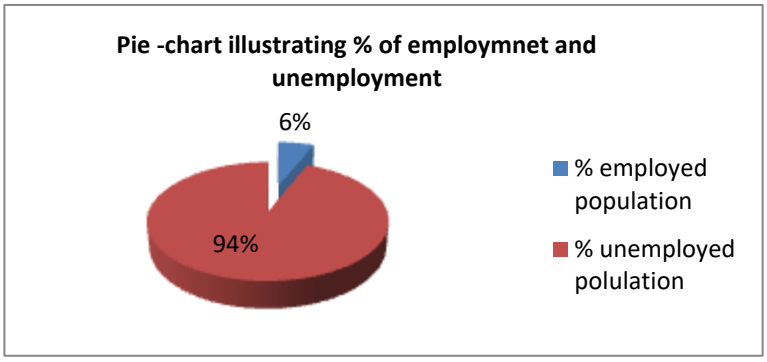


Figure 19: Pie chart showing employment status across local populace.

It is important to note around 94% who are formally unemployed would have involved intensively in other private business activities in the communities. For instance, operating of canteens, transport services, copra and cocoa production, selling of vegetables and root crops and fish marketing.

B. Population and denomination

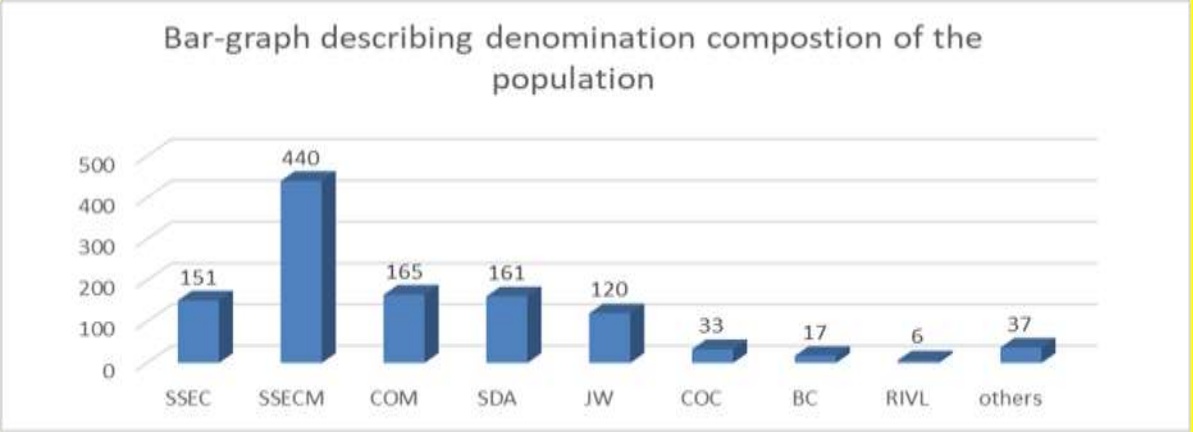
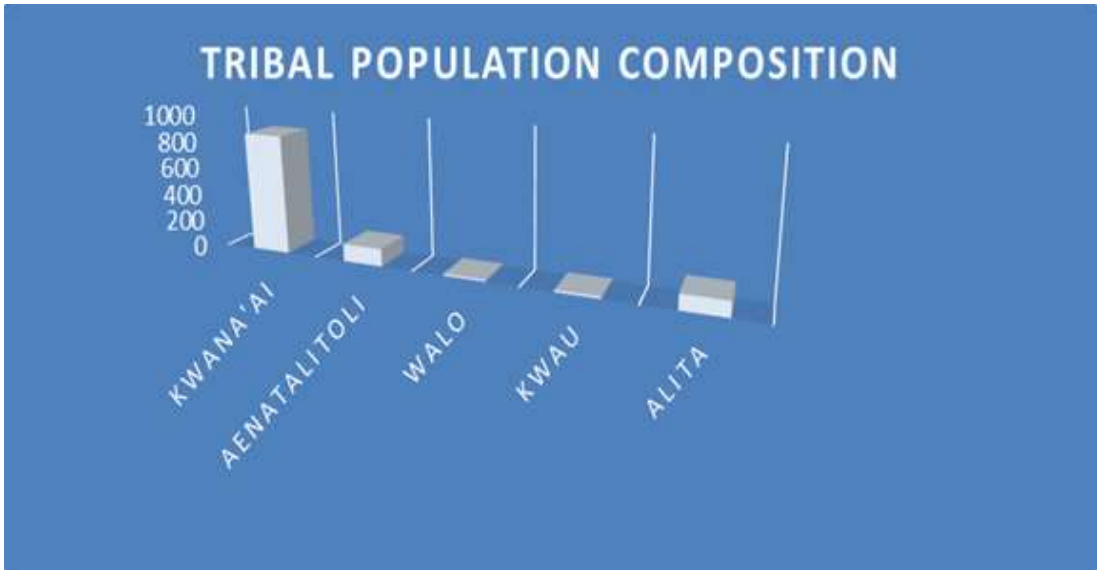


Figure 20: Bar-graph describing denomination composition of

More than 1000 people who resided in 10 small communities located between Taba'a and Kwai River, SSEC-M (South Sea Evangelical Church - Movement) made up of more than 38% of the population. Followed by COM (Church of Melanesian), SDA (Seventh Day Adventist), SSEC (South Sea Evangelical Church), and JW (Jehovah's Witness) each consisted of at least around 10% -14% of the total population. The remaining three denominations situated at the bottom of the graph with not more than 3% each of the total population. Interesting to note that there are at least 3.3% of the population that do not identify themselves with any congregation or denomination

C. Population and Tribes

Part of the assessment, the team identify tribal composition of people residing between Taba'a and Kwai River. As shown in the bar-chart above, Kwana'ai tribe is the most populated compared to other 4 tribes found living in the assessment area.



Kwana'ai pagan priest (Rarafalu) on the right and George Ganiau on the left (photo taken by Gideon.T September 2021 at Kwarifau)

5.6.2 Health Profiles of Communities

This section focuses on health status and health facilities that are relevant to most communities existed between Kwai and Taba'a River according to assessment conducted in month of September 2021. Health indicators highlighted below, described the primary health care standard expected at least in a developing context like Solomon Islands: describing the type of health infrastructures access by members of surveyed communities and reflecting on Matakwalao aid post medical monthly report of types of disease treated and recorded at the clinic.

A. Bar-graph depicting Access to Water Supply in the communities

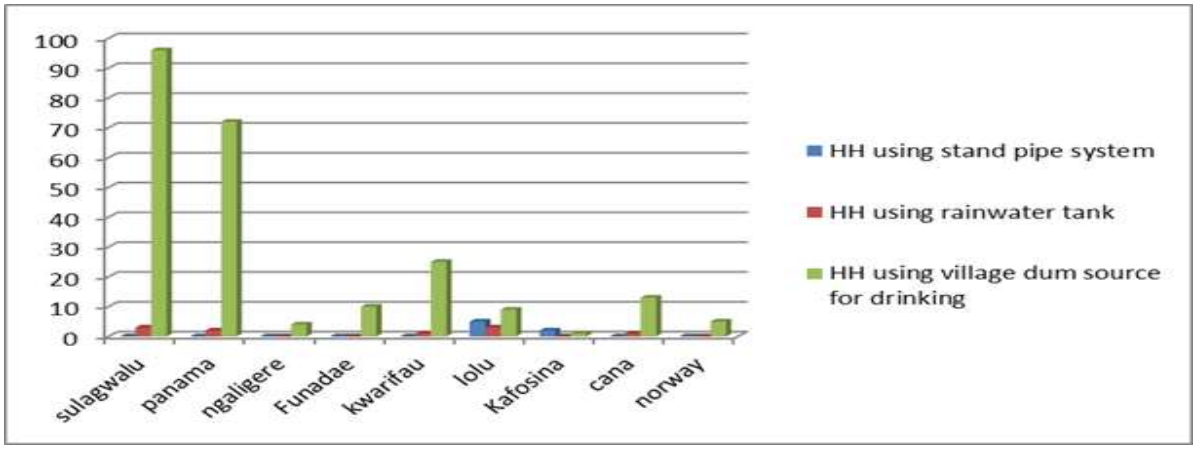


Figure 23:Bar graph showing community to health survey conducted for 10 communities

Field visit and household survey indicated eight community of the 10 surveyed villages used village Dum water source for drinking except for Lolu and Kafosina who have access to few stand pipe system in their community.

B. Bar-graph Illustrating Access to Proper Sanitation

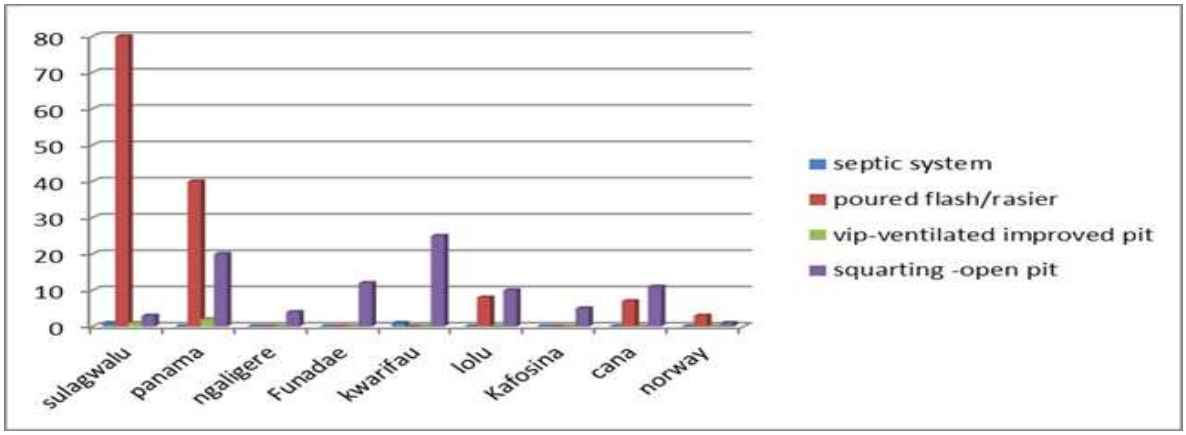


Figure 24:Community response to Proper sanitation survey for 10 sample communities.

Nearly 80% of Sulagwalu and around 40% of Panama community recorded household using poured flash toilet system. Few household at Lolu, Cana and Norway are also using poured flash whilst Ngaligera, Funadae, Kwarifau and Kafosina household mostly used open pit toilet system in their communities.

C. Health Centers

There are at least 12 health centers existed in north Malaita region. Refer to map attached for details. Fauambu and Maluu are currently known as Area health centers, others could termed as rural health centers and Nurse aid post.

Within the study area Matakwalao nurse aid post existed approximately 1 km to the project site. The aid post is registered under the Malaita provincial government, with a catchment population of 2300 people for more than 20 communities in ward 9 of Malaita province. 10 communities that are part of social assessment have accessed medical services and referrals from Matakwalao aid post. The furthest community is Kwarifau with around 5 km to the aid post. NB/, there are other communities that are within the catchment zone of the clinic that made up the 2300 aid post catchment population, currently they are not part of the social survey conducted for this EIS.

Basic medical services offered at Matakwalao aid post are:

a. Outpatient's clinic
b. EPI- immunization expanded program
c. Anti-natal clinic
d. Family planning and maternal child health and nutrition
e. Health education
f. Treatment for common disease and injuries
g. Promotion of essential drugs

There were two registered nurse-aid (RNA) staff currently working at the health center. The aid post currently offered vaccine treatments, since it has a solar powered – TCW 15 SDD (refrigerator vaccine storage). However the aid post did not able to provide other nursing care services, due to lack of nursing care facilities. Medical services are mostly based on curative measures with increase referral cases. Matakwalao aid post directly referred health cases to Malu'u mini-health center for further treatment and referrals to Kilufi before reaching the National Referral Hospital in the capital, Honiara.

5.6.3 Institutions

This section will look at types of institution that exist in communities near Suava Bay Economic Growth Centre. Noted there are overlaps between the two forms of institution (formal and informal) depending on the context surrounding a given institution. According to

(Leftwich & Sen, 2010 and Berman, 2013). Whilst formal institutions are impersonal and arrangements are made in contracts, informal institutions are personal and arrangements are non-contractual. Community survey and consultation findings, education and health sectors are the two formal institution found within the area. Church, including rest of other existing groups would be fairly known under informal institutions. Though church and other groupings in the community categorized under informal institutions they have a much stronger influence compare to current formal institution found in the communities. To simplify the institutional context in the community, institutions are further categorizes into four (4) major areas i.e. education, health, church and community/family/tribal institutions. These institutions have established facilities and structures with high visibility on the ground. The type of institution existed between the two rivers in close proximity to Suava bay growth center, are outline in the table below.

Table: Summary of existed facilities and structures around Project Area.

Education	**Health**	**Church**	**Community/family/tribal**
Manafaeni primary	Matakwalao aid post clinic	Sulagwalu SSEC Movement Church	Matakwalao community policing
Lolu primary		Athens SSEC Church	family grocery group
Kwarifau primary		Manafaeni SDA	Sulagwalu UNDP youth entrepreneurship group
Ngongore early childhood		Kwarifau SDA	Sulagwalu World Vision youth entrepreneurship group
		Lolu church of Melanesian	Waves family Enterprise
		Lolu COC church	Kwana'ai board of trustees- ink
		Cana SSEC Movement Church	North rock transport services-business
		Cana SSEC Church	New dawn transport services-business
		Norway Baptist Church	Kwatonaere market centre committee
		Manafaeni Jehovah Witness	PS Soccer club-sport club
		Lolu Revival church	Estate financial scheme group
		Kwarifau COM	Master seed family business
			Sub-tribe groupings
5	1	12	13

Around 19% of institutions identified are formal and more than 80% are informal groups or institutions. Refer to graph above, more than 41% are community/tribal groups, 38.71% are church groups, 16.13% are schools and 6.25% for health institution.

5.6.4 Community Structures and Family Structures

With the arrival of church, government and education traditional roles, belief and perspective shifted, providing new source of power, structure and authorities in the hope of delivering development and a hope for better life compared to life lived within the traditional setting. Eventually it weakens the traditional power base and the source of traditional value system, presenting new challenges and realities that tribes and communities need to adjust to in order to maintain their position of authority, rights and sense of identity in a more complicated context.

Kwanaái people have seen that there is a need to institutionalized community or tribal governing bodies under available legal provision to become lawful and recognized by the state. Finding during consultation, Kwanaái tribe in year 2007 formally registered under company haus as a legal entity mandated to deal with tribal affairs of the community. Refer to Kwanaái Board of Trustees structure outline below:

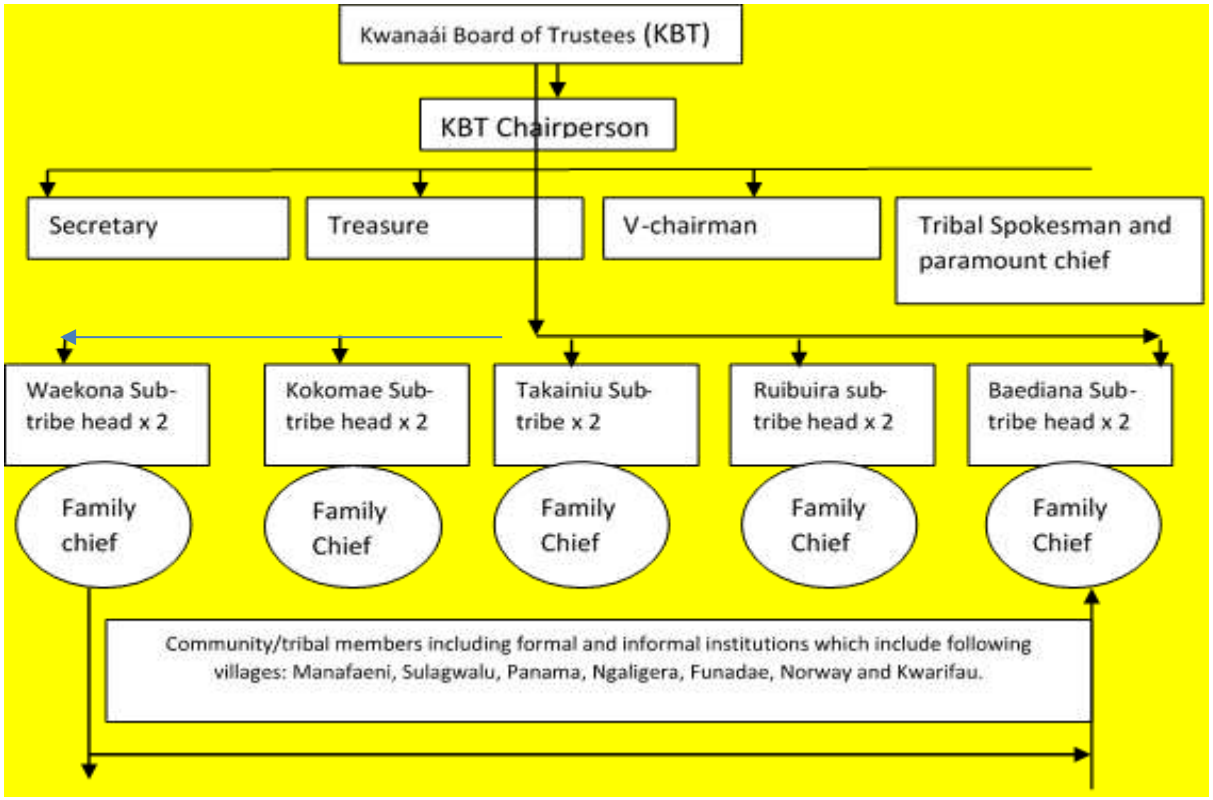


Figure 25: The Organisational Structure of KBT (personal Communication, G.Nunufana, sept 15 2021, Sulagwalu Village)

5.6.5 Land Ownership

Community consultation with elders and key tribal leader of Kwanaái and surrounding tribe regarding land ownership of Suava bay Economic Growth Centre reveals a long history of land cases that gone through various court proceedings. Documents regarding past and current court case and decision have been consulted and the recent determination is hereby attached for reference purposes. Traditional rights and ownership of Suava Bay Growth Centre site could be best described in detail according to number of court cases in chronological order presented in the table below.

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Year	Plaintiff and Defendant	Type of court	Determinations
1935 - 1936	John Tana of Alita tribe(Plaintiff) vs. Luifoa of Fautharii/Kwanaái tribe (defendant) Fauthuumaku Land	HIS Britannic Majesty's High Court for the Western Pacific Held in the British Solomon Islands protectorate under pacific order in Council 1893.	The decision was in favor of Luifoa of Fautharii/Kwanaái tribe.
1972-	Fautharii/Kwanaái Land registration took place under the Matakwalao land settlement		

1974	scheme, conducted in line with land registration acts and processes. *Refer to attached map of registered lots.* All customary land were registered under the name Fautharii customary land.		
1977	Ramousia (Plaintiff) of Alita tribe vs Jeffery.T of Fautharii/Kwanaái tribe Kwaliai land case	Toabaita –Local court	The decision was in favor of Jeffery T of Fautharii/Kwanaái tribe
1978	Ramousia (Plaintiff) of Alita tribe vs Jeffery (defendant) of Fautharii/Kwanaái tribe Kwathadiumalefo land	Customary land appeal court. (CLAC)	Decision in favor of Jeffery T of Fautharii/Kwanaái tribe
1979	Ramousia (plaintiff) of Alita tribe vs Jeffery T (defendant) of Fautharii/Kwanaái tribe Kwathadiu Malefo land	High Court of Solomon Islands – land Appeal case	Decision was in favor of Jeffery of Fautharii/Kwanaái tribe
1980	- Maekali (Plaintiff) of Aenatalitoli tribe for Aenatalitoli land. - Edwin (plaintiff) of Kwau tribe for Kwau land. - Ramousia (Plaintiff) of Alita tribe for Kwathadiumalefo land - Kalainao (plaintiff) of Mamalakwai tribe for Mamalakwai land. Vs Jeffery of Fautharii/Kwanaái tribe Aenatalitoli, Mamalokwai and Kwau land within Fautharii/Kwanaái land.	West Kwaraáe Local court	- Maekali of Aenatalitoli lost his case - Edwin of Kwau tribe, Kwau land lost his case - Kalainao of Mamalokwai lost his case - Ramousia of Alita lost his case
1980	- Leslie dolaiasi (plaintiff) of Aenatalito for Aenatalitoli land - Edwin (plaintiff) of Kwau tribe for Kwau land - Ramousia (plaintiff) of Alita tribe for Kwathadiumalefo land Vs Jeffery T (Defendant) of Fautharii/Kwanaái	Malaita CLAC	- Leslie won his case - Edwin Won his case - For Ramousia, the decision was in favor of Jeffery T, however Ramousia was given secondary interest to the land.
1981	Ramousia (plaintiff) of Alita tribe vs. Jeffery (defendant) of Fautharii/Kwanaái tribe. Kwathadiumalefo land within Fautharii/Kwanaái land	High court of Solomon Islands – land appeal case	Decision in favor of Jeffery T of Fautharii/Kwanaái tribe.
2010	In June 2010 Kwana'ai tribe sign an MOU with the government through ministry of commerce to all government conduct assessment and survey at the ear marked project site.		
2012	Kwanaái tribe enters into an outright sales agreement contract with Solomon Islands		

	government for the site ear marked for EGC national project. 5.8 million dollar has been paid to Kwanaái tribe and part of the payments remains with around 2 million dollars according to the sales contract agreement. *Refer to attached sales agreement document.*		
2012	Government conducted a public hearing to acquire lots identified with in the earmarked zone. Claims of tribes who presented their stories were all set aside by the acquisition officer who presides over the hearing. Eventually Solomon Islands Government (SIG) acquired 2 lots; lot 256 and 258, title already transferred to the commissioner of lands. *(Refer to attached map)* And the government proceed with open call for another public hearing for lot 163 and 164 since it was registered as customary own lots without name of any individual or even tribe attached to the two respective parcel, except for part of lot 153 which has names attach to the lot parcel, however yet to be paid by the government.		
2015	Joseph Niurodo (plaintiff) of Takibakwa tribe vs George Manubuasa (defendant)	Malaita Local Court	-matter remitted to the chief of the area - both parties must attend chief settlement - Party not satisfy with chief's settlement can refer to the local court.
2015 - 2020			
Nov 2020	The second fresh Acquisition hearing was outsourced and presided by Island Consultancy Services at Maluu on 3rd November 2020. The acquisition hearing was attended by Takibakwa and Fautharii/Kwanaái tribe. Determination of the acquisition officer eventually resulted in Fautharii/Kwanaái claim being set aside; determination decision was in favor of Takibakwa tribe. Report was produced on 12th November 2020. Kwanaái tribe launches an appeal against the determination within the 90 days' notice period.		
Jan 2021	Commission of lands sends notice parties involved that the determination report produced by Island Consultancy Services had some technical errors and needs to be revisited using right legal avenue to deal with the matter.		
Feb 2021	Kwanaái tribe appellant legal practitioner (Nigel Galo) applies for Amended Notice of Appeal to the central magistrate court of Solomon Islands. *See attached file*		
15 April 2021	Consent orders produced and signed by all parties involved in the magistrate court of Solomon Islands at Auki as outline below 1. Determination of the acquisition of 12 November 2020 is hereby set aside. 2. The appeal is hereby discontinue 3. Parties to bear their own cost		

Figure 26: Land Determination History of the Project Site. (Personal communication, G.Nunufana, oct 12 2021, Sulagwalu village)

Fautharii/Kwanaái tribal land had long history of court proceeding and land settlements hearing through various legal means to settle land issues in the country. It begins in year 1935 until recently in April 2021. The final high court case was determined in favor of Fautharii/Kwanaái tribe since 1981 between Ramousia (Plaintiff) of Alita tribe and Jeffery T (Defendant) of Fautharii/Kwanaái tribe. It took 31 years of no court hearing until recently when Kwanaái tribe enters into an outright sales agreement with the government of Solomon Islands, allowing portion of the land for the intended National Economic Growth Center projects.

Recently, a consent order issued by the magistrate court of Solomon Islands on 15th April 2021, which implies a set aside of determination by Island Consultancy Servicer Acquisition officer issued on 12th November 2020 and order a discontinue of appeal from Kwanaáí tribe, indicated Kwanaáí tribe sits on an upper position to dialogue with regarding progress and expansion for Suava bay EGC project.

Regardless of that, it is important to note that there are interested parties who still wish to test their claim over the same pieces of land, as discuss during consultation with tribal and community leaders. Dispute might arise by new parties or same tribe who have tested their claim in the past regarding the targeted project site. However, compare to other tribal land in north Malaita, Kwanaáí tribal land has a high court biding order since 1981.

5.6.6 Types of common or individual rights on natural resources

Land tenure system in Melanesian society is a pressing concern for the people and the government where there is a contradiction between communal or tribal and capitalist economic value system. Land and other natural resources existed on the land is normally owned by tribal members in traditional Melanesian society. Expressed by Ben.B in the article "Land in Kwaraáe and development in Solomon Islands" for Kwaraáe, land represents the entire natural resources base, the foundation of material and cultural existence. According to community consultation conducted as part of the EIS, Toabaita people in North Malaita echoes similar relationship to land and other natural resources in terms of rights and ownership. Relationships to land are integral part of relationship with one another that honored and valued even among community members today. The ideal understanding of ownership and right to natural resources is commonly own by the tribe.

5.6.7 Gender

This EIS report seeks to describe level of understanding regarding gender topic in communities near to the project site, drawing on a general picture of North Malaita. This assessment was conducted for communities between Kwai and Taba'a River. Due to limited resources to mobilize team, a sample of 60 household heads are asked to provide feedback on gender related questions, testing their current understanding and acceptance level of the topic. It is worth noting a detail analysis should be conducted to gathered in-depth information to describe current gender equality condition of Suava bay area.

The bar-graph below illustrate % of response by male and female when asked with the question: Did you hear about the word gender equality any time before? Respondent feedbacks are tabulated in the graph below.

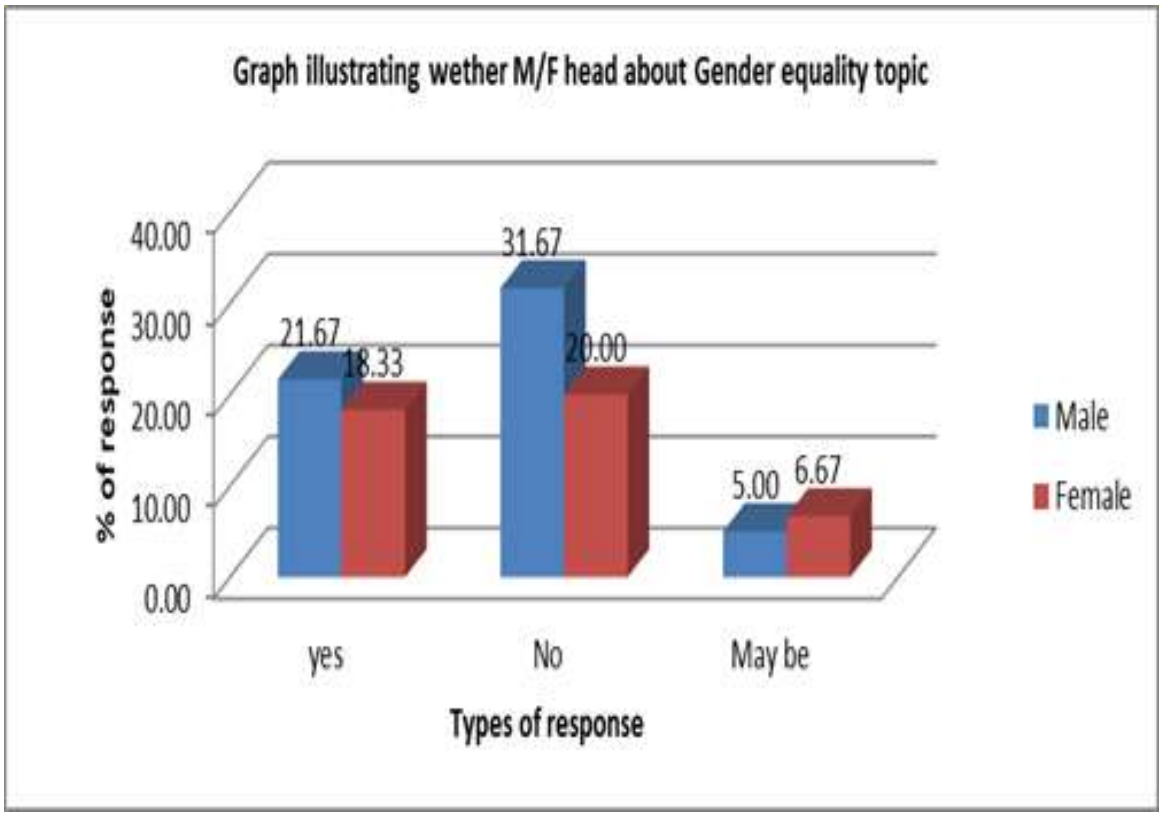


Figure 27: Community response on gender equality topic conducted for 60 households

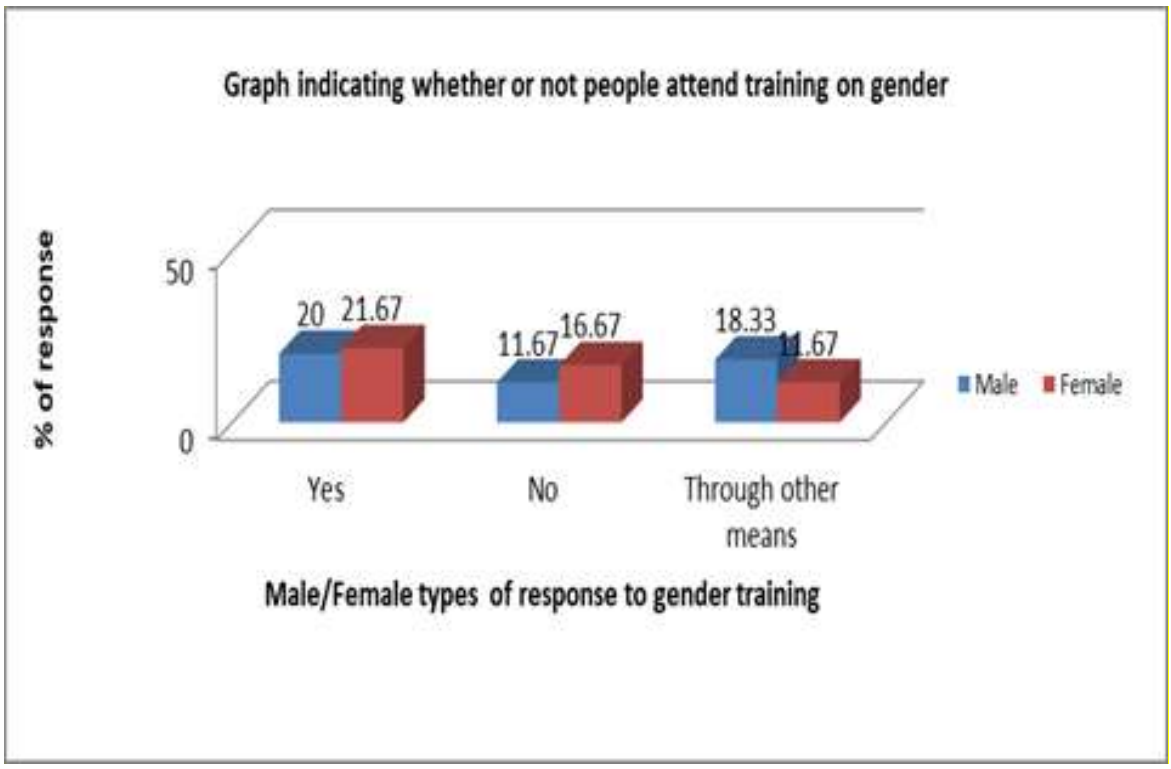


Figure 28: Community response to gender training opportunities.

More than 21% of male and 18% of female said they heard about gender equality topic in the past. 31.67 % of male response and around 20% female stated they never heard about the word gender equality any time in the past. Whilst more than 5% male and more than 6% female are not really sure whether they learn about that concept or not.

Additional question are posed to test whether someone acquired information through proper training or not. Their responses are described in the fig 5.6.7. b.

20% of male and more 21% of female stated they attend trainings on gender topics. Uncovered during the assessment most family heads attend trainings from World Vision Solomon Islands, Malaita women's desk and UNDP programs implemented in the communities. More than 29% of respondent stated, they heard it through friends, church conference and Solomon Islands Broadcasting Cooperation (SIBC) radio programs.

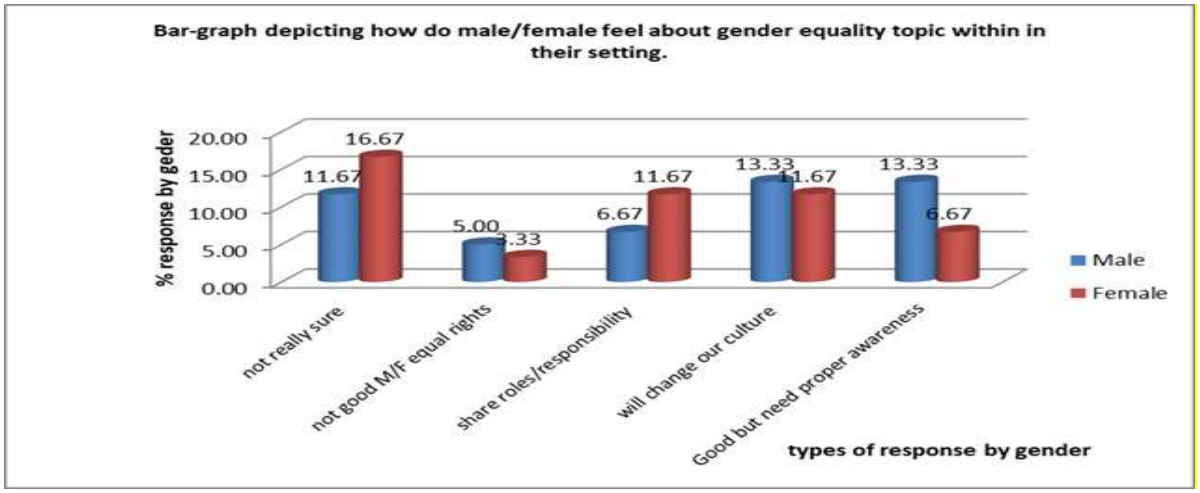


Figure 29: Community reactions on importance of gender considerations in the local Communities.

With the understanding that gender equality could be a very sensitive topic in a male dominant society like Toabaita, a question was posed to test whether such topic would be worth discussion among rural people in north Malaita or not. Asking the question; how do you feel about gender equality topic within you setting?

Mix reaction is evident via responses provided during the assessment. More than 27% not really sure, around 8% feel that it is not right according to Toabaita culture and tradition, around 18% feel that it is a good thing when considering sharing of roles and responsibilities at home. Around 24% of the respondents feel that it will drastically change the culture. However 20% of response indicated it is a good thing but requires proper awareness to be conducted in the communities. The 27% not really sure, 8% did not accept it, 25% believe will change the culture and 20% agree but rising need for proper awareness, reflecting more than 80% response who show sign of hesitation to gender equality aspect in the community.

Overall it is possible to conclude though not fully assess during community consultation and visit, highlighted through other assessment done in the rural Solomon Islands in parallel to this topic, women would likely to face greater challenges regarding access to sufficient health care support, access to better education, limited engagement in economic opportunities, limited chance to take on leadership roles, little access to justice and susceptible to domestic violence and other forms of abuse in rural context of Solomon Islands. (Solomon Islands Gender Assessment Report, ADP, 2015).

5.7 Cultural Component, Including Non-physical Resources and Elements

This section describes the cultural heritage focusing on the history and material remains of few historical and contemporary events that embodied significant cultural values and meaning that underpins the way local communities look at themselves and the outside world.

Assessment report discusses both Tangible and intangible cultural elements transmitted inter-generationally in the community. Discussion begins by highlighting the historical background to the local culture and tradition before moving on to specific elements that stand out as important element of the local culture during the assessment.

Information is mostly gathered through qualitative methods, key informant interviews and observation. Besides, secondary source data from literature review and accessing online materials have been utilized to draw analysis and present information for this component

5.7.1 Cultural Heritage

I. Background

Solomon Islands with 992 islands grouped in to Nine (9) island province share a diverse culture that made up the entire country. A Population which mostly Melanesian with few Polynesian, Micronesian, Chinese/Asians and few Europeans. Malaita being the most populated island in the country, are mostly Melanesian decent and with few Polynesian from Malaita Outer Islands (MOI).

Suava bay economic growth center existed in a deep Melanesian cultural context that dominates the island of Malaita. According to C.Moore, Melanesian is a geographic descriptor for the grouping of island people spread from Timor and New Guinea in the west and Manus in the northeast and south to Vanuatu, New Caledonia and Fiji on the eastern fringe of the Solomon and Coral Sea. Malaita sits in the middle of the Solomon Archipelago, a double-chain of islands below the Bismarck Archipelago east of New Guinea. According to C.Moore and Akin in the book making of Mala, “Mala was first recorded as ‘Malaita’ or ‘Malatya’ by Spanish explorers in 1568, which may have been because of a misunderstanding. When the Spaniards pointed to the island on the horizon and asked what it was called, the people of neighboring Isabel Island are thought to have said ‘Mala ita’: that is Mala over there”.

Categorizing Malaita under the broad image of Melanesian society would not be adequate to draw a complete picture regarding the cultural situation of Malaita people in particular.

Therefore this assessment wishes to highlight few cultural elements that are distinctively part of Malaita culture, focusing on Northern Region and Kwanaái tribe who enters into a sales contract agreement with national government of Solomon Islands.

ii. Five Regions of Malaita

Table below described the similar dialect groupings existed in 5 demarcated regions in Malaita province.

Table 12: Community response to gender training opportunities.

Northern Region	Central Region	Eastern Region	Southern Region	Malaita Outer Island
• **Toabaita** • **Baelelea** • **Lau** • **Baegu** • **Fataleka**	• Kwaraae • Langalanga • Fataleka • Kwaio	• Kwaraáe • Kwaio • Guluala • Baegu • Lau • Fataleka	• Kwarekwareo • Tai • Mareho • Asimae • Asimauri • Raroisuu • Are • Aiaisi	• Luaniua • Sikaiana • Pelau

Suava Bay-Kwatonaere growth center sits among three northern dialects known as Toabaita, Baelelea and Lau, (point highlighted yellow) in the map provided above

Figure 30: The five Regions of Malaita Province

It is important to understand the regionalism concept of Malaita province for the purpose of this EIS assessment report. It carries significant meaning in terms of traditional geographical boundaries, Malaita provincial government demarcated regions for planning and dissemination of basic services, cultural identities, dialectal similarities and spreading of tribes (family-tree) on the island of Malaita.

Suava bay economic growth center is located at Kwatanaere in ward nine, Lau Baelelea Constituency at the bottom of the mouth like shape of the physical outlay of the Island of Malaita, in Northern region. Based on geo-political boundaries the project is located in Lau Baelelea constituency, however according to culture and traditional boundaries it is within Toabaita boundaries that begins at Kwai River and end at Aero River.

iii. Culture and Tradition in North Malaita

The existing cultural context surrounding the EGC would best describe based on north Malaita culture, more specifically according to Toabaita culture and tradition. There are number of factors singled out as cultural pillars observed and valued based on culture and tradition. To name a few, the following are highlighted; governance and leadership, marriage, chants and oral history, cultural festivals, ancestral worship, death, Nalinut season, traditional dancing, giving birth to a child and traditional livelihood activities. Though many of these practices haven't strongly observed by many people in North Malaita today, having sound background knowledge would help explain some of the current behaviors that builds up or break-down the social structure of the communities.

iv. Governance and Leadership

The traditional governance system could be described as big-man system of leadership. Base on Roger. M. Kessing; Governance and leadership in traditional setting mostly came from a priest in northern part of Malaita. Besides, there are other self-acquired positions of authority that doesn't really depend on cultural rites of ceremony but ultimately depends on ones bravery acts. That is the role of a worrier (Ramo) and an orator (Aofia). Toabaita is a patrilineal society where rights and ownership are transferred through male line.

According to assessment conducted, almost 100% of the communities assessed had been Christianized, thus the role of traditional/Kastom priest have been shifted to church/religious leaders and with inclusion of community chiefs concept in the villages and political elected leaders. However the role of a traditional/Kastom priest, Warrior and orator cannot be totally

substituted when it comes to sensitive cultural issues or even anything to do with development on the land.

v. Marriage and Bride Price

Traditionally, marriage must be arranged by elders or parents of a young man and a young girl in Toabaita culture. It is the responsibility of the male side to search for a girl and ask the parent of the female.

It is profoundly prohibited for a male to get close to a female or enter into a relationship without prior involvement of parents or an elderly person within the tribe. Doing that would equals to compensation and death penalties. Whilst prior relationship before weeding is slightly accepted, the lovers must sit in a position where both had their backs facing each other and must be monitored by an elderly woman in a distance. This is called GONU in north Malaita culture. For this reason north Malaita, particularly Toabaita had practices MUA as part of marriage conditions for a couple. MUA is a term referred to cultural taboos prohibiting interaction with a male or a female by whom a person had a relationship with prior to marriage.

Bride price payment is a practice adopted within Toabaita culture even today at a minimal rate compared to Lau and Baelelea people. However this practice had been seen over emphasize and nearly lost its genuine meaning when parents over-charge their girls for reasons far beyond cultural standards. Whilst churches have established certain standards to control over charging, few people still practice giving bride price demand to male side at higher rate.

Overtime most of these practices have change with the influence of Christianity and education. However, it is important to understand the original meaning and practices of marriage and bride price as one of the oldest cultural practices that are heavily regulated which can be traced back to patrilineal family relationship according to male lineage in Malaita.

vi. Cultural Festivals

North Malaita has a beautiful cultural event observed in their culture called Maoma. It is the climax of physical, social, economic and spiritual activities that forms the core of Toabita culture and tradition. Noted during community consultation with tribal leaders, Kwanaái tribe seems to be the last tribal group to host this cultural festival in

Toabaita region in 1996. It is a time of great feasting and celebration after a 3-5 years period of keeping them holy and consecrated for this particular event. People from neighboring tribes would turn up with foods and gifts in aid to the tribe that host the event.

vii. Art of Mao Dancing

Mao cultural dancing is a popular cultural art of entertainment, which always gives bride and joy among locals even in today settings. Recently the art of Mao dancing is gaining popularity in the country and mostly with inclusion of new dancing patterns and sounds. An art of public performance that resonate strongly in Toabaita tradition, which has its roots in a culture of deep traditional acts of worship. Today Mao dancing is becoming popular in Malaita and to the country at large, a piece of culture that originated in Toabaita.

viii. Child Bearing

Though now a day's almost every woman give birth to a child at proper delivery health care center, giving birth to a child in a traditional Toabaita society is strictly observed according to cultural norms and beliefs in honor and respect to cultural norms and practices. As part of history, giving birth to a child, a mother would go out to an isolated site out in the bush to give birth to a child. According to that tradition, the child and the mother would be kept themselves out of sight for a period of more a week before coming home with the child. As stated by few elders of the community they are the living example of such tradition.

ix. Ancestral Worship

Toabaita people are well known for ancestral worshipping. There are number of sacred shrines and sacrificial structures established in Toabaita region. Ancestral worshipping is the central activity that defines Toabaita culture and tradition. Kwanaái people have number of sacred shrine that are still preserve and observed according to Toabaita tradition.

Toabaita region being the host to one of the major Christian church in the country (SSEC), the practice of ancestral worship has been highly condemn as evil during arrival of Christian missionaries, thus ancestral worshiping quickly vanished.

However worship shrines and other material remains of such culture were upheld and kept even today by certain individuals and few clans in Toabaita.

x. Death Observance

Death according to local culture must be observed with great respect. It is culturally sensitive to move around unnecessarily or involve in other physical activities in an environment where relatives and members of the immediate families of the decease resided. In the past people observed mourning period for more than a week. Today in Toabaita contemporary settings, number of days to observed death in a community normally would be around 1-3 days. Lighting of fires and engaging in noisy physical activities could interpreted as celebrating death as target achieved, a belief that could traced back to the culture of head hunting and sorcery practices. Ignoring such norm even in today's setting would leads to demanding of compensation by relatives of the deceased.

xi. Ngali-nut festival in Toabaita Culture.

Harvesting Ngali-nut in Toabaita tradition is known as one among the surviving history of the region. A well structure traditional socio-economic activity. During harvesting season men and women engaged in harvesting carried out strictly to traditional practices. Bamboo-nuts are produced and surplus can be used for trading with saltwater people for fishes and other marine products through batter system. Rest are usually preserved for the renowned cultural festival known as Maoma in North Malaita. Bamboo-nuts and taro is used to produce a culturally valued food called Kata in Northern region.

Currently the practice of harvesting Ngali-nut and production of Bamboo-nuts are commercialize and still remain a potential cultural livelihood activities to attract tourist and others who might wish to learn about the Ngali-nut festival in North Malaita.

xii. Tribes and Languages

Suava bay EGC at Kwatonaere as claimed by community leaders during consultation is located in Kwanaái land in North Malaita. Kwana'ai tribe came out of Furii tribe in

Toabaita region. Furii tribe claimed to be the original tribe who first came and settled at placed called Furii in the highlands of Toabaita, whom its decedents spread throughout the Toabaita region.

People of Kwanaái who descend out of Furii lives among three different language groups in North Malaita, hence their language is a hybrid of three surrounding language speaking group. It is a slow speech pattern adopting Toabaita, Baelela and slightly Lau vernaculars.

Irrespective of mixture of dialect adopted by people of Kwanaái, their culture, belief system, traditional practices and speaking linked much to Toabaita speaking, culture and tradition. The close identification with Toabaita people is due mainly to the fact that majority of Toabaita speaking people are descendants of Furii tribe in north Malaita, by which Kwanaái tribe have its origin. Beside Kwanaái tribe, Aenatalitoli, Walo, Kwau and Alita tribes are also located in the surroundings of Suava Bay economic growth center and are part of the assessment conduct in the month September 2021.

Table 13. Tribes and Language Profiles within the Suava EGC

Community	Tribe	Dialect
Manafaeni	Kwana'ai	Mix Toabaita & Baelelea
Sulagwalu	Kwana'ai	Mix Toabaita & Baelelea
Panama	Kwana'ai	Mix Toabaita & Baelelea
Ngaligera	Kwana'ai	Mix Toabaita & Baelelea
Funadae	Kwana'ai	Mix Toabaita & Baelelea
Kwarifau	Kwana'ai	Mix Toabaita & Baelelea
Lolu	Aenatalitoli	Baelelea
Kafosina	Kwau	Mix Toabaita & Baelelea
Cana	Alita	Toabaita
Norway	Walo	Toabaita

xiii. Sacred Sites

There are traditional grave sites and Christian burial sites found within and in close proximity to the EGC area. Refer to exhibit

Right within the demarcated EGC site is a burial site called Faualimango, said to be established during the period of Roman Catholic Christian missionaries who arrived at Suava Bay area in the hope to establish a school and Christianize the locals. A clinic was then established by Catholic missionaries few meters away from where the EGC is

located around year 1900s and up. Based on this history, that site was now called Roma, located approximately less than a km from EGC zone. As recalled by locals, Roman Catholic missionaries used to live there and was later asked to leave by Luifoa of Kwanaái tribe. They went up to Takwa and had established their station up until today. As told by locals during consultation with key tribal leaders, the burial site has been used to bury those who died at the once established catholic clinic, who were not attained by their clans' men to bring dead bodies back to their homes. They asked elders of Kwanaái tribe to buried people who died at the clinic at Faualimango burial site.

Recently in year 2000, a woman of Biluki tribe in Mbaelelea died at her son in-law's (Agwasitaloa) home at Kwatonaere sea front and was buried at Faualimango after consulting elders of Kwanaái tribe. An interview with Ririko's son on September 2021 at Kwatonaere market, reveal that his uncle Alex Saii went and asked Lemech Tabai and other elders of Kwanaái tribe seeking approval to bury his mother at Faualimnago, since it is too far to bring back the dead body to where they originally belong. Upon the elders approval they buried the dead body at Faualimango burial site. (personal Communication, John Lamani, sept 2021, Kwatonaere Market)

The Faualimango name simply refers to Mud-Crab stone. The word "Fau" for stone in Toabaita dialect and Alimango mean Mud-crab. As told by elders of the village men of Kwanaái usually collect Mud-crab near a stone at that site, thus they refer to that particular spot as Faualimango.

Refer to the map attached indicating grave site found in or close to the approximately 300x300 square kilometer of the government acquired land at Kwatonaere.

5.7.5 Unique Landscape

From observations there are no unique landscapes found within the project area. On Malaita Iunique sites are found on the Lau lagoon, mountainous areas, central regions and Southern Region. Project site is actually located in Suava Bay and between Taba'a River in the west and Kwai River in the East. Few tourist attractions sites such as estuarine, waterfalls and coral reefs are located outside of the project area.

5.8 Health Component

5.8.1 Objectives and Scope

The scope of this study is to conduct a Health Impact Assessment (HIA) on the proposed EGC consistent with Solomon Islands *Environmental Regulations 2008* and other related subsidiary Legislations, more specifically the Environmental Health Act 1996, Public Health Regulation 1970 and Safety at Work Act.

The two main characteristics of HIA are;

1. Predict the consequences of project related actions and
2. Providing information that can help decision makers prioritize prevention and control strategies throughout the project circles (IFC, 2009).

Hence, HIA is a critical tool for developing evidence based recommendations for project decision makers and key stakeholders.

"Health is the responsibility not only of the health sector but also of other relevant sectors such as engineering, design, construction, community affairs department, local waste management services, road safety departments and local emergency departments" (IFC, 2009).

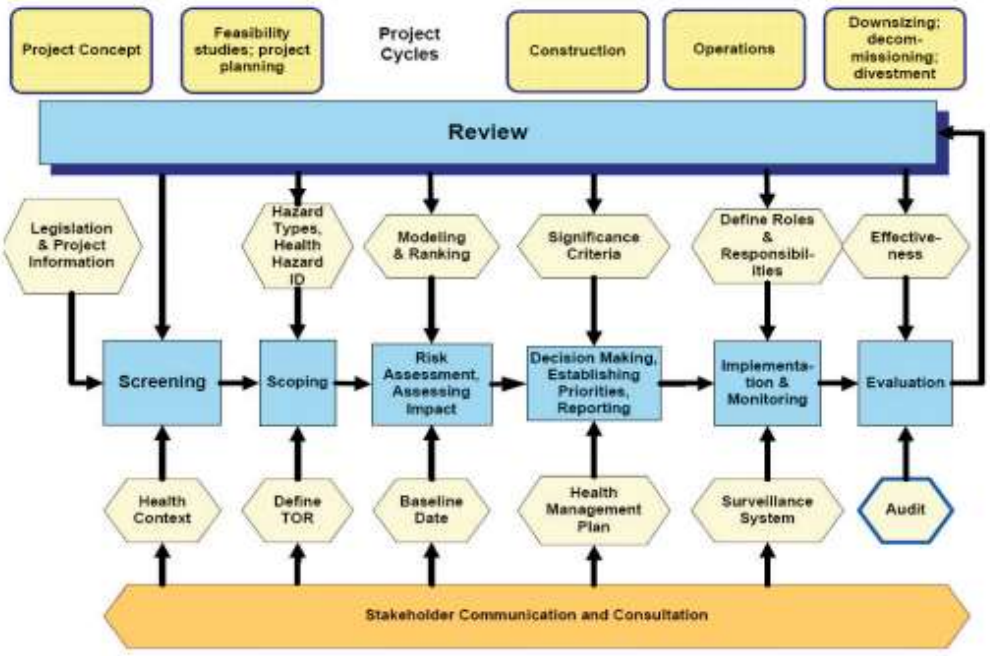
Key HIA Functions. The main key functions of HIA are as follows;

- Predicting the consequences of different project related options
- Providing information required to help prioritize prevention and control strategies throughout the project cycle
- Serving as a vehicle to engage companies and key stakeholders in a collaborative decision making process
- Identifying the most critical environmental and social determinants of health that may be affected by the project
- Addressing health issues that may influence overall sustainability objectives
- Facilitating inter-sectoral collaboration beyond the health sector and capacity building with local, regional and national host country health resources.
- Enhancing the project "license to operate" in the eyes of local communities and the host government (IFC, 2009).

5.8.2 HIA Framework and Methodology

The HIA for a new projects or new locations ideally seeks to identify and estimate the significant changes that may occur in the health of the defined population as the result of different actions. When a concurrent or retrospective health assessment is triggered, it aims to determine whether impacts are occurring or have occurred. Therefore, the timing of HIA is critical. For maximum benefit, the project should conduct the HIA before the final engineering design specification and construction contract are" locked in".

For this project, the IFC HIA framework and methodology was adapted as depicted below;



Source: Adapted and modified from IPIECA, 2005.

Figure 31: IFC –HIA framework and methodology

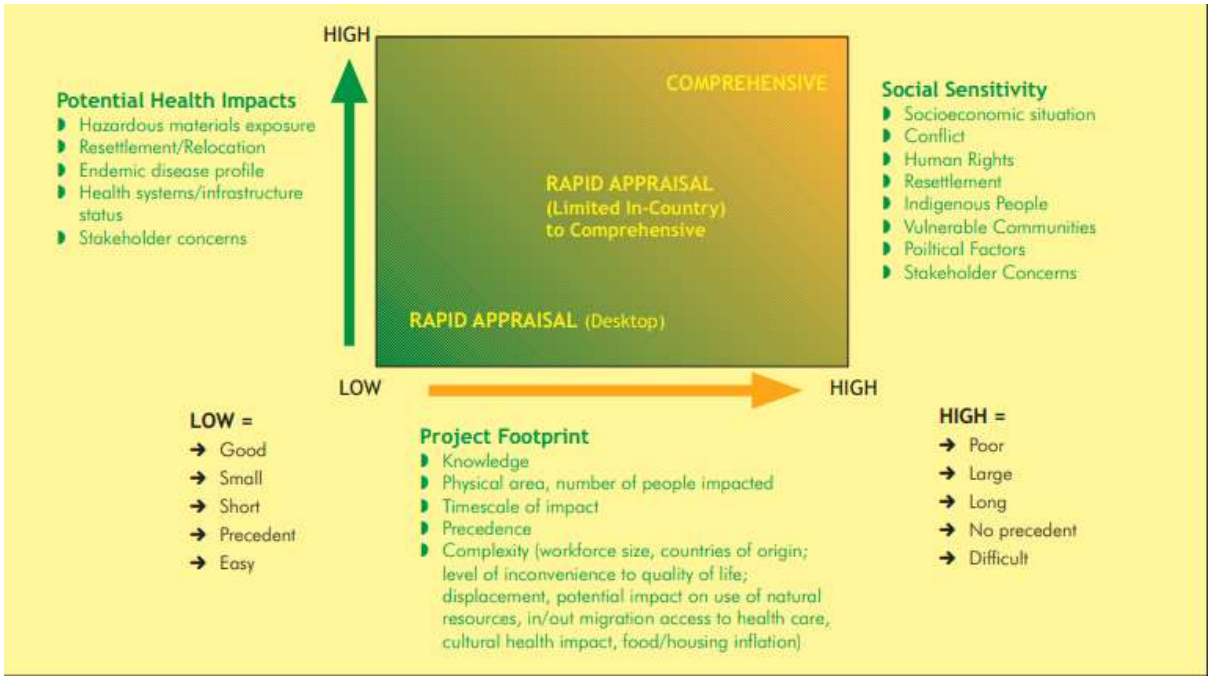


Figure 32: Selecting an HIA Type

5.8.2.1 HIA within the proposed project: How does the HIA "fit" within the other impact assessment e.g. environmental and social?

Since health impacts need to be assessed as part of the social and environmental impact assessments, the project should include the health component as part of the SEIA terms of reference. The proper integration of an HIA into its SEIA includes resolving boundaries, avoiding duplication, integrating mitigation measures and integrating executive summaries.

All projects, particularly, large projects, should consider the following aspects;

- The nature and extent (geographical and distribution of effects) of potential health impacts may not match the communities defined in the SEIA's
- How were the potentially affected communities (PAC) and households defined and selected by the different impact assessments?
- Health equity considerations that are key to PAC and other key stakeholders have that are felt disproportionately across different population subgroups
- The biology of disease transmission is complex and variable across geographical settings (for example, urban, peri-urban, and rural) seasonal aspects, and cultural practices. The geographical areas, and the communities and households located within them, may differ from the way they are defined on a purely environmental or social basis

- The utility and validity of existing health databases generated at the district and provincial levels could be overestimated
- The range and depth of potential household and community level health impacts, particularly when there is resettlement or relocation are often complex, subtle and potentially long lasting.

5.8.2.3 Specific mini HIA methodology" Sectorial approach: Looks at impacts across broad sectors,

For this mini HIA, a sectorial approach looking at the impacts across the broad sectors was taken into consideration mostly on the 12 key environmental health areas as presented on Table 13 and 14.

Waste Management – one of the areas needs urgent consideration is waste management. EGC will host commercial activities and there will be influx of people. Business houses will bring a lot of goods and services, hence, would result in a lot of waste products generated onsite.

Having a proper waste management disposal site is a prerequisite for mitigating a safe and healthy environment to avoid the direct and indirect impacts to human health and wellbeing.

Given the minimal land availability (space) within the proposed EGC, an alternative site had been identified to locate a small land fill site. However, given the dampness of the site, **a proper geotech assessment would be helpful to assist in the design and planning of a small well engineered design sanitary landfill site to prevent leachate pollution into the Suava Bay that would have direct and indirect impact to the mangrove and marine ecosystems within the Suava Bay (refer to separate study conducted by WECS)**.

Map 1: Shows the location of the proposed waste management site and existing water sources close to the EGC site.

Map 2: Shows the elevation profile and distance of the proposed waste management site to the coastal environment.

Map 3: Elevation profile of the proposed waste management site.

5.8.2.7 Housing: Will new housing be built within or effects for potentially affected communities?

There is a proposed site for construction of residential housing at the EGC site (refer photo 1). The site is located within a low-lying area which is susceptible to the impacts of sea level rise and coastal erosion.

Hence, there is a need to backfill the area and compacted to acceptable health environmental, health and safety standards prior to construction of any residential housing.

5.8.2.8 Water supply: Sanitation and food: Will there be changes in access to water quantity and supply sources; will local sanitation services be improved, overwhelmed or otherwise affected?

During the field observation visit conducted at the site, there is no sources of water supply located within the proposed EGC site. Hence, this would be one of the issues that need to be considered carefully in the development of the EGC. Water is life, hence without adequate and safe water supply, everything will be nothing.

However, there are sources of water supply that were visited and inspected which are located within the customary owned land outside the acquired site within the vicinity of the EGC site. (Refer to photo 1).

The potential water source to supply the SEGC is located approximately 300 meters at 80m asl from the EGC site and is a surface water stream (refer to plate 11). This is an ideal source to supply to the EGC site. However, proper treatment must be done prior to distribution to the EGC site to make the water supply safe for drinking and other utilities use.

Plate 11: Water source on a customary land which is close to the EGC

Another identified water source is located approximately 300 meters from the SEGC site. This is a spring water source (plate 12 & 13). This is an ideal source of water supply, once additional engineering design is made to improve and protect the water source from environmental pollution due to is close proximity to the main access road to the EGC site.

There is also likelihood that the source can be polluted from roaming animals, birds etc. if not protected, as its located close to residential buildings within the Cocoa plantation.

Plate 12: Spring source of water supply above the EGC site.

Plate 13: Part of the spring water source

5.8.2.9 Transportation: Changes in roads/ports/air access

Transportation access to the site is by means of the main northern road. Access road to the EGC site had already been constructed. Other means of access would be by means of sea using OBM which is accessible to the site given the location of the EGC site close to the coastal area whiting Suava Bay. Other means of access is by ship and the closest wharf would be Malu'u wharf once it is completed.

5.8.3.0 Communications, information distribution

The site as far as communication coverage is concerned is excellent. There is already existing telecommunication towers established close to Malu'u sub-station that covers the site well.

5.8.3.1 Environmental Health Areas (EHA's): As described in IFC guidance Note 4 for performance standard 4, Community Health, Safety and Security "these are the 12 defined areas to examine for potential project impacts,

Table 14: Typical Health Impact issues by Environmental Health Areas.

Health Impact Issues							
Environmental Health Area	Influx Camp followers, job seekers, family, service workers	Resettlement/ Relocation	Water Management (including creating of new water bodies, altering existing water bodies, and changes in drainage patterns.	Linear features (Roadways, transportation routes, transmission lines)	Hazardous Materials control and Disposal including waste containers (drums)	Changes in income & expenditure consumption including food/housing inflation.	Infrastructure: facilities including onsite housing, catering facilities, housing & laundry, sewage treatment plants (STP), surface water run off control, dams and containment facilities.
Vector Related	Increasing human parasite burdens (Malaria)	Movement to different prevalence area.	Creation and movement of breeding grounds.	Improper drainage, temporary water proof creation.	Creation of breeding sites with drums at household level.		Creation and movement of breeding grounds, improper drainage, temporary pool creation.
Respiratory & Housing	Crowded housing both work camps and community	Number of occupants per room, mix of occupants, children/elderly/adults (different vulnerability)		Facilitating mixing/interaction of different groups.		Housing infiltration triggered crowding.	Crowded housing in work camps, spread of ectoparasites.
Veterinary Medicine	Movement and migration of livestock due to influx of new groups.	Movement and migration of livestock due to influx of new groups.	Creation and/or movement of livestock watering locations.		Inadvertent water source contamination of streams/rivers.		Changes in movement and migration of livestock.
Sexually Transmitted Infections	Mixing of high and low prevalence	Mixing of high & low vulnerability groups.		Facilitating movement of high risk groups into		Men with money mixing with vulnerable	Inappropriate access to project

, HIV/AIDS	groups.			rural settings.		women.	housing by local community members.
Soil, Water & Sanitation	Overburdening existing services/systems, explosive, food borne epidemics	Failure to anticipate extended family influx in initial design.	Changes in surface water flows/quality potential groundwater drawdown.		Releases into surface water, long term impacts to groundwater.		Release into surface water from STP, changes in surface water flows/quality, potential groundwater drawdown.
Food & Nutrition	Influx of extended family, more mouths to feed	Shift from subsistence agriculture to peri-urban living/trading.	Changes in crop/garden selection and planting cycle.	Changes in access to gardens or local markets.		Food inflation further marginalizing vulnerable groups.	Food infiltration, food related illness, changes in local dietary habits.
Accidents & Injuries	Overcrowding, falls, burns, road traffic		Drownings, boat accidents.	Road traffic, increased pedestrian activity.	Unplanned releases/emissions.		Overcrowding, falls, burns, road traffic.
Hazardous Materials Exposure	Squatter developments, adjacent to industrial facilities with unplanned releases.			Movement via trucks of hazardous materials across communities to project areas.	Use of project drums and containers for water and food storage, inadequate incinerator design.		Release of contaminants into local community streams and rivers.
Social Determinants of Health, Psychosocial, Gender Issues	Cultural shock due to rapid social change.	Transformation of rural to peri-urban/urban lifestyle.		Greater ease of mixing of different social/ethnic groups.		Sudden money influx into a barter biased economic structure.	Greater ease of mixing of different social/ethnic groups.
Cultural Health Practices	Introduction of new practices and/or elimination of existing	Introduction of new practices and /or elimination of existing practices.				Shift to western medicine.	Introduction of new practices and /or elimination of

	practices.						existing practices.
Health Services Infrastructure & capacity	Increased visits for outpatient and inpatient services.	Increased visits for outpatient and inpatient services, if access improves.		Changes in access		Attraction of additional providers/increase in insurance enrolment.	Changes in access
Non-communicable Disease, Hypertension, Diabetes	Changes in diet	Peri-urban living versus high intensity subsistence farming.				Shift from high physical activity to sedentary lifestyle.	Changes in diet.
Key		High Risk Potential			Medium Risk Potential		Low Risk Potential

Table 15: Community Focused mitigation measures

Community focused mitigation measures external to the project	Timing	Action Plan		Responsibility	Potential collaboration agency/org/resources	indicators	Significance methods
		C&C	PAC's				
Respiratory & Housing: Respiratory Diseases – Tuberculosis (TB), Uppers respiratory infections (URI's), housing design							
Risk: Transmission of respiratory diseases (within project facilities) that impact community members.							
Communicate with local level TB control program coordinator to initiate case finding treatment and follow up with family members and others living with the same housing compound as workers diagnosed with active TB	C -DC		▪	Company, local TB control program case Manager	Country TB- Control Program		Project Medical records review.
Review resettlement housing design, related to indoor cooking practices	D		▪	Company			Housing audit
Risk: Respiratory illness, psychological and social stress in resettled communities due to resettlement housing design							
Review resettlement home design space requirements i.e., total square meters vs number of rooms	D-C		▪	Co. Engineering design, construction		Occupants per room	Resettlement site assessment.
Sexually transmitted Infections including HIV/AIDS							
Risk: Increased rates of sexually transmitted infections 9STI) and HIV/AIDS that impact local community.							
Issue TOR for HIV prevention program targeting high risk groups particularly sex workers (SW). Include requirements for case finding and treatment of	C-DC		▪	Company HIV Program Coordinator	Country health services, local HIV NGO's	Number of STI's treated	Program assessment.

curable STI's, social marketing and condoms, peer educators program, condom distribution and voluntary counseling & testing (VCT) targeting PAC's. Implement and evaluate quarterly.							
Vector related, insect related							
Risk: Increased rates of vector – and insect related diseases (malaria, schistosomiasis, onchocerciasis, dengue fever) impacting local communities.							
Implement an ongoing entomological survey program for mosquitoes and snails in PAC's (resettlement communities and potentially affected communities).	C-DC		▪	Company, DSS	Country health services, vector control division	Entomological infection (i.e., infected bites/yr.) and parasite prevalence rates in children.	DSS report reviews.
Resettlement design and construction ▪ During resettlement design planning sessions conducted with communities to be resettled, include visually based educational sessions with women leaders of the communities regarding protective measures affected by the construction and maintenance of screened windows and doors.	D,C		▪	Company Community Affairs Dept.	Local women's groups.		Assessment of resettlement houses
▪ Conduct resettlement housing design educational sessions with communities to be resettled, led by women who are in the communities, who have attended	C		▪	Community Affairs Dept.	Local women's groups		Assessment of resettlement houses.

educational sessions, regarding malaria protective measures provided by screened windows and doors.							
▪ Construct resettlement housing with 16 mesh screening over windows and rooftop eaves (if applicable) and screen doors (if acceptable to the community).	C		▪	Co. Engineering and Construction	Local malaria control officer		Assessment of resettlement houses.
Locate resettlement housing at least 500 m from significant anopheles breeding sites	PD, D		▪	Design Engineering and construction	Country health services	Entomologic survey results	Site assessment.
Consider malaria transmission data per community in decisions regarding placement of resettlement housing, e.g., avoid locating communities with current low transmissions within/near communities with high transmission rates.							
Design project initiated boreholes according to country design requirements for the area, with appropriate drainage such that mosquito breeding sites are not created.	D		▪	Design, Engineering and construction community WASH agency.	Country WASH specifications		Site assessment
Provide support to district health malaria control programs to provide long lasting insecticide treated nets (ITN's) and reduced costs to PAC's to proactively manage the perception that malaria will become worse due to the project. Educate women leaders in the community regarding benefits and proper use of, include women leaders who have	C-DC		▪	Company, country health services	District health services	Bed net use	DSS

educated in education and distribution campaigns. Redistribute every 5 years.							
Educate project community representative regarding environmental management measures within the PAC's for control of vector breeding sites and maintain proper drainage in flood prone areas, especially in rainy seasons. Project community representative collaborate with local WASH committees to implement environmental management measures during community clean up days.	C-DC		▪	Company, WASH Committees	Local district environmental health officer		Site audit.
Soil, Water, sanitation related							
Risk: Transmission of water related diseases (cholera etc.) worms, rodent, and fly related diseases, and exposure to sewage outfall impacting local communities.							
Provide adequate numbers of toilets and urinals for workers at each work site (establish number per local or applicable international guidance/requirements).	C-DC			Co. Site services			Site assessment
Conduct health education programs for project workers regarding fecal/oral transmission of diseases, transmission of helminthic diseases (ascariasis, pinworm etc.) and safe drinking water and food safety. Provide pictorial take home handouts.	C-O			Company educational dept.	District EHO		Training records audit
Collaborate with local waste management services to implement non-hazardous waste management plans in resettlement communities such that; ➢ Number of garbage cans and dumpsters provided is sufficient to hold accumulated	C-DC		▪	Company site services, catering supervisor, local waste managemen t services	District EHO		Site assessment.

garbage ➢ Garbage is stored in rodent proof containers and with tightly lifting lids ➢ Sanitary and solid waste collected daily and covered daily with a solid layer of soil (15 -30 cm) or incinerated to prevent insect and rodent access ➢ Prohibit the movement of large quantities of foodstuffs to local animal farmers, so that rodent and reptile habitats are not created ➢ Appropriate container program to void breeding waterborne vectors (dengue control).							
Food and Nutrition							
Risk: Transmission of food borne diseases, increases in vitamin deficiency diseases.							
Collaborate with the government sponsored DSS to conduct anthropometric monitoring (height, weight, age) within the PAC's	C-DC		▪	DSS		Stunting wasting, underweight , z scores	Demographic surveillance system
Collaborate with local health education services to provide materials (from food and nutrition related educational programs conducted for workers) to local health education services and school programs.	C-DC		▪	Company, local health education service	Country health services		
Assist with food sanitation awareness materials to local district environmental	C-DC		▪	Company	Local environmental dept., internet sources		

sanitation officers fo educational sessions with food handlers and slaughterhouses, particularly vendors who sell food to project workers.							
Accidents and Injuries							
Risk: Potential increase in roadway related accidents and injuries							
Collaborate with the district road safety unit to establish and maintain pictorial road safety signage in local language and English language (if needed), description along project roadways directly surrounding project facilities, including conveyor belts routes, road way rerouting areas, heavy equipment crossing areas etc.	C-DC		▪	Company, Country road safety Dept.	District road safety work group	Traffic accidents	Roadway audits.
Hazardous Materials Exposure							
Risk: Potential exposure of community to project related materials							
Implement emergency spill response plans and procedures, including medical monitoring plans, for each potential contaminant (project and community). Test a least quarterly.	C-DC		▪	Company, local emergency response units			Program audit
Conduct pest management program (for workers and resettled farmers) that focuses on organic methods and includes education campaigns regarding hazardous of handling and using fertilizers and pesticides.	C-DC		▪	Company, local government agricultural agency			Program audit, DSS
Psychosocial							
Risk: Potential increase in violence related activities and alcohol drinking							
Collaborate with the authorities to establish a system to monitor violence and community cohesion related to project activities. Conduct violence prevention education programs, particularly focusing on gender violence. Conduct alcoholism prevention education programs.	C-DC		▪	Company, local government Gender Violence Unit			Program audits
Throughout all project cycle materials published for the	C-DC		▪	Company	Local education system		Communicatio ns materials assessment

community include information about the closure and decommissioning phase and its effects on both workers ad communities.							
Health Systems infrastructure							
Risk: Potential disruption of access to health care by resettled population							
Provide assistance for the provision of national health insurance to resettled populations	C-DC		▪	Company, Country health service			DSS
Cultural health practices							
Risk: Potential disruption to local cultural practices through resettlement or relocation							
Understand local cultural health practices so that resettlement conditions accommodate local practices and behaviors and provide opportunities for health improvement if feasible.	C-DC		▪	Company, district social services dept.			DSS
Non communicable Diseases							
Risk: Potential increases in hypertension and diabetes due to changes in lifestyle							
Provide educational handouts used in worker education programs to country health services for use in local clinics	C-DC		▪	Company	Local health services		Records audit
Veterinary Medicine							
Risk: Potential increases in livestock related diseases such as TB and brucellosis, due to changes in pastoralists, migration patterns.							
Collaboration with local agricultural programs to implement animal vaccination programs	C-DC		▪	Company, local agricultural programs	Swiss Tropical Institute	Animal vaccination rates	surveys
Monitoring and Evaluation							
Risk: Lack of adequate in country vital statistics services, resulting in inability to evaluate key performance indicators related to project impacts.							
Collaborate within existing government and vital statistical services to strengthen capacity and perform future monitoring surveys.	C-DC		▪	Company, government statistical services	INDEPTH Network	Demographic surveillance systems data	DSS

KEYS:

KEYS	Description
▪	Specific health mitigation targets
C&C	Company and contractor health plans
RR	Resettled or relocated health plan
Timing C	Construction
Timing O	Operations
Timing DC	Decommissioning

PD	Predesign
D	Design phase
PE	Pre-Employment
Co.	Company
EHA	Environmental Health Area
CDC	Center for Disease Control
WHO	World Health Organization
PAC's	Potentially Affected Communities
WATSAN	Water Sanitation Agency

5.8.3.2 Potentially Affected Communities (PAC): Which communities are most likely to be impacted: are these communities the same as defined by the environmental and or social assessment, why or why not?

Most communities who would be impacted on the proposed EGC development are those within zones 8, 9, 10 and 11 of North Malaita and Lau/Mbaelelea constituency. Hence, summary of the positive and negative impacts to the PAC communities is developed as per the table below;

Table 16: Environmental Aspects Register

ENVIRONMENTAL ASPECTS REGISTER														
Risk Number	**Location**	**Activity, Product or Service**	**Potential Environmental or Social Aspect (or Hazard)**	**Potential Environmental or Social Impact (or Risk)**	**Positive (P) Negative (N)**	**Legal Requirement**	**Likelihood**	**Consequence**	**Positive Impact Risk**	**Negative Impact Risk**	**Significant?**	**Control Measure**	**Responsibility**	**Risk Area**
1	NEW BUILDING & CONSTRUCTION	Earth Works	Soil Erosion	Surface Water pollution	N	Y	2	3		M	N	Construct sediment traps.		Environmental
2	NEW BUILDING & CONSTRUCTION	Earth Works	Top Soil Removal	Loss of Organic Matter	N	N	2	1		L	N	Removed topsoil utilised where applicable.		Environmental
3	NEW BUILDING & CONSTRUCTION	Earth Works	Soil Erosion Prevention	Water Quality protection	P	Y	5	2	M		N	Construct sediment traps.		Environmental
4	NEW BUILDING & CONSTRUCTION	Earth Works	Sand Erosion prevention	Water Quality protection	P	Y	5	2	M		Y	Plant buffer trees/shrubs along the coastal. Construct seawall breakers to prevent sea level rise/waves.		Environmental
5	NEW BUILDING & CONSTRUCTION	Chemicals Storage & Usage	Paint & turpentine spills	Water Contamination	N	Y	1	2		L	N	Clean up with in accordance with environmental best practices management guidelines, ensure spill kits available where being used.		Environmental
6	NEW BUILDING & CONSTRUCTION	Chemicals Storage & Usage	Paint/turpentine & other chemical containers disposal	Land contamination	N	Y	2	3		M	N	Dispose into designated hydrocarbon waste disposal pit.		Environmental
7	NEW BUILDING & CONSTRUCTION	Building Maintenance	Woodworks/cutting& planning creating saw dust	Air pollution	N	Y	1	2		L	N	Conduct woodworks only in construction areas or at construction yard where possible.		Environmental
8	NEW BUILDING & CONSTRUCTION	Building Maintenance	Disposal/Recycle of sawdust	Aesthetic	N	N	2	3		M	N	Collect all saw dust in bags for uses as spill kits.		Environmental

9	BUILDING & CONSTRUCTION	Plumbing Works	Septic tank overflow	Water Contamination	N	N	4	4		E	Y	Regular checks and inspections allow for the tank to be pumped out prior to overflow. In the event of overflow dilution method is used.		Environmental
10	HOUSING	Wastewater Disposal	Inappropriate Septic Sludge Disposal	Water Pollution	N	Y	5	4		E	Y	Use licensed sewerage disposal contractor.		Environmental
11	HOUSING	Water Usage	Leaking Taps	Depletion of Natural Resource	N	N	3	1		L	N	Report immediately any leaks to building plumbing section.		Environmental
12	NEW DEVELOPMENT	Rainfall runoff	Untreated discharge (silt, oil) into water sources.	Water Pollution	N	Y	4	3		E	Y	All runoff diverted to drainage interceptor system		Environmental
13	NEW DEVELOPMENT	Diesel Genset Electricity Generation	Refuelling spillage on Ground	Soil Contamination	N	Y	5	2		M	N	Spill containment, operator training		Environmental
14	NEW DEVELOPMENT	Diesel Genset Electricity Generation	Exhaust Excessive Smoke emissions	Air Pollution	N	Y	3	3		M	N	Maintenance schedules in place and adhered to.		Environmental
15	NEW DEVELOPMENT	Diesel Genset Electricity Generation	Servicing Oily Waste Incorrect Disposal	Soil Contamination	N	Y	5	2		M	N	Waste oil disposed of in workshops are dirty. Dispose oils to hydrocarbon disposal pit.		Environmental
16	NEW DEVELOPMENT	Lubricating Oil Dispensing	Spillage to Drain	Water Pollution	N	Y	3	3		M	N	Storage area sufficiently bunded. Install oil traps		Environmental
17	NEW DEVELOPMENT	Petroleum Hydrocarbons	Disposal of Wastes	Water Pollution	N	Y	3	3		M	N	Dispose at hydrocarbon pits.		Environmental
18	NEW DEVELOPMENT	Petroleum Hydrocarbons	Leaks & Spillages	Water Pollution	N	Y	3	3		M	N	Neutralise and clean up with spill kits immediately and record incident.		Environmental
19	NEW DEVLOPMENT	Land preparation	Unintended Fire	Loss of Organic Matter, wildlife habitat destruction, environmental pollution, loss of young coconut palms	N	Y	4	4		E	Y	Implement Zero burning policy. Carry out awareness with employees.		Environmental

20	NEW DEVLOPMENT	Land preparation	Land clearing	Destruction of heritage sites	N	Y	4	4		E	Y	Determine thorough social and cultural investigation if cultural sites exist. If so then plan for buffer zones or other appropriate action.		Environmental
21	NEW DEVLOPMENT	Land preparation	Land Clearing	Loss of Vegetation HCV	N	Y	2	3		M	N	Conduct HCV assessment before any land clearance. No new development unless fully approved.		Environmental
22	NEW DEVLOPMENT	Land preparation	Soil Erosion	Soil Resource Loss and reduced productivity	N	Y	3	3		M	N	Construct Sediment traps at waterway entrances to stop excess sedimentation entering natural waterways, monitored and reported on new plantings audit. Plant cover crops.		Environmental
23	NEW DEVLOPMENT	Land preparation	Soil Erosion	Surface Water Pollution	N	Y	4	2		M	N	Construct Sediment traps. Plant cover crops.		Environmental
24	NEW DEVLOPMENT	Land preparation	Mangrove clearing	Loss of biodiversity & mangrove wildlife habitat	N	Y	3	2		M	N	Establish replanting of mangroves to replenish homes for mangrove biodiversity & wildlife.		Environmental
25	NEW DEVLOPMENT	Mangrove clearing	soil Erosion	Coastal soil resource loss	N	Y	3	2		M	N	Establish replanting of mangroves to act as buffer zones to reduce coastal soil erosion & pollution.		Environmental
26	NEW DEVLOPMENT	Bulldozer Windrowing (flat land)	Soil Erosion	Surface Water Pollution	N	N	3	3		M	N	Plant LCC Immediately		Environmental
27	NEW DEVLOPMENT	Bulldozer Windrowing(flat land)	Soil Erosion	Topsoil Loss /reduced productivity	N	N	3	3		M	N	Plant LCC Immediately		Environmental
28	NEW DEVLOPMENT	Road Construction	Soil Erosion	Water Pollution	N	N	5	3		E	Y	Ensure culverts and sedimentation traps are in place, surface road progressively and ensure only assigned roads are used, no casual tracks		Environmental
29	NEW DEVELOPMENT	Solid Waste Disposal	Burning of waste	Air Pollution	N	Y	3	2		M	N	No intentional burning at waste disposal areas. Extinguish and report fires if they occur.		Environmental
30	NEW DEVELOPMENT	Solid Waste Disposal	Disposal of vegetation in landfill	Use of Landfill Space	N	N	5	1		M	N	No vegetative waste to be placed in landfills.		Environmental

31	RESOURCE MANAGEMENT	Fuel Usage Transport	Excessive use of fuel resources	Waste of natural resource, greenhouse gas, excessive costs	N	N	3	3		M	N	Regular servicing and maintaining of vehicles. Transport and plantations record fuel usage for monthly comparisons to determine excessive usage.		Environmental
32	TRANSPORT	Heavy Equipment Servicing	Oil Spill onto ground	Soil Contamination	N	N	3	3		M	N	Drip trays to be used for maintenance. Any spills to be cleaned up, and all contaminated soils removed to Hydrocarbon disposal area.		Environmental
33	TRANSPORT	Truck operation	Exhaust smoke emissions	Air Pollution	N	N	3	2		M	N	Trucks to mechanically maintained. Fuel records to be compared monthly to ensure vehicles are not unnecessarily using fuel because of either poor engine condition or excessive use outside of operational requirements		Environmental
34	TRANSPORT	Truck operation	Traffic Dust at Estate Housing	Air Pollution	N	N	3	1		L	N	Install speed humps.		Environmental
35	TRANSPORT	Refuelling	Spill	Water Pollution	N	Y	2	2		L	N	Vehicles to be refuelled within approved areas inside bunds. All spills to be managed as per environmental best practise management guidelines and emergency response plan if emergency situation.		Environmental
36	TRANSPORT	Heavy Equipment in field Servicing	Accident / Spill on ground	Soil Contamination	N	Y	2	2		L	N	Use of drip trays if possible. All spills to be managed as per spill management guidelines and emergency response plan if in emergency situation		Environmental
37	TRANSPORT	Vehicle Fuel Draining	Spills to ground/drains	Soil/Water Contamination	N	Y	2	2		L	N	Only to be conducted at vehicle workshop area unless impractical. Then drip trays, containment drums and spill kits to be used and follow environmental best practices guidelines.		Environmental
38	TRANSPORT	Vehicle/engine servicing	Oil Spill	Water Pollution	N	Y	5	1		M	N	Construct wash bay & oil traps		Environmental

39	TRANSPORT	Vehicle/engine servicing	Battery acid disposal to Drain	Water Pollution	N	Y	3	3		M	N	Dry cell batteries being preferentially used.		Environmental
40	TRANSPORT	Vehicle Wash down	Untreated discharge (silt, oil)	Water Pollution	N	Y	4	3		E	Y	Concrete Bay & Silt/Oil traps		Environmental
41	TRANSPORT	Vehicle wash down	Waste oils runoff into the coastal environment	Marine pollution	N	Y	5	5		E		Build proper drainage and sedimentation trap to contain waste oil runoffs. Dispose oils into hydrocarbon disposal pit. Use spill kits to capture any waste oil when servicing the machineries.		Environmental
42	WASTE DISPOSAL	Wastewater Disposal	Ineffective sewerage systems leading to overflow or contamination of surrounding areas.	Water Pollution	N	Y	4	3		E	Y	Install designed, approved sewerage disposal systems. Water monitoring program to determine if functioning correctly.		Environmental

5.8.3.3 Baseline Analysis: Current available data, since this is a mini HIA, no new health specific field data collection is anticipated; what are the data sources are they adequate, data gaps analysis?

Most health statistics data that would be used in this report would be sourced from desktop research and secondary data's sourced from Malu'u Mini Hospital, which is the closest health care center within the project site.

5.8.3.4 Stakeholder Analysis: Who are key stakeholders for health, are there differences between stakeholders associated with health issues versus social/environmental issues; what are the power relationships across and between the stakeholders and the project?

Effective stakeholder engagement is integral to the quality of health impact assessment to the success of associated mitigation actions (IFC 2007, cited in (IFC, 2009).

Health related stakeholder engagement should be integrated into the projects overall environmental and social impact assessment process. That way, a company can avoid going back to the communities for separate consultation regarding health issues.

5.8.3 Gender and Cultural Considerations

During the stakeholder identification and analysis phase, it is important to address gender and cultural practices. In many places, women make the key health related decisions, therefore, it is important to have a strategy that involves women at the community level.

A. Risk Analysis

- Analysis: Each of the 12 EHA's should be considered for potential impacts, positive, negative or both, risk is a combination of impact and likelihood.
- Overall summary analysis
- Mitigation: What are the general strategies and actions that can be used; what is the role and responsibility for the host government versus the project proponents; how will interventions be coordinated?
- Monitoring and Evaluation (M&E): Describe the system that will be used for this activity, defines key performance indicators, define roles and responsibilities between the project and the host government.

Summarized below on Table 18 is the overall summary of the mitigation and monitoring measures to be taken to mitigate the potential environmental, health and safety risks associated with the EGC. Note also, that part of the environmental, health and safety mitigation measures and monitoring measures are defined in the specific tables depicted above as well.

Table 17: Environmental Health and Safety Mitigation Measures

Types of project activity	Potential impacts	Effects of impacts (long/short term)	Mitigation measures	Cost of mitigation	Monitoring requirement	Responsible organization
Physical Environment						
Land/vegetation clearance	Increase surface runoff	Long term	Maintain buffer zones on the river catchments Prohibit operation on steeps slopes >30 degrees or 400m above sea level Construct adequate drainage for excess water flow in to vegetated areas	Include in the operation cost	Buffer widths Roadworks/drainage Gravel pits	Forestry Officer Environment Officer
Land/vegetation clearance	Accelerated soil erosion	Long term	Maintain buffer zones on the river catchments Prohibit operation on steeps slopes >30 degrees or 400m above sea level Construct adequate drainage for excess water flow in to vegetated areas Execute selective felling to maintain canopy protection	Include in the operation cost	Buffer widths Roadworks/drainage Landing size Gravel pits	Forestry Officer Environment Officer
Land/vegetation clearance	Water quality impairment	Long term	Maintain buffer zones on the river	Include in the operation cost	Monitor for physical parameters namely, pH,	Environment Officer

			Prohibit operation on steeps slopes >30 degrees or 400m above sea level Construct adequate drainage for excess water flow in to vegetated areas Cease operation during rainy times Monitor all water course weekly Avoid storage of fuel tanks near water course		Turbidity, TDS, DO Monitor chemical parameters namely, Nitrate, Nitrite, Calcium, Potassium, heavy metals, Lead, Mercury & Cadmium Arsenic Monitor fecal coliforms, *E.coli*	
Loss of trees	Habitat destruction	Long term	Execute selective felling to maintain canopy protection Prohibit operation on steeps slopes >30 degrees or 400m above sea level Construct adequate drainage for excess water flow in to vegetated areas	Include in the operation cost	Buffer widths Felling	Environment Officer Forestry Officer
Loss of Trees	Flooding	Long term	Avoid extraction of gravels in the middle of the river. Clear any logs or debris that will hinder flow of the water during flooding.	Include in the operation cost	Buffer widths Install flood-monitoring gauze along the river to monitor strength of flood.	Environment Officer

Prolong exposure to High Noise level	Hearing loss	Long term	Provision of ear muffs and noise protection devices for workers Clearly marked traffic signs/boards to show danger	Include in the operation cost	Check PPE on employees Signage Machines	Environmental Health & Safety Officer
	Dredging	Long term	Avoid extraction of gravels in the river. Only extract gravels on the edge of the river where it is dry.	Include in the operation cost	Monitor any likely diversion of the river flow. Clear any blockages along the river due to runoffs during floods.	Environment Officer
Land clearing/earth work	Surface Water pollution	Long term	Construct sediment traps.	Include in the operation cost	Conduct monthly water quality sampling along Honiara coastal marine environment & drinking water sources within Honiara City.	MHMS/MECDM
Land clearing/earth work	Loss of Organic Matter	Short term	Reuse & recycle topsoil removed where applicable.	Include in the operation cost	Avoid burning of organic matters such as leaves, grass etc. to recover organic matter.	contractor
Land clearing/earth work	Water Quality protection	Long term	Construct sediment traps.	Include in the operation cost	Conduct monthly water quality protection assessment within Honiara coastal areas.	MHMS/MECDM
Land clearing/earth work	Water Quality protection	Medium term	Plant buffer trees/shrubs along the coastal. Construct seawall breakers to prevent sea level rise/waves.	Include in the operation cost	Conduct monthly water quality protection assessment within Honiara coastal areas.	MHMS/MECDM

Land clearing/earth work	Reduce water & soil infiltration rate	Long term	Preserve certain forest areas within the project area as parks to assist balance the infiltration and overland flow	Include in the operation cost	Monitor change of ground water discharge from the baseline readings during rain and dry season	MECDM/MHMS
Land clearing/earth work	Increase runoffs	Long term	Establish buffer zones on both sides of the stream	Include in the operation cost	All nearby rivers & stream must have a turbidity level of 5 NTU during normal days without storm. -establish 50m buffer zone from the stream.	MECDM/MHMS
Land clearing/earth work	Dust pollution	Short term	Establish temporary buffer zones to contain dust	Include in the operation cost	Workers to undergo biannual health check to monitor status of the health and wellbeing.	Contractor
Land clearing/earth work	Dust pollution	Short term	Continuous sprinkling water on the construction site to contain excess dust	Include in the operation cost	Continuous monitoring of the worksite and sprinkle water where necessary.	Contractor
Land clearing/earth work	Dust pollution	Short term	Wear appropriate PPE (face musk, clothing) at all times	Include in the operation cost	Strict enforcement to wear appropriate PPE at the worksite.	Contractor
Staging	Increase sediment runoffs	Short term	Construct Sediment traps at waterway/drainage entrances to stop excess sedimentation entering natural waterways & marine coastal areas.	Include in the operation cost	Conduct quarterly environmental monitoring of the marine coastal areas.	MECDM/MHMS
Staging	Increase turbidity runoffs during rainy season	Short term	Construct Sediment traps at waterway entrances to stop excess sedimentation entering natural waterways & marine coastal	Include in the operation cost	Conduct quarterly environmental monitoring of the marine coastal areas	MECDM/MHMS

			areas.			
Heavy duty vehicle	Noise pollution	Short term	Establish temporary noise buffers to contain excess noise	Include in the operation cost	Strict enforcement of wearing appropriate PPE at the worksite.	Contractor
Transport	Noise pollution	Short term	Wear appropriate PPE (ear muffs, plugs) at all times	Include in the operation cost	Workers to undergo biannual health check to determine their hearing capability.	Contractor
Hydrocarbon spillage	Soil contamination	Long term	Spill containment & operator training	Include in the operation cost	Construct grease trap on water ways/drainage to contain any hydrocarbon spillages.	contractor
Hydrocarbon spillages	Water pollution	Long term	Spill containment & operator training -construct grease trap on water ways/drainage to contain any hydrocarbon spillages	Include in the operation cost	Construct grease trap on water ways/drainage to contain any hydrocarbon spillages.	contractor
Open defecation	Water Contamination	Short term	Install temporary onsite open pit latrine for use.	Include in the operation cost	Water monitoring program to test for any faecal contamination of the water supply.	MHMS
Untreated discharge (silt, oil) into water sources.	Water Pollution	Long term	All runoff diverted to drainage interceptor system	Include in the operation cost	Conduct quarterly audit of the project site	Contractor
Refueling spillage on Ground	Soil Contamination	Long term	Spill containment, operator training	Include in the operation cost	Conduct routine UA/UC observation to monitor spillages	Contractor
Exhaust Excessive Smoke emissions	Air Pollution	Short term	Maintenance schedules in place and adhered to.	Include in the operation cost	Conduct monthly inspection of all contractor vehicles.	Contractor
Servicing Oily Waste Incorrect	Soil Contamination	Long term	Dispose oils to hydrocarbon disposal pit.	Include in the operati	Conduct monthly inspection of the project site to ensure that	Contractor/MHMS/Labour

Disposal				on cost	Enviro, Health & Safety requirements are adhere too.	
Spillage to Drain	Water Pollution	Long term	Storage area sufficiently bunded. Install oil traps	Include in the operati on cost	Conduct monthly water sample monitoring to ensure water source is free from chemical & hydrocarbon pollution.	MHMS/MECDM
Disposal of Wastes	Water Pollution	Long term	Dispose at hydrocarbon pits.	Include in the operati on cost	Ensure that best environmental management practice is practice at the project site.	Contractor Contractor
Leaks & Spillages	Water/soil Pollution	Long term	Neutralize and clean up with spill kits immediately and record incident.	Include in the operati on cost	Conduct monitoring of the water source ensure its free from chemical and heavy metal such as lead, cadmium & mercury.	MHMS/MECDM
Unintended Fire	Loss of Organic Matter, wildlife habitat destruction, environmen tal pollution, loss of fruit trees	Short term	Implement Zero burning policy. Carry out awareness with employees.	Include in the operati on cost	Continuous monitoring of the worksite by the project OHS Officer.	Contractor
Land clearing	Destruction of heritage sites	Long term	Determine thorough social and cultural investigation if cultural sites exist. If so then plan for buffer zones or other appropriate action.	Include in the operati on cost	Plan for buffer zones to conserve heritage sites	Contractor
Land Clearing	Loss of HCV Vegetation	Long term	Conduct HCV assessment before any land clearance. No new development unless fully	Include in the operati on cost	No new development to commence unless the project site is assessed.	Hire Consultants

			approved.			
Soil Erosion	Soil Resource Loss and reduced productivity	Long term	Construct Sediment traps at waterway entrances to stop excess sedimentation entering natural waterways. Plant cover creepers.	Include in the operation cost	Plant cover creepers or vegetation to act as buffers for soil nutrients. Proper landscaping to be done once building completed.	Contractor
Soil Erosion	Surface Water Pollution	Long term	Construct Sediment traps. Plant cover creepers.	Include in the operation cost	Conduct monthly water sample to determine water quality.	MHMS/MECDM
Soil Erosion	Ground Water Pollution	Long term	Ensure culverts and sedimentation traps are in place, surface road progressively and ensure only assigned roads are used, no casual tracks	Include in the operation cost	Surface road progressively and ensure only assigned roads are used, no casual tracks.	Contractor
Road Construction	Water Pollution	Long term	Ensure culverts and sedimentation traps are in place, surface road progressively and ensure only assigned roads are used, no casual tracks	Include in the operation cost	Ensure only assigned roads are used, no casual tracks.	Contractor
Solid Waste Disposal	Air Pollution	Long term	No intentional burning at waste disposal areas. Extinguish and report fires if they occur.	Include in the operation cost	Discourage burning of solid waste at the project site.	Contractor
Fuel Usage Transport	Waste of natural resource, greenhouse gas, excessive costs	Long term	Regular servicing and maintaining of vehicles. Transport record fuel usage for monthly comparisons to determine excessive usage.	Include in the operation cost	Monitor monthly Transport fuel usage for comparisons to determine excessive usage.	contractor

Heavy Equipment Servicing	Soil Contamination	Long term	Drip trays to be used for maintenance. Any spills to be cleaned up, and all contaminated soils removed to Hydrocarbon disposal area.	Include in the operation cost	Any spills to be cleaned up, and all contaminated soils removed to Hydrocarbon disposal area.	Contractor
Truck operation	Air Pollution	Medium term	Trucks to be mechanically maintain. Fuel records to be compared monthly to ensure vehicles are not unnecessarily using fuel because of either poor engine condition or excessive use outside of operational requirements	Include in the operation cost	Fuel records to be compared monthly to ensure vehicles are not unnecessarily using fuel because of either poor engine condition or excessive use outside of operational requirements.	Contractor
Truck operation	Air Pollution	Short term	Install speed humps.	Include in the operation cost	Monitor movement of vehicles within the project site. -Put up speed limits on the road accessing the project site.	Contractor/police
Refueling	Water Pollution	Short term	Vehicles to be refueled within approved areas inside bunds. All spills to be managed as per environmental best practice management guidelines and emergency response plan if emergency situation.	Include in the operation cost	Avoid refilling of fuel at the project site. Refill should only be done at the workshop provided with bund.	Contractor
Heavy Equipment in field Servicing	Soil Contamination	Long term	Use of drip trays if possible. All spills to be managed as per spill management	Include in the operation cost	Conduct no service of heavy-duty vehicle at the project site. Standby spill kits	Contractor

			guidelines and emergency response plan if in emergency situation		and sawdust should be put in place to cater for any accident spillages.	
Vehicle Fuel Draining	Soil/Water Contamination	Long term	Provide drip trays, containment drums and spill kits to be used. Ensure to adhere environmental best practices guidelines.	Include in the operation cost	Avoid draining of waste fuel or hydrocarbons at the project site.	Contractor
Vehicle/engine servicing	Water Pollution/soil contamination	Long term	Construct wash bay & oil traps	Include in the operation cost	No vehicle service to be conducted onsite at the project site.	Contractor
Vehicle Wash down	Water Pollution/soil contamination	Long term	Use spill kits or Silt/Oil traps. Dispose spill kits in hydrocarbon pits.	Include in the operation cost	Avoid washing of vehicles at the project site.	Contractor
Paints spillage	Water/soil contamination	Long term	Use spill kits. Dispose spill kits in hydrocarbon pits	Include in the operation cost	Avoid disposing of waste paints at the project site. Conduct water sample analyses to test for heavy metal parameters.	Contractor MHMS/MECDM
Alcohol/drugs	Anti-social behaviors	Short term	Strict enforcement of health & safety rules at the project site.	Include in the operation cost	Zero tolerance of alcohol & drugs policy enforced. Conduct daily safety talks & checks on all employees prior to work. Restrict carrying of personal bags into the project site. Conduct random breathalyzer test on workers.	Contractor

6.0 Alternatives

Considering alternatives for Suava Bay EGC proposed project, the following three basic areas have been identified: 1. Alternative technology and design (2) Alternative locations and (3) development options.

6.1 Alternative Technology and Design

i. Gravel Extraction

The method of gravel extraction is an open cut strip. Such method normally used when the materials are found over a large area and relatively on the ground surface. The developer will design and furnish all materials and equipment to be fully compatible with the open cut strip extraction taking it consideration the environmental conditions of the site.

ii. Road network

The developer will upgrade existing roads and build new roads. Existing road network can be upgraded to minimum road standards to facilitate movements during construction. New roads will be constructed to Ministry of Infrastructure and Development (MID) design standards and specifications. Minimum road cross section requirements include 8m carriage way, 1m shoulder and 1m drainages on both sides. A total of 10m road corridor. There is no indication from the developer at this stage to tar seal the roads, but it is important purposely to avoid surface erosion and migration of sediments.

iii. Port Area

The proposed wharf will be a course way type. This indicates, the proposed facility would only allow landing craft with minimum load capacity. The developer's method of unloading and loading will be done using landing crafts. Decking of ships at the proposed wharf will be restricted and not allowed to avoid any unforeseen events such as wreckage and damage to corals. Loading will be carefully assessed and monitored to avoid any risk of accidents. The EIS team recommends the proposed wharf must be permanent, properly designed and climate proof. Otherwise to avoid further degradation to the marine environment, the developer can use the Auki and Maluu wharf to unload its materials.

iv. Land Reclamation

Landfill and sewage treatment facilities are important components in any township development. The developer has identified an area for sewage treatment plant but is very near to the project area. It is important, the water treatment plant design takes into consideration the water bodies nearby. The design of the facility and sewage networks, however, are not available during this assessment. In addition to that, landfill is yet to be completed for entire earmarked EGC zone. These facilities require detail studies and structural designs discussed thoroughly with relevant government agencies. The EIS team recommends, Landfill, sewage treatment plant and other structures come under separate EISs.

6.2. Alternative Location

It is not feasible to consider the other alternatives because of the social and environmental disadvantages.

Why work must be carried out at the selected site:

- • Developer has already acquired the site;
- • Access to the main sealed road; and
- • Repatriation programs have already commenced for informal settlers since 2013.

6.3. No Development Options

The "No Development Option" implies not proceeding with the development rather choosing to leave the area as it is at the current state, which is certainly provided no alternative for the development. As a result, there will be no impacts on the physical and social environments. This eliminates all benefits from the development to the SIG, province, and landowners. It is equally important to consider the positive benefits of the development and in doing so there are also collective efforts to minimize the potential negative environmental and social impacts.

7.0 Climate Change and Disaster Risk

7.1 Climate Change

No climate change data is available which is specifically for the project site. However, the climate change predictions for Solomon Islands in general may also apply for the site.

According to Australian Bureau of Meteorology and CSIRO, 2011, temperature in the Solomon Islands have been increasing at a rate of 0.15^{o}C per decade since 1951. This has

also resulted in a warming ocean and subsequent rise in sea level. Satellite data indicate that sea level in the Solomon Islands has been increasing at a rate of 2.8-3.6 mm per year (Australian Bureau of Meteorology and CSIRO, 2011).

The project site is located at the seafront so any rise in sea level is going to have an impact on it. Measures which will be put in place to mitigate for climate change impacts include construction of a seawall on the shoreline if necessary. Coastline trees and vegetation will also be planted and maintained on the shore to prevent shore-line erosion.

7.2 Disaster Risk

7.2.1 Coastal Inundation and/ Or Erosion

The light blue shaded area indicated in the map in Exhibit 2O shows the areas within the range of 5meters representing areas likely to be exposed to coastal hazards like storm surge, extreme high tide and coastal inundation. As shown the proposed area is risk and prone to coastal inundation and / or erosion.

In the survey, it was also notice in some areas along the coast of North Malaita coastal inundation have continued to erode the shoreline.

Plate 14 (Top and Bottom): Gabion being eroded by high waves, Ward 8, North Malaita. (Photo by WECS,2021)

Plate 15 (Top and Bottom): Culvert and Roads being inundated by the sea in Ward 7, North Malaita. Courtesy by WECS, Sept 2021

7.2.2 Sea Level Rise

Exhibit 2xx identifies areas within one meter (1m) of mean sea level (MSL) representing areas likely to be exposed to sea level rise (SLR) for 2100 projection. The sea level rise projection is based on RCP 8.5 scenario. Again, the project proposed area is still prone to the impacts of sea level rise even in 2100 projection.

Plate 16: Sea Level Rise on North Malaita coastline (By WECS, 2018)

Plate 17: Same Location in 2021 (By WECS, 2021)

The survey identifies the project site to be within the 5m above sea level. Using the 100-year model prediction shows impact of sea level rise has been felt in the region. Plate 17 and 18 above are a good and real time impact seen today. In Plate 17, the photo was taken in 2018 of the last barriers standing on the shoreline and three years later on the same location in 2021 only debris is visible as in Plate 18.

7.2.3 Cyclone

Generally, in Solomon Islands cyclone (also known as hurricane or typhoon) hazard is classified as high according to the information that is currently available. This means that there is more than a 20% chance of potentially-damaging wind speeds in your project area in the next 10 years. Based on this information, the impact of cyclones must be considered in all phases of the project, in particular during design and construction. Project planning decisions, project design, and construction methods should consider the level of cyclone hazard. Note that damages can not only occur due to wind but also cyclone induced heavy rainfall and subsequent flooding as well as coastal floods in coastal areas. Further detailed information should be obtained to adequately account for the level of hazard.

Climate change impact: Global average tropical cyclone wind speed and rainfall is likely to increase in the future, and the global average frequency of tropical cyclones is likely to decrease or remain unchanged. It is possible that the frequency of the most intense tropical cyclones will increase substantially in some ocean regions (IPCC, 2013). The present hazard level in areas currently affected by tropical cyclones may increase in the long-term. Projects

located in such areas should be robust to future increases in cyclone. For Malaita, it is located north of the path the tropical cyclone which the impacts of cyclone can be felt but not in the high rated paths as in Figure 3.

7.2.3 Extreme Rainfall and Flooding

The map below indicates the flood prone areas in relation to the existing watercourses and the proposed land for the national project. It identifies areas lying within low lying elevation such as drainage, river channels and ponds. It represents the areas likely to be flooded during the extreme rainfall events.

7.2.4 Landslide

In Solomon Islands, landslide susceptibility is classified as high according to the information that is currently available. This means that this area has rainfall patterns, terrain slope, geology, soil, land cover and (potentially) earthquakes that make localized landslides a frequent hazard phenomenon. Based on this information, planning decisions such as project siting, project design, and construction methods, must consider the potential for landslides. Further detailed information should be obtained to better understand the level of landslide susceptibility in your project area.

Climate change impact: Climate change is likely to alter slope and bedrock stability through changes in precipitation and/or temperature. It is difficult to determine future locations and timing of large rock avalanches, as these depend on local geological conditions and other non-climatic factors.

The map below identifies steepness of the slopes. The profile is regarded as safe areas at elevation 4m. The proximity of any occurrence of landslide to the propose area is safe as shown in the map.

Figure 33: Slope Stability Profile for the Project Site.

7.2.5 Earthquake

Solomon Islands earthquake hazard is classified as high according to the information that is currently available. This means that there is more than a 20% chance of potentially-damaging earthquake shaking in your project area in the next 50 years. Based on this information, the impact of earthquake must be considered in all phases of the project, in particular during design and construction. Project planning decisions, project design, and construction methods should consider the level of earthquake hazard. Further detailed information should be obtained to adequately account for the level of hazard.

Solomon Islands is located in the ring of fire; thus, it is expected to have footprints of

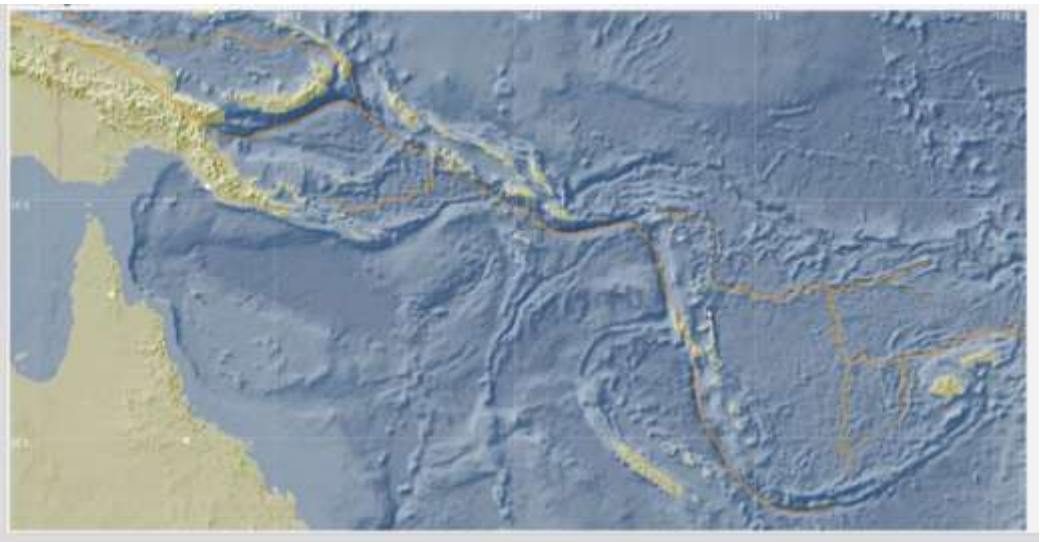


Figure 34: The Pacific Rim of Fire

earthquakes. Malaita is located North on the Solomon Block in the earthquake footprint as indicated in figure 17 and 18 below.

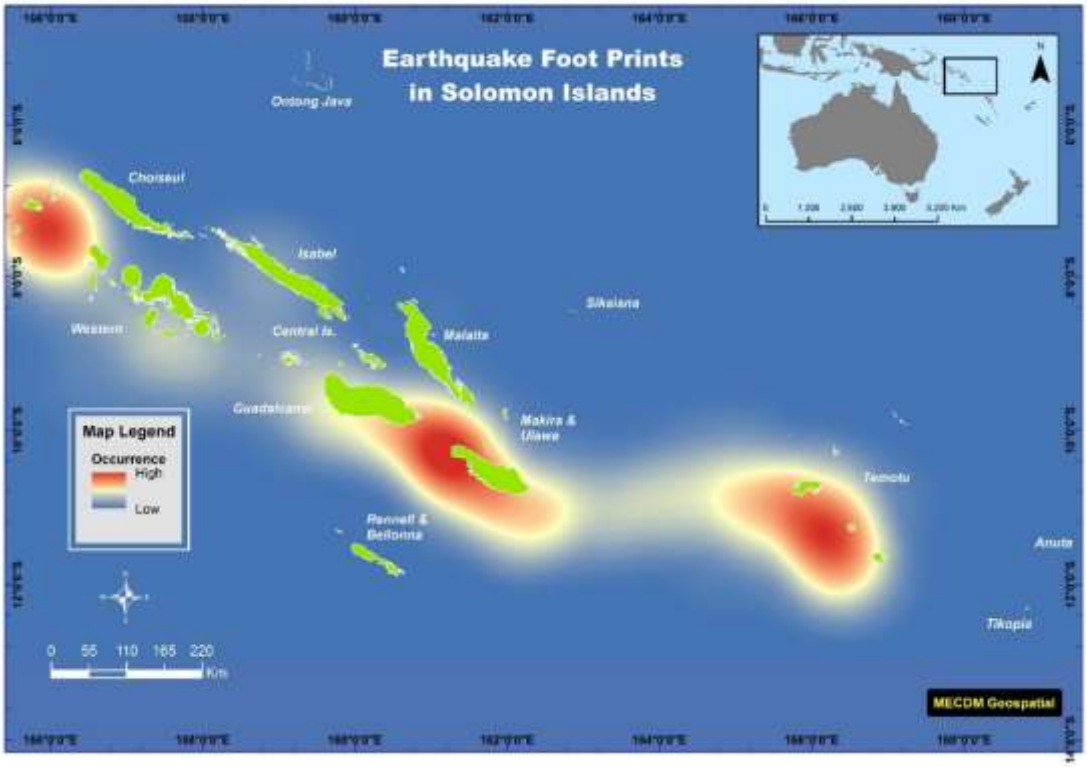


Figure 35: Earthquake footprints for Solomon Islands

7.2.6 Tsunami

In Solomon Islands tsunami hazard is classified as high according to the information that is currently available. This means that there is more than a 20% chance of a potentially-

damaging tsunami occurring in the next 50 years. Based on this information, the impact of tsunami must be considered in different phases of the project for any activities located near the coast. Project planning decisions, project design, and construction methods must consider the level of tsunami hazard. Further detailed information should be obtained to adequately account for the level of hazard.

Climate change impact: The areas at risk of tsunami will increase as global mean sea level rises. According to the IPCC (2013), global mean sea level rise depends on a variety of factors, and estimates for 2100 range from ~20 cm to nearly 1 m. However, regional changes in sea level are difficult to predict. Projects in low-lying coastal areas such as deltas, or in island states should be designed to be robust to projected increases in global sea level.

7.2.7 Volcano

For Solomon Islands, volcanic hazard is classified as high according to the information that is currently available. This means that the selected area is located at less than 50 km from a volcano for which a potentially damaging eruption has been recorded in the past 2,000 years and that future damaging eruptions are possible. Based on this information, the impact of volcanic eruption must be considered in all phases of the project, in particular during project design, implementation and maintenance. Further detailed information should be obtained to adequately account for the level of risk posed by individual volcanoes.

The closest volcano in relation to the proposed site is on Savo Island, in the Central Province. Savo Island is located xxkm north of South West of Suava Project site. Savo volcano is a forested andesitic to dacitic stratovolcano that forms the 6x7 km wide. It contains a shallow, elliptical 1x1.5 km wide summit crater.

Savo volcano has had dangerous explosive eruptions in the past centuries reflected in local legends. The first historic eruption was in 1568, when Spanish explorers arrived at the island.

Due to its proximity to the capital Honiara and its frequent explosive eruptions, Savo is probably the most dangerous volcano of the Solomon Islands.

7.2.8 Coastal Flood

For Solomon Islands and the Suava Bay Project, coastal flood hazard is classified as high according to the information that is currently available. This means that potentially-damaging waves are expected to flood the coast at least once in the next 10 years. Based on this information, the impact of coastal flood must be considered in different phases of the project

for any activities located near the coast. Project planning decisions, project design, and construction methods must consider the level of coastal flood hazard. Further detailed information should be obtained to adequately account for the level of hazard.

Climate change impact: According to the IPCC (2013), there is high confidence that extremes in sea level will increase with mean sea level rise yet there is low confidence in region-specific projections in storm surges. Projects in low-lying coastal areas such as deltas, or in island states should be designed to be robust to projected increases in global sea level.

8.0 Environmental Impact Assessment and Mitigation Measures

8.1 Methodology and Approach

This section looks at the overall likely impacts on the physical, biological, socio-economic and physical cultural resources of the project area of influence. The second focus is to identify mitigation measures to ensure all possible negative impacts such as environmental and social impacts will be avoided or minimized to an acceptable level.

The identification of the potential impacts is done through baseline data collection during on site assessment(s) and from secondary sources and considering present environmental setting of the project area, and nature and extent of the proposed project activities.

The duration of the impacts is measured according to the scope of work and the period of time the works will be carried including the physical and biological environment in the project site vicinity. The magnitude of impact may be negligible, minor, marginal or significant and mitigated. The mitigation measures identified below along with other environmental management requirements normally associated with international best practice will be implemented in accordance with the Environmental Management Plan.

8.2 Scope of the Assessment

The scope of assessment is focus mainly on the site on which this proposed EGC will be built. The EIS covers all propose development activities as per development design (concept) and or a master plan for EGC project site in Suava Bay. Thus, it will cover the potential environmental and social impacts associated with the proposed project activities of the project classified as:

- Impacts during pre-construction/design phase;
- Impacts during construction phase;

- Impacts during operation phase; and,
- Impacts during decommissioning phase.

8.3 Identification of Impacts.

8.3.1 Potential Impacts – Physical Environment

A. Wetland (reduce wetland area)

The current status of the flora and fauna of the project site was assessed by ecological survey, review of literature of the area, and an assessment of terrestrial environment.

Flora

The vegetation communities were identified and classified into community habitat types. Sampling process include identification of dominant tree species, assessment of stage growth (assessment of phenoltypical features of vegetation) and assessment of canopy cover. The area was highly disturbed by human development activities since known history to date. The first set of site clearance work was done in around 2015, then in 2019 construction of access road and drainage. Then lately this year 2021, back filling work already took place in the project area.

Impacts:

- Permanent destruction of all flora within earmarked project site (10hectare).

Mitigation:

- Preserved Taboo site to for future reference as remnant representation of original flora type of project area.
- Replant local flora species as per landscaping and beautification work of project site.
- Preserved trees within 10m from coastline.

Fauna

Information on fauna was gathered from existing literature on reported species as well as through observations during the field visits. Random interviews with the community members were conducted in and around project area. Also through transect, field visual observations to observe fauna base on their abilities to live and adapt to the local environment. It is observed that the wetland community is highly disturbed and some common diurnal faunae are seen in the project area during day time. For examples birds are

observed quite high up on the tall canopy trees and so forth. Nocturnal fauna is also not commonly seen during night observation at project site. Therefore, there is no IUCN red listed species of great ecological concern being observed in the area.

Impacts:

- Permanent destruction of habitat due to site clearance and back filling work.
- Migration of species to nearby wetland forest.

Mitigation:

- Preserve taboo site to serve as habitat for remaining and visiting fauna.

B. Water quality (Ground, Surface & Marine).

The following are potential impacts on the water quality:

- Waste generated at facilities during the operational phase can cause nuisance and potential contamination to coastal waters and or ground water.
- Sludge disposal - Accumulated Sediments can result in creation of anoxic bottoms (depleted of oxygen).
- Contamination of ground water and eutrophication of the marine environment, any disposal of treated freshwater from the EGC
- High content of nutrients and organic substances from EGC.
- Runoffs carrying turbid water impacting corals and aquatic organisms.

Mitigation: The following measures are proposed to try and reduced the impacts:

Waste Generation:

- Septic tanks and garbage receptacles will be set up at construction site which will be regularly cleared by the Contractor.
- All wastes from work sites and camps to be disposed of in approved landfill / areas.
- No wastes to be dumped in waterways or close to the coast.
- MCILI to ensure wastes not discharged to rivers or coastal waters and that all wastes disposed of in proper areas.
- Each construction company required to set up sanitary latrines.
- Contractor to provide adequate and safe drinking water in camp.
- Plant trees and or grass on sea coast and along drains on project site perimeter.

Waste from warehouse, office and residence:

- Effluent, sediments and other wastes shall be disposed of through the use wastewater treatment and settling ponds.

- Waste water from warehouse, office and residences must be piped into a settlement pond/tank and allow natural filtration process to take place.
- Dewatered sludge can be buried underground in a sanitary landfill.
- Waste is properly treated to avoid environment pollution and health impacts.
- Wastewater to be properly treated before discharging.
- Quality of discharged water shall be monitored periodically.
- Proper collection and disposal.
- ECG to set up rubbish bin in designated area for collection of solid waste before transporting to damp site.
- No direct discharge of water is allowed in the backfilled area to avoid liquidation and or saturation of soil.

Runoff and Turbidity;

Use of silt control devices and sediment traps/fences including Construction of embankments and replanting to avoid direct runoffs.

C. Increase Runoffs (flash flood)

The map below indicates the flood prone areas in relation to the existing watercourses and the proposed land for the national project. It identifies areas lying within low lying elevation such as drainage, river channels and ponds. It represents the areas likely to be flooded during the extreme rainfall events.

D. Poor Waste Management

Waste management and control is vital to minimize solid and liquid waste pollution at the project area. As such all solid wastes must be properly collected and discarded at a proper dump site. All liquid wastes to be properly contained and treated before discharging into the environment.

E. Air quality

The current air quality is good which confirm to that of a remote wetland community in a rural area. Moreover, during construction phase localized air pollution from the diesel power used by contractors will be the main cause of air pollution. Dust pollution from moving heavy vehicles during construction work is another cause of pollution.

***Mitigation**:*

Measures for operational air impacts will include ensuring that the diesel generator is fitted with standard emissions controls as specified by the manufacturer and generator are serviced and maintained in accordance with the manufacturer's specifications.

The developer (MCILI) shall be committed to control emitted dust and gases pollutant from such operations through the proposed emission control procedures described in the environmental management plan (EMP) included in this report.

F. Noise pollution

The noise produced will be from the diesel generator and moving vehicles during construction. Although project site is located far from any human residence, the access road actually runs through Panama village. Noise from machines and construction work must be minimized only for normal working hours. However, for sustainability in the long run, a solar hybrid system is recommended for the project site.

Mitigation:

- The noise is not considered to significantly harm animals nor cause impacts on the population.
- The developer (MCILI) should establish the generator inside an insulated soundproof room to keep the environment free from noise pollution.
- Noise barrier should also be considered around the generator room as a mitigation from noise pollution.
- Installed solar power system instead of generator.
- The increase noise level is considered occupational noises that require occupational health and safety measures.
- The workers dealing with the generator (power supply for the facility) should use earmuffs during operation of the diesel generator.
- All construction works to be ceased by 5PM each working day.

G. Soil Erosion

8.3.2 Potential Impacts – Biological Environment

A. Terrestrial Ecology

The potential impacts of Terrestrial Ecology are;

- Permanent change of ecosystem from a pristine Wetland/Mangrove ecosystem to Commercial town.
- Permanent loss of vegetation and fauna.
- Loss of ecological services and good.

Mitigations:

- Fair royalty payment to resources owners for the disruption of environment good and services.
- Preserved trees within 10 meters on the coastline.
- Plant fruit trees to stabilize soil and form forest pockets.
- Include local tree species in replanting program in landscaping work to stabilize soil.

B. Marine/Coastal Ecology

Potential impacts and mitigations are discussed below.

Potential impacts;

- Destruction of seagrass and coral ecosystem.
- Deterrence of fish species due to noise and habitat damage.
- Alteration of breeding grounds for fish and invertebrate species.
- Oil spillage and chemical pollution
- Land reclamation- destroy bottom benthic habitats.
- Changes to coastal hydrology and geomorphology- may cause erosion and deposition due to alteration of wave reflection, refraction and diffraction and littoral drift pattern.

Mitigation:

- Installation of sediment traps during major excavation and installation of structure such as Wharf or jetty.
- Careful site selection and port design to minimize current patterns and other coastal hydrology.
- Construction of sea walls, jetties, offshore breakwaters and periodic beach nourishment.
- Engage in habitat reconstruction and rehabilitation of seagrass and coral reef.
- Contractor to provide rubbish bin and enforce strict waste management practice.

C. Mangroves

There are no major concerns to this very important ecosystem in terms of IUCN listed species and or other threatened species. This is because the ecosystem is highly disturbed by human activities such as gleaning for mangrove fish and invertebrates for food, deforestation for timber, firewood and other materials. Moreover, as per figure () the mangrove ecosystem is located outside and or on the boundary line of the project area in the west end. Destruction of mangrove patch within project area and on the western end is highly likely but considerations on coastal erosion and flooding management is vital.

D. Freshwater Ecology

The freshwater ecology of the project area is simply a wetland ecosystem and given the swampy property of water making it not suitable for fauna and flora to thrive there. There is no IUCN listed species found in the freshwater environment within project boundary. During survey time, about 1 hectare of land had been backfilled to date. There is low species diversity and already freshwater ecosystem has been altered by drainage work and soon backfilling of whole project area. As per observations there is no species of great ecological consideration for conservation observed in the project area.

Mitigation:

- Avoid direct dispose of waste into small water stream running on the project boundary.
- Waste dump site should not be earmarked on upper catchment area of streams.
- Plant riparian vegetation along stream banks on east and western end of SUAVA EGC

8.3.3 Potential Impacts – Built Environment

8.3.3.1 Traffic congestion

8.3.3.2 Damage to public infrastructure

Public infrastructures identified with in the assessment zone (i.e. from Taba'a –Kwai River) are mostly schools, Clinic, Road, Bridges, and Calvert. This section looks at formal and other infrastructures that made up of the built environment around Suava Bay EGC. Highlighting the significance of potential impacts and drawing measures to mitigate those impacts.

D. Roads, Bridges and Culverts

The only road access found in the area was the 88km ragged Coronas (gravel) road from Auki to the project site. The road was constructed in year 1970s up by the Solomon Islands government. The road suffered number of maintenance issue many times in the past by

contractors in the country. Community people stated that road in north Malaita did not last for even two years after upgrading and maintenance by number of contractors in the past.

Recently in year 2017 Solomon Island government through MID facilitate the construction of a 1 km access road from the main road (Auki-Fouia road) to project site on the sea coast in Suava Bay.

The two bridges found in the locality is Taba'a and Kwai Bridge. Taba'a Bridge was recently upgraded and Kwai Bridge is still in its worse condition, damaged by flash flood some years back.

There are five (5) culvert system, four (4) found along the road from Taba'a to Kwai River and one (1) along the newly constructed road to the project site.

Damage (potential Impacts)	Magnitude of the Impact	Mitigation Measures
Flood damaged bridges	High	Embankment
Poor Road Drainage	High	Proper Drainage System
Road portholes, muddy road and drains run through roads	High	Road Maintance
Culvert blocked by flood run offs and debris.	Medium	Continuous Desilting of Culverts

E. Schools

There are two primary school and two early childhood education in close proximity of around 2 km to the project site, between Taba'a and Kwai River. Manafaeni Primary school registered and run by SDA authority which accommodate around 200 students and Lolu primary school hosted around 100 kids, registered and run under Malaita education authority.

Damage (potential Impacts)	Magnitude of the Impact	Mitigation Measures
Poor /no staff house	High	Resources Capacity -i.e New Staff Housing
Leaf hut for early childhood centers – unhealthy and poor learning environment	High	Improve Early childhood environment
Poor access to schools – muddy roads	High	Easy access to schools by building walk paths
Inadequate school equipment and materials – poor academic performance.	Medium	Resourcing Schools by stakeholders
Overcrowded classes	medium	Build new classrooms

F. Clinic

There is only one health aid post (Matakwalao clinic) found in close proximity to the project site. Two registered nurse aid currently working at Matakwalao clinic and the clinic is supervised by a locally set up committee. On average more than 20 people turns up at the clinic seeking medical treatments each day. During most busy days more than 50 people turns up and during less busy days less than 10 people turns up at the clinic. The clinic catchment population is more than 2000 people from around twenty (20) communities in ward Nine (9), Malaita province.

Damage (potential Impacts)	Magnitude of the Impact	Mitigation Measures
Outbreak of any diseases will not be contained and deal with at the clinic.	High	
Development at Suava Bay will be going to put pressure on very basic services and limited drugs available at the	high	Capacitating the Clinics by relevant authorities

clinic		
No nursing care services and facility available at the clinic	high	
Poor/slow referral action due to no vehicle or other means of transportation is set back	high	

G. Water and Sanitation

There was no water and sanitation at the proposed project site according to assessment conducted. Development growth center of such nature requires proper water supply and sanitation systems to be in place, before embarking on other developments on the site.

Damage (potential Impacts)	Magnitude of the Impact	Mitigation Measures

8.3.5 Social and Cultural Impact Assessment

8.3.5.1 Purpose and Objectives

The overreaching goal of carrying out social and cultural impact assessment is to determine initial socio-cultural condition to inform potential developer or those who make decision in the process of developing Suava Bay Economic Growth Center of the likely consequences of their decision, before they can able to made decisions. It is important to draw bench mark at initial stage to help planers and developers bring about a more sustainable, equitable biophysical and socio-culturally and equitable economic environment.

The social assessment was run for a period of three weeks. Conducted through key informant interview, community consultation, observation and sites visits. Secondary data are gathered and analyze in the process of compiling the Social and Cultural Impact Assessment.

8.3.5.2 Description of the social-Cultural, Institutional, Historical and Political Context

Below are the socio-economic findings of the EIS, describing the socio-cultural, institutional, historical and political context surrounding Suava bay Economic Growth Centre.

i. A population of more than 1000 people with more than 200 household living in the study identified site (Taba'a – Kwai River). Revealed through the study, the population has a male population majority of 51% whilst around 49% are female. Around 1% are people living with special need in those communities.
ii. Suava bay economic growth center is located at Kwatonaere in ward nine (9), Lau Baelelea Constituency at the bottom of the mouth like shape of the physical outlay of the Island of Malaita, in Northern region. according to geo-political boundaries the project is located in Lau Baelelea constituency, however according to traditional boundaries it is within Toabaita boundaries that begins at Kwai River and end at Aero River in north Malaita.
iii. The existing cultural context surrounding the EGC could generally describe based on north Malaita culture, more specifically according to Toabaita culture and tradition. There are number of factors singled out as cultural pillars observed and valued based on culture and tradition. The following are highlighted; governance and leadership, marriage, chants and oral history, cultural festivals, ancestral worship, death, Nalinut festivals, traditional dancing, giving birth to a child and traditional livelihood activities. Though many of these practices haven't strongly observed by many people in North Malaita today, having sound background knowledge would help explain some of the current behaviors that build or break-down the social structure of the communities.
iv. Four tribes found currently residing between the two rivers in close proximity to the project area. They are known as Kwana'ai, Aenatalitoli, Alita, Kwau and Walo tribes. Kwana'ai tribe claim to be the founding tribe that discovers and settled, currently occupies most part of the land that stretches from inland to the sea between Taba'a and Kwai River. 10 villages existed between the two rivers of which 6 communities are occupied by member of kwana'ai tribe and remaining 4 communities occupied by other 4 tribes.

v. Few public facilities are found in the communities and most are either communally or privately owned. Common government facilities are schools and clinic, road, brides and currently including the EGC site.

vi. According to the assessment around 98% are members of Christina denomination and around 2% are either pagan worshipers or did not attend to any congregation. South Sea Evangelical Church Movement, those who identified themselves with late Rev Michael Maeliau's teaching, has made up majority of the residing Christian population. Other denomination found within the area are; COM, Baptist Church, Jehovah's Witness, Ramah Church, COC and Christian Rival Church.

vii. Around 80% of the population did not understand the concept of gender equality and 20% stated they understand through workshop attended, hearing from others and listening to SIBC programs. Similar to other rural context in the country, women would likely to face greater challenges regarding access to sufficient health care support, access to better education, limited engagement in economic opportunities, limited chance to take on leadership roles, little access to justice and susceptible to domestic violence and other forms of abuse in rural context of Solomon Islands. (Solomon Islands Gender Assessment Report, ADP, 2015)

viii. The study reveals around 94% of active working population of age 25-49 are formally unemployed and around 6% formally employed. With around 1% formal health workers and more than 4 percent from teaching and less than 1% from other institutions. The formally unemployed portion of the population obviously engaged in private income generating either in fisheries, agriculture, forestry and other macro-economic activities on a subsistence bases in rural communities.

ix. Field visit and household survey indicated eight (8) community of the 10 surveyed villages used village Dum water source for drinking except for Lolu and Kafosina who have access to few stand pipe system in their community. Nearly 80% of Sulagwalu and around 40% of Panama community recorded household using poured flash toilet system. Few household at Lolu, Cana and Norway are also using poured flash whilst Ngaligera, Funadae, Kwarifau and Kafosina household mostly used open pit toilet system in their communities.

x. Matakwalao aid post is the only medical facility found in the locality of the assessment zone. It exists at Panama community with less than a KM to Kwatonaere growth center. The aid post is registered under the Malaita provincial government, with a catchment population of 2300 people for more than 20 clustered communities

in ward 9 of Malaita province. 10 communities that are part of social assessment have accessed medical services and referrals from Matakwalao aid post.

xi. Around 19% of institutions identified are formal and more than 80% are informal groups or institutions. More than 41% are community/tribal groups, more than 38 are church groups, and 16.13% are schools and 6.25 for health institution. The most influential institution on ground were churches and tribal groupings.

xii. Kwana'ai tribe formally established and registered, operated under Kwana'ai Board of Trustees, Inc. (KBT) since 2007. According to their constitution after every 2 years new board members are formed through election. The KBT deals with all matters relating to tribe, land and development on Kwana'ai land. KBT since in operation requires strengthening of its governance structure to become an effective avenue to dialogue with and spear-heard development on the ground.

xiii. There are 6 traditional/Kastom sacred sites and 5 Christian/lotu grave site or cemetery located approximately within two (2) km in close proximity to Suava bay Economic Growth Center. Faualimango grave site is found right in the demarcated economic growth center site.

8.3.5.3 Legislative and Regulatory Considerations

A. The Town and Country Planning Act 1997.

This Act has potential to provide for the consideration of the environment sector for conservation of cultural and biodiversity areas. The Act applies to all urban areas (Capital city – Honiara and Provincial towns) and includes the management of land (all ownership), the management and planning functions for urban and rural areas including development. The objective of the Act is to ensure that land is developed and used in accordance with proper polices and a high consideration of the people's welfare.

B. Provincial Government Act 1997

The Provincial Government Act (1997) gives power to the Provinces to make their own legislation including for environment and conservation. Schedule 3 of the Act provides a list of activities for which the Provinces have responsibility to pass ordinances. One of the activities includes Cultural and Environment - protection of wildlife, coastal and lagoon shipping. The ordinances include:

- Trade and Industry - local licensing of professions, trades and businesses and markets.
- Cultural and Environment - protection of wildlife, coastal and lagoon shipping.
- Agriculture and Fishing - protection, improvement and maintenance of freshwater and reef fisheries.

Land and Land Use - codification and amendment of existing customary laws about land. Registration of customary rights in respect of land including customary fishing rights. Physical planning except within a local planning area.

- Local matters - waste disposal.
- Rivers and Water - control and use of river waters, water pollution.
- Corporate or Statutory Bodies - establishment of corporate or statutory bodies for provincial services including those for economic activities.

The State of the Environment Report (2008) shows that eight provincial ordinances have been passed and including two for Guadalcanal Province: i) Guadalcanal Wildlife Management Area Ordinance 1990 and ii) Guadalcanal Province Protection of Historical Places Ordinance 1985.

C. International – Cultural

- World Heritage Convention. Acceded 1992. Protection of sites of Outstanding Universal Values. (East Rennell Island is listed as a World Heritage site).
- The Convention for the Safeguarding of the Intangible Cultural Heritage 2003
- The Convention of the Protection and Promotion of the Diversity of Cultural Expressions 2005.

8.3.5.4 Analysis of key Social Impacts and Issues

Carrying out Social Impact Assessment in any form of development or as such the Suava Bay Economic Growth Canter, is a check and balance and raising awareness of specific issues that will affect people or what they have identified to be their biggest challenges.

According to (Vanclay, 2003), the International Association of Impact Assessment (IAIA) International centre for Social Impact Assessment that the analyses social impacts, alternatives, and monitoring of planned intervention should allow participation and integrate the concerns of interested and affected parties in the assessment of social impacts.

The issues, concerns, and mitigation strategies raised by interested and affected communities are outlined in the Impact Assessment Report likewise community consultation point of view.

During community consultation, concerns, and suggestions have been included in the risks identified in the social impact assessment. More on that, social impact assessment gathered information relating to land issues, need for equal distribution of work at project site, rise of anti-social behaviours, gender aspect, denying of access to traditional livelihood activities, rise of new settlements, eradication of local culture and opportunities and challenges that development will bring to the people currently residing next to the project site. In addition observance to employment laws, health and safety, community consultation and training, and numerous other social issues.

A. Land related Issues

Land has always been an issue in many development efforts. In the case of Suava Bay EGC, the same applies. However, the land is legally registered as part of the Matakwalao land settlement scheme in 1974 under Fautharii decedent of Kwana'ai tribe. Consultation with neighboring clans resided between Taba'a and Kwai River reveals that other parties are still pursuing their claims over the land. However, the government already procced with acquiring the land from Kwana'ai tribe since 2012 with a payment of 5.5 million, left with 2.5 to complete the payment agreement according to the outright sale contract between SIG and Kwana'ai people. Kwana'ai trustees express their concern to the government to honor the agreement signed with them. Failure on government side would going to jeopardize chances of a successful implementation of EGC project at Suava bay.

B. Employment opportunity related Issue at Project Site

Competition for job at the project site has become an issue. Community leaders express their intention of allowing development into their land was purposely to offer employment for potential and capable members of their tribe. This issue will become a growing concern for surrounding communities of the EGC project at Suava Bay. It is therefore important for planners and contractors to consider fair and equal distribution of employment opportunities for members of surrounding communities and resources owners in close proximity to the project site. Over politicizing of contracts, will leads to discontentment among local populace near the project site as witnessed with few contracts given to certain contactors in the past at the EGC site.

C. Rise of Anti-Social Behaviors

Anti-social behavior will be one of the major challenges facing the Suava Bay EGC in ward 9 north Malaita. Unlawful activities are already high in the community, for instance rise of illegal drugs and liquor use is already a challenge for many communities in Malaita.

The operation of a growth center at Suava Bay will likely to give rise to anti-social behaviors with the influx of people from other parts of Malaita and Solomon, with different background and culture interacting with local population.

Anti-social behavior comes in different forms and nature, many of them also relates to cultural issues, gender, conflict, and general nuisance. The issue of antisocial behavior related to drug abuse and intrusion into the nearby community is expected to increase, this will in turn lead gender and family related abuses and value deterioration.

Consultations with local people in the Project Area in the month of September 2021 indicated that an increase of cash in the local area provided through local employment, young women had already become victims, lured by money to involve in anti-cultural practices, causing disagreement and demanding of compensation by concern families.

D. Rise of new settlements

Rise of new settlement will become a concern to Suava Bay EGC. Tribal members who have parcel of land next to the EGC area will likely to move and erect new settlements. Besides, a full operation of the growth center will leads to uncontrollable sale of land by local land title holders which would eventually resulted in new communities with different tribes settling next to the EGC site. Currently the entire smaller settlement surrounding Suava bay EGC can traced their originality to kwana'ai tribe or any of the four existing neighboring clans. With rise of new settlements from other tribes will create a multi-tribal society, which will pose threat to existing clans on the land. A similar scenario that occurred during arrival and establishment of Christian churches in the past. People from different tribes gathered around a particular church in search for a much better and peaceful life. Once moved and settle, they will soon become permanent residence, producing a social setting like squatter environment around Honiara City.

E. Increase Pressure on Social Services and Infrastructures

Populace inflow especially from families of those employed on the Project or others looking for work can bring about important and unsustainable requests on local social services, for example, demand for schools, increases of diseases need higher demand for health centers/clinics, churches, and convenience facilities. Unsustainable demands for these services will likely result in a break down in service delivery. Strategies to expand social services whilst managing population arrival will be required to assist in mitigating this issue.

F. Loss of existing routes to farm site and fishing area at Suava Bay Economic Growth Center Site.

Construction activities will create several issues associated with accessibility to land and waterways which are currently used for hunting, gathering, fishing, gardening, and other livelihood-based activities. Several villages are within proximity to all port sites, and so construction activities have the potential to intrude upon lands and waterways which are used for livelihood-based activities of local people.

G. Increase of Traffic Movement in Rural Communities.

Whilst access to improve and daily transportation can be seen as positive development, increase movement and fast riding vehicle in rural communities will become threat to many children who spent most part of a day along main road accesses. Consultation with communities highlighted people who own vehicles using the project area as their alcohol drinking zone. Drunkards drive in and out of the current land filled site at high speed putting life of road commuters at risk. The government must intervene to enforce traffic laws to owners of vehicle in north Malaita. The likelihood of accidents will increase for each of the development phase. The community adjacent to the project will need to prepare for this increase in traffic flow and understand traffic rules and laws.

H. Loss of Cultural Heritage and Value

Fully functioning of Suava Bay EGC will definitely put pressure on the local culture and tradition. Below are expected impacts to the cultural heritage and value:

i. Such development which will introduce more outside business investors and foreigners to come in will bring in cross-culture which destroy the traditional culture that can pass through such as oral traditions, performing arts,

ii. Death of cultural knowledge, thus lead to a loss of Intangible cultural heritage includes oral traditions, performing arts, social practices, rituals, festive

events, knowledge, and practices concerning nature and the universe or the knowledge and skills to produce traditional crafts.

iii. Permanent damage or disturbances of known cultural heritage site, whether tangible or intangible which may lead to the loss of cultural traditional sites.

Development Outcomes – key Activities	Potential Impacts	Proposed Strategy/Mitigation measures
Outcome 1 Phase (1) Land clearing and preparation (Construction and operation phase) - Land clearing, removal of over burden, stock piling and backfilling, i.e. gravel extraction reclamation stage	Land related Issues	○ Work along with responsible ministry (commissioner of lands) and company and landowner for mutual understanding ○ Government to complete the outstanding payment for landowners to avoid future dispute and disturbance by landowners. ○ Tribes to be represented in the Task Force under the Development unit. ○ Complete the process of acquiring titles ○ Developer to strengthen relationship with Kwana'ai Board of trustees.
	Employment opportunity related Issue at Project Site	○ Employment opportunities that matches local residence should be prioritize for people residing near to the project site.
	Rise of Anti-Social Behaviors	○ Work in close collaboration with house of chiefs, church authorities and Matakwalao Community By law enforcement team and Kwana'ai board of trustees ○ Build a strong relationship with Maluu police.

		○ Established a police post at the project site.
	Loss of existing routes to farm site and fishing area at Suava Bay Economic Growth Center Site.	○ Provide access road to communities surrounding project site to access their garden, nearby villages, schools, clinics and fishing activities.
	Increase of Traffic Movement in Rural Communities.	○ Work along with police to closely monitoring illegal drivers, drinking, and driving ○ Work along with police for strong monitoring of license and enforcement with regards to traffic law. ○ Link with Community policing to relate cases to police.
	Loss of Tabu sites	○ Consider option to preserve Tabu site found at the project sites ○ Proper consultation to be conducted with land owners and people who have claim identified tabu site. ○ Compensate damage tabu site according to relevant laws.
Outcome 2 (2) – this includes construction of roads, drainages, pathways, buildings, septic tanks (Market building, wastes	Land related Issues	○ Work along with responsible ministry (commissioner of lands) and company and landowner for mutual understanding ○ Government to complete the

Management site, warehouse and cool storage house)		outstanding payment for landowners o Tribes to be represented in the Task Force under the Development unit. o Complete the process of acquiring titles
	Employment opportunity related Issue at Project Site	o Employment opportunities that matches local residence should be prioritize for people residing near to the project site.
	Rise of Anti-Social Behaviors	o Work in close collaboration with house of chiefs, church authorities and Matakwalao Community By law enforcement team and Kwana'ai board of trustees o Build a strong relationship with Maluu police. o Established a police post at the project site.
	Loss of existing routes to farm site and fishing area at Suava Bay Economic Growth Center Site.	o Provide access road to communities surrounding project site to access their garden, nearby villages, schools, clinics and fishing trips.
	Increase of Traffic Movement in Rural Communities.	o Work along with police to closely monitoring illegal drivers, drinking, and driving o Work along with police for strong monitoring of license

		and enforcement with regards to traffic law.
	Loss of cultural norms and values.	o Set up a cultural committee to facilitate trainings and awareness and conduct induction to people who new to the place. o Set up a cultural institution to educate youth and children and organized cultural festivals, promoting cultural norms and values.
Outcome (3). Phase (3) - operational stage, Marketing and other commercials activities operated at Suava bay Economic growth center.	Daily disturbances	o Provide security to present at the development site at all-time to Control movement of people during clearing phase/constructions and operation o
	Land related issues	o Work along with responsible ministry (commissioner of lands) and company and landowner for mutual understanding o Tribes to be represented in the Task Force under the Development unit. o
	Increase of traffic and movement	o Work along with police to closely monitoring illegal drivers, drinking, and driving o Work along with police for strong monitoring of license and enforcement with regards

		to traffic law.
	Population increases and rise of new settlements	○ Liaise with developer and land owning group to develop a police guiding establishment of new settlements.
	Increase of Anti-social behavior	○ Work in close collaboration with house of chiefs, church authorities and Matakwalao Community By law enforcement team and Kwana'ai board of trustees ○ Build a strong relationship with Maluu police. ○ Established a police post at the project site
	Kastom and tradition	○ A cross cultural training program for all employees and contractors should be developed by a company developer or assigned liaison officer in conjunction with a suitably qualified cultural heritage specialist.
	Employment related issues	○ Employment opportunities that matches local residence should be prioritize for people residing near to the project site.
	Increase Pressure on Social Services and Infrastructures	○ Improve current social facilities such as schools, clinic and accommodation to host visitors and government officers who may visit the

		place or resided to work on the project site.

9.0 Summary of Environmental Management Plan

Table 18: EMP for the Suava Bay EGC Project

IMPACT MITIGATION			IMPACT MONITORING				
ENVIRONMENTAL ISSUES and OBJECTIVE	**MITIGATION MEASURES TO BE INCLUDED IN THE EMP**	**MITIGATION RESPONSIBILITY (IMPLEMENTATION)**	**PARAMETERS TO BE MONITORED**	**WAYS FOR VERIFICATION**	**FREQUENCY**	**MITIGATION ESTIMATED COST**	**SUPERVISION**
PRE – CONSTRUCTION PHASE							
Physical Environment							
Location of the Proposed Site To access the location for the Flooding, Coastal Flooding, Coastal Inundation, Coastal Erosion and Sea Level Rise	• The detailed design should take into account hydro-meteorological data and geological surveys (e.g., erosion rate, peak flood, annual rainfall, soil texture, etc.) and climate change hazard maps analysis for the structures to be constructed.	MCILI and Contractor	✓ All the mentioned data to included and taken into account in the detail engineering design of the facility	✓ Review the detail design engineering drawing	Before the biding documents are out for tender	No Marginal Cost	MCILI/ Contrctor/Consultant
Site Selection	• Conduct a screening through careful site investigation with participation of professional experts (e.g., geologist, biologist, archaeologist, hydrologist); • Consult with local authority and people; • Make sure that problems with UXO, flood, erosion, depression, damage to significant cultural resources, land acquisition and resettlement, loss of biodiversity to be adequately managed before commencement of detailed design.	MCILI	✓ Carried out assessments	✓ Successfully completed and assessment	Subproject preparation cost	Preparation Cost	

UXO clearance	• No UXO study required for project site due to it being outside of the battle fields during WWII. • If required, MCILI will inform concerned agencies, local authority and people about a detailed plan for detection and clearance of UXO at least one week before work starts.	MCILI and contractor	✓ Clearance is conducted or not	✓ Certification of Clearance	Subproject preparation cost	Preparation Cost	
Geotech Assessment	•		✓	✓			
Detailed Design	• Results from screening and hydro-meteorological and geological survey data should be taken into consideration at detailed design stage; • Detailed design should be reviewed and appraised by the panel of professional experts to ensure that operation of the EGC station will not face any environmental problem.	MCILI and design consultant	✓ Technical specifications	✓ Before commencement of construction	Subproject preparation cost	Preparation Cost	
Ecological Environment							
Protection of (sensitive) Natural Areas To minimize negative impacts on sensitive ecosystems, or the natural environment	• Identify potential environmentally sensitive/natural areas and making sure the proposed activities are away from them • Ensure the construction personnel are aware of the locations of these areas and avoid them	Joint monitoring by MCILI, MECDM and EIS Consultant	✓ No works are to be done near or in the vicinity of the (sensitive) natural areas	✓ Visual Inspection on the proposed site; ✓ Consultation with the community and workers	As required; Before the construction starts and after construction	No marginal cost	MCILI and EIS Consultant
Socio-Economics Environment							
Cultural Heritage To avoid any serious damage to cultural heritage site, archeological artifacts or sites	• In case a cultural heritage site is identified during the construction, the contractor will cease all work immediately and notify the National Museum of the Ministry of Culture and Tourism and MECDM.	Joint monitoring by MCILI and EIS Consultant	✓ Sites or resources discovered and their protection or preservation	✓ During activities stop work notice issued. ✓ Site and resources discovered are dealt with properly	As required; Before the construction starts and after construction	No marginal cost	MCILI and EIS Consultant

Social or Community Concerns To avoid and minimize social impacts of relocating or resettlement of people	Plan to avoid/minimize displacement of residents or people; Discuss the projected impacts and negotiate proposed measures in advance with the affected community and the provincial government officers.	Joint monitoring by MCILI and EIS Consultant	✓ The proposed work site is within the proposed land and within the area; ✓ No residual of loss and no compensation required	✓ Formal and verbal complaints ✓ No. of compensation claims received	As required and need verification	No marginal cost	MCILI and EIS Consultant
To minimize damage to personal and community property	Accesses into the project area will either be reconstructed or constructed so that all activities will take place within existing working area. Conduct surveys before activities commence to identify members of the affected population.	Joint monitoring by CRISP and Contractor	✓ The proposed work site is within the proposed land and within the area; ✓ No residual of loss and no compensation required	✓ Formal and verbal complaints ✓ No. of compensation claims received	As required and need verification	No marginal cost	MCILI and EIS Consultant
CONTRUCTION PHASE							
Physical Environment							
Management of stockpiles and spoil-heaps To minimize dust and run-off	• Discuss dumping locations with the Provincial Government; • Ensure proper drainage to isolate the site; • Ensure stockpile or soil-heap location do not block surface run-off or drainage lines; • Cover or re-vegetate spoil-heaps or stockpiles if prolonged exposure is envisaged, to minimize erosion and sediment run-off; • Maximum stockpile height shall be 3m; and • Place geotextile silt traps around material stockpiles	MCILI and Contractor	✓ Proper discharge of waste; ✓ Occurrence of erosion at the site and work areas;	✓ Visual field checks; ✓ Formal and verbal complaints	Monthly	To be included in the contract	MCILI
Dust Control To minimize health risk or inconvenience due to dust production	• Spray water on exposed surface during dry periods; • Maintain construction equipment; • Prohibit the use of machinery or equipment that produces excessive pollutions (e.g., generates dark fumes) • Ensure that vehicles transporting dust producing materials are;	MCILI and Contractor	✓ Air quality emission, dust and particulate matter; ✓ Use of tarpaulins; ✓ Loading of vehicles; ✓ Stockpile areas	✓ Periodic visual inspection ✓ Any particulate matter and smoke hanging around for a longer	Monthly or immediately as soon as the complaint is lodged.	To be included in the contract	MCILI

	○ not overloaded; ○ provided with tail boards and side boards; and, ○ adequately covered • Material stockpiles are to be stored in sheltered areas and properly covered; and • Ensure all construction vehicles and plant are well maintained.						
Soil Instability and Erosion To minimize the amount of sediment lost from the site	• Keep vegetation clearing to a minimum; • Cover the exposed areas; • Place silt traps as where appropriate; • Re-vegetate immediately after construction activities are done; • Climate proofing to ensure flooding effects and erosion do not increase locally; • Modify design to accommodate extreme weather events, increased rainfall and run – offs, including coastal effects; • Climate proofing, good design to ensure flooding effects and scouring & erosion are not locally increased; • Works along the coast must be undertaken with extreme care and precautionary measures.	Joint monitoring by MCILI and Contractor	✓ Reduced localized flooding; ✓ No stock piling in or near to coast	✓ Visual observation on site or work areas; ✓ Verbal or formal complaints	As required or monthly	To be included in the contract	MCILI and Engineer
Controlling Sediments To reduce coastal erosion, siltation, sedimentation, water quality and increased turbidity due to the proposed project	• Construction works within the vicinity of the coast must be carried out with extreme caution; • Use of silt or sediment control devices during construction works and extraction activities within the vicinity of the coast, and ensure the devices are cleaned. • Temporary structures are to be removed immediately after works be restored; • Side slopes of embankments designed to reflect soil strength and reduce/ avoid increased erosion; • Minimize size and duration of cleared areas	Joint monitoring by MCILI and Contractor	✓ Occurrence of erosion along the coast (site) and work sites;	✓ Visual and field inspection; ✓ Verbal or formal complaints	Monthly	To be included in the contract	MCILI and Engineer (MID)

	and undertake progressive revegetation of cleared work areas; • Avoid clearing activities during rainy season where possible; • Use of heavy machineries in the aquatic environments be minimized; • Good design used in all construction activities to minimize need for changes to natural gradients; • Spoils or stockpiles will not be located near or on the coastal slope; • Placement of diversion ditches around stockpiles; • Abstraction from or pollution of coastal waters is not permitted; • Debris, spent fuel or oil and waste material is not to be dumped in the sea or along the coasts; • All waste materials generated during works and chemicals used will be stored in secured containers away from the coast, surface waters.						
Noise Control To minimize nuisance from noise	• Construction equipment and vehicles maintained and checked to minimize noise; • Contractor will develop a schedule of operations with MCILI and Communities to identify days of work and no work and hours for certain activities; • Limit noisy construction activities to daytime hours, i.e., noisy construction activities prohibited between 8am and 6pm; • Provide workers with noise abatement equipment (earmuffs etc.); and • Complaints regarding noise will be addressed by the Contractor	Joint monitoring by MCILI and Contractor	✓ Adhere to the agreed work schedule and timings ✓ No. of complaints (lodged in or verbally) and resolution; ✓ Workers safety equipment	✓ Review schedule of construction (ensuring it is complying with)	Monthly or immediately after a complaint is raised	To be included in the contract	MCILI and Engineers (MID)

Waste generated at construction site	• All wastes from work sites to be disposed of in approved land fill or areas • No wastes is to be dumped in or stored close to streams, or the coast (including mangrove areas) • Contractor ensures wastes are not discharged into the surrounding water bodies or rivers and that all wastes are disposed of in approved appropriated sites; • The Contractor will used the current landfill site at Ranadi to dispose any solid waste; • Adequate drainage and proper handling of sewage and other liquid wastes to prevent pools that could encourage or breed disease vectors • Site office and work yard will have sanitary latrines • Rubbish bins are to be provided on site and no site-specific landfill at camp • As part of training and awareness contractor will provide sufficient information on appropriate waste disposal methods	Joint monitoring by MCILI and Contractor	✓ Waste Management – Visual Inspection where the contractor used to dispose their solid wastes and it properly disposed; ✓ Provision of sanitary facilities; ✓ No direct discharges into the sea; ✓ Removal of wastes produced	✓ Spot checks – visual inspection; ✓	Monthly, or as required	To be included in the contract	MCILI and Engineers
Ecological Environment							
Cultural Heritage To avoid any serious damage to cultural heritage site, archeological artifacts, sites, assets and resources.	• Cease activity immediately; • Inform National Museum (Tambu Register) of the Ministry of Culture and Tourism, and MECDM; and • Undertake all actions required	Joint monitoring by MCILI, Contractor and National Museum and MECDM	✓ Sites or resources discovered and their protection or preservation	✓ During activities – stop work notice issued; ✓ Site and resources discovered dealt with properly;	As required and monthly	To be included in the contract	MCILI and Engineers
Terrestrial- Flora, Fauna and Marine To prevent runoffs, discharges and generation of liquid wastes	• Use of silt control devices; • Direct discharges to the sea or on the ground surface is prohibited; • Abstraction from and pollution of water	Joint monitoring by MCILI and Contractor	✓ Proper discharge of waste; ✓ Occurrence of erosion at the site and work areas;	✓ Visual inspection to the site and work areas ✓ Formal and verbal complaints	Monthly or as required	To be included in the contract	MCILI and Engineers

	resources is prohibited; • Diversion ditches is to be placed around stockpiles; • No liquid wastes are to be dumped in the water ways; • Use of heavy machineries in the aquatic environment is to be minimized; • All work areas must be restored to pre-conditions as quickly as possible after all completion of works; and • Spoils and stockpiles will not be located near the coast, on slopes or within 15m of the high tide mark			✓ Damping areas			
Material Management To minimize impacts of site clearance and material delivery	• Clearing of ecologically sensitive areas (inter – tidal flats, swamp or mangrove areas) and productive or farm lands is prohibited; • The century old trees are not allowed to be cut; the supervising engineer will be on site and also the works supervisor to ensure the trees are not damaged; • Suitable sites is to be identified in consultation with PMU, land owners and local community • Approved machinery only to be used (dredging is not permitted) • Permits for material extraction must be obtained from the Ministry of Mines, Energy and Rural Electrification (MMERE); • Topsoil is to be preserved and replaced during rehabilitation of site	Joint monitoring by MCILI and Contractor	✓ Materials only obtained from designated sites (locations and methods); ✓ Rehabilitation of sites;	✓ Visual inspection; ✓ Review the extraction plan and method	Monthly	To be included in the contract	MCILI and Engineers
Material Management To avoid intrusion into precious ecology, disturbance of marine and terrestrial habitats, effects	• Vegetation clearance to be kept to minimum, avoid felling of road – side trees where ever possible; • Contractor responsible for information and sanctions regarding harm to wild life and felling	Joint monitoring by MCILI and Contractor	✓ Check for poaching and unnecessary vegetation clearance on site and work areas; ✓ Progress of	✓ Spot inspection at the construction site and work yards; ✓ Revegetation activities	Monthly	To be included in the contract	MCILI and Engineers

on flora and fauna	of trees not required to be cleared; • Camp, equipment and stockpiles not to be located in ecologically significant or sensitive areas; • Progressive re – vegetation to be carried out in all areas disturbed by the project with fast – growing and native species; and • Contractor to supply sufficient cooking fuel to avoid use and felling of trees by workers		revegetation work areas; ✓ Training of workers and information level; ✓ Adequate and proper fuel storage	✓ Consultation with villagers and workers			
Socio-Economic Environment							
Social or Community Concerns To minimize social disturbance and maximize community benefits from the project	• Advice the local community of project plans in advance of construction and discuss with them on the design • Avoid or minimize disturbances to the communities close to the project site • Control runoff and manage sedimentation • Maintain liaison with community representatives and arrange for the involvement of community groups where practicable such as catering (women's group) or engaging people to do unskilled jobs	Joint monitoring by MCILI and Contractor	✓ Number of complaints of incidents between workers and villager reported verbally or formally and recorded ✓ Number of groups been engaged to do unskilled jobs ✓ Consultations done with the community and Provincial Government	✓ Number of verbal or formal complaints; ✓ Number of groups engaged; ✓ Project progress report	Continuous	No marginal cost	MCILI and Engineers,
Social disruption Presence of Contractor's personnel during Construction. Workers and association with local people	• Discuss the projected impacts and negotiate proposed measures in advance with people • Site office or contractor to consultation with authorities and local community in the vicinity. • Contractor(s) is to ensure workers actions in and outside the work area are controlled. • Ensure proper signage and security at construction site, i.e. prohibition of unauthorized persons (especially children) from entering the camp, site office, or work area	Joint monitoring by MCILI and Contractor	✓ Number of complaints of incidents between workers and villager reported verbally or formally and recorded ✓ Number of children entering the construction site ✓ Number and effectiveness of signage	✓ During activities – checking records for complaints, consultations with the workers about issues raised	continuous	No marginal cost	MCILI and Engineers,
Safety and Health To avoid increased social impacts include: ▪ Possibility of conflicts or	• Contractor to ensure workers' actions and work sites are controlled; • Signage and security, i.e., prohibition on unauthorized people (especially children)	Joint monitoring by MCILI and Contractor	✓ Provision of safety equipment to workers (PPEs); ✓ Signage and security	✓ Staff records; ✓ Visual inspection; ✓ Consultation with the community	As required or monthly	No marginal cost	MCILI and Engineers,

resentments between people from the surrounding villages/ communities and workers ▪ Children are potentially exposed to exploitation Impacts on general health and safety	entering the camp, site office and works yard; • Workers to respect village and land owners' boundaries; • Contractor to provide adequate and safe drinking water in camp; • Protection for the public in vicinity of work site and safe access across work site provided; • No damage to property and resources; • No child labour or children allowed to work; • Use Person Protection Equipment (PPE); • Chemicals will be stored in secured containers away from the coast and water bodies or surface water; • Chemicals stored in area or compound with concrete floor and weather proof roof.		to prevent unauthorized people from entering the work site and yard; ✓ Signage installed as required and appropriately.	members; ✓ Checking the complaint register; ✓ Consultation with the workers			
General Health and Safety Awareness for construction worker	• Education on basic hygiene practices to minimize spread of communicable diseases; • Contractor to provide health facilities and 1st Aid kit on site office and work site, and to provide safety equipment for workers; and • Prohibit usage of drugs and alcohol on construction site	Joint monitoring by MCILI and Contractor	✓ Check if the construction site has 1st Aid Kit; ✓ STIs and HIV/AIDS awareness implemented ✓ Toolbox meetings between supervisor and construction crew	✓ Visual Inspection; ✓ Verbal Complaints by workers	Monthly	No marginal cost	MCILI and Engineers
To prevent traffic and access disrupted during construction and traffic safety affected	• Notify community members in advance of schedule and duration of works; • Consultations and care taken to minimize disruption to access; • Disposal sites and haulage routes identified in consultation with the communities • Signage used and installed at appropriate area in the vicinity of work; and • Safe access across work site be provided for the public and communities	Contractor and villagers	✓ No. of accidents or events; ✓ Maintenance of access; ✓ Signage installed; ✓ Road free of materials and debris	✓ During activities – visual inspections; ✓ Consultation with the community members and workers – formal and verbal complaints by the community and workers	Monthly	No marginal cost	MCILI and Engineers
OPERATION PHASE							

Physical Environment							
Air Quality and Dust	• Ensure diesel generators have standard emissions controls remaining fitted and generators serviced, maintained and operated in accordance with manufacturer's specifications; Check regularly to identify potential sources of air pollutants; Replace the damaged and expired tools, equipment,	MCILI	✓ How often the gensets get cleaned ✓ If there is black smoke/exhaust coming out from genset exhaust	✓ How many time the oil and other things that needs changing	Weekly	Project Operational cost	MCILI
Noise	• Additionally, noise barrier should be given around the generator room as a mitigation measure from noise pollution. The increased noises that require occupational health and safety measure. The workers inside the project area should use earmuffs during the operation of the diesel generator; Measure noise at sensitive receptors to check compliance with other international standards such as World Bank EHS - ensuring that compliance with level of noise are provided for the residential, institutional, educational and night time at 45dB; 55dBA during the day and 3dBA at the background; The workers inside the project area should use earmuffs during the operation of the diesel generator. • Installed solar power system instead of generator	MCILI	✓ Maintenance done for the past month ✓ noise levels	✓ Number of complaints on the noise from the facility ✓ Inspection and ✓ supervision;	Weekly	Project Operational cost	MCILI
Water Quality	**Waste Generation** – •Septic tanks and garbage receptacles will be set up at construction camp sites which will be regularly cleared by the MCILI. •All wastes from work sites and camps to be disposed of in approved landfill / areas. •No wastes to be dumped in waterways or	MCILI	✓ Conduct in-situ water quality testing ✓	✓ Number of incidents that occur ✓ Test results from the quality water tests	Weekly	Project Operational cost	MCILI and MECDM

	close to the coast •MCILI to ensures wastes not discharged to rivers or coastal waters and that all wastes disposed of in proper areas. •Construction camps will have sanitary latrines. •MCILI to provide adequate and safe drinking water in camp. •Effluent, sediments and other wastes shall be disposed of through the use wastewater treatment facility •Waste is properly treated to avoid environment pollution and health impacts •Wastewater to be properly treated before discharging •Quality of discharged water shall be monitored periodically. •Proper collection and disposal **Runoff and Turbidity** – •Use of silt control devices and sediment traps/fences including Construction of embankments and replanting to avoid direct runoffs						
Ecological Environment							

Wastewater	All wastewater from house and office should be treated using the water treatment tank (septic tank). A monthly monitoring of wastewater quality is necessary to ensure that wastewater discharge meets national standard requirements	MCILI	✓ pH, BOD_5, COD, TSS,[10] NO_3^-, PO_4^{3-}, NH_3 ✓ Surface water - pH, BOD_5, Suspended Solid (SS), Dissolved Oxygen (DO), Coliform	✓ Inspection at water outlet of the EGC ✓ Inspection at the water intake	Once every three months	Operation Cost	MCILI
Solid waste	As the staff will stay in the EGC (people) household waste will generate during the operation of the project. Since the solid waste collection does not cover the EGC area, the EGC staff will establish a dust bin and the collected solid waste will be carried to the nearest collection point every week.		✓ Proper collection and disposal	✓ EGC Station Observation	Daily	Operation Cost	EGCManager and MCILI
Socio-Economics Environment							
Health and Safety - Emergency Fire Hazard	Carry out fire risk assessment during operation to identify sources of fuel and ignition and establish general fire precautions including, means of escape, warning and fighting fire; Fire extinguishers should be located at identified fire points around the site. This extinguisher shall be appropriate to the nature of the potential fire.	MCILI	✓	✓		Project Operational cost	
Occupational Health and Safety	Staff and workers operating the EGC station should be (i) annually trained in labour safety rules and first aid and (ii) provided with labour safety tools. The EGC manager should follow law on	MCILI	✓ No of incidences ✓ Training and awareness	✓ No cases	Monthly	Project Operational cost	MCILI

[10] TSS – Total Suspended Solids; BOD – Biochemical Oxygen Demand; COD – Chemical Oxygen Demand

	Labour. The EGC station should be provided with qualified first-aid kits and fire-extinguishers at all times. Unauthorized persons are prohibited to enter the EGC station. Dangerous area, if any, should be provided with a warning signboard						

10.0 Conclusion and Recommendation

10.1 Conclusions

The MCILI is in the process of constructing the Suava Economic Growth Centre in the northern region of Malaita Province. An EIS was undertaken to determine the possible impacts of the development and its subsequent operation. It is the conclusion of this EIS that there will be impacts of the development and its subsequent operation. However these impacts can be mitigated which will render the impacts neutral to negligible overall.

10.2 Recommendation

The development and operation of the growth center should progress as planned. However, mitigation measures proposed in this EIS should be adhered to in order to render negligible the impacts of the proposed development and subsequent operation of the freshwater hatchery. The nutrient analysis (phosphates and nitrates) for this EIS has been delayed due to issues at the National Public Health laboratory stated above. These results are not very critical yet as it is still construction stage. These results however will be critical just before the operation of the hatchery facility as baseline levels need to be recorded before any nutrient output from the hatchery operation. The availability of such baseline is important to manage waste from the hatchery facility. It is recommended that construction should continue at this stage, however the results for nutrient analysis should be provided and included into this EIS before the operations of the hatchery begins.

11.0 Works Cited

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12.0 Annexes

12.1 EXHIIT 1: SUAVA GROWTH CENTRE SUB DIVISION PLAN AND DESIGN

12.2 EXHIBIT 2: MAPS

12.3 EXHIBIT 3: SOCIAL SURVEY AND DEMOGRAPHY DATA

12.4 EXHIBIT 4: NON-TECHNICAL SUMMARY