IDENTIFICATION AND PRIORITISATION OF ADAPTATION AND MITIGATION TECHNOLOGIES FOR THE SOLOMON ISLANDS

TNA TECHNOLOGY NEEDS ASSESSMENT

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IDENTIFICATION AND PRIORITISATION OF ADAPTATION AND MITIGATION TECHNOLOGIES FOR SOLOMON ISLANDS

REPORT I

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This document is an output of the Technology Needs Assessment (TNA) project of Solomon Islands, funded by the Global Environment Facility (GEF) and implemented by the United Nations Environment Program (UNEP), and executed through the UNEP Copenhagen Climate Centre in collaboration with the University of the South Pacific (USP). The present report is the output of a fully country-led process and the views and information contained herein is a product of the TNA team, led by Ministry of Environment, Climate Change, Disaster Management and Meteorology (MECDM), Solomon Islands.

Foreword

The Solomon Islands' high vulnerability to the impacts of climate change and extreme climatic events such as sea level rise including coastal soil erosion at various locations across its rural communities means that the country is in dire need of innovative technologies to lessen damage to life, property, natural eco-systems, and its economy. I am confident that the Technology Needs Assessment (TNA) process initiated by the Ministry of Environment, Climate Change, Disaster Management and Meteorology (MECDM) in partnership with the United Nations Environment Program (UNEP) Copenhagen Climate Centre and the University of the South Pacific (USP) will play an effective role in increasing resilience against climate (UCCC)change vulnerabilities through transfer and diffusion of prioritized technologies in prioritized sectors including coastal erosion and relocation for adaptation while renewable energy and forest conservation for the mitigation sector. I am pleased to note that the entire process to prioritizing sectors and identifying technologies were carried out in a transparent, collective, and country driven by relevant stakeholders' enthusiasm and cooperative spirit shown by stakeholders through this phase-I. It was highly consultative process as impact of the current Covid 19 pandemic. Being highly consultative, it involved several stakeholders and experts from the government, private sector, and non-government organisations.

Furthermore, I firmly believe that implementing both adaptation and mitigation technologies prioritised in the TNA report Phase-I will help the country build resilience and mitigate climate change's impacts. I would like to thank the members of the TNA National Team and my colleagues within our Ministry and experts of each Technical Working Group for their invaluable contributions to the preparation of this Report.

Lastly, I also wish to acknowledge the contributions of the national consultants and experts of UCCC and USP for their constant support and guidance for implementation of the TNA project.

Dr Melchior Mataki
Permanent Secretary
Ministry of Environment, Climate Change, Disaster Management and Meteorology

List of Abbreviations

AFOLU	:	Agriculture, Forestry and Land Use
BAU	:	Business As Usual
COP 14	:	Fourteenth Session of the UNFCCC Conference of the Parties
DLI	:	Distribution Logistics Infrastructure
DTU	:	Technical University of Denmark
EEZ	:	Economic Exclusive Zone
ENSO	:	El Nino Southern Oscillation
EV	:	Electric Vehicle
FAO	:	Food and Agriculture Organization of the United Nations
FRL	:	Forest Reference Level
GCF	:	Green Climate Fund
GEF	:	Global Environment Facility
GHG	:	Green House Gas
HDI	:	Human Development Index
HFLD	:	High Forest Cover Low Deforestation
ICZM	:	Integrated Coastal Zone Management
INC	:	Initial National Communication
IPCC	:	Intergovernmental Panel on Climate Change
MDPAC	:	Ministry of Development Planning and Aid Coordination,
MECDM	:	Ministry of Environment, Climate Change, Disaster Management and Meteorology
MoFT	:	Ministry of Finance and Treasury
MPGIS	:	Ministry of Provincial Government and Institutional Strengthening
MRD	:	Ministry of Rural Development
MTDP	:	Medium-Term Development Plan
MTTAP	:	Medium Term Transport Action Plan
NAMA	:	Nationally Appropriate Mitigation Actions
NAP	:	National Adaptation Plan
NAPA	:	National Adaptation Program of Action
NC	:	National Communication
NCCP	:	National Climate Change Policy
NDC	:	Nationally Determined Contribution
NDMO	:	National Disaster Management Office.
NDMP	:	National Disaster Management Plan.
NDS	:	National Development Strategy
NGO	:	Non-Government Organisation
PMCI	:	Project Management, Coordination, and Implementation Unit
REDD	:	Reducing Emissions from Deforestation and forest Degradation
SIG	:	Solomon Islands Government
SINEPSP	:	Solomon Islands National Energy Policy and Strategic Plan
SITAM	:	Solomon Islands Transport Asset Management System
SIWA	:	Solomon Islands Water Authority
SLR	:	Sea Level Rise
SOE	:	State-Owned Enterprise
STIIP	:	Sustainable Transport Infrastructure Improvement Program
TFS	:	Technology Factsheets
TNA	:	Technical Needs Assessment
UDP	:	UNEP-DTU Partnership

UNDP	:	United Nations Development Program
UNEP	:	United Nations Environment Program
UNFCCC	:	United Nations Framework Convention on Climate Change
USP	:	University of the South Pacific
V&A	:	Vulnerability and Adaptation

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Executive Summary

The Solomon Islands is an archipelago located in the Melanesian region of the Pacific, south-east of Papua New Guinea. Considered the "Amazon of the Seas", the country's expansive area covers a unique range of atolls, mountains, and salt-water lagoons, and has some of the world's richest marine diversity. The country comprises of an archipelago of 997 islands with a total land area of 28,447 km² islands spreading over 1,589,477 km^2 of ocean. Its total projected population of more than 721,000 (2021) is dispersed across 90 inhibited islands. The country is reported to be one of the most vulnerable to climate change, largely since most of its population lives within 1.5 km of the coastline and the islands are regularly exposed to extreme climatic events, including sea level rise, coastal erosion, and storm surges. With the object to develop strategies to effectively counter the impact of climate change, the country has participated in the Technical Needs Assessment (TNA) as part of a technical assistance received by United Nations Environment Program (UNEP) and funded by the Global Environment Facility (GEF).

The TNA is a process which is undertaken to identify a country's development priorities under sustainable perspective (Charlery & Trærup. (2019)[1]. These needs are derived from ongoing policies, programmes and projects, long-term vision documents as well as strategies for climate change mitigation and adaptation already in place. The TNA is in line with the United Nations Framework Convention on Climate Change (UNFCCC) especially article 4.5 and various National Climate Change enabling activities. The aspects have been captured in the National Communication (NC) and National Development Strategy (NDS) of Solomon Islands. The NC and the Nationally Determined Contribution (NDC) which was submitted to the Conference of Parties through UNFCCC Secretariat have also provided support for this TNA process. To reaffirm this process, the Solomon Islands has already designed and established a National Energy Policy and Strategic Plan (2014) which provides a pathway towards achieving a long term sustainable renewable energy sector.

[1] Charlery, L., & Trærup, S. L. M. (2019). The nexus between nationally determined contributions and technology needs assessments: a global analysis. *Climate Policy*, *19*(2), 189-205.

The government through the TNA steering committee has selected "Coastal erosion and Relocation" for adaptation and "Transport and Forestry" sub sectors for mitigation related technologies. The decision to select and pursue these four (4) sub-sectors under the TNA processes was made by the TNA steering committee in line with the national priority areas, taking into account with polices such as the National Adaptation Plan of Action (NAPA), the National Development Strategy (NDS,2016-2035), Solomon Islands State of Environment Report (2019), the National Determine Contribution (NDC) and in-development Relocation Guidelines. The Ministry of Environment, Climate Change, Meteorology and Disaster Management (MECDM) acting as the secretariat to the TNA steering committee then introduces the selected sub sectors to the stakeholders to identify appropriate and relevant technologies that could be development to enhance the country's adaptation and mitigation strategy in the country.

The Solomon Islands National Energy Policy and Strategic Plan (SINEPSP) will enhance the use and utilisation of renewable energy technologies for sustainable development in urban and rural areas up to 79% by 2030 considering adaptation and mitigation needs to climate change. Besides the energy sector, the country also looked at the forest conservation which is critical to sustainable development at the same time reduction of greenhouse gases into the atmosphere. With the adaptation sector, the government and stakeholders have considered relocation and coastal erosion as the priority area for consideration under the TNA process.

In this process the assessments included development of climate change response needs and opportunities for building resilience based on some of the outlined activities in both the NDCs and the NDS of the Solomon Islands. The need to focus on the priority areas of the national government was adopted when assessing the four selected sectors, two on mitigation and two on adaptation. Under mitigation the sectors prioritised were transport and forestry whereas on adaptation side it is coastal erosion management and relocation / resettlement.

Technology Needs Assessment

The Technology Needs Assessment (TNA) process presents an opportunity for least developed countries to reflect on their needs to achieve their development goals, identify gaps, and technological solutions needed to address the identified gaps or constraints.

Technology Prioritisation by Stakeholders

The TNA report main output is a list of prioritised technologies or project ideas which the country could develop into concept notes and proposals for funding considerations. Nevertheless, before coming up with a list of priorities, the process entails stake holders identifying and selecting the most appropriate technologies for the country to implement based on certain agreed criterion such as capex, opex, development benefits, market readiness, GHG emission reduction potential, environmental benefits, job creation etc

The technologies that were considered by the stakeholders for this purpose under ***Mitigation 1- Transportation Sector*** includes sustainable road (including drainage & landscaping), electric out-board motor (OBM), electric vehicles (EV) focusing on mini-buses and vehicle pooling station, sustainable bridge, and artificial Harbor. As for the purpose under ***Mitigation 2 - Forestry Sector,*** this consist of multipurpose national forest inventory (MNFI), establishment of a terrestrial protected areas network, reforestation and rehabilitation, protection of watershed through establishment of forest reserves, improve regulation, monitoring and enforcement within the forest sector, and agroforestry and food security. Additionally, these technologies were also considered by the stakeholders for **Adaptation *I*** – Coastal erosion including coastal vegetation restoration, sea wall -nature base solution, sea wall-hard wall structure, integrated coastal zone management, climate trust fund and sandbag technologies. ***Adaptation II*** – relocation sector includes climate change relocation policy, permanent relocation, cash transfer program, relocation trust fund, temporary relocation initiative and enabling environment for relocation.

Below are the brief descriptions of the identified technologies for mitigation

Mitigation Technologies 1: Transportation Sector

i. ***Electric Vehicle (EV) Minibus and Vehicle Pooling Station,*** electric vehicle mini bus is a public transportation vehicle that can accommodate 11 normal passengers and 2 special need passengers using the electric power, it is 100% zero emissions and 100% environmentally friendly. The minibus will use 56kw Lithium-Ion battery and can run

bus up to 120mile (190Km) range from a single charge. Electric minibuses do not pollute air with NO_x or CO_2s which ensures cleaner air, and this is especially needed in cities and urban areas. However, they are faster, quieter and can create great savings in fuel and maintenance comparing to carbon-fuel led vehicles. While the vehicle pooling station is a place for the EV minibus for recharging and vehicle maintenance.

ii. ***Electric (OBM)Out-boat Motor***, this is to support the common mode of sea transport in the Island's Country. The Electric OBM is proposed for the mitigation technologies. The electric motors are significantly quieter and completely silent, also environmentally friendly and ecologically sustainable. Firstly, Electric Engines don't directly produce any CO_2 emissions and nitrogen oxide that pollutes the air when running. Secondly, they don't allow oil residues to seep into the water. Running costs significantly cheaper and maintenance-free: less effort, also high flexibility: electricity onboard and in port.

iii. ***Sustainable Road (including Drainage & landscaping),*** it is a system of roads which limit their impact on the environment to a minimum through different sustainable practices. The goal is to maximize the lifetime of the road while restricting its emissions. The green street provides multiple environmental, social, and economic benefits to communities. These benefits are realized by the entire community: individuals, families, local businesses, local governments, and schools. Compared to traditional "gray" streets, green streets are more attractive, increase the safety and walkability of a community, and encourage and support the local economy

iv. ***Sustainable Bridge*** like many other countries in the tropical zone, climate change has now affected the normal trend of rainfall and this technology suits the Island country. Having flooded rivers and rising sea level slowing the flow of the river into the ocean, would be better to have technologies such as Sustainable bridges to sustain the mode of land transport even though rivers are flooded, and ocean waves are very high to travel through.

v. ***Artificial Harbour*** as an archipelago country of many small islands, as well as located in the vast area of mostly ocean waters, frequent occurrence of tropical cyclones occurring nearly every year or the effect from a nearby country can be felt. Not a lot of Natural Harbor is close to the main Capital as well as the Provincial Capitals. A more affordable mode of transportation is through the ocean and most of these vessels needs shelter, and the limited availability of natural harbor makes it difficult to safeguard most vessels. Therefore, having an artificial harbor would allow harbors to be placed wherever it is required and for how many vessels capacity.

Mitigation Technologies 2: Forestry Sector

i. ***Reforestation and Rehabilitation,*** reforestation is the process of planting trees in a forest where the number of trees has been decreasing and Forest restoration is defined as "actions to re-instate ecological processes, which accelerate recovery of forest structure, ecological functioning and biodiversity levels towards those typical of climax forest. Reforestation and rehabilitation will enhancement of forest carbon stocks: The creation or improvement of carbon pools and reservoirs and their ability to sequester and capacity to store carbon.

ii. ***Protection of watershed through Establishment of Forest Reserves,*** is a large, contiguous area of highly or very highly erodible soils that is protected from development and retained in forest cover to provide long-term water supply. By determine the regulation on watershed protection acts, develop the technical guideline on watershed protection and capacity building and public awareness on watershed protection through the forest reserve to ensure that the rural populations living in watersheds are not disadvantaged in the process of protection or management for water quality.

iii. ***Establish a network of terrestrial protected areas,*** terrestrial protected areas are totally or partially protected areas of at least 1,000 hectares that are designated by national authorities as scientific reserves with limited public access, national parks, natural monuments, nature reserves or wildlife sanctuaries, protected landscapes, and areas managed mainly for sustainable use. Marine areas, unclassified areas, littoral (intertidal) areas, and sites protected under local or provincial law are excluded.

iv. ***Agroforestry & Food Security*** is a land use system recognized worldwide for its long-term sustainability as "a dynamic, ecologically based, natural resources management system that, through the integration of trees in farms and in the landscape, diversifies and sustains production for increased social, economic and environmental benefits for land users at all levels. agroforestry systems protect and maintain soil productivity and reduce the need to clear new forest areas. Agroforestry addresses issues such as land scarcity, sustainable land use and the diversification of income-generating opportunities for people. Indigenous multipurpose trees have the potential to impact on peoples' livelihoods, but they need to be developed as complementary to forest plantations. This approach will create a conciliatory scenario for the production of wood, fruits and nuts

v. ***Multi-Purpose National Forest Inventory (NFI),*** forest inventories are systematic collections of data on the location, composition, and distribution of forest resources. The generated data allows for the assessment of various forest products and services and is a prerequisite for sustainable forest management. NFI enable countries to evaluate their stocktaking of a country's forest resources. They are multi-purpose and can be used to capture data on, for example, biodiversity, socio-economic aspects of forest use, and carbon stored. These data inform forest management decisions, national policy, and international reporting requirements.

Below are the brief descriptions of the identified technologies for adaptation.

Adaptation I: Coastal Erosion technologies

i. ***Coastal vegetation restoration -*** Coastal vegetation restoration is a technology that is aimed to replant trees and vegetation at coastal areas around the Island. The native vegetation in coastal areas plays an important role in stabilising the surface against wind erosion and provides habitat for wildlife. This technology will prevent further washing away of land by SLR and anthropogenic activities at these coastal areas.

ii. ***Sea wall (hard structure)-*** Construction of sea wall (hard structure) around the country at selected sites will provide relief to the respective communities and help build resilience against impact of climate change especially sea level rise and Coastal soil erosion. Currently some government, business houses and individuals participate in construction of sea walls against seal level rise and coastal soil erosion at their properties but at huge capital cost. This technology will ensure that similar structures will also be built at vulnerable and exposed sites across the provinces.

iii. ***Integrated Coastal Zone Management (ICZM) –*** This is a dynamic, multidisciplinary, and iterative process to promote sustainable management of coastal zones. It covers the full cycle of information collection, planning (in its broadest sense), decision making, management and monitoring of implementation. Furthermore, it be implemented as establishment of marine areas that largely or wholly managed by coastal communities and/ or land-owning groups, with the support of government and partner representatives. The communities impose restrictions on areas such as “no take zones” and on certain equipment, practices, species, or sizes of catches. The purpose of this technology is to conserve the area from overfishing or harvesting but at the same time managing the coastal beaches from soil erosion and extraction by individuals in the community.

iv. ***Sandbag*** **-** The sandbag seawall is a protective measure to stop erosion especially along the coastal line areas. This is a much cheaper and effective way of construction of sea wall because they are made up with sand itself. Nevertheless, because of the way the sandbag seawall is constructed, the repairs required are extensive and involve replacing most of the existing wall. This technology is intended to be constructed at vulnerable communities across the provinces.

v. ***Climate Trust fund*** **-** A trust fund is a legal entity that holds property or assets on behalf of another person, group, or organization. It is an estate planning tool that keeps your assets in a trust managed by a neutral third party, or trustee. A trust fund can include money, property, stock, a business, or a combination of these instruments or assets. A climate change trust fund is therefore a legal entity which is established by law for the country to invest in money purposively to meet short- and long-term funding requirements for adaptation and mitigation activities to the impact of climate change.

vi. ***Sea wall nature-based solution*** **-** Construction of sea wall nature-based solution around the country at selected sites will provide relief to the respective communities and help build resilience against impact of climate change especially sea level rise and Coastal soil erosion. Currently some communities have participated in sea walls nature based but at their own initiatives. There is not yet government sponsored nature-based solution with sea walls.

Adaptation II: Relocation sector technologies

i. ***Climate -induced community relocation policy*** **-** The objective of this technology is to ensure that the government formulate and develop a policy to regulate and administer climate induced community relocation at the national level. The policy must look at options and alternatives for relocation of vulnerable communities from the impact of climate change and how government, NGOs and other humanitarian-based organization could address the issue at the local levels. Such policy should embrace science and practice. Currently there is no such policy and thus the government does not have any firm direction on this technology in the country.

ii. ***Permanent relocation*** **-**Re-settlement or Permanent relocation refers to transfer of homes and properties from one location to a much safer location with no intention of returning to the original or primary residence (Kleit & Manzo,2006)[2]. Permanent relocation may include a period of temporary relocation while a household locates a lead-safe dwelling unit to occupy as their new primary residence. Permanent relocation of a household includes service animals that

[2] Kleit, R. G., & Manzo, L. C. (2006). To move or not to move: Relationships to place and relocation choices in HOPE VI. *Housing Policy Debate*, *17*(2), 271-308.

accompany and provide services to a person with a disability. Pets are not considered service animals and are not eligible. The objective of this technology is to ensure that the government and donor aid partners relocate vulnerable communities to identified communities across the country.

iii. ***Safe home (Temporary relocation)-*** Climate-induced extreme events -safe home means a private home where short- term emergency shelter is provided primarily to victims of climate disaster events. Temporary relocation includes transfer of households from a permanent resident to a new site for a period less than 12 months. This relocation can be off-site or on-site depending on the project. These may also include on-site units which are temporary units that residents are provided that have features like a hotel room, such as bedding, water supply, road access but are not necessarily a hotel accommodation. According to the Director CCD[3], these are climate change resilience model homes for the Solomon Islands.

iv. ***Enabling framework (infrastructure) for climate induced relocation -*** Enabling framework is not consistently defined in literature but it sets out policies, ideas, rules and the environment which could best facilitate a certain process or activity. In this context, the enabling framework technology is established to facilitate the actual relocations process, the government should invest in providing the environment which will attract the impacted communities and households to this site. The enabling environment includes construction of infrastructures such as roads, bridges, wharves, schools, hospitals, health centres, community halls etc. Sustainable development and rebuilding efforts are most successful when they are deeply rooted in the community.

v. ***Relocation Trust Fund -*** Relocation trust fund is like climate trust fund, but its more focused with relocation and resettlement objectives. It may secure funding by the national government or donor aid partners purposively for relocation programs only. This technology may assist the vulnerable communities with their relocation strategies.

vi. ***Cash Transfer Program-*** A cash transfer is simply a payment from the government to help improve the lives of its citizens impacted by climate change and disaster events. Examples of cash transfer programs in the U.S. include Social Security and unemployment benefits. It is anticipated that similar programs be established by either national government or donor aid partners to manage and administer this technology to vulnerable and low-income earners with their adaptive strategies immediately after experiencing disasters or extreme events.

[3] Director Climate Change Division (2021). Ministry of Environment, Climate Change, Disaster Management, and Meteorology, Honiara, Solomon Islands.

Chapter 1
INTRODUCTION

1. 1 ABOUT THE TNA PROJECT

The Technology Needs Assessment (TNA) process originated from the Poznan Strategic Programme on Technology Transfer established at the Fourteenth Conference of the Parties (COP 14) to the United Nations Framework Convention on Climate Change (UNFCCC), with the purpose to scale up investment in technology transfer thus empowering developing countries to address their requirements for environmentally sound technologies.

A TNA is a country-driven process, grounded in national sustainable development plans, building national capacity and facilitating the analysis and prioritisation of climate technologies to support the implementation of the UNFCCC Paris Agreement. TNA's are central to the work of Parties to the Convention on technology transfer and present an opportunity to track on evolving needs for new equipment, techniques, and practical knowledge and skills, which are necessary to mitigate greenhouse gas emissions and reduce the vulnerability of sectors and livelihoods to the adverse impacts of climate change. The enhancement of technology development, its transfer, deployment and dissemination is a key pillar of the international response to climate change.

The Cabinet officially endorsed Solomon Islands to participate in the fourth phase of the TNA (TNA Phase IV) Project (GEF-7). The scope and depth of the TNA is well aligned to national development objectives and allows national stakeholders to explore synergies with other national processes, striving towards the implementation of Solomon Islands National Adaptation Programmes of Action (NAPA).

The TNA is a three-stage process and has three key objectives:

1. To identify and prioritise mitigation and adaptation technologies for selected sectors;
2. To identify, analyse and address barriers hindering the deployment and diffusion of the prioritised technologies, including the enabling framework for these technologies;

3. To conduct, based on the inputs obtained from the previous two steps, a Technology Action Plan, which is a medium/long term plan for increasing the implementation of identified technologies. The Technology Action Plan outlines actions to be undertaken.

1.2 EXISTING NATIONAL POLICIES ON CLIMATE CHANGE MITIGATION AND ADAPTATION, AND THEIR DEVELOPMENT PRIORITIES

1.2.1 National Circumstances

Solomon Islands is located in the Pacific east of Papua New Guinea and comprises a scattered archipelago of 994 islands combining mountainous islands, as well as low lying coral atolls within a tuna-rich and potentially mineral-rich maritime Economic Exclusive Zone (EEZ) of 1.34 million square kilometres. The land area of 28,000 square kilometres with 4,023 kilometres of coastline is the second largest in the Pacific after Papua New Guinea. The double chain of islands is described as a fragmented island arc situated along the boundary between the Ontong Java Plateau-Central Pacific Basin and the Solomon Sea-Woodlark-Torres Basin.

The six main islands of Choiseul, New Georgia, Santa Isabel, Malaita, Guadalcanal, and Makira are characterized by a rugged and mountainous landscape of volcanic origin. Between and beyond the bigger islands are hundreds of smaller volcanic islands and low-lying coral atolls. All the mountainous islands of volcanic origin are forested with an abundance of rivers and streams and many of the coastal areas are surrounded by fringing reefs and lagoons. Solomon Islands is located within the earthquake belt or 'Ring of Fire' and is extremely vulnerable to the effects and impacts of earthquakes and tsunamis.

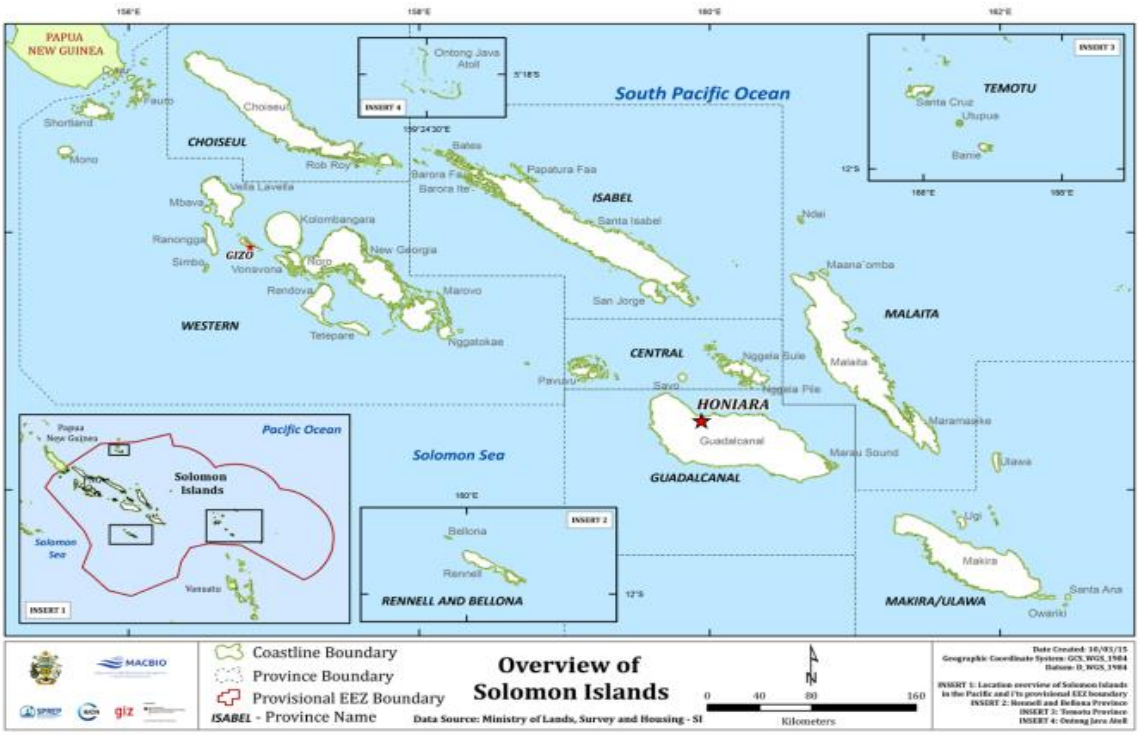

Figure 1 Map of Solomon Islands

Solomon Islands has a climate humid and warm with mean daily maximum temperature of about 30^{o}C and a mean daily minimum of about 23^{o}C. Rainfall distribution is quite varied with annual average rainfall normally ranges from 3000mm to 5000mm. Often drought in the country is associated with the El Nino Southern Oscillation phenomenon (ENSO). From about December to March, a period of west to north-westerly monsoonal winds and abundant rainfall can be expected as well as a period where tropical cyclones form and affect the islands. The south-east trade winds (SE trades) blow from around May to October and trigger higher rainfall particularly on the windward side of the islands.

Based on data from World Bank, in 2020 number of populations in Solomon Islands was 686 people, with annual growth rate was 2.5%. Solomon Islands have ninety-five different languages are spoken and about 80% of the population live in rural areas with around 75% of the total population living within 500 meters of mean sea level. The country's Human Development Index (HDI), at 0.567 in 2019, positioning it at 151 out of 189 countries[4], is the second lowest in South Pacific.

[4] https://hdr.undp.org/sites/default/files/Country-Profiles/SLB.pdf

The Solomon Islands' economic freedom score is 56.5, making its economy the 110th freest in the 2022 Index. The Solomon Islands is ranked 22nd among 39 countries in the Asia–Pacific region, and its overall score is below the regional and world averages. Over the past five years, the economy of the Solomon Islands registered slow growth from 2017 to 2019 before contracting in 2020 and recovering in 2021. Economic freedom has fluctuated over that period, but always at a fairly low level. International donor assistance contributes to the country's strong fiscal health, but scores for investment freedom and financial freedom are among the world's lowest.

1.2.2 National Strategies, Policies and Actions Related to Climate Change

A. National Development Strategy (NDS) 2016-2035

The NDS focuses on two key areas: social and economic livelihoods, hence its National Vision "Improving the Social and Economic Livelihoods of all Solomon Islanders". The NDS sets out a long-term development strategy and priority development objectives to guide government activities, the Medium-Term Development Plan (MTDP) and the budget. It provides a strategic vision through to 2035 that will provide greater stability and continuity. It provides a framework that will lay the foundations of long-term recovery and reform.

Five key long term NDS Objectives have been identified on which development should focus:

1. Sustained and inclusive economic growth;
2. Poverty alleviated across the whole of the Solomon Islands, basic needs addressed and food security improved; benefits of development more equitably distributed;
3. All Solomon Islanders have access to quality health and education;
4. Resilient and environmentally sustainable development with effective disaster risk management, response and recovery; and
5. Unified nation with stable and effective governance and public order.

The implementation of NDS - Medium Term Strategies and Priorities are:

NDS Objective One: Sustained and inclusive economic growth

Medium Term Strategy 1: Reinvigorate and increase the rate of inclusive economic growth.

Medium Term Strategy 2: Improve the environment for private sector development and increase investment opportunities for all Solomon Islanders.

Medium Term Strategy 3: Expand and upgrade weather resilient infrastructure and utilities focused on access to productive resources and markets and to essential services.

Medium Term Strategy 4: Strengthen land reform and other programmes to encourage economic development in urban, rural and customary lands.

NDS Objective Two: Poverty alleviated across the whole of the Solomon Islands, basic needs addressed and food security improved; benefits of development more equitably distributed

Medium Term Strategy 5: Alleviate poverty, improve provision of basic needs and increase food security.

Medium Term Strategy 6: Increase employment and labour mobility opportunities in rural areas and improve the livelihoods of all Solomon Islanders.

Medium Term Strategy 7: Improve gender equality and support the disadvantaged and the vulnerable.

NDS Objective Three: All Solomon Islanders have access to quality health and education

Medium Term Strategy 8: Ensure all Solomon Islanders have access to quality health care; combat communicable and non-communicable diseases.

Medium Term Strategy 9: Ensure all Solomon Islanders can access quality education and the nation's manpower needs are sustainably met.

NDS Objective Four: Resilient and environmentally sustainable development with effective disaster risk management, response and recovery

Medium Term Strategy 10: Improve disaster and climate risk management, including prevention, risk reduction, preparedness, response and recovery as well as adaptation as part of resilient development.

Medium Term Strategy 11: Manage the environment in a sustainable resilient way and contribute to climate change mitigation.

NDS Objective Five: Unified nation with stable and effective governance and public order

Medium Term Strategy 12: Efficient and effective public service with a sound corporate culture.

Medium Term Strategy 13: Reduce corruption and improve governance at national, provincial and community levels.

Medium Term Strategy 14: Improve national unity and peace and promote cultural heritage at all levels.

Medium Term Strategy 15: Improve national security, law and order and foreign relations.

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B. National Climate Change Policy 2012-2017

Solomon Islands National Climate Change Policy (NCCP) 2012-2017 provided a framework for coordinated approach to respond to the impacts of climate change. The vision was A resilient, secure and sustainable Solomon Islands responding to climate change; the mission was to enhance adaptation, disaster risk reduction and mitigation capacity throughout the Solomon Islands that contributes to increased resilience and achievement of sustainable development goals.

The NCCP 2012-2017 was consisted of 10 policy's directives and strategies:

1. Solomon shall have in place an effective enabling environment and institutional arrangement to plan, implement and coordinate an integrated and multi-stakeholder participatory approach to addressing climate change;
2. Climate change shall be mainstreamed into all development sectors and integrated into the work of government agencies, national institutions, civil society and private sector;
3. The Government of Solomon Islands considers it vital and urgent to develop the capacity of the country to assess risks and vulnerabilities associated with climate variability and change and to reduce climate change risks and adapt to the predicted impacts of climate change. This includes short term disaster risk reduction measures for climate variability and episodic extreme events, and long-term adaptation to climate change including, inter-alia, enhancing ecosystem and social resilience, climate proofing infrastructure and relocating communities as a last resort;
4. Solomon Islands government will continue to exhort to reduce their GHG emissions. On its part the government is committed to carrying out its own inventory of emissions and pursue Nationally Appropriate Mitigation Actions (NAMAs) to reduce its own GHG emissions through use of renewable energy and other mitigation technologies that

brings benefits to the country's economy, environment and improves the livelihoods of its people;

5. The government shall work together with national stakeholders and development partners to ensure that there is a better understanding of climate change at all levels and sections of society for the effective planning and implementation of appropriate climate change adaptation and mitigation actions;
6. The government recognizes the importance of technology transfer to enhance the country's capacity to carry out adaptation and mitigation actions. Technology transferred for use in Solomon Islands should be proven and adaptable, environmentally friendly, appropriate to user, culturally friendly, and can be managed on a sustainable basis;
7. The government shall work together with stakeholders and development partners to strengthen the capacity of national, provincial and community organizations and human resources for the effective planning and implementation of appropriate climate change adaptation, disaster risk reduction and mitigation actions;
8. The government will ensure that technical assistance and financial resources to support climate change programs and projects in the country is mobilized, managed and accounted for in an efficient, participatory, and transparent manner;
9. The government shall develop and maintain strong partnerships and work cooperatively with its national partners, stakeholders, regional and international organizations and institutions and development partners to address climate change;
10. The government shall establish a mechanism to monitor the implementation of this climate change policy

C. National Adaptation Programmes of Action (NAPA) 2008

The NAPA was an attempt by the Solomon Islands Government to assemble the urgent specific needs and special situations of the country. The NAPA prioritized and ranked key sectors of the economy that required urgent and immediate adaptation to solicit funding and enable technology transfer, consistent with Article 4.9 of the UNFCCC. Article 4, paragraph 9, of the Convention, particularly requires "That Parties shall take full account of the specific needs and special situations of the least developed countries in their actions with regard to funding and transfer of technology".

There were 13 keys of vulnerabilities had been assessed and lead to seven (7) priority adaptation action:

(1) Managing the impacts of, and enhancing resilience to, climate change and sea-level rise, on agriculture and food security, water supply and sanitation, human settlements, human health and education, awareness and information. The main objectives were to increase the resilience of food production and enhance food security to the impacts of climate change and sea-level rise, to increase the resilience of water resources management to impacts of climate change and sea-level rise, to improve the capacity for managing impacts of climate change and sea-level rise, to increase the capacity of health professionals to address adverse impacts of climate change on human health, and to promote climate change education, awareness and information dissemination;

(2) Climate change adaptation on low-lying and artificially built-up islands in Malaita and Temotu Provinces, with the main objectives were to develop and implement plans to relocate as an adaptation measure;

(3) Waste management, the main goal of this project was to better manage impacts of climate change on waste management by developing a national integrated sustainable Waste Management Plan and Strategy for incorporating impacts of climate change.

(4) Coastal Protection, the main goal of this project was to increase the resilience and enhance adaptive capacity of coastal communities, socio-economic activities and infrastructure by integrating climate change adaptation (climate proofing) into construction of a roads and other infrastructure;

(5) Fisheries And Marine Resources, to improve the understanding of the effects of climate change and climate variability including El Nino-Southern Oscillation on the inshore and tuna fishery resources, by improving the capacity to protect inshore fisheries and marine resources.

(6) Infrastructure Development, to improve the resilience of key infrastructure to climate change and sea-level rise by integrating of climate change risk proofing into infrastructure design and development; and

(7) Tourism, integrate climate change adaptation strategies and measures into tourism planning and development, by building the capacity in managing impacts of climate change on tourism.

1.3 VULNERABILITY ASSESSMENTS IN THE COUNTRY

1.3.1 Climate Change Impact

According to the United Nations Development Programme (UNDP), impacts of climate change – such as increased droughts or more erratic storms – threaten to undermine decades of development gains and put at risk efforts to eradicate poverty. Climate change will affect different parts of Solomon Islands in different ways. Coastal communities will face different problems to inland communities, and people living in towns will experience different changes to those living in remote rural areas. Climate Change will affect all the sectors of the country.

A. Sea Level Rise (SLR)

According to reports, scientists predict that sea levels in the country will rise by as much as 1 meter by 2100, increasing the level of risks to low lying coastal communities throughout the country. Some of these risks include increased coastal erosion due to the rising sea levels as currently being experienced in areas such as Ontong Java, Roviana Lagoon and the Reef Islands in Temotu Province. The rising sea levels also expose these communities to other risks such as coastal saltwater intrusion, which is a serious problem for coral atolls, and which leads to decreased levels of fresh water supplies and increased risks to communities' food gardens and food security in general.

B. Increased Rainfall

Increased rainfall throughout the country may mean that flooding throughout the country during the wet season becomes more severe, leading to increased risks to flood prone communities and to their properties and food gardens as well as increased risks to the country's infrastructures such as roads and bridges. These changes may also lead to some parts of the country becoming wetter while other parts become dryer (droughts). The seasonality of rainfall may also change.

C. Increasing Temperatures

A hotter weather, when combined with other climate change impacts such as increasing rainfall and increased pests and diseases, will all affect food security if nothing is done to adapt to or mitigate their combined effects. Additionally, increasing sea surface temperatures, rising sea levels and damage from tropical cyclones will affect the health of coral reefs and other marine ecosystems.

D. Unpredictable Weather

Rising temperatures may also lead to the increased likelihood of more intense and longer periods of rainfall, leading to an increased risk of flooding. The likelihood of tropical cyclones developing may also increase along with increased storms and general bad weather out in the

ocean, leading to increased risks to sea farers. On land, risks due to these changes may include risks to human lives, properties, infrastructure damage, diseases and risks to certain economic activities such as tourism.

E. Increased Risk of Diseases

Climate change could also increase the incidence of insect, food and water-borne diseases. Heat stress, skin diseases, respiratory infections and asthma could also increase with climate change.

1.3.2 Vulnerability

Vulnerability is an essential component of the climate resilience discussion because people that are the most likely to experience the majority of negative impacts of climate change are those that are least capable of developing robust and comprehensive climate resiliency infrastructure and response systems. However, what exactly constitutes a vulnerable community is still open to debate. The Intergovernmental Panel on Climate Change (IPCC) has defined vulnerability using three characteristics: the "adaptive capacity, sensitivity, and exposure" to the effects of climate change. The adaptive capacity refers to a community's capacity to create resiliency infrastructure, while the sensitivity and exposure elements are both tied to economic and geographic elements that vary widely in differing communities. There are, however, many commonalities between vulnerable communities.

Vulnerability can mainly be broken down into two (2) major categories, economic vulnerability, based on socioeconomic factors and geographic vulnerability.

A. Economic vulnerability

At its basic level, a community that is economically vulnerable is one that is ill prepared for the effects of climate change because it lacks the needed financial resources. Preparing a climate resilient society will require huge investments in infrastructure, city planning, engineering sustainable energy sources, and preparedness systems. From a global perspective, it is more likely that people living at or below poverty will be affected the most by climate change and are thus the most vulnerable, because they will have the least amount of resource dollars to invest in resiliency infrastructure. They will also have the least amount of resource dollars for clean-up efforts after more frequently occurring natural climate change related disasters.

B. Geographic vulnerability

A second definition of vulnerability relates to geographic vulnerability. The most geographically vulnerable locations to climate change are those that will be impacted by side effects of natural hazards, such as rising sea levels and by dramatic changes in ecosystem

services, including access to food. Island nations are usually noted as more vulnerable but communities that rely heavily on a sustenance-based lifestyle are also at greater risk, such as: food insecure, water scarce, delicate marine ecosystem, fish dependent and small island community

1.4 SECTOR SELECTION FOR MITIGATION AND ADAPTATION

The baseline for the selection of the priority mitigation and adaptation sectors for Solomon Islands is based on the Nationally Determined Contribution (NDC) 2021, NCCP: 2012-2017 and NAPA of 2008, and the NDS: 2016-2035.

1.4.1 An Overview of Expected Climate Change and its Impacts in Sectors Vulnerable to Climate Change

As with other Small Island developing States, Solomon Islands energy sector remains a largest contributor to greenhouse gas emissions as well as being considered a key enabling factor that will support efforts in poverty alleviation, access to better health care and education services, and improvement of the standard of living and livelihood of communities. However, access to affordable energy has been very challenging in the Solomon Islands due to the widely scattered market on islands that are separated by large areas of sea and with small, isolated communities.

Despite its status as a low emitting least developed country, Solomon Islands will nonetheless, commit to reduce its emissions by 14% by 2025 below 2015 and by 33% below 2015 by 2030 compared to a business-as-usual projection. If and when Paris Agreement addresses international assistance to access financial and technical resources, Solomon Islands can, with international assistance, contribute:

a. Unconditional mitigation target: 14 % reduction in emissions by 2025, and 33% by 2030 below 2015 compared to BAU projections.
b. Conditional mitigation target: 27 % reduction in emissions by 2025, and 45% by 2030 below 2015 compared to BAU projections.
c. Overall mitigation target: Net Zero by 2050.

Solomon Islands has the potential to increase electricity access and use through renewable energy resources and technologies to 100% by 2050. However, increasing the use of these renewable energy resources presents challenges; including a lack of enabling environments to

foster private investment in the electricity sector and the need to improve funding opportunities (through consolidating funding proposals) and support to assist the Solomon Islands Energy Authority and the Energy Division in expanding energy access in both urban and rural areas.

The 2014 Solomon Islands National Energy Policy provided an enabling platform that will inform decision makers on policy directions and strategies for improving the effectiveness of the Solomon Island energy sector and achieving the NDS 2011–2020 through increased access to reliable, affordable and clean sources of electricity. Based on Business as Usual (BaU) Projection (based on extrapolation 1994-2010 emissions), indicate an increase in GHG emissions to 707,425 tCO2e in 2015; 805,900 tCO2e in 2020, 904,375 tCO2e in 2025; and 1,002,850 tCO2e in 2030 in Solomon Islands.

NDC covers combustion of fossil fuels and forest carbon sequestration. Fossil-fuel use covers more than 95% of reported national inventory; Greenhouse gas emissions are a result of combustion of imported fossil fuels in the energy sector: Electricity generation (39%) and Transport (sea and land transport – 61%)). Agriculture, Forestry and Land Use (AFOLU), and Coastal and Marine ecosystems.

Solomon Islands contains over 89% forest cover and is therefore considered a High Forest Cover Low Deforestation Country (HFLD) with low historical but very high and steeply increasing recent forest emissions, largely as a result of growing logging industry (FRL Report 2019). The government through a Food and Agriculture Organization (FAO) of UN supported programme on reducing emissions from deforestation and degradation (REDD+) has carried out a historical forest cover change to quantify emissions and removals and developed a forest reference level (FRL).

FRL sets the benchmark on which the results-based payments will be made for emission reductions from deforestation, forest degradation and carbon stock enhancement. Solomon Islands is committed to undertake a multi-purpose national forest inventory over the next few years. This will provide the basis for forest monitoring and informed decision-making to improve forest management and research. Further Solomon Islands intends to implement sustainable logging policy (Sustainable Logging Policy 2018) and quantify forest carbon sequestration and protect forest above 400-meter contour.

SIG also intends to protect at least 20% of the terrestrial and inland water; 15% of coastal and marine areas enabling ecological, representative and well-connected system of protected area in the country, as provided in The National Biodiversity Strategic Action Plan 2016-2020. The newly launched National Forestry Policy 2020 is also hoped to assist the government manage and sustain the country's forest resources for the benefit and resilience of all Solomon Islanders. The two goals of the first strategy of the policy (Strategy 3.1. Forest Conservation Strategy) are Goal 1. Protection and conservation of biodiversity and forest ecosystems; and Goal 2. Recognition and promotion of ecosystems services for sustainable livelihood.

Adaptation priorities still linked to vulnerability and adaptation (V&A) and disaster risk reduction (DRR) strategies highlighted in the NCCP, NAPA, and foreseen long term adaptation needs foreseen in the National Adaptation Plan (NAP). The Government of Solomon Islands considers it vital and urgent to develop the capacity of the country to assess risks and vulnerabilities associated with climate variability and change and to reduce climate change risks and adapt to the predicted impacts of climate change (MECDM 2016). This includes short term disaster risk reduction measures for climate variability and episodic extreme events, and long-term adaptation to climate change including, inter-alia, enhancing ecosystem and social resilience, climate proofing infrastructure and relocating communities as a last resort.

1.4.2 Process and results of sector selection

An extensive review of the country's priority sectors and analysis of policy documents and other documents pertaining to climate change and adaptation actions were carried out in conjunction with wider stakeholder engagement by the Ministry of Environment, Climate Change, Disaster Management and Meteorology (MECDM), to identify sectors that are most vulnerable to climate change at a Senior Management Meeting acting as interim TNA Steering committee that comprises of the Permanent Secretary of MECDM, Deputy Secretary Technical of MECDM, Director Climate Change Division, National Programme Coordinator of the Program Management and Coordination Unit (PMCU) and senior staff of the PMCU in August 2021. As the Ministry responsible for mainstreaming climate change adaptation and mitigation into the economy, the technical team at MECDM acted as an Advisory team to the interim TSC. It informed the sector prioritisation process based on the mitigation, adaptation, and development priorities of the country.

The prioritisation of sectors for the TNA project primarily depended on the outcomes of NDC 2021, NCCP: 2012-2017 and NAPA of 2008 and NDS: 2016—2035, as listed in Table 1 below: The other sectors which were also considered by the ITSC include; Water sector, Health Sector, Waste Management sector and energy sector. Nevertheless, these final four sectors were selected unanimously selected because, they represent priority areas which little work has been done by the government or donors to support technology development in this space, thus it was recommended that these sectors will be processed through the TNA process of Technology development and potential concept note development.

Table 1 TNA Priority Sectors

Mitigation	Adaptation
Transportation	Coastal Erosion Management
Forestry	Relocation/ Resettlement

1.5 METHODOLOGY FOR SELECTION OF TECHNOLOGIES

After selection of the four main subsectors to be considered for both Adaptation and Mitigation streams the following steps were carried by the TNA team for the final selection of the technologies.

(i) **Fact Sheet Analysis -** The consultants undertook desk top reviews and formulate fact sheets for all potential technologies under each sector identified for both adaptation and mitigation. These facts sheets were then emailed to the potential workshop participants for further input and review.

(ii) Introductory Workshop participation for both adaptation and mitigation.

(a) **Factsheet -** The TNA coordinator and the consultants had presented and discuss the Technology fact sheets with workshop participants in turn. The workshop participants on some occasions add more technologies to the list of technologies prepared for deliberation during the workshop.

(b) **Multi-Criteria Analysis (MCA)** – The identified technologies were then processed through the MCA tool for decision making. The consultants had gone through the different functions of the MCA such as, performance matrix, scoring matrix and decision matrix. To calculate these different functions, each technology is allocated with various categories such as capex, opex, maintenance (costs) and were weighted against the benefits such as economic, social costs, climate change related and technology diffusions. Each category was then weighted with a figure which all together adds up to 100. The method in which the performance marks were allocated was, for cost, if the technology is expensive the percentage awarded would be low (20%), likewise if the technology is cheap then the mark allocated would be high, for example 90%. The same method was also applied with both the scoring and decision function. That percentage was then applied to the weighting of each category then add all

up to 100, technology with the highest aggregate score was then given the highest priority.

(c) **Sensitivity Test Analysis** – The results were analysed and applied with a sensitive test to see if a change in one of the categories might totally influenced or change the technology ranking. This was then accepted as the prioritised technology result.

(d) **Sectorial Working Group** – Each sectorial working group was given minimum two weeks to review and analysis the result for their respective sector.

(e) **Validation Workshop**- After two weeks then Final prioritised technology for each sector was then presented by the SWG with any amendment (if any). The participants discussed and approved the final list as recommended by the working group.

(f) **TNA Steering Committee**- at this stage consultants then compiled the prioritized technology in formal report and submit it through the TNA Secretary to the SC for further review and scrutiny. After the SC review and endorsement was then submitted to the UNEP CCC as the final report of prioritised technologies for the Solomon Islands.

Chapter 2
INSTITUTIONAL ARRANGEMENT FOR THE TNA AND THE STAKEHOLDER INVOLVEMENT

2.1 NATIONAL TNA TEAM

A schematic of the institutional arrangement for the National TNA Phase IV Project for Solomon Islands is shown in **Figure 2** below.

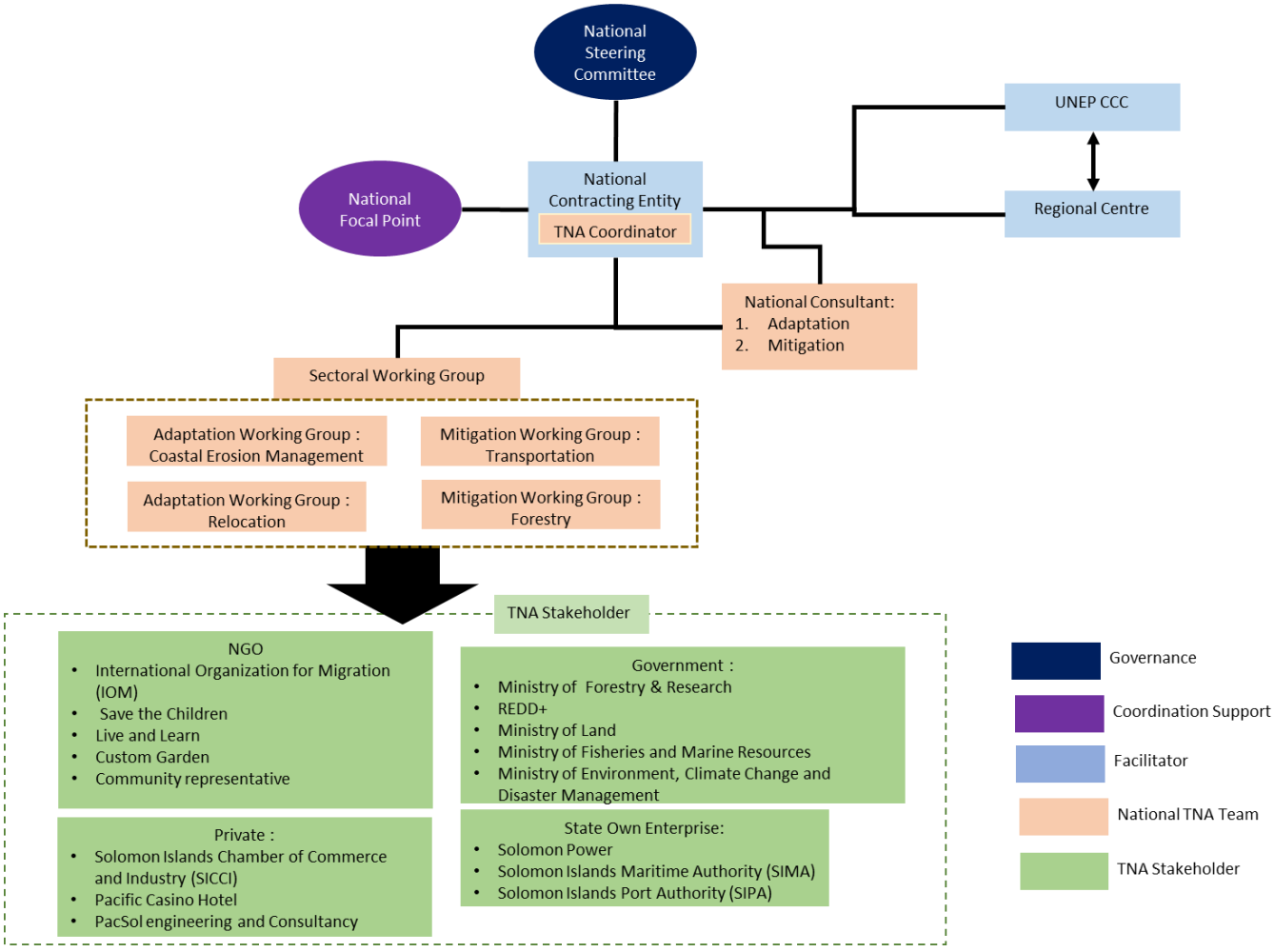

Figure 2 Solomon Islands National TNA Team Structure

1.2.1 National Steering Committee

The role of the Steering Committee is to provide high-level guidance and approval for the TNA process and the outcomes. Representation on the Steering Committee is at a senior government officer level, and the members include: Deputy Secretary Technical of MECDM, Director Climate Change Division, Deputy Secretary Technical Ministry of Infrastructure Development (MID), Director Civil Engineering Department/MID, Deputy Commissioner of Forest, Deputy Commissioner of Lands, Deputy Director Inshore of Ministry of Fisheries and Marine Resources, Director Economic - Productive Sector of Ministry of National Planning and Development Coordination (MNPDC) and Chief Executive Officer of the Solomon Islands Chamber of Commerce (SICCI).

1.2.2 National TNA Coordinator

The National TNA Coordinator, was appointed from the PMCU at the MECDM. The TNA coordinator has the responsibility to manage overall TNA process, including the recruitment of national consultants (adaptation and mitigation) and ensure the consultations and workshops held to identify the priority sectors for the TNA process. The role of the coordinator also includes presentation of report findings to the NSC for endorsement.

1.2.3 National TNA Consultant

National TNA in Solomon Islands was performed with the involvement of local mitigation and adaptation experts. The lead national consultants were selected by MECDM Panel Members in close consultation with UNEP CCC and the Pacific Regional TNA Hub the University of the South Pacific, following an open and transparent selection process.

National expert consultants are responsible for finalising the TNA Report after thoroughly identifying and prioritising technologies for the two sectors identified under climate change adaptation and mitigation after exhaustive consultation with the relevant stakeholders and experts. The National Consultants lead the process of multiple-criteria analysis, along with the national stakeholder groups, and facilitate the process of technology prioritisation, addressing the barriers and developing an enabling framework.

1.2.4 TNA Sectoral Working Group

There were four (4) sectoral working groups refer to **annex 7** Solomon Islands Technology Needs Assessment Project National Steering Committee Constitution, that were established as working technical groups under the TNA process. These 4 Sectoral Working Group include:

1. Coastal Erosion working Group,
2. Relocation working Group
3. Transportation working Group
4. Forestry working Group.

The primary role of each sectoral working group is to review and analyse each fact sheet and corresponding Multi-Criteria Analysis (MCA) rankings before presenting it at the validation workshop.

2.2 STAKEHOLDER ENGAGEMENT PROCESS FOLLOWED IN THE TNA – OVERALL ASSESSMENT

The stakeholder consultation process for the TNA work in Solomon Islands followed the principles of sustainable wellbeing, inclusivity, social cohesion, partnership, agility, urgency, transparency and communication, and integrated learning. Stakeholders include government agencies, private sector, non-government organisations, civil-service organisations, and community representative.

The TNA report was prepared after an extensive stakeholder process. The stakeholder engagement methods included:

(i) Email correspondence and exchanges on the Technology Factsheets (TFS);

(ii) Bilateral; the national consultants also undertook a series of "one on one" bilateral meeting with relevant stakeholders across the country. These stakeholders included some government departments, SOE's and NGOs. These bi-laterals were to purposely share views on the likely sectors that are critical for urgent development or investment by the TNA process.

(iii) Awareness workshop for selected sectors that facilitated the formation of a technical working group; and

(iv) National stakeholder consultation of key stakeholders for technology prioritisation.

2.3 CONSIDERATION OF GENDER ASPECTS IN THE TNA PROCESS

Gender aspect's consideration in the TNA process is important as the climate change affects all members of society and its impacts can be different for men and women. In the Pacific region the different gender roles are influenced by culture, social systems, local institutions and religion, and it varies across communities. One of the vital factors in society structural system is the gender relations between men and women, to understand the power relations between women and men through the different gender roles they play in their families and community. The proportion of male and female during the TNA stakeholder workshop in Solomon Islands was 69% male and 31% female. The TNA process provides the engagement both gender in participation of the decision-making process.

Chapter 3
MITIGATION TECHNOLOGY PRIORITISATION FOR TRANSPORTATION SECTOR

3.1 KEY CLIMATE CHANGE VULNERABILITIES IN THE TRANSPORTATION SECTOR

Transport infrastructure such as roads, bridges, airstrips and wharves, is likely to be sensitive to climate change because it is usually built to last for a long time. For this reason, the Solomon Islands Government has identified improving the resilience of key infrastructure to climate change and sea-level rise as a national goal in its National Transport Plan. Infrastructure plays a vital role in the economy of the Solomon Islands, contributing approximately 13% on average to Gross Domestic Product. If these assets are not designed to withstand future climate impacts, it is likely that losses from climate related hazards will increase in the future. An efficient national transport system, resilient to future climate events, will be better able to support the movement of goods and people, international and regional trade, and improve the reach and quality of essential government services.

Solomon Islands is among the most vulnerable countries to the impacts of climate change yet continue to be increasingly dependent on imported fossil fuels that dominates its Greenhouse Gas (GHG) emissions, as per the Solomon Islands' NDC of 2016, transport (land and sea) accounts for 61% of the total emissions from the energy sector. The NDC of Solomon Islands also reflect the targets to reduce GHG emission by reducing reliance on imported fossil fuel. Major share of GHG emissions from transport (land and sea), accounting for 61% of the total emissions from the energy sector, makes it a priority area to introduce and implement low carbon interventions.

3.2 DECISION CONTEXT

Based on Transport target from NDS:2016-2035, by 2030 Solomon Islands government targeted to provide access to safe, affordable, accessible and sustainable transport system for all, improving road safety by expanding public transport. Those target in-line with National Transportation Plan 2011-2030, Solomon Islands Government's vision for the transport sector

is: ‘An effective transport infrastructure and transport services to support sustained economic growth and social development in Solomon Islands’.

According to Solomon Islands Transport Asset Management System (SITAM), 2015: Solomon Islands’ transportation infrastructure is on poor shape unsealed road was not maintainable, bridges and culverts also not maintainable. Wharfs is quite out of date and in a poor condition. Rehabilitation and upgrading land infrastructure in needed rather than build new roads, bridges and airfield also provide the land transportation network system in the provinces. However, expansion and rehabilitation of maritime infrastructure is essential needed such as create the artificial harbour to minimize the transport cost and distance on the sea transport system

Meanwhile the transportation problem in Greater Honiara (East Honiara, Central and West Honiara) is poor road infrastructure which causes traffic jam on the roads; thus, drivers tend to take shorter routes to avoid getting stuck and not getting enough income at the end of the day. The poor road infrastructure conditions due to the many potholes, causes by pavement damage, including no good road network drainage system and pavement methods that does not meet the criteria for use in the tropical country. Solomon Islands’ NDC of 2016 is trying to reduce the GHG emission up to 27% by 2025 and 45% GHG emission reduction by 2030, by using low carbon transportation vehicles or electric vehicles, reduce the potential of road degradation because of weather condition by providing sustainable transport drainage network and pavement- system

3.3 AN OVERVIEW OF EXISTING MITIGATION TECHNOLOGY OF TRANSPORTATION SECTOR

According to Medium Term Transport Action Plan (MTTAP) 2019-2023 SIG’s policy is to assign various priorities to the following classes of activities under MTTAP, as follows:

1. High Priority – Maintenance of maintainable roads, wharves and airstrips. Includes capacity building in MID & MCA to enable these to be accomplished
2. Medium Priority – Rehabilitation of roads, rehabilitation of wharves, construction of selected new wharves and rehabilitation of non-functioning airfields were operation otherwise viable

3. Low Priority – Limited sections of new roads and selected airfield expansion works - provided these can be accomplished largely through bilateral aid e.g. Munda Airport Phase 3, Henderson International Upgrade

PROVINCIAL EQUITY

A key principle of the MTTAP is that of provincial equity, i.e. the sharing of transport infrastructure funds and benefits between the provinces. While larger population bases typically have more pressing infrastructure needs and projects that tend to offer large economic benefits, the MTTAP also aims to provide for the lower populated more remote parts of the country. The mix of maintenance and development projects put forward in this MTTAP seeks to maximise achievement of the following objectives:

1. All maintainable existing transport infrastructure to be sustained through routine and periodic maintenance
2. All non-maintainable roads, wharves and airfields to be rehabilitated over time, where economically justified in light of NTP priority scores.
3. At least one wharf rehabilitation and one new wharf or ramp development project in each province.
4. At least one road rehabilitation or new road development project in each province.
5. Airport projects with bilateral support to complete Munda Airfield Upgrade Phase 3 and Henderson Apron Upgrade
6. Accomplishment of STIIP DLIs to assure their linked funding to NTF

MINOR WORKS POLICY

Minor works are small scale transport infrastructure projects, typically under SBD 350,000 in value. They are not individually listed in the NTP or MTTAP 2019 but contribute to SIG's goal of improving the transport network.

The following categories of minor works may be implemented as part of this action plan:

1. Road Safety Improvements – e.g., provision of pedestrian facilities/road crossings, local area traffic management, traffic signs and pavement markings.
2. Small Craft Berthing Facilities – e.g., platforms/structures built, or added to community wharves, to enable their use by small water craft such as outboard motor boats.
3. Gender Sensitive Design Features – e.g., construction of laundry pads, toilets and bus shelters in conjunction with transport infrastructure such as roads, bridges, wharves and airfields.

4. Design Features for People with Disabilities – Minor works that facilitate movement of people with disabilities e.g., curb drop crossings, pedestrian ramps, tactile surfacing (for visually impaired) and flush crossings of raised road medians.
5. Maritime Navaids – e.g., lights, buoys and signs that facilitate operations of vessels and small craft.

3.4 MITIGATION TECHNOLOGY OPTIONS FOR TRANSPORTATION SECTOR AND THE BENEFITS

According to discussion with the National Stakeholder, some mitigation technologies have been identified explained in the **Table. 2** below:

Table 2 The option and Benefit of Technology Option for Transportation Sector [5]

No	Type of Technology	Benefit	Brief Description
1	Electric vehicles (EV) Mini Bus and Vehicle Pooling Station	• Electric minibuses do not pollute air with NOx or CO2s which ensures cleaner air and this is especially needed in cities and urban areas. • However, EV Mini Bus is faster, quieter and can create great savings in fuel and maintenance comparing to carbon-fuel led vehicle • Vehicle pooling station support a green business initiative by reducing carbon footprint, it will provide comprehensive services for charging and vehicle maintenance	• Electric Minibus is 100% Zero Emissions and 100% Environmentally Friendly. Charge to 80% in 90 minutes with the large 56kw Lithium-Ion battery. • The bus can run up to 120mile (190Km) range from a single charge. • The bus carter 11 normal passengers and 2 special need passengers. • fuel and maintenance comparing to carbon-fuel led vehicles. • the vehicle pooling station is a place for the EV minibus for recharging and vehicle maintenance

5

ZERO EMISSION BUS FACT SHEET. (n.d.). [online] Available at: https://www.sierraclub.org/sites/www.sierraclub.org/files/sce/new-jersey-chapter/Handouts/VW_Zero_Emission_Bus_Factsheet.pdf.
https://www.escape.com.au/escape-travel/gizo-reefs-wrecks-and-traditional-solomon-islands-culture/news-story
https://www.roadsbridges.com/green-complete-streets-integrating-puzzle-pieces
https://www.shortspansteelbridges.org/sustainable-bridge/
https://theconstructor.org/transportation/harbors-types-water-transportation/20103/

No	Type of Technology	Benefit	Brief Description
2	Electric Out-board Motor	• Electric motors are significantly quieter or completely silent • Environmentally friendly and ecologically sustainable, electric engines don't directly produce any CO2 emissions and nitrogen oxide that pollutes the air when running. Secondly, they don't allow oil residues to seep into the water. • Running costs significantly cheaper • Maintenance-free: less effort • Greater safety on board • Efficiency and acceleration are higher • Handling and operation are easier • High flexibility: electricity onboard and in port	• 1 Kw outboard that has an equivalent power of a 3 HP petrol motor, 40HP-80HP electric outboard will be used, the usable energy is 12.8 kWh (40HP) and 25.6kWh-51.2kWH (80 HP) Lithium-Ion battery. The charging time is 4-5 hour to reach 80% of battery capacity • Maximum propeller speed is 2,400 rpm, with the speed 50km/hour. • Solar panel speed boat technology: engine power 2 x 35 kWh, Speed 18 Km/hour, endurance 4 hours.
3	Sustainable Road (including Drainage & landscaping)	• A green street provides multiple environmental, social, and economic benefits to communities. These benefits are realized by the entire community: individuals, families, local businesses, local governments, and schools. Compared to traditional "gray" streets, green streets are more attractive, increase the safety and walkability of a community, and encourage and support the local economy • Enhanced community livability and safety. A community's livability takes into consideration both the built and natural environment, pedestrian and bicycle access, social stability and equity, economic prosperity, and the availability of recreational spaces. • The more livable a community, the higher the quality of life. • increased property values and decreased infrastructure costs (e.g., sewer piping) • Increased habitat and biodiversity	• Use of porous asphalt along the length of trail • Provides wider sidewalks using permeable pavement and a two-way separated bike lane and fills critical gaps in the bikeway network • Accommodates motor vehicle traffic, parking, and loading zone lanes • Prioritizes green infrastructure and sense of place along corridors • Focuses on users from ages 8 to 80 years

No	Type of Technology	Benefit	Brief Description
		• Healthier communities leading to lower healthcare costs through improved air and water quality • Economic prosperity and growth by supporting and enhancing local and small businesses • Reduced urban "heat island" effect • Decreased energy costs from renewable energy sources (e.g., solar power) • Increased publicly available green and recreation space • Job creation (traditional and green jobs)	
4	Sustainable Bridge	**Being economical** in terms of their entire lifetime, including decommissioning, and also considering the effects of user disruption during construction and maintenance. **Meeting social priorities**, considering both the construction workers, and the people living near to and using the bridge. **Minimizing environmental impact** in terms of carbon dioxide emissions and embodied energy during fabrication and construction and ensuring as many bridge components as possible are recyclable and preferably reusable at the end of the bridge's life	**Green design**, often referred to as green architecture, is an approach to building bridges and other structures that minimizes harmful effects on the environment and human health and well-being. The architect or designer takes extra steps to protect the air, water, earth, humans, and wildlife by choosing eco-friendly building materials and using construction practices that minimize environmental and human health impact. **Sustainable design**, also referred to as environmental design, environmentally sustainable design, or environmentally conscious design, is a design philosophy that focuses on social, economic, and ecological
5	Artificial Harbour	**Cost reduction** – It would be costly to find and locate a natural harbor and it would be difficult to adjust any project towards that location. Whereas when having an artificial harbor, it can be	An artificial harbour in other words means a manmade infrastructure. It can be constructed anywhere with required designed and

No	Type of Technology	Benefit	Brief Description
		done right close to the project site which makes it easier for access. **Design freedom -** Unlike natural harbor, the artificial harbor can be designed to suit what criteria is needed for the site. Whereas the artificial harbor will be rigid and may limit what is required for the design.	requirement needed. It may involve the use of breakwater, seawalls, or jetties. Also, a dredging process will be required. This artificial harbour can be at the coastal zone where breakwater will be constructed as armours or it can be behind the coastal zone, which is within the land, whereby a lot of digging will be done.

3.5 CRITERIA AND PROCESS OF TECHNOLOGY PRIORITISATION FOR TRANSPORTATION SECTOR

The five (5) technologies were evaluated and appraised against a set of criteria that were established via stakeholder consultations, and the Multi-Criteria Analysis (MCA) was used to prioritise the technologies for transportation sector. In consultation with the stakeholders, it was decided that seven (7) criterions such as: (1) Cost, including capital cost, operation and management; (2) Institutional/Political, with the sub criterion coherence with national regulation and ease for the implementation; (3) Environmental, by considering the ecosystem enhancement; (4) Social with the sub criterion poverty reduction, gender balance and health improvement; (5) Economic, by considering the private investment encouragement, improve the economic performance and create new job; (6) Climate Related including the GHG reduction and reduce vulnerability and built climate resilience; and (7) Technology, by considering the safety and maturity and effectiveness of the technology.

During the scoring process, the stakeholders for the transportation sector referred to the Technology Fact Sheets, used their experiences and deliberated on each of the criteria. Then they collectively decided to give individual scores and average out the scores for each of the criteria. Hence, a performance matrix **Table 4** was constructed, and the scoring was carried out after discussing the information provided in the technology factsheets and experiences of respective stakeholders. **Table 3** presents the criterion, sub criterion, source of performance judgment, value justification, value preferred and weight for transportation sector used in the prioritisation process.

Table 3 MCA Criterion, Value, Preferred and Weight for Transportation Sector

Number	Criterion	Sub Criterion	CODE	Source of Performance Judgment	Value Justification	Value Preferred	Weight
I	Cost	Capital Cost	**A.**	Technology provider and qualitative expert judgment	0= very high cost ---> 100 = very low cost	lower	10
		Operation &Management	**B.**	Technology provider and qualitative expert judgment	0= very high cost ---> 100 = very low cost	lower	10
II	Institutional/Political	Coherence with national regulation	**C.**	qualitative expert judgment	0=very low --- >100=very high	higher	5
		ease for the implementation	**D.**	qualitative expert judgment	0=very low --- >100=very high	higher	5
III	Environmental	Enhance the ecosystem	**E.**	qualitative expert judgment	0=very low --- >100=very high	higher	10
IV	Social	Reduce Poverty	**F.**	qualitative expert judgment	0=very low --- >100=very high	higher	3
		Gender Balance (1-5)	**G.**	qualitative expert judgment	1=very low --->5=very high	higher	4
		Improve Health	**H.**	qualitative expert judgment	0=very low --- >100=very high	higher	3
V	Economic	Encourage private investment	**I.**	qualitative expert judgment	0=very low --- >100=very high	higher	5
		Improve economic performance	**J.**	qualitative expert judgment	0=very low --- >100=very high	higher	5
		create a job	**K.**	qualitative expert judgment	0=very low --- >100=very high	higher	5

Number	Criterion	Sub Criterion	CODE	Source of Performance Judgment	Value Justification	Value Preferred	Weight
VI	Climate Related	Reduce direct GHG	**L.**	qualitative expert judgment and technology specification	0=very low --- >100=very high	higher	10
		Reduce vulnerability & Build climate resilience	**M.**	qualitative expert judgment	0=very low --- >100=very high	higher	10
VII	Technology	Safety	**N.**	qualitative expert judgment	0=very low --- >100=very high	higher	7
		Maturity & effectiveness	**O.**	qualitative expert judgment	0=very low --- >100=very high	higher	8

Table 4 MCA Performance Matrix for Transportation Sector

No	Criterion	I		II		III	IV			V			VI		VII	
	Types of Technology Mitigation	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**
1	Electric vehicles (EV) Mini Bus and Vehicle Pooling station	20	40	90	90	80	60	4	80	85	70	50	80	60	80	65
2	Electric Out-board Motor	30	60	90	90	80	80	4	80	85	75	65	80	75	80	80
3	Sustainable Road (including Drainage & landscaping)	20	60	80	50	90	90	4	85	80	90	90	80	80	90	75
4	Sustainable Bridge	20	20	70	70	50	80	4	75	85	90	80	50	70	80	80
5	Artificial Harbour	20	60	50	60	50	80	4	70	85	90	80	50	75	80	80

The scoring matrix **(table 5)** determined by the value preferred and the scored generated using the formula:

Higher Value

$$Y_i = \frac{X_i - X_{min}}{X_{max} - X_{min}} * 100$$

Lower Value preferred

$$Y_i = \frac{X_{max} - X_i}{X_{max} - X_{min}} * 100$$

the allocation of weights for the weight matrix **Table 6** was conducted through a participatory process. Stakeholders were given a budget of 100 points, which has to be divided among all the criteria (refer to table 3). The weight distribution based on the corelation between criterion with the climate change mitigation.

Table 5 MCA Scoring Matrix for Transportation Sector

No	Criterion	I		II		III	IV			V			VI		VII	
	Types of Technology Mitigation	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**
1	Electric vehicles (EV) Mini Bus and Vehicle Pooling station	100.0	60.0	100.0	100.0	83.3	50.0	100.0	66.7	83.3	66.7	33.3	100.0	50.0	50.0	50.0
2	Electric Out-boat Motor	80.0	20.0	100.0	100.0	83.3	83.3	100.0	66.7	83.3	75.0	58.3	100.0	87.5	50.0	100.0
3	Sustainable Road (including Drainage & landscaping)	100.0	20.0	75.0	0.0	100.0	100.0	100.0	77.8	66.7	100.0	100.0	100.0	100.0	100.0	83.3
4	Sustainable Bridge	100.0	100.0	50.0	50.0	33.3	83.3	100.0	55.6	83.3	100.0	83.3	50.0	75.0	50.0	100.0
5	Artificial Harbour	100.0	20.0	0.0	25.0	33.3	83.3	100.0	44.4	83.3	100.0	83.3	50.0	87.5	50.0	100.0

Table 6 MCA Weighting Matrix for Transportation Sector

No	Criterion	I		II		III	IV			V			VI		VII	
	Types of Technology Mitigation	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**
1	Electric vehicles (EV) Mini Bus and Vehicle Pooling station	1000	600	500	500	833	150	400	200	417	333	167	1000	500	350	400
2	Electric Out-boat Motor	800	200	500	500	833	250	400	200	417	375	292	1000	875	350	800
3	Sustainable Road (including Drainage & landscaping)	1000	200	375	0	1000	300	400	233	333	500	500	1000	1000	700	667
4	Sustainable Bridge	1000	1000	250	250	333	250	400	167	417	500	417	500	750	350	800
5	Artificial Harbour	1000	200	0	125	333	250	400	133	417	500	417	500	875	350	800

Table 7 Prioritizing Technology for Transportation Sector

No	Types of Technology Mitigation	Total	Rank
1	Electric vehicles (EV) Mini Bus and Vehicle Pooling station	7,350.00	3
2	Electric Out-board Motor	7,791.67	2
3	Sustainable Road (including Drainage & landscaping)	8,208.33	1
4	Sustainable Bridge	7,383.33	4
5	Artificial Harbour	6,300.00	5

3.6 RESULTS OF TECHNOLOGY PRIORITISATION FOR TRANSPORTATION SECTOR

10 June 2022, the working group were having the validation for technology prioritisation for transportation sectors with the final outcomes showed that the following prioritised technologies were recommended for further analysis:

Rank 1:	**Technology Option 3**	**Sustainable Road (including Drainage & landscaping)**
Rank 2:	**Technology Option 2**	**Electric Out-board Motor**
Rank 3:	Technology Option 1	Electric vehicles (EV) Mini Bus and vehicle pooling station
Rank 4:	Technology Option 4	Sustainable Bridge
Rank 5:	Technology option 5	Artificial Harbour

Chapter 4
MITIGATION TECHNOLOGY PRIORITISATION FOR FORESTRY SECTOR

4.1 KEY CLIMATE CHANGE VULNERABILITIES IN THE FORESTRY SECTOR

Solomon Islands has the highest percentage of forest cover in the Pacific region, it contains over 89% forest cover and is therefore considered a High Forest Cover Low Deforestation Country (HFLD) with low historical but very high and steeply increasing recent forest emissions, largely as a result of growing logging industry (FRL Report 2019).

In 2016 and 2017, around 65% of the county's export earnings came from forestry, mainly through sale of round logs, which accounts for 20% of the state revenue (CBSI, 2017). On a positive note, logging activities in the rural areas give rise to employment opportunities, royalties and spin-off benefits to resource owners and surrounding communities that improve rural livelihood at least during the lifetime of the logging developments. On the other hand, the social and the environmental repercussions including GHG emissions are significant and may persist over a long period of time. 76% of all forest related emissions in the Solomon Islands are caused by commercial logging and small-scale portable sawmill operations (Milling) in lowland and hill forest.

The IPCC fourth report has shown that GHG will continue to increase to affect our climate (SIG, 2017). Solomon Islands as a Small Island Developing State (SIDS) is only marginally responsible for but among the most vulnerable countries to the adverse impacts of climate change (GFDRR, 2011). This is due to the circumstance that the majority of the population lives along coastlines, which agglomerates economic and infrastructure activities in these locations. The most likely impacts for this location will derive from sea-level rise, which affect crops and fresh water sources, especially in the low-lying islands.

Severe weather patterns such as cyclones and heavy rains that result in flash floods and soil erosion (landslides) affect crop production, infrastructure and community livelihood on the coast and further inland. This will cause adverse effects on the country's food security, economy, human health, natural resources and physical infrastructure. It is expected that the

economic losses as results of climate change for Solomon Islands will amount to 4.7% of the annual GDP by 2100 (SIG, 2014).

4.2 DECISION CONTEXT

According to NDS: 2016-2035, the goal of Forestry Sector by 2020 is to promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and increase afforestation and reforestation globally. Based on National Adaptation Plan 2008 in addition to the specific impacts from climate change on forests in Solomon Islands, the importance of forests in alleviating climate change is a matter of global concern as old growth trees and their soils are carbon sinks - soils in undisturbed tropical rainforests contain large amounts of carbon. Specific actions are:

a. Current forestry activities must be followed by reforestation and afforestation.
b. Develop policy frameworks to protect mature forests to maintain carbon sink
c. Utilise existing support projects to address climate change issues
d. Incorporate into the Forestry Licensing Procedures the requirement that is in the Environment Act for all timber enterprises to comply with requirements to obtain 'development consent'
e. Develop a database on all environmental issues (past and present reports, studies and data) that are relevant to the Forest Sector
f. Liaise with the Ministry of Education to provide scholarships to study forestry and climate change impacts
g. Incorporate climate change into relevant forestry courses in the School of Natural Resources.

Forestry is the major component of foreign revenue but is only going to remain so for 4 to 5 years under current rates. Logging and forest clearing have two-fold issues – loss of carbon sinks and exacerbating the impacts from climate change (such as from flooding, cyclones, storm surge). Changes in temperature and rainfall will affect forest productivity. There is a lack of coordination and cooperation in the sector. Legislation and policy need to be reviewed as a matter of urgency which would provide opportunity for incorporating climate change issues and concerns.

4.3 AN OVERVIEW OF EXISTING MITIGATION TECHNOLOGY OF FORESTRY SECTOR

Table 8 Existing Forestry Mitigation Technology Available in Solomon Islands [6]

No	Type of technology	Description
1	Forest Monitoring system	Current technology has been used for forest monitoring system are: • National forest monitoring system • Deforestation alert and monitoring system • Land use land use change and forestry assessment
2	Capacity Development for Sustainable Forest Resource Management in Solomon Islands	The project establishes in 2017 – 2022, the target group are MOFR Officers (both Headquarters and Provincial stations), Partner Stakeholders, and Pilot Site Communities (Falake and Komuniboli)
3	MOFR website over view	The MOFR's website continues to serve its audience by providing Solomon Islands forestry information as well as other vital information about forestry management and day-to-day operations had been established in 2020. This website also provides an overview of the SFRM project, a collaboration between JICA and the MOFR, and JICA's work for the MOFR. As seen on the website under the JICA Project, the Project Overview, Project Story Maps, and SolGeo-FIMS are available for viewing.
4	Forest Information management system (FIMS)	SolGeo-FIMS is an open spatial data geoportal built for the Ministry of Forestry and Research (MOFR). This is to create, retrieve, update, and store information on forests in Solomon Islands. The system is focused on geospatial data, both raster and vector, as well as documents related to forest assessments. End users will be able to browse through national forest maps including Forest Management Units (FMU), Forest Type Maps (FTM), High Conservation Value (HCV) Maps, Land Cover Maps, and the carbon stock estimated usingGEDI2019 global forest canopy data for Solomon Islands. The FIMS had been created in 2020
5	Land Use Planning	Participatory land use planning in Falake and Komuniboli in 2020. The Ministry of Forestry and Research (MOFR) and JICA have started a pilot activity to promote participatory land- use (LU) planning, focusing on agroforestry, afforestation/ restoration forest, and timber production for sustainable forest resource management. The Komuniboli community in Guadalcanal Province and Falake community in Malaita Province were selected as the pilot sites.

[6] https://www.mofr.gov.sb/en/jica-project

No	Type of technology	Description
6	social networking service (SNS) tools	The MOFR-JICA Project supported the development of the MOFR website, including the MOFR-JICA Project information page. In addition to general public relations through this website, the Project has prepared several social networking service (SNS) tools such as a YouTube channel, Facebook group, and Twitter account to enhance information sharing and exchange
7	Agroforestry Project	The MOFR-JICA Project (the "Project") has supported livelihood improvement activities including agroforestry at two pilot communities, Falake and Komuniboli, to reduce pressure on natural forests and dependency on logging concessions in 2022. Agroforestry is one of the land use systems where trees and crops are planted on the same land management unit. In the context of Solomon Islands, agroforestry can contribute to sustainable forest resource management from two aspects: (i) the establishment of plantations that have valuable timber tree species and (ii) income generation through the sale of agroforestry products. In addition, agroforestry provides an opportunity for women to participate in forest management, which is usually considered men's work
8	Forest Management Unit (FMU)	The establishment of Forest Management Units (FMUs) is one approach that needs to be considered amidst current forest degradation in the country. This is because the FMU concept can help us govern our forests much better. This may include promoting the sustainable use of forests, protection, and conservation. This will improve the quality of our decision-making when it comes to forest management issues. An FMU is a minimum unit of forest the scale of which is "not too small" and "not too big" for forest monitoring. The small size of the watershed (5 ha level) makes up the FMU in Solomon Islands. The FMU is used for monitoring and recording changes to forests with other useful forest information.
9	High Conservation Value (HCV)	One of the biggest challenges facing us as a country is forest degradation. Commercial logging operations and other economic activities are often the cause of deforestation. High Conservation Value (HCV) is one of the approaches that will help us protect, maintain, and sustain our forests by knowing their value. Basically, HCV regions are those that hold biological, ecological, social, or even cultural values. In HCV areas we expect to see pristine forest, threatened or endangered species, or sites that hold cultural and traditional significance. HCV is a meaningful approach for Solomon Islands as it will help us maintain our forests by promoting sustainable forest management ideas. The HCV map of Solomon Islands is created based on the conservation concept by the Roundtable on Sustainable Palm Oil (RSPO)
10	Land Cover Map	Land Cover Map is newly created using recent satellite images. The Land Cover Map has basic information for effective forest management in Solomon Islands. The map defines land use type and

No	Type of technology	Description
		additional forest type. A forest type is basically a group of tree stands that have a general similarity in composition and character. It may be unique, which means the particular forest is a distinctive forest dominated only by a particular species type. However, a forest type is more often, and naturally, of forested land of mixed composition. According to the forest type classification adopted by the Solomon Islands National Forest Resource Inventory, various forest types have been identified. These forest types include Upper Hill Forest, Hill Forest, Lowland Rainforest, Freshwater Swamp Forest, and Saline Forest. Other forest types such as planted forests, river courses, and so forth, were classified under Other Forest Areas. Given that the map will be revised every five years, land use changes can be detected, and this information contributes to the establishment of an effective forest management policy.
11	Carbon, Biomass, and Timber Volume Data	The data on current carbon, biomass, and timber volume is essential for the sustainable use o f forest resources. The data set is estimated using satellite LiDAR data (Global Ecosystem Dynamics Investigation (GEDI), https://gedi.umd.edu/) and inventory data on the pilot sites of Komuniboli and Falake. The data set covers the entire Solomon Islands and is uploaded to SolGeo-FIMS.
12	Forest Management	The MOFR-JICA Project has supported forest management activities, including natural forest management/planted forest management, in Komuniboli and in Falake. Including Technical Training for Regenerating Forest, utilizing the forest,

4.4 MITIGATION TECHNOLOGY OPTIONS FOR FORESTRY SECTOR AND THE BENEFITS

Table 9 Mitigation Technology Option According the National Stakeholder

No	Type of Technology	Benefit	Brief Description
1	Reforestation and Rehabilitation	• reforestation allows for the accelerated development of forest structure, species composition, and canopy that provides many benefits including wildlife habitat, clean and abundant water, carbon sequestration, forest wood products for consumers, forested recreation opportunities, and maintenance of soil productivity through soil erosion reduction. • Reforestation presents unique opportunities to address emerging issues associated with climate change by conserving and managing genetic diversity to adapt to a changing climate, as well as sequestrating carbon to counter greenhouse gas emissions.	• The MFR existing reforestation programme has an objective to plant 500ha of forest-land per year with a focus on commercial species (teak and mahogany are most prevalent). The programme has seen success in areas with higher numbers of forest officers and locations close to nurseries. • During periods of donor support reforestation reached nearly 200ha per annum (pa) but are currently closer to 300ha pa. • The program is also working on rehabilitation of logged over forest areas through enrichment planting using local indigenous tree species. At present, 90 hectares of logged over forest area has been piloted both in the Western and Isabel Provinces. This program is still at the pilot stage but has the potential for expansion due to the large areas of logged over forest within the Solomon Islands and the potential for rapid regeneration.[7]
2	Protection of watershed through Establishment of Forest Reserves	• Well managed natural forests almost always provide higher quality water, with less sediment and fewer pollutants, than water from other catchments • Impacts of forests on security of supply or mitigating flooding are less certain although	• Determine the regulation on watershed protection acts • Develop the technical guideline on watershed protection • Capacity building and public awareness on watershed protection through the forest reserve to ensure that the rural populations living in watersheds are not

[7] https://solomonislands-data.sprep.org/system/files/2014_Solomon%20Islands_REDD%20Roadmap_p.pdf

No	Type of Technology	Benefit	Brief Description
		forests can reduce floods at a local headwater scale • As a result of these various benefits, natural forests are being protected to maintain high quality water supplies to cities • Protection within watersheds also provides benefits in terms of biodiversity conservation, recreational, social and economic values	disadvantaged in the process of protection or management for water quality
3	Establish a network of terrestrial protected areas	• Safeguard Biodiversity • Prevent the Spread of Disease • Provide Local Economic Success • Ensure Food and Water Security • Build Resilience Against Climate Change	• Terrestrial protected areas are totally or partially protected areas of at least 1,000 hectares that are designated by national authorities as scientific reserves with limited public access, national parks, natural monuments, nature reserves or wildlife sanctuaries, protected landscapes, and areas managed mainly for sustainable use. • Solomon Islands determine 40% land terrestrial and 60% marine areas [8]
4	Agroforestry & Food Security	• Reduction of pressure on forest. • More efficient recycling of nutrients by deep-rooted trees on the site. • Better protection of ecological systems. • new income generation through the sale of agroforestry product • smallholder plantations are established there should correspondingly be an increase in employment in rural communities.	• Agroforestry is a land use system recognised worldwide for its long-term sustainability. It can be defined as a dynamic, ecologically based, natural resources management system that, through the integration of trees in farms and in the landscape, diversifies and sustains production for increased social, economic and environmental benefits for land users at all levels.

[8] https://www.sprep.org/attachments/VirLib/Solomon/action-plan-implementing-cbdpow.pdf

No	Type of Technology	Benefit	Brief Description
		• An improved ecotourism focus is envisaged – to treasure different ecosystems, especially those that offer income-generating opportunities. Villagers' participation as tour guides, and similar positions, offers an employment opportunity • enhancing the crop diversity and reducing dependency on natural forest • Agroforestry provides many benefits that includes favorable microclimate, reduction in erosion, enhanced biodiversity, increased water quality, more infiltration leading to effective groundwater recharge, enhanced and elongated dry flow, improvement in habitat, soil fertility	• Essentially, agroforestry systems protect and maintain soil productivity and reduce the need to clear new forest areas. • Agroforestry addresses issues such as land scarcity, sustainable land use and the diversification of income-generating opportunities for people. Indigenous multipurpose trees have the potential to impact on peoples' livelihoods but they need to be developed as complementary to forest plantations. This approach will create a conciliatory scenario for the production of wood, fruits and nuts
5	Multi-Purpose National Forest Inventory	• The Forest Inventory and Analysis program collects data on all land ownerships on an annual basis. The data are used to develop reports on a regular basis; reports and raw data are available to the public at no cost. The data are also used by scientists in a growing number of applications • It is supporting the Government's actions towards sustainable forest management through reliable information,	• Forest inventories are systematic collections of data on the location, composition, and distribution of forest resources. The generated data allows for the assessment of various forest products and services and is a prerequisite for sustainable forest management • NFIs enable countries to evaluate their stocktaking of a country's forest resources. They are multi-purpose and can be used to capture data on, for example, biodiversity, socio-economic aspects of forest use, and carbon stored. These data inform forest management decisions, national policy, and international reporting requirements. • A National Forest Inventory is one of the key sources of data (emission factors) for estimating

No	Type of Technology	Benefit	Brief Description
			anthropogenic forest-related greenhouse gas emissions and is an essential element of NFMS under REDD+, along with SLMS.

4.5 CRITERIA AND PROCESS OF TECHNOLOGY PRIORITISATION FOR FORESTRY SECTOR

The five (5) technologies were evaluated and appraised against a set of criteria that were established via stakeholder consultations, and the Multi-Criteria Analysis (MCA) was used to prioritise the technologies for transportation sector. In consultation with the stakeholders, it was decided that seven (7) criterions such as: (1) Cost, including capital cost, operation and management; (2) Institutional/Political, with the sub criterion coherence with national regulation and ease for the implementation; (3) Environmental, by considering the ecosystem enhancement; (4) Social with the sub criterion poverty reduction, gender balance, health improvement and cultural heritage preservation; (5) Economic, by considering the private investment encouragement, improve the economic performance and create new job; (6) Carbon sequestration and reduce vulnerability and built climate resilience; and (7) Technology, by considering the rapid technology diffusion and maturity and effectiveness of the technology.

During the scoring process, the stakeholders for the forestry sector referred to the Technology Fact Sheets, used their experiences and deliberated on each of the criteria. Then they collectively decided to give individual scores and average out the scores for each of the criteria. Hence, a performance matrix **Table 11** was constructed, and the scoring was carried out after discussing the information provided in the technology factsheets and experiences of respective stakeholders. **Table 10** presents the criterion, sub criterion, source of performance judgment, value justification, value preferred and weight for transportation sector used in the prioritisation process.

Table 10 MCA Criterion, Value, Preferred and Weight for Forestry Sector

CODE	Criterion	Sub Criterion	CODE	Source	Value	Value Preferred	weight
I.	Cost	Capital Cost	**A.**	Feasibility Study and qualitative expert judgment	0= very high cost ---> 100 = very low cost	lower	10
		Operation &Management	**B.**	Feasibility Study and qualitative expert judgment	0= very high cost ---> 100 = very low cost	lower	10
II.	Institutional / Political	Coherence with national regulation	**C.**	qualitative expert judgment	0=very low --- >100=very high	higher	10
		Ease of implementation	**D.**	qualitative expert judgment	0=very low --- >100=very high	higher	10
III.	Environmental	Protect of environment resource	**E.**	qualitative expert judgment	0=very low --- >100=very high	higher	5
		Support ecosystem & biodiversity	**F.**	qualitative expert judgment	0=very low --- >100=very high	higher	5
IV.	Social	Reduce Poverty	**G.**	qualitative expert judgment	0=very low --- >100=very high	higher	3
		Gender Balance (1-5)	**H.**	qualitative expert judgment	1=very low --- >5=very high	higher	3
		Improve Health	**I.**	qualitative expert judgment	0=very low --- >100=very high	higher	2
		Preserve Cultural Heritage	**J.**	qualitative expert judgment	0=very low --- >100=very high	higher	2
V.	Economic	Encourage private investment	**K.**	qualitative expert judgment	0=very low --- >100=very high	higher	3
		Improve economic performance	**L.**	qualitative expert judgment	0=very low --- >100=very high	higher	3
		create a job	**M.**	qualitative expert judgment	0=very low --- >100=very high	higher	4

CODE	Criterion	Sub Criterion	CODE	Source	Value	Value Preferred	weight
VI.	Climate Related	Carbon sequestration	**N.**	qualitative expert judgment	0=very low --- >100=very high	higher	10
		Reduce vulnerability & Build climate resilience	**O.**	qualitative expert judgment	0=very low --- >100=very high	higher	10
VII.	Technology Related	Rapid technology diffusion	**P.**	qualitative expert judgment	0=very low --- >100=very high	higher	4
		Maturity & effectiveness	**Q.**	qualitative expert judgment	0=very low --- >100=very high	higher	6

Table 11 MCA Performance Matrix for Forestry Sector

No	Criterion	I		II		III		IV				V			VI		VII	
	Types of Technology Mitigation	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**
1	Reforestation and Rehabilitation	70	10	85	80	70	70	70	3	80	75	80	80	80	95	90	75	70
2	Protection of watershed through Establishment of Forest Reserves	50	85	85	85	95	95	30	4	85	85	40	40	50	95	95	75	70
3	Establish a network of terrestrial protected areas	50	85	85	85	95	95	60	5	85	85	40	40	50	97	95	80	80
4	Agro-forestry & Food Security	60	60	85	85	65	65	85	5	80	50	85	85	85	70	80	80	80
5	Multi-Purpose National Forest Inventory	10	15	95	75	95	95	60	5	80	80	50	85	60	75	65	75	50

The scoring matrix (**Table 12)** determined by the value preferred and the scored generated using the formula:

Higher Value	Lower Value preferred
$Y_i = \frac{X_i - X_{min}}{X_{max} - X_{min}} * 100$	$Y_i = \frac{X_{max} - X_i}{X_{max} - X_{min}} * 100$

the allocation of weights for the weight matrix **Table 13** was conducted through a participatory process. Stakeholders were given a budget of 100 points, which has to be divided among all the criteria (refer to table 10). The weight distribution based on the corelation between criterion with the climate change mitigation.

Table 12 MCA Scoring Matrix for Forestry Sector

No	Criterion	I		II		III		IV				V			VI		VII	
	Types of Technology Mitigation	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Reforestation and Rehabilitation	0.0	100.0	33.3	90.9	28.6	44.4	72.7	33.3	88.9	71.4	72.7	76.9	72.7	93.8	83.3	75.0	75.0
2	Protection of watershed through Establishment of Forest Reserves	33.3	0.0	33.3	100.0	100.0	100.0	0.0	66.7	100.0	100.0	0.0	15.4	18.2	93.8	100.0	75.0	75.0
3	Establish a network of terrestrial protected areas	33.3	0.0	33.3	100.0	100.0	100.0	54.5	100.0	100.0	100.0	0.0	15.4	18.2	100.0	100.0	100.0	100.0
4	Agro-forestry & Food Security	16.7	33.3	33.3	100.0	14.3	33.3	100.0	100.0	88.9	0.0	81.8	84.6	81.8	15.6	50.0	100.0	100.0
5	Multi-Purpose National Forest Inventory	100.0	93.3	100.0	81.8	100.0	100.0	54.5	100.0	88.9	85.7	18.2	84.6	36.4	31.3	0.0	75.0	25.0

Table 13 MCA Weighting Matrix for Forestry Sector

No	Criterion	I		II		III		IV				V			VI		VII	
	Types of Technology Mitigation	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Reforestation and Rehabilitation	0	1000	333	909	143	222	218	100	178	143	218	231	291	938	833	300	450
2	Protection of watershed through Establishment of Forest Reserves	333	0	333	1000	500	500	0	200	200	200	0	46	73	938	1000	300	450
3	Establish a network of terrestrial protected areas	333	0	333	1000	500	500	164	300	200	200	0	46	73	1000	1000	400	600
4	Agro-forestry & Food Security	167	333	333	1000	71	167	300	300	178	0	245	254	327	156	500	400	600
5	Multi-Purpose National Forest Inventory	1000	933	1000	818	500	500	164	300	178	171	55	254	145	313	0	300	150

Table 14 Prioritizing Technology for Forestry Sector

No	Types of Technology Mitigation	Total	Rank
1	Reforestation and Rehabilitation	6,507	3
2	Protection of watershed through Establishment of Forest Reserves	6,073	4
3	Establish a network of terrestrial protected areas	6,649	2
4	Agro-forestry & Food Security	5,332	5
5	Multi-Purpose National Forest Inventory	6,781	1

4.6 RESULTS OF TECHNOLOGY PRIORITISATION FOR FORESTRY SECTOR

10 June 2022, the working group were having the validation for technology prioritisation for forestry sectors with the final outcomes showed that the following prioritised technologies are recommended for further analysis:

Rank 1:	**Technology Option 5**	**Multi-Purpose National Forest Inventory**
Rank 2:	**Technology Option 3**	**Establish a network of terrestrial protected areas**
Rank 3:	Technology Option 1	Reforestation and Rehabilitation
Rank 4:	Technology Option 2	Protection of watershed through Establishment of Forest Reserves
Rank 5:	Technology Option 4	Agroforestry & Food Security

Chapter 5
ADAPTATION TECHNOLOGY PRIORITISATION FOR COASTAL EROSION

5.1 KEY CLIMATE CHANGE VULNERABILITIES IN THE COASTAL EROSION SECTOR

Sea level rise , coastal erosion, saltwater inudation exerbeted with extreme evenironment events such as storm surges and cyclones will continue to impact coastal communities in years to come. According to the NAPA of 2008, the adverse impacts of climate change in Solomon Islands will be felt in critical human systems affecting agriculture and food security, water supply and sanitation, human settlements and human health. These vulnerabilities are being exacerbated by lack of understanding, awareness and information regarding the adverse impacts of climate change and consequent sea-level rise. Most of these communities will be able to withstand and/or cope with negative effects of climate change and sealevel rise if they can better understand and are aware of the linkages between their experiential evidence of effects of climate change on the key sectors they depend on. With such a backdrop, coupled with the fact that most of the population lives within 1.5 km of the coastline and the islands are regularly exposed to impact of climate change and extreme events.

5.2 DECISION CONTEXT

The NDS: 2016-2035 is an important policy document which acts as an overarching pillar for specialised policy formulation and development. Within this ambit, the fourth objective of the NDS is enshrined with the aim to provide communities across the country particularly along the coastlines to be resilient to the impact of climate change and disasters. The NAPA (2008) an earlier policy document which focuses on the adaptation planning for the country also re-affirms this guarding objective-providing secure and resilient rural communities to the people of Solomon Islands.

5.3 AN OVERVIEW OF EXISTING ADAPTATION TECHNOLOGY OF COASTAL EROSION SECTOR

At least five islands in the Solomon Islands chain have been completely lost to rising seas and coastal erosion over the past decade Albert, et al, (2016)[9] . These islands have completely vanished under the surface, and at least two cases where entire human populations have had to relocate to avoid the waves. Because of this immanent challenge, households, and villagers at diverse coastal communities have been participating in various means of technologies to adapt to the coastal erosion risk, vulnerability, and exposure. This includes construction of coastal barriers, planting of native trees, collection of rocks and sandbags against waves and ever-increasing sea-level rise at these sites.

[9] Albert, S., Leon, J. X., Grinham, A. R., Church, J. A., Gibbes, B. R., & Woodroffe, C. D. (2016). Interactions between sea-level rise and wave exposure on reef island dynamics in the Solomon Islands. *Environmental Research Letters*, *11*(5), 054011.

5.4 ADAPTATION TECHNOLOGY OPTIONS FOR COASTAL EROSION SECTOR AND THE BENEFITS

The following adaptation technologies were identified in consultation with stakeholders as key technologies in the Coastal Eroosion sector in the Solomon Islands. The TFS for each of the technologies were prepared by the National adaptation consultant and was emailed to all the stakeholders for validation. For this process, stakeholders were given ample time for the opportunity to provide their comments and suggestions. Main adaptation benefits for these technologies are summarised below and fact sheets are provided in Annex 3.

Table 15 Adaptation Technology Options for Coastal Erosion Sector and The Benefits

No	Type of Technology	Benefit	Brief Description
1	Coastal Vegetation restoration	• Coastal Vegetation restoration help prevent erosion; filter pollutants; and provide food, shelter, breeding areas, and nursery grounds for a wide variety of organisms. • It provides the first layer of defence against sea level rise and coastal erosion.	• Coastal vegetation includes mangroves, salt marshes, seagrasses, macroalgae, and coastal strand and dunes, buffers shores and retains sediments from the effects of erosive processes, such as tides, waves, and storms, sea level rise and coastal erosion. • According to Albert, et al, (2016)[10] coastal vegetation restore stability alone the coastline and protect the coastal communities against impact of climate change. Thus, restoration of coastal vegetation particularly native plants would be of great benefit to the coastal communities.
2	Sea wall- Nature based Solution	• It protects residential shorelines from upland erosion and surge flooding. • A seawall acts as a coastal defence to waves and storm surges. When a wave crashes against the shore, the seawall redirects a lot of that energy back to the water.	• Nature-based solutions are often designed to bring benefits to both people and nature. It is a soft structured environmentally design of sea wall with the aim to provide habit at the same time refuge for the communities against the impact of coastal erosion.

[10] Albert, S., Leon, J. X., Grinham, A. R., Church, J. A., Gibbes, B. R., & Woodroffe, C. D. (2016). Interactions between sea-level rise and wave exposure on reef island dynamics in the Solomon Islands. *Environmental Research Letters*, *11*(5), 054011.

No	Type of Technology	Benefit	Brief Description
3	Integrated coastal zone management (ICZM)	• Conserving natural habitats and species. • Controlling pollution and the alteration of shorelands and beachfronts including coastal erosion. • Controlling watershed activities that adversely affect coastal zones.	• Integrated coastal zone management (ICZM) is a dynamic, multidisciplinary, and iterative process to promote sustainable management of coastal zones. • It covers the full cycle of information collection, planning (in its broadest sense), decision making, management and monitoring of implementation of the marine and coastal resources.
4	Sea wall (Hard[11] structured)	• Protects the base of cliffs, land, and buildings against erosion. They can prevent coastal flooding in some areas. • Seawalls are usually massive structures designed to resist storm surges.	• A seawall is a form of coastal defence constructed where the sea, and associated coastal processes, impact directly upon the landforms of the coast. • Its purpose is to protect areas of human habitation, conservation, and leisure activities from the action of tides, waves, or tsunamis.
5	Sandbags	• Sandbags for Flood Défense Systems. The stacking method of multiple filled sandbags makes them an excellent flood control option. • It has reduced beach contamination from loose rock which could be the case with concrete structured sea wall.	• Sandbags are one of the most effective ways to deflect water when storms and heavy rains cause flooding. Arranging sandbags into a wall can direct the flow of waves away shorelines, roads, or any sensitive structure that might be damaged by a deluge.
6	Climate Trust Fund	• Committees have access to finance climate related adaptation program as local levels. • Encourages communities to take ownership and be responsible to manage future climate related impacts in their communities, • and allows for broader knowledge sharing and understanding of climate change and its impacts.	• The Tonga Climate Change Trust Fund is the Pacific region's first and only existing national fund with a specific focus on climate change. • The Solomon Islands government intend to establish similar fund to specifically for the context of Solomon Islands. • Its sole purpose is funding of climate related activities at the local level.

[11] The recent IPCC report highlights that construction of hard structured sea wall is a form of maladaptation since it has environmental repercussion to both human beings and the environment.

5.5 CRITERIA AND PROCESS OF TECHNOLOGY PRIORITISATION FOR COASTAL EROSION SECTOR

During this process, the multi-criteria analysis (MCA) tool is used in ranking the six (6) identified technologies in their priority order based on a set of criteria that are relevant to country context. In consultation with the stakeholders, it was decided that six (7/6) criterions such as: (1) Cost, (2) Institutional/Political, (3) Economic (4) Social (5) Climate Related and (6) Technology

During the scoring process, the stakeholders for the coastal erosion sector referred to the Technology Fact Sheets, used their experiences and deliberated on each of the criteria. Then they collectively decided to give individual scores and average out the scores for each of the criteria. Hence, a performance matrix was constructed, and the scoring was carried out after discussing the information provided in the technology factsheets and experiences of respective stakeholders. **Table 16** presents the Categories and Criteria used in the prioritisation process upon which the Performance Matrix (**table 17**) and Scoring Matrix (**table 18**) were constructed.

- The rating for performance matrix identified based on cost investigation from the technology providers and feasibility study also the qualitative expert judgment.
- The scoring matrix determined by the value preferred and the scored generated using the formula:

Higher Value

$$Y_i = \frac{X_i - X_{min}}{X_{max} - X_{min}} * 100$$

Lower Value preferred

$$Y_i = \frac{X_{max} - X_i}{X_{max} - X_{min}} * 100$$

- the allocation of weights for the weight matrix is conducted through a participatory process. Stakeholders are given a budget of 100 points, which has to be divided among all the criteria. The weight distribution based on the corelation between criterion with the climate change adaptation.

Table 16 MCA Criterion, Value, Preferred and Weight for Coastal Sector

Code	Criterion	Sub-criterion	Code	Remark	Value	Preferred Value	Weight
I	Cost	Capex	**A**	Capital cost	0= very high cost --> 100 = very low cost	Lower	10.00
		Opex	**B**	Operational cost	0= very high cost --> 100 = very low cost	Lower	10.00
		Maintenance	**C**	Cost for improvement	0= very high cost --> 100 = very low cost	Lower	10.00
II	Institutional/political	Meet National Priority	**D**	Coherence with national priority	0=very low --->100=very high	Higher	5.00
		Ease Implementation	**E**	Government likely to implement without incurring additional costs	**0=very low --->100=very high**	Higher	5.00
III	Economic	Private Sector Inv.	**F**	Promote PPP	**0=very low --->100=very high**	Higher	5.00
		Improve economic performance	**G**	Promote business opportunities	0=very low --->100=very high	Higher	5.00
		Job creation	**H**	Provide opportunities for new jobs for locals	0=very low --->100=very high	Higher	5.00
IV	Social	Reduce poverty	**I**	Could be used to reduce poverty	0=very low --->100=very high	Higher	5.00
		Gender Equality	**J**	Consider and imply Gender inclusion	0=very low --->100=very high	Higher	5.00

Code	Criterion	Sub-criterion	Code	Remark	Value	Preferred Value	Weight
		Improve healthy	**K**	Improve health of the communities	0=very low --- >100=very high	Higher	5.00
V	Climate Related	Improve air quality	**L**	Enhance quality of air	0=very low --- >100=very high	Higher	5.00
		Reduced Vulnerability & resilience	**M**	Increase adaptive capacity	0=very low --- >100=very high	Higher	10.00
VI	Technology	Safety	**N**	The technology increase level of security	0=very low --- >100=very high	Higher	5.00
		Maturity effectiveness	**O**	The technology could be easily transfused by the local ownership	0=very low --- >100=very high	Higher	10.00

Table 17 MCA Performance Matrix for Coastal Erosion Sector

No	Criterion	I			II		III			IV			V		VI	
	Types of Technology - Adaptation	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**
1	Coastal Vegetation restoration (CVR)	80	60	80	70	65	50	50.00	30.00	75.00	75	60	75	60	60	55
2	Sea Wall- Hardware	40	45	60	60	75	65	30.00	20.00	40.00	65	50	45	55	50	50
3	Sea Wall- Nature based	55	65	65	75	85	75	70.00	40.00	65.00	60	75	90	75	70	70
4	Sandbags	45	40	60	30	30	65	20.00	20.00	50.00	55	65	40	55	50	60
5	Integrated Coastal Zone Management (ICZM)	55	55	60	70	75	60	30.00	30.00	75.00	65	60	75	60	70	65
6	Climate Trust Fund	60	60	50	60	60	70	40.00	50.00	20.00	60	55	25	50	60	50

Table 18 MCA Scoring Matrix for Coastal Erosion Sector

No	Criterion	I			II		III			IV			V		VI	
Types of Technology - Adaptation		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**
1	CVR	0.00	20.00	-	88.89	63.64	-	60.00	33.33	100.00	100.00	25.00	100	40.00	50.00	25
2	Sea Wall-Hardware	100.00	80.00	66.67	66.67	81.82	60.00	20.00	0.00	36.36	50.00	25.00	40	20.00	0.00	0.00
3	Sea Wall-Nature based	62.50	-	50.00	100.00	100.00	100.00	100.00	66.67	81.82	25.00	100.00	130	100.00	100.00	100
4	Sandbags	87.50	100.00	66.67	0.00	0.00	60.00	0.00	**0.00**	54.55	-	50.00	30	20.00	-	50
5	ICZM	62.50	40.00	66.67	88.89	81.82	40.00	20.00	33.33	100.00	50.00	25.00	100	40.00	100.00	75
6	Climate Trust Fund	50.00	20.00	100.00	66.67	54.55	80.00	40.00	100.00	-	25.00	0.00	**0.00**	0.00	50.00	0.00

Table 19 MCA Weighting Matrix for Coastal Erosion Sector

No	Criterion	I			II		III			IV			V		VI	
Types of Technology - Adaptation		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	CVR	0.00	200.00	0.00	444.44	0.00	0.00	300.00	166.67	500.00	500	125	500	22.22	250.00	250
2	Sea Wall-Hardware	100.00	800.00	666.67	333.33	333.33	300.00	100.00	0.00	181.82	250	125	200	155.56	0.00	0.00
3	Sea Wall-Nature based	62.50	0.00	500.00	500.00	250.00	500.00	0.00	333.33	409.09	125	500	650	22.22	500.00	1,000
4	Sandbags	87.50	1,000.00	666.67	0.00	333.33	300.00	0.00	0.00	272.73	0.00	250	150	22.22	0.00	500
5	ICZM	62.50	400.00	666.67	444.44	333.33	200.00	100.00	166.67	500.00	250	125	500	66.67	500.00	750
6	Climate Trust Fund	50.00	200.00	1,000.00	333.33	500.00	400.00	200.00	500.00	0.00	125	0.00	0.00	66.67	250.00	0.00
		0.00	200.00	0.00	444.44	0.00	0.00	300.00	166.67	500.00	500	125	500	22.22	250.00	250

5.6 RESULTS OF TECHNOLOGY PRIORITISATION FOR COASTAL EROSION SECTOR

The working group for coastal erosion sector under the adaptation has concluded that the TNA process considers prioritization of "**Sea wall -Nature based solution technology"** and the "**Integrated coastal zone management technology"** as the two prioritized technologies to progress further through the TNA process. Both technologies get the highest rankings after the MCA assessment as you could see from the Table 20 below.

Table 20 Prioritization of Technologies for Coastal Erosion Sector

No	Types of Technology Adaptation (Coastal Erosion Management)	Total	Rank
1	Sea wall-Nature based	3,830	1
2	Integrated coastal zone management	3,749	2
3	Climate Trust fund	3,308	3
4	Sea wall-hardware	3,140	4
5	Sandbags	3,060	5
6	Coastal Vegetation restoration	2,736	6

Chapter 6
ADAPTATION TECHNOLOGY PRIORITISATION FOR SECTOR RELOCATION

6.1 KEY CLIMATE CHANGE VULNERABILITIES IN THE RELOCATION SECTOR

Relocation due to impact of climate change extreme event is always perceived to be the last resort to both the government and vulnerable communities across the country for the past decades. This position has profoundly rooted in traditional approach where villagers thought that if one is relocated from one's native or original land one loses his or her identity and one's right to ownership over land and resources at the original location. However, because of the increasing impact of climate change and related extreme events, the government now has adopted a more contemporary approach towards climate change induced relocation. Now, the government has recognised and prioritised relocation as one of its adaptive strategies to the impact of climate change and disaster events. This is reflective in the collaboration of the national government with the International Organization of Migration in formulating a guideline for planned relocation strategy across the country. According to the Permanent Secretary of MECDM, Dr Melchior Mataki, relocation should not be the last resort but, the first option for the government and communities facing adverse impact of climate change to evaluate when deciding on adaptive alternatives to the impact of climate change and disaster events.

6.2 DECISION CONTEXT

The Government's **vision** is to build resilient communities across the country, ensure more than its five thousand (5,000) villages along the coastlines are secured and safe from the impact of climate change and extreme events. The NDS (2016-2035) has reaffirmed this intention by the government to ensure that it provide resilient villages and communities against the impact of climate change to vulnerable communities.

Based on that resilient objective, the current government in its redirection policy statement has stated that the government should invest in renewable technologies to mitigate its GHG emissions and at the same time develop a strategy to ensure that vulnerable communities are

relocated or resettled at higher grounds against impacts of climate change including coastal erosion, sea level rise and storm surges.

The country's land mark adaptation policy document (NAPA, 2008) has clearly stated that the need to relocate communities and/or villages is the responsibility of the governments at all levels – community, local, province, and national. Through the NAPA, the Government has identified priority sectors where adaptation actions are urgently needed. These include, inter alia:

1. Relocating communities in atolls and low-lying areas prone to storm surge, to higher grounds and promote building on stilts.
2. Identifying and breeding crops that withstand saline conditions.
3. Introduction of water treatment technology.
4. Identifying communities at risk of climate change and disaster.
5. Construction of sea walls, wave breakers and planting mangroves along coastlines; and,
6. Preserving traditional cultural norms and practices through documentation.

In the revised NDC (2021), adaptation, especially management of coastal resources which include proper resource planning, conservation, zoning, relocation, and resettlements are critical components of adaptation, especially from sea level rise, coastal erosion, and storm surges.

6.3 AN OVERVIEW OF EXISTING ADAPTATION TECHNOLOGY OF RELOCATION SECTOR

Despite the reluctant approach the national government has undertaken towards relocation initiatives around the country, a few communities have participated in some forms of self - initiated relocation exercises from their vulnerable communities due to the impact of climate change and extreme events to safe locations. For example, a community on the Ranogha Island in the Western Province of Solomon Islands has relocated from its original location near the coastline to 145m square inland (Ha'apio et al 2018)[12]. This relocation initiative is an example of a relocation exercise that is planned and initiated by the local community themselves. There was not much deeper engagement by the national government into this exercise. It was purely

[12] **Ha'apio, M.O,** Wairiu, M., Gonzalez, R., & Morrison, K. (2018). Transformation of rural communities: lessons from a local self-initiative for building resilience in the Solomon Islands. *Local Environment*, *23*(3), 352-365.

on traditional leadership and some level of provincial level engagements. A similar initiative is also arranged and administered by the Malaita Provincial government where currently there is a relocation exercise being initiated for the households of Kwai Island to mainland – Atori village in eastern part of Malaita Province. These two cases have demonstrated that relocation is not a new concept to many vulnerable communities across the country, thus must not approach it as a foreign concept or external model of adaptation but must embrace and develop policy and technologies in this context to ensure many other vulnerable communities have second option to building their livelihoods against the impact of climate change and extreme events.

6.4 ADAPTATION TECHNOLOGY OPTIONS FOR RELOCATION SECTOR AND THE BENEFITS

The following adaptation technologies were identified in consultation with stakeholders as key technologies for Relocation sector in the Solomon Islands. The TFS for each of the technologies were prepared by the National adaptation consultant and was emailed to all the stakeholders for validation. For this process, stakeholders were given ample time for the opportunity to provide their comments and suggestions. Main adaptation benefits for these technologies are summarised below and fact sheets are provided in Annex 4.

Table 21 Adaptation Technology Options for Relocation Sector and The Benefits

No	Type of Technology	Benefit	Brief Description
1	Climate Change relocation policy	• It sets the guidelines for relocation exercise to be carried out, • It prevents land disputes and other associated challenges with relocation • It removes the stigma associated with relocation because it promotes planned re-settlement.	• Climate policy usually highlights or outline how a country should tackle numerous environmental challenges, such as climate change, air and water pollution, natural resource management, natural disasters, and relocation complexities. • It should be explicit about the type of relocation technologies which the communities have access to etc.
2	Permanent relocation	• It provides new alternatives for the relocated households to rebuild their livelihoods and well beings • It provides new opportunity for household and relocated families for transformative activities	• Permanent relocation refers to transfer of homes and properties from one location to a much safer location with no intention of returning to the original or primary residence (Kleit & Manzo,2006)[13]. • In the context of Solomon Islands permanent relocation would refer extreme environmental induced events which triggers relocation of a community to a new safe and higher locations.

[13] Kleit, R. G., & Manzo, L. C. (2006). To move or not to move: Relationships to place and relocation choices in HOPE VI. *Housing Policy Debate*, *17*(2), 271-308.

No	Type of Technology	Benefit	Brief Description
3	Cash Transfer Program	• It Medium to Reduce poverty • Increasing economic capacity at local levels to deal with climate change disaster reduction.	• A cash transfer is simply a payment from the government to help improve the lives of its citizens impacted by climate change and disaster events. • Examples of cash transfer programs in the U.S. include Social Security and unemployment benefits.
4	Relocation trust Fund	• Assist to finance households and communities to relocate at new sites • Provide alternate source of funding from donor partners	• Relocation fund is like climate trust fund, but its more focused with relocation and resettlement objectives. • It may secure funding by the government or donor aid partners
5	Temporary Relocation	• Provide opportunity for the temporary relocated communities to decide on permanent relocation option. • Permanent relocation decision is not harsh on the relocated communities. • Capacity building on livelihood activities is taught and transferred to relocating families or representative before actual participating in the permanent relocation.	• Temporary relocation is similar to safe home context. The identified communities are hosted at a temporary location before deciding to relocate permanent. • The respective communities receive counselling, advice, guidance, and some time special trainings to aid their permanent relocation graduation.
6	Enabling environment for relocation	• The relocating families or households are provided with enabling infrastructure, such as roads, plot of land for gardening, communal facilities such as community hall, school, water supply etc. • This promotes business growth at these identified relocation sites.	• Under enabling environment for relocation, the government could invest in infrastructures that could act as pull factor to attract villagers to relocate to this new location. • Under this context, there is no outright relocation exist in this arrangement. Households will make the final decision to relocate by themselves.

6.5 CRITERIA AND PROCESS OF TECHNOLOGY PRIORITISATION FOR RELOCATION SECTOR

During this process, the multi-criteria analysis (MCA) tool is used in ranking the six (6) identified technologies in their priority order based on a set of criteria that are relevant to country context. A list of criteria categories, sub-categories, and criterion to be considered for the relocation sector technology prioritisation. In consultation with the stakeholders, it was decided that six (6) criterions such as: (1) Cost, (2) Institutional/Political, (3) Economic, (4) Social, (5) Climate Related and (6) Technology.

During the scoring process, the stakeholders for the coastal erosion sector referred to the Technology Fact Sheets, used their experiences and deliberated on each of the criteria. Then they collectively decided to give individual scores and average out the scores for each of the criteria. Hence, a performance matrix was constructed, and the scoring was carried out after discussing the information provided in the technology factsheets and experiences of respective stakeholders. **Table 22 presents** the Categories and Criteria used in the prioritisation process upon which the Performance Matrix (**table 23**) and Scoring Matrix (**table 24**) were constructed.

- The rating for performance matrix identified based on cost investigation from the technology providers and feasibility study also the qualitative expert judgment.
- The scoring matrix determined by the value preferred and the scored generated using the formula:

Higher Value

$$Y_i = \frac{X_i - X_{min}}{X_{max} - X_{min}} * 100$$

Lower Value preferred

$$Y_i = \frac{X_{max} - X_i}{X_{max} - X_{min}} * 100$$

- the allocation of weights for the weight matrix is conducted through a participatory process. Stakeholders are given a budget of 100 points, which has to be divided among all the criteria (**Table 25)**. The weight distribution based on the corelation between criterion with the climate change adaptation.

Table 22 MCA Criterion, Value, Preferred and Weight for Relocation Sector

Code	Criterion	Sub-criterion	Code	Remark	Value	Preferred Value	Weight
I	Cost	Capex	**A**	Capital cost	0= very high cost --> 100 = very low cost	Lower	10.00
		Opex	**B**	Operational cost	0= very high cost --> 100 = very low cost	Lower	10.00
		Maintenance	**C**	Cost for improvement	0= very high cost --> 100 = very low cost	Lower	10.00
II	Institutional/political	Meet National Priority	**D**	Coherence with national priority	0=very low --->100=very high	Higher	5.00
		Ease Implementation	**E**	Government likely to implement without incurring additional costs	**0=very low --->100=very high**	Higher	5.00
III	Economic	Private Sector Inv.	**F**	Promote PPP	**0=very low --->100=very high**	Higher	5.00
		Improve economic performance	**G**	Promote business opportunities	0=very low --->100=very high	Higher	5.00
		Job creation	**H**	Provide opportunities for new jobs for locals	0=very low --->100=very high	Higher	5.00
IV	Social	Reduce poverty	**I**	Could be used to reduce poverty	0=very low --->100=very high	Higher	5.00
		Gender Equality	**J**	Consider and imply. Gender inclusion	0=very low --->100=very high	Higher	5.00
		Improve healthy	**K**	Improve health of the communities	0=very low --->100=very high	Higher	5.00

V	Climate Related	Impr.air quality	**L**	Enhance quality of air	0=very low ---->100=very high	Higher	5.00
		Reduced Val & resilience	**M**	Increase adaptive capacity	0=very low ---->100=very high	Higher	10.00
VI	Technology	Safety	**N**	The technology increase level of security	0=very low ---->100=very high	Higher	5.00
		Maturity effectiveness	**O**	The technology could be easily transfused by the local ownership	0=very low ---->100=very high	Higher	10.00

Table 23 MCA Performance Matrix for Relocation Sector

No	Criterion	I			II		III			IV			V		VI	
	Types of Technology Adaptation	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Climate policy	80	60	60	80	70	80	65	70	90	4	90	90	90	80	50
2	Permanent relocation (PR)	20	30	30	70	40	80	60	65	90	3	90	70	60	80	40
3	Temporary Relocation (TR)	40	30	60	50	45	70	65	40	80	3	80	70	70	40	30
4	Enabling environment for relocation **(EER)**	50	55	80	60	50	90	70	65	60	4	70	60	50	40	45
5	Relocation trust Fund (RTF)	75	60	60	50	50	70	70	40	70	3	90	90	80	40	45
6	Cash Transfer Programme (CTP)	60	60	50	40	60	80	60	65	90	3	90	90	60	55	50

Table 24 MCA Scoring Matrix for Relocation Sector

No	Criterion	I			II		III			IV			V		VI	
	Types of Technology - Adaptation	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Climate policy	0	0	40.00	100.00	100.00	50.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
2	Permanent relocation (PR)	100.00	100.00	100.00	75.00	0	50.00	0	83.33	100.00	0	100.00	33.33	25.00	100.00	50.00
3	Temporary Relocation (TR)	66.67	100.00	40.00	25.00	16.67	0	100.00	0	66.67	0	50.00	33.33	50.00	0	0
4	Enabling environment for relocation **(EER)**	50.00	16.67	0	50.00	33.33	100.00	200.00	83.33	0	100.00	0	0	0	0	75.00
5	Relocation trust Fund (RTF)	8.33	0	40.00	25.00	33.33	0	200.00	0	33.33	0	100.00	100.00	75.00	0	75.00
6	Cash Transfer Programme (CTP)	33.33	0	60.00	0	66.67	50.00	0	83.33	100.00	0	100.00	100.00	25.00	37.50	100.00

Table 25 MCA Weighting Matrix for Relocation Sector

No	Criterion	I			II		III			IV			V		VI	
	Types of Technology - Adaptation	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**
1	Climate policy	0.00	0.00	400	500.00	500.00	250.00	500.00	500.00	500.00	500.00	500.00	500.00	1000.00	500.00	1000.00
2	Permanent relocation (PR)	1,000	1000.00	1000	375.00	0	250.00	0.00	416.67	500.00	0.00	500.00	166.67	250.00	500.00	500.00
3	Temporary Relocation (TR)	667	1000.00	400	125.00	83.33	0.00	500.00	0.00	333.33	0.00	250.00	166.67	500.00	0.00	0.00
4	Enabling environment for relocation **(EER)**	500	166.67	0.00	250.00	166.67	500.00	1000.00	416.67	0.00	500.00	0.00	0.00	0.00	0.00	750.00
5	Relocation trust Fund (RTF)	83	0.00	400	125.00	166.67	0.00	1000.00	0.00	166.67	0.00	500.00	500.00	750.00	0.00	750.00
6	Cash Transfer Programme (CTP)	333	0.00	600	0.00	333.33	250.00	0.00	416.67	500.00	0.00	500.00	500.00	250.00	187.50	1000.00

6.6 RESULTS OF TECHNOLOGY PRIORITISATION FOR RELOCATION SECTOR

The working group for Relocation subsector under adaptation has concluded that the TNA process considers prioritization of "Climate Change Relocation Policy" formulation and the "Permanent Relocation technology" to be considered as priority technologies for relocation subsector for adaptation.

Table 26 Prioritization of Technology for Relocation Sector

No	Types of Technology Adaptation	Total	Rank
1	Climate Change relocation policy	**7,150**	**1**
2	Permanent relocation	**6,458**	**2**
3	Cash Transfer Programme	**4,025**	**6**
4	Relocation trust Fund	**4,250**	**5**
5	Temporary Relocation	**4,442**	**4**
6	Enabling environment for relocation	**4,871**	**3**

Chapter 7
SUMMARY AND CONCLUSION

The technology needs assessment was a nationally driven, gender0inclusive process involving relevant stakeholders. The initial consultation with stakeholders and reviews of National Development Strategy, National Climate Change Policy and National Adaptation Programme of Action resulted in the prioritization for mitigation and adaptation. The two sectors prioritized in mitigation technology were transportation and forestry; and two prioritized sectors in adaptation were coastal erosion and relocation. A long list of technologies was identified for each sector and was later shortlisted according to the maturity, applicability, local availability, and stakeholder acceptability of each technology. During the workshop conducted on 31st March 2022, a total of 5 technologies were identified in the transportation sector, and a total of 6 technologies were identified in the forestry sector for mitigation; additionally, the adaptation sector, a total of 6 technologies were identified in the coastal erosion and 6 technologies in relocation.

The technology factsheets were developed further for these shortlisted technologies in consultation with stakeholder experts in the field through many bilateral meetings. The short0listed technologies underwent further analysis and prioritization using the MCA tools. The decisions were based some criteria such as cost, institutional / political support, environmental, social, economic, climate related and technology related. The following technologies were identified as the most technology prioritizations: options for the respective sectors as follows:

Table 27 Technology Prioritisation for Mitigation and Adaptation

Mitigation	
Sector: Transportation	
Rank 1:	Sustainable Road (including Drainage & landscaping)
Rank 2:	Electric Out0board Motor
Sector: Forestry	
Rank 1:	MultiPurpose National Forest Inventory
Rank 2:	Establish a network of terrestrial protected areas

Adaptation	
Sector: Coastal Erosion	
Rank 1:	Sea wall0Nature based
Rank 2:	Integrated coastal zone management
Sector: Relocation	
Rank 1:	Climate Change relocation policy
Rank 2:	Permanent relocation

The technologies prioritized do not exist in the country to a significant extent, and stakeholders pointed out the need to upscale these matured technologies to develop a climate resilient economy. Barrier analysis will be carried out and development of technology action plans developed for these prioritized technologies to reflect the need for such technology actions in the respective sectors and subsectors. The results of the TNA project will support the national development priorities.

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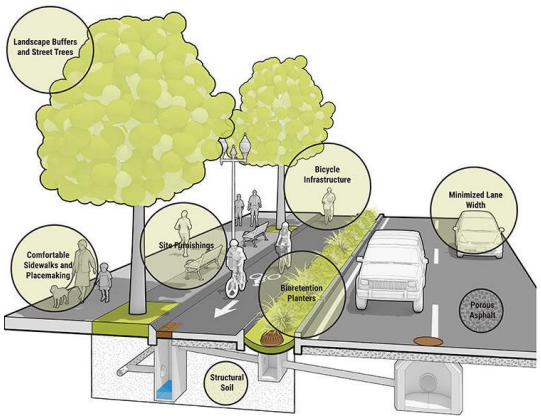
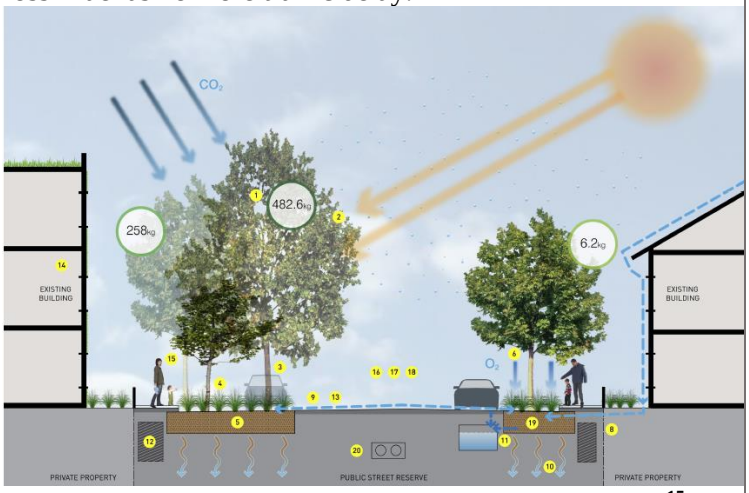
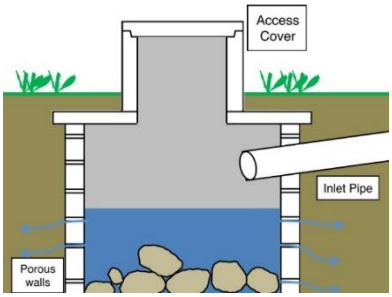
ANNEXES

Annex 1 Technology Factsheets for Transportation Mitigation

Mitigation Technology 1: Sustainable Road Design

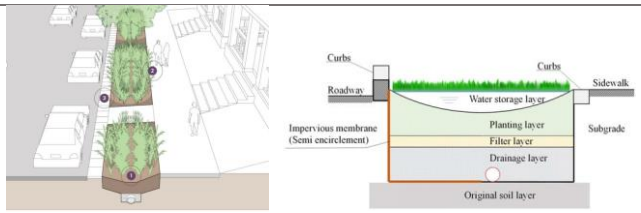
Sustainable Road Design to Preventing Quality Deterioration Of Road And Provide Space For Non0Motorize User	
1.0 Sector	Transportation Infrastructure
2.0 Technology Characteristics	
2.1 Technology Name:	Sustainable road design
2.2 Introduction:	**<u>Background</u>** ➢ One of the main caused of road damage in Greater Honiara is the road drainage cannot accommodate the surface run off rain water. ➢ Reducing service run off will also reduce suspended sediments and debris (rubbish). ➢ The road damage causes the delay of travel time and increase the use of fossil fuel, it brings the impact of increasing the GHG emission in town. ➢ The dependency to the motorist vehicle in Greater Honiara is high as the pedestrian pathway is not accommodate to pedestrian need in term of safety and comfortability ➢ Sustainable road design needs to be implemented in Solomon Islands as it not just accommodates the road design but also the drainage system and road  **Figure 3 Sustainable Road design concept[14]** **<u>Climate Rationale for the technology</u>** The sustainable road design incorporates green storm0water management strategies and facilities that use vegetation, soils, permeable surfaces and engineering principles to collect, infiltrate, convey and clean storm0water runoff from the streets. The landscape buffer will absorb GHG emission, and reduce the urban heat island (increasing the local temperature in the

[14] https://www.roadsbridges.com/green-complete-streets-integrating-puzzle-pieces

	urban area), permeable surface and proper drainage system will keep the durability of road construction, with the high durability of road construction it will give the positive impact to the travel time, travel cost and reduce the consumption of fossil fuel as no more traffic delay.  ***Figure 4. Implementation of green complete streets*[15]**
2.3 Technology Characteristics/ Highlights: Few bullet points, i.e., low/high cost; advance technology; low technology.	• Medium cost (High of initial cost but low in operational and maintenance) • Medium technology requirement for constructing, operation and management • Hard Technology **<u>Technology brief descriptions</u>** • Use of porous asphalt along the length of trail • Provides wider sidewalks using permeable pavement and a two0way separated bike lane and fills critical gaps in the bikeway network • Accommodates motor vehicle traffic, parking, and loading zone lanes • Prioritizes green infrastructure and sense of place along corridors • Focuses on users from ages 8 to 80 years  ***Figure 5.* a soakaway structure[16]**

[15] http://zemingchen.blogspot.com/2015/06/sustainable-road-design.html

[16] https://www.roadex.org/e-learning/lessons/drainage-of-low-volume-roads/components-of-road-drainage-system/



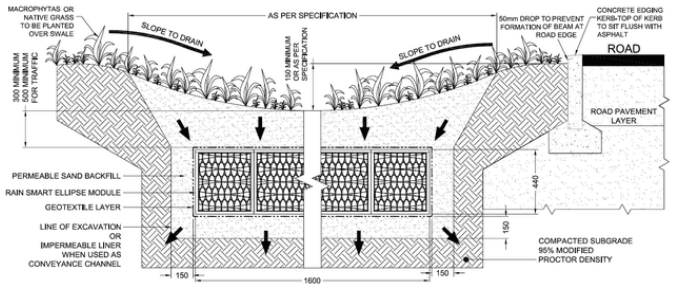


Figure 6. Bioretention Swale [17]

Swales are most applicable in lower density or lower traffic contexts, as they have relatively large footprints and little or no vertical separation from the sidewalk and street. Swales are commonly implemented on neighbourhood or residential streets, along shared0use paths, medians, roundabouts, or other unused right0of0way areas and in areas where more space is available for siting the facility within the planting strip or a curb bulb along the street.

Figure 7 Implementing innovative green complete streets.

2.4 Institutional and Organizational Requirement:	• Ministry of Infrastructure and Development (MID) and Honiara City Council (HCC) or provincial government. • Engaging with the local university to do the research for ecofriendly pavement material and landscaping (civil engineering department and forestry)
3.0 Implementation assumption	

[17] https://nacto.org/publication/urban-street-stormwater-guide/stormwater-elements/green-stormwater-elements/bioretention-swale/
https://www.rainsmartsolutions.com/glass_swale_bioretention_basins

3.1 Endorsement by Experts: How the technology will be implemented and diffused across sectors	• Sustainable road design will not only be focusing on road construction but also facilities for the pedestrian, non0motorized vehicle and also drainage system • The coordination multi sectoral needed to give the clear responsibility designation for construction and maintenance • Mainly the road, drainage and pedestrian construction should under responsibility of MID, but the landscaping and maintenance should be done by local government
3.2 Adequacy for current climate: Explain the technology could have some improvements in country environment	• The sustainable road design will reduce of GHG emission by absorbing carbon dioxide gas, reduce the local temperature, encourage pedestrian to walk, encourage the use of non0motorized vehicle, it is mean reducing the fossil fuel, and the green landscape also can be as new habitat for local fauna
3.3 Size of beneficiaries group: Technology that provides small benefits to larger number of people will often be favored over those that provide larger benefits, but to fewer people.	➢ All the road user motorizes and non0motorize will get benefit from the new road design
4.0 Costs	
4.1 Cost to implement mitigation options: Capital Cost	➢ Rehabilitation of sealed road USD 750,000/Km[18] , total capital cost for 211Km length of road is USD 158.25M ➢ Additional cost is 16 M including the feasibility study, and detail engineering design ➢ Total cost is 173.25 M
4.2 Additional costs to implement mitigation option, compared to "business as usual"	➢ The additional costs which may be required to implement this technology includes cost for feasibility study and detail engineering design
4.3 Operational and Maintenance Cost	➢ Maintenance for 2 lanes road cost is USD 4,000/km [19], total length of road in Greater Honiara and sealed road in Guadalcanal is 211Km. total cost maintenance is USD 844,000.
4.4 cost of GHG reduction	➢ The sustainable road design will reduce of GHG emission by absorbing carbon dioxide gas, reduce the local temperature, encourage pedestrian to walk, encourage the use of non0motorized vehicle, it is mean reducing the fossil fuel, and the green landscape also can be as new habitat for local fauna
4.5 lifetime	➢ 30 years
5.0 Benefits	
5.1 Development impact, indirect /benefits	• The sustainable road design will reduce of GHG emission by absorbing carbon dioxide gas, reduce the local temperature, encourage pedestrian to walk, encourage the use of non0motorized vehicle, it is

[18] http://sirap.sb/images/Docs/SI_National_Transport_Plan_2017-36_v03e.pdf
[19] https://documents1.worldbank.org/curated/en/971161468314094302/pdf/339250rev.pdf

	mean reducing the fossil fuel, and the green landscape also can be as new habitat for local fauna
5.2 Economic benefits:	• the good condition of road will reduce the travel cost and travel time • the reducing of travel time will keep the produce in good quality so the income of the market vendor will increase • the increasing of income, and more opportunity on selling of the produces can reduce the number of poverties • good road condition will increase the land price on the urban fridge
5.3 Social benefits:	• Population density in the city will decrease with a good transportation system, because people will choose to live outside the city due to low house rental prices • The availability of pedestrian paths encourages people to walk, thereby reducing the risk of obesity and being healthier • the existence of parks and green lanes along the road will reduce air pollution and can also be used as a place to socialize and do physical activities for urban population.
5.4 Environment benefits:	The sustainable road design will reduce of GHG emission by absorbing carbon dioxide gas, reduce the local temperature, encourage pedestrian to walk, encourage the use of non0motorized vehicle, it is mean reducing the fossil fuel, and the green landscape also can be as new habitat for local fauna
6.0 Local context	
6.1 Opportunities and Barriers: Barriers to implementation and issues such as the need to adjust other policies.	**<u>Opportunities</u>** ➢ the supports sustainable road construction as part of environment preservation and providing public space ➢ availability of local material for pavement system ➢ engaging with university for research and development **<u>Barriers</u>** ➢ high cost ➢ lack of maintenance ➢ social behaviour will spoil the road design and road beautification ➢ high level of rain ➢ the phosphorus asphalt not locally available
6.2 Status: Status of technology in the country	**<u>Technology Status</u>** Currently Solomon Islands not apply the sustainable road design yet
6.3 Timeframe:	36 months for 30% of the road length

Specify timeframe for implementation	
6.4 Acceptability to local stakeholders: Where the technology will be attractive to stakeholders	Yes

Mitigation Technology 2: Electric Outboard Motor

Reducing the Fossil Fuel Consumption	
1.0 Sector	Public Water Transportation Services
2.0 Technology Characteristics	
2.1 Technology Name:	Electric Outboard Motor
2.2 Introduction:	**<u>Background</u>** Solomon Islands geographically consist of over 1000 islands. Gizo Town, the capital of Western Province in the Solomon Islands, depends nearly 90 % of Transportation mode through Water Transportation which is the Ocean. Most Sea transportation used to travel from Islands to Islands to transport goods and services as well as people. Since the Islands are not so big, the people depend more on the Ocean for the supply of their daily food as well as a source of catches for income revenue. Currently, the sea public transportation services in the Western Provinces of Solomon Islands, are getting higher and higher in cost. This is due to the Petrol Fuel which is very expensive as a result also increases the cost of Public Transportation using Outboard Motor. Some sea transportations were used for getting supplies from the towns to the villages and when the petrol fuel increases, the cost of sea transportation for each people or the cargo fees also increases.  **Figure 1. Outboard Motor boats waiting for Passengers to travel to other Islands[20]** Currently, the public transportation services in the Western Province of Solomon Islands are still using the Petrol Outboard motor for daily traveling from Islands to Islands. The cost of goods transported as well as passengers depends on the price of fossil fuel. It has been experienced that the fossil fuel always goes up eventually affects the costs for goods and services as well as passengers to increase drastically. Even though there is a mode of Air transport, the cost and availability are not effective. Water Transport is a more

[20] (https://www.escape.com.au/escape-travel/gizo-reefs-wrecks-and-traditional-solomon-islands-culture/news-story)

economical mode of transport and there is a variety of options you can choose.
Having options like in the figure below, would reduce the cost of fossil fuel, however, need a pool for recharging.

Figure 2. 40 HP and 80 HP Electric Outboard Motor Engine[21]

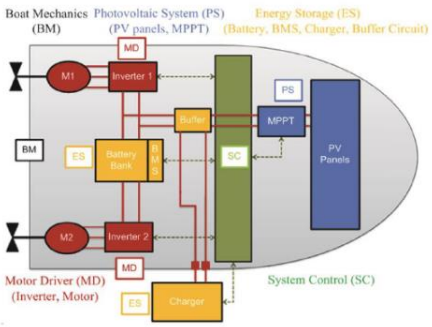
To provide sea public transportation with the bigger capacity, also can use solar panel boat.

Figure 3. Solar Panel speed boat 300seater [22]

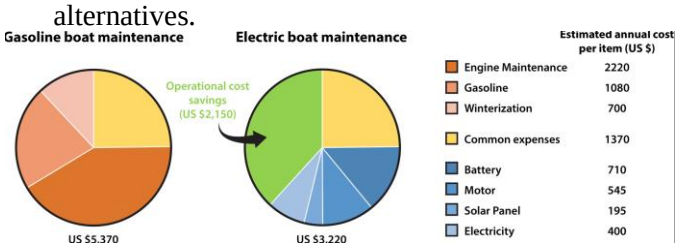
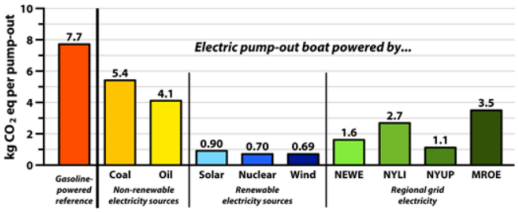
<u>Climate Rationale for the technology</u>

The energy tariff of Solomon Islands is one of the highest in the Pacific since a major share of energy in the Islands is met through fossil fuels. In 2012, the total cost of petroleum fuels was SBD 843 million, approximately 14% of Solomon Island's national Gross Domestic Product (GDP). Over 50% of petroleum fuel being imported into the Solomon Islands is being consumed by the Transport sector (land and sea). About 100% of total installed capacity of energy generation for sea transport in Solomon Islands is based on fossil fuels. Accordingly, as per the Solomon Islands' Nationally Determined Contributions (NDC 2016), transport (land and sea) accounts for 61% of the total emissions from the energy sector. This is by far the biggest contributor of GHG emissions in the country. By using the electric outboard motor, it can reduce the GHG emission contribution.

[21] (https://www.torqeedo.com/us/en-us/products/outboards/deep-blue.)
[22] (https://hnhqship.en.made-in-china.com/product/bCVQEolzANWM/China-Solar-Panel-Cabin-Double-Desk-Electric-Boat-High-Speed-Passenger-Ship-for-Sale.html)

2.3 Technology Characteristics/ Highlights: Few bullet points, i.e., low/high cost; advance technology; low technology.	• Medium cost (High of initial cost but low in operational and maintenance) • Medium technology requirement for operating the Electric Outboard Motor • Hard Technology **Technology brief descriptions** • Electric outboard motor is silent, clean, and maintenance0free with no fuel or exhaust smells. • 1 Kw outboard that has an equivalent power of a 3 HP petrol motor, 40HP080HP electric outboard will be used, the usable energy is 12.8 kWh (40HP) and 25.6kWh051.2kWH (80 HP) Lithium0Ion battery. The charging time is 405 hour to reach 80% of battery capacity • Maximum propeller speed is 2,400 rpm, with the speed 50km/hour. • Solar panel speed boat technology: engine power 2 x 35 kWh, Speed 18 Km/hour, endurance 4 hours.
2.4 Institutional and Organizational Requirement:	• Outboard Motor driver association work together with Solomon Islands Public Transport Authority (SIPTA) in providing the electric outboard motor.
3.0 Implementation assumption	
3.1 Endorsement by Experts: How the technology will be implemented and diffused across sectors	• The electric outboard motor will use the battery as main power source • The electricity power can be generated from Solar panel on boat or on shore pool, and use the alternators as the backup power, an alternator or a stater that charges the battery when the engine is running.  **Figure 4. shore pool and solar panel for boat charger[23]** 

[23] (https://plugboats.com/first-st-tropez-electric-boat-show-charge-up-success/)

	Figure 5. Electric diagram of the all0electric boat[24]
3.2 Adequacy for current climate: Explain the technology could have some improvements in country environment	• Electric outboard is 100% Zero Emissions and 100% Environmentally Friendly, it can drastically reduce the carbon emission production from the public transportation, this in line with the government target: 27% reduction in its GHG emissions by 2025 and 45% GHG emission reduction by 2030.
3.3 Size of beneficiaries group: Technology that provides small benefits to larger number of people will often be favored over those that provide larger benefits, but to fewer people.	➢ Beneficiaries: outboard motor user in western province, there was 2,046 outboard motor owners [25] ➢ The solar panel speed boat can be used to transport between big islands on the western area of Solomon Islands
4.0 Costs	
4.1 Cost to implement mitigation options: Capital Cost	➢ Initial cost for 10 units electric outboard 40HP including the charging pool is: USD 500.000 ➢ Initial Cost for three units Speed 300seater solar panel speed boat is: USD 4.5 M ➢ Additional Cost: USD 1M ➢ Total Cost: USD 6 M
4.2 Additional costs to implement mitigation option, compared to "business as usual"	➢ The additional costs which may be required to implement this technology includes cost for feasibility study, pool charging site preparation, insurance and public awareness.
4.3 Operational and Maintenance Cost	➢ Electric outboard and solar panel speed boat also have substantially lower operating and maintenance (O&M) expenses as compared to their diesel and CNG alternatives. 
4.4 cost of GHG reduction	➢ Electric motor system eliminates fumes, odour, engine noise and pollution. Widespread use of the system may result in a significant reduction of greenhouse gas emissions from fast boats 

[24] (https://www.researchgate.net/publication/268511955_Integrated_Motor_Drive_Design_for_an_All-Electric_Boat)

[25] Solomon Islands Census Data, 2009

	Figure 6. Greenhouse gas emissions per pump0out[26]
4.5 lifetime	➢ 12 years
5.0 Benefits	
5.1 <u>Development impact, indirect /benefits</u>	Below are some of the major benefits for implementing this technology: • the electric outboard power source using the renewable energy, it's not depend on the fossil fuel; • the sea transport will not be disturbed by outside factor (locked of international border or main port) • the transport cost will be stable
5.2 Economic benefits:	• As the transport cost lower, people have more opportunity to selling their produce in the main market and it will generate the local economic growth • the range of boat services is wider, because it does not depend on the availability of fossil fuel, so small islands and atolls cab be reached by the boat service (currently they are using canoe to the islands hub)
5.3 Social benefits:	• Electric outboard design is more comfortable as it is noiseless and free burned emission pollution • The house hold can provide the daily need easily as their transport will not depend on fossil fuel availability • Better accessibility to the public services
5.4 Environment benefits:	➢ The major benefit of electric outboard is the contribution that they can make towards improving air quality ➢ pure electric outboard produces no carbon dioxide emissions when driving. This reduces air pollution considerably. ➢ electric outboard gives us cleaner ocean.
6.0 Local context	
6.1 Opportunities and Barriers: Barriers to implementation and issues such as the need to adjust other policies.	<u>Opportunities</u> ➢ High demand of electric outboard in western province ➢ Sun all year round for solar panel energy source **<u>Barriers.</u>** ➢ Performance and rains ➢ Total cost of ownership ➢ Shortage of charging infrastructure ➢ Lack consumer awareness about electric outboard technology
6.2 Status: Status of technology in the country	**<u>Technology Status</u>** Currently no electric outboard technology in Solomons Islands
6.3 Timeframe:	24 months

[26] (https://iwaponline.com/wpt/article/15/3/781/75388/Environmental-and-health-impacts-of-electric)

Specify timeframe for implementation	
6.4 Acceptability to local stakeholders: Where the technology will be attractive to stakeholders	Yes

Mitigation Technology 3: Electric Vehicle and Vehicle Pooling Station

Reducing the Fossil Fuel Consumption	
1.0 Sector	Public Transportation Service
2.0 Technology Characteristics	
2.1 Technology Name:	Providing the public minibus using electric vehicle for school, employers and general public user
2.2 Introduction:	**Background** all the public transport in Solomon Islands is depend on fossil fuel, it caused the transportation system consume high (50%) of country' fossil fuel consumption. The use of fossil fuel led to the biggest contribution of GHG emission in the country. Currently, the public transportation services in Solomon Islands are still mixed between services for schools, employees and the general public, it's had high risk of increasing local transmission of Covid019 virus. Separation of the use of public transportation for schools, employees and the public in general needs to be done to limit movement between groups. Solomon Islands public transportation system also not accommodate yet the service for special need people, the special need transportation service vehicle is needed give the public transportation service to all (National Development Strategy 201602035)   **Figure 1. 220seater electric mini bus** (Minibus World, n.d.) **Climate Rationale for the technology** The energy tariff of Solomon Islands is one of the highest in the Pacific since a major share of energy in the Islands is met through fossil fuels. In 2012, the total cost of petroleum fuels was SBD 843 million, approximately 14% of Solomon Island's national Gross Domestic Product (GDP). Over 50% of petroleum fuel being imported into the Solomon Islands is being consumed by the Transport sector (land and sea). About 95% of total installed capacity of energy generation in Solomon Islands is based on fossil fuels. Accordingly, as per the Solomon Islands' Nationally Determined Contributions (NDC 2016), transport (land and sea) accounts for 61% of the total emissions from the energy sector. This is by far the biggest contributor of GHG emissions in the country. By using the electric vehicle (EV) for public bus, Solomon Islands can cut down the

	GHG emission contribution and reduce the local climate heat temperature.
2.3 Technology Characteristics/ Highlights: Few bullet points, i.e., low/high cost; advance technology; low technology.	• Medium cost (High of initial cost but low in operational and maintenance) • Medium technology requirement for operating the EV mini bus • Hard Technology **<u>Technology brief descriptions</u>** • Electric Minibus is 100% Zero Emissions and 100% Environmentally Friendly. Charge to 80% in 90 minutes with the large 56kw Lithium0Ion battery. • The bus can run up to 120mile (190Km) range from a single charge. • The bus carter 11 normal passengers and 2 special need passengers.
2.4 Institutional and Organizational Requirement:	• Solomon Public Transport Authority (SPTA) is needed for managing the operational of EV Minibus, to keep the service according to safety and healthy standard.
3.0 Implementation assumption	
3.1 Endorsement by Experts: How the technology will be implemented and diffused across sectors	• The EV vehicle will use the battery as main power source, it will be recharged using the electricity power in the pool station. • The electricity power can be generated from Solar panel or hydro0power • Currently Solomon Islands is constructing the big Hydropower "Tina Hydro" that can be as source of electricity power • Other option the SPTA engage with SITA provide the charging pool with hybrid system (Hydro power and solar panel)  **Figure 2. Electric vehicle charger pool** (Staticflickr.com, 2022)
3.2 Adequacy for current climate: Explain the technology could have some improvements in country environment	• Electric Minibus is 100% Zero Emissions and 100% Environmentally Friendly, it can drastically reduce the carbon emission production from the public transportation, this inline with the government target: 27%

	reduction in its GHG emissions by 2025 and 45% GHG emission reduction by 2030.
3.3 Size of beneficiaries group: Technology that provides small benefits to larger number of people will often be favored over those that provide larger benefits, but to fewer people.	➢ Beneficiaries: 80% of Honiara Greater Area population depend on public transportation ➢ Separation of the use of transportation modes between schools, employees and the general public will make the travel time more effective
4.0 Costs	
4.1 Cost to implement mitigation options: Capital Cost	➢ Initial cost for 10 units EV mini0Bus 13 seater, 56 Kw including the charging pool is: USD 6 M ➢ Additional Cost: USD 1M ➢ Total Cost: USD 7M
4.2 Additional costs to implement mitigation option, compared to "business as usual"	➢ The additional costs which may be required to implement this technology includes cost for feasibility study, pool charging site preparation, insurance and public awareness.
4.3 Operational and Maintenance Cost	➢ Electric buses also have substantially lower operating and maintenance (O&M) expenses as compared to their diesel and CNG alternatives. The average lifetime maintenance cost for an electric bus is just USD 0.60/mile[27].
4.4 cost of GHG reduction	➢ On a well to wheels basis, a new diesel bus contributes roughly 3,000 grams of CO2 equivalent per mile (gCO2e/mile), a new CNG vehicle 2,800 gCO2e/mile, and a full0electric bus 650 gCO2e/mile[28].
4.5 lifetime	➢ 12 years
5.0 Benefits	
5.1 Development impact, indirect /benefits	Below are some of the major benefits for implementing this technology: • the EV public vehicle is safer for public usage as the its maximum speed of 50Km/hrs. it can reduce the potential rate of accident • Special need friendly as the EV public mini bus provide the space for special need passenger • EV technology transferable, it's easy for technician to learn and apply the technology.
5.2 Economic benefits:	• The operator of EV mini bus will get the income benefit and provision of employment from the new system • Low maintenance cost will increase the income benefit • Lower transport cost will reduce the poverty

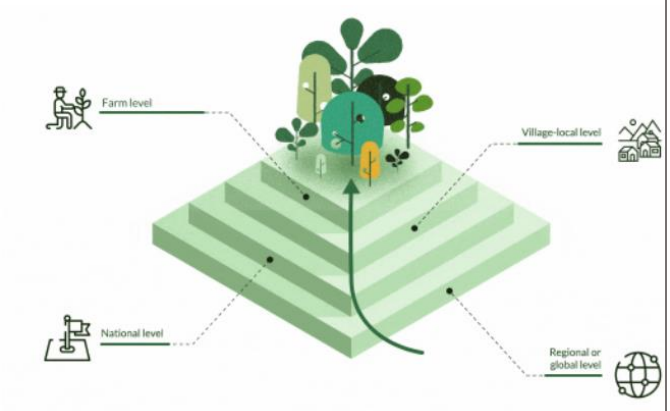
[27] https://www.sierraclub.org/sites/www.sierraclub.org/files/sce/new-jersey-chapter/Handouts/VW_Zero_Emission_Bus_Factsheet.pdf

[28] "Urban Bus GHG Emission Comparison," Advanced Clean Transit, California Air Resources Board, May 2015 http://www.arb.ca.gov/msprog/bus/workshoppresentation.pdf.

5.3 Social benefits:	• EV mini0Bus designed to provide space for special need people, and its safer for woman and child as the bus unit designated for special used (school bus, employees bus and general public bus) • Bus design is more comfortable as it is noiseless and free burned emission pollution • Its more effectives as it can charter more passengers in one unit and have fix schedule for departure and arrival
5.4 Environment benefits: Reductions in GHG emissions Reducing the local heat temperature and ecosystem degradation	➢ The major benefit of electric cars is the contribution that they can make towards improving air quality in towns and cities. ➢ With no tailpipe, pure electric cars produce no carbon dioxide emissions when driving. This reduces air pollution considerably. ➢ Electric cars give us cleaner streets making our towns and cities a better place to be for pedestrians and cyclists.
6.0 Local context	
6.1 Opportunities and Barriers: Barriers to implementation and issues such as the need to adjust other policies.	<u>Opportunities</u> ➢ High demand of public transport in greater Honiara ➢ Sun all year round for solar panel energy source ➢ Construction of Tina Hydro to provide the cheaper energy price **<u>Barriers.</u>** ➢ Performance and rains ➢ Total cost of ownership ➢ Shortage of charging infrastructure ➢ Lack consumer awareness about EV technology ➢
6.2 Status: Status of technology in the country	**<u>Technology Status</u>** Currently no EV technology in Solomons Islands
6.3 Timeframe: Specify timeframe for implementation	36 months
6.4 Acceptability to local stakeholders: Where the technology will be attractive to stakeholders	Yes

Annex 2 Technology Factsheets for Forestry Mitigation

Mitigation Technology 1: Multi Purpose National Forest Inventory

MultiPurpose National Forest Inventory	
1.0 Sector	Forestry Management
2.0 Technology Characteristics	
2.1 Technology Name:	Multi-Purpose National Forest Inventory
2.2 Introduction:	**Background** Forest inventories are in general, systematic collections of data for a defined area of interest which constitutes the population of interest. They aim to gather data on the location, composition and distribution of both the "resource forest" and the "ecosystem forest" that are relevant for forest related processes in management, policy and research. Forest inventories allow us to assess various forest functions, and are commonly recognized as prerequisites for forest planning and analyses because they estimate and assess not only the status of forest at a given point in time but also the changes over time that are central for forest planning and for monitoring the sustainability of forest management and forest policies.  **Figure 1 Different geographic / political units for which Forest inventories generate data and information**
2.3 Technology Characteristics/ Highlights: Few bullet points, i.e., low/high cost; advance technology; low technology.	• High cost (High in capital, operation and management) • Medium technology • Soft and hard Technology
2.4 Institutional and Organizational Requirement:	Ministry of Forestry and Research (MOFR)

3.0 Implementation assumption	
3.1 Endorsement by Experts: How the technology will be implemented and diffused across sectors	• National forest inventories (NFIs) are defined in FAO's Voluntary Guidelines on National Forest Monitoring (VGNFM) as a technical process of data compilation and forest resources analysis for a whole country. NFIs can build upon multiple data sources, including field inventories and remote sensing, to estimate relevant forest characteristics at particular points in time. • NFIs enable countries to evaluate their stocktaking of a country's forest resources. They are Multipurpose and can be used to capture data on, for example, biodiversity, socio0economic aspects of forest use, and carbon stored. These data inform forest management decisions, national policy, and international reporting requirements.
3.2 Adequacy for current climate: Explain the technology could have some improvements in country environment	• A National Forest Inventory is one of the key sources of data (emission factors) for estimating anthropogenic forest related greenhouse gas emissions and is an essential element of NFMS under REDD+, along with SLMS (satellite Land Monitoring System) • The collection, analysis and use of information at national and provincial level are strategic in nature. The information is used primarily in the development, implementation and monitoring of national forest policies and sector strategies
3.3 Size of beneficiaries group: Technology that provides small benefits to larger number of people will often be favored over those that provide larger benefits, but to fewer people.	Beneficiaries group including forest owners and dwellers, environmental NGOs, forest0based industries, research organizations, academia, citizens, etc.
4.0 Costs	
4.1 Cost to implement mitigation options: Capital Cost	➢ Total forest in Solomon Islands for the project is 28,400 Km2, Cost for national forestry inventory per tract (5Km2) is 3,500 USD total cost for national forestry inventory for all area in Solomon Islands is USD 19,95M USD for 5,700 tracts ➢ Awareness and Workshop: 2 M ➢ Total Cost = USD 21.95 M
4.2 Additional costs to implement mitigation option, compared to “business as usual”	➢ Additional cost including community awareness and technical workshop
5.0 Benefits	

5.1 Development impact, indirect /benefits	• Provide reliable forest resource information covering a whole country to include computation of forestry statistics; • Assess forest areas, growing stock volumes, changes in biodiversity status, land use, carbon stock, and ecosystem services; • Generate scientific data and information with the primary goal to guide and support decision processes in forest related policies; • Monitor the sustainability of forest management and forest policies on a national and sub0national level; • Enter into various international reporting processes, including the United Nations Framework Convention on Climate Change and the United Nations Convention on Biological Diversity.
5.2 Economic benefits:	• National forestry inventory will improve the performance of national economic as the investor will get the detail information about the forest values • The projects also provide some employment opportunities to the local as forest rangers or forest surveyors
5.3 Social benefits:	• National Forest Inventories (NFIs) can be used to estimate recreational and social usage of forest land at a national level and relate this use to other biophysical, spatial and topographical features
5.4 Environment benefits:	• National forest inventories will give the various information to protect of environment resource and to support ecosystem & biodiversity
6.0 Local context	
6.1 Opportunities and Barriers: Barriers to implementation and issues such as the need to adjust other policies.	**Opportunities** ➢ National regulation in supporting national forest inventory ➢ International aid in implementing national forest inventory ➢ Research and development in forest with some university in Solomon Islands **Barriers** ➢ Stretch of forest located in the archipelago makes transportation costs expensive ➢ Lack of skill and practical knowledge forest inventory ➢ Unpredictable climate change
6.2 Status: Status of technology in the country	**Technology Status** Currently Solomon Islands already set the national forest inventory. Komuniboli Community is First Pilot Site for National Forest Inventory

6.3 Timeframe: Specify timeframe for implementation	36 months
6.4 Acceptability to local stakeholders: Where the technology will be attractive to stakeholders	Yes

Mitigation Technology 2 Establish a network of terrestrial protected areas

Establish a network of terrestrial protected areas	
1.0 Sector	Forest
2.0 Technology Characteristics	
2.1 Technology Name:	Establish a network of terrestrial protected areas
2.2 Introduction:	**Background** The Solomon Islands have a limited number of protected areas established under Provincial Ordinance or Customary Law. Establishment of areas under the Protected Areas (PA) Act will increase the legal status of these areas and new areas identified by landowners and the government as requiring protection. Early evidence indicates that there is significant landowner interest in establishing PAs, and conservation areas, however there is a lack of clarity on how these will be funded and limited support to landowners and communities to undertake the relevant steps to establish PAs. Increasing capacity within MECDM to support PA establishment as well as promoting PA development, as part of approaches to land use planning will be important in establishing an effective PA network. However, the conservation challenges and threats that the Solomon Islands face are common to most Pacific Island countries. The people have a high dependency on marine and terrestrial resources for subsistence and also for generating cash income. A number of threats and pressures exist on these marine and terrestrial resources including logging, overfishing, pollution and climate change. All of these factors are compounded by rapid population growth particularly in coastal areas. This leads to an increase in coastal development and additional pressure on both terrestrial and near0shore natural resources in the area.
2.3 Technology Characteristics/ Highlights: Few bullet points, i.e., low/high cost; advance technology; low technology.	• High cost (High in capital, operation and management) • Medium technology • Soft
2.4 Institutional and Organizational Requirement:	Ministry of Forestry and Research (MOFR)
3.0 Implementation assumption	
3.1 Endorsement by Experts: How the technology will be implemented and diffused across sectors	• Terrestrial protected areas are totally or partially protected areas of at least 1,000 hectares that are designated by national authorities as scientific reserves with limited public access, national parks, natural monuments, nature reserves or wildlife sanctuaries, protected landscapes, and areas managed

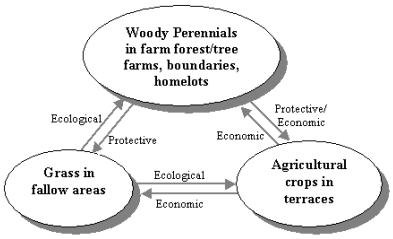
	mainly for sustainable use. Marine areas, unclassified areas, littoral (intertidal) areas, and sites protected under local or provincial law are excluded.
3.2 Adequacy for current climate: Explain the technology could have some improvements in country environment	• Protected areas are an important line of defence in combatting the twin crises of climate change and biodiversity loss simultaneously. • Terrestrial protected areas currently store about 12% of terrestrial carbon stocks. • If effectively managed, protected areas safeguard biodiversity in both the terrestrial and marine realms, and help society cope with climate change impacts by reducing risks associated with climate related hazards. They also maintain the essential ecosystem services upon which the health and livelihoods of people depend. • Protected areas are themselves at risk from climate change, requiring managers to take actions to increase resilience, which will be the subject of a separate brief on Building the Resilience of Protected Areas to Climate Change • Protected areas (PAs) are central to climate change adaptation policies used by countries worldwide and critical for biodiversity conservation and ecosystem functioning.
3.3 Size of beneficiaries group: Technology that provides small benefits to larger number of people will often be favored over those that provide larger benefits, but to fewer people.	Beneficiaries group including the land owner, and public as forest preserve the environmental balance surround residential areas and the urban areas
4.0 Costs	
4.1 Cost to implement mitigation options: Capital Cost	➢ 10% of Solomon Islands Forest targeted as protected area [29], around 200,000 Ha. The cost for establish the terrestrial protected area in Solomon Islands is USD 250/ Ha or USD 50M ➢ Awareness and Workshop: 2 M ➢ Total Cost = USD 52 M
4.2 Additional costs to implement mitigation option, compared to "business as usual"	➢ Additional cost including community awareness and technical workshop
5.0 Benefits	
5.1 <u>Development impact, indirect /benefits</u>	• protect areas that are most important for biodiversity, including intact ecosystems; • ensure that conservation supports land connectivity wherever possible; • pursue conservation in various regions to ensure that the global system of protected areas is representative of our planet's diverse nature and ecosystems;

[29] https://www.cepf.net/stories/saving-forests-solomon-islands-one-protected-area-time

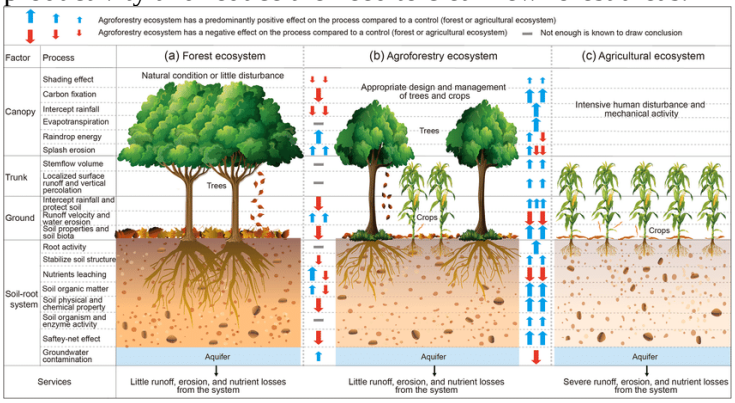
	• support indigenous peoples' land rights and promote indigenous0led conservation; and, • increase funding for conservation and protected area management and transition toward reliable long term funding source
5.2 Economic benefits:	• Protected areas can help local economies by attracting tourists who spend money in nearby communities, by protecting ecosystem services (such as water provision, flood protection, generation of non0timber forest products) which increase productivity, or through improved infrastructure and institutional development. However, protected areas also impose costs by restricting access to land and natural resources.
5.3 Social benefits:	• It will give the social benefit such as health improvement and cultural heritage preservation
5.4 Environment benefits:	• Protected areas (PAs) are a fundamental tool for protecting Earth's biodiversity from excessive extinction rates and erosion of goods and services • enhancing local biodiversity, water and soil retention, sandstorm prevention, carbon sequestration and human well0being services
6.0 Local context	
6.1 Opportunities and Barriers: Barriers to implementation and issues such as the need to adjust other policies.	**<u>Opportunities</u>** ➢ Regulation in supporting the application of terrestrial protected area ➢ International aid in implementing terrestrial protected area ➢ Support from the local community in implementing terrestrial protected area **<u>Barriers</u>** ➢ Lack of skill and practical knowledge on effective and efficient reforestation ➢ Unpredictable climate change ➢ community limitations in accessing status data on the progress of reforestation activities
6.2 Status: Status of technology in the country	**<u>Technology Status</u>** There are few terrestrial conservation areas and protected areas around the country; 1. Kahua Conservation Association – Makira Ulawa Province 2. Bauro Highland Conservation Association 0 Makira Ulawa Province 3. Kolombangara Island Biodiversity Conservation Association – Western Province 4. Tetepari Descendent Association 5. NRDF – Western/Choiseul Provinces
6.3 Timeframe: Specify timeframe for implementation	36 months

6.4 Acceptability to local stakeholders: Where the technology will be attractive to stakeholders	Yes

Mitigation Technology 3: Agroforestry

Agroforestry	
1.0 Sector	Agroforestry
2.0 Technology Characteristics	
2.1 Technology Name:	Agroforestry
2.2 Introduction:	Background Agroforestry is a land use system recognised worldwide for its long term sustainability. It can be defined as "a dynamic, ecologically based, natural resources management system that, through the integration of trees in farms and in the landscape, diversifies and sustains production for increased social, economic and environmental benefits for land users at all levels" (ICRAF 1997). Essentially, agroforestry systems protect and maintain soil productivity and reduce the need to clear new forest areas. To successfully promote agroforestry, the MAL and MoF must collaborate in planning and implementing it. In the context of Solomon Islands, agroforestry can contribute to sustainable forest resource management from two aspects: (i) establishment of plantations that have valuable timber tree species, and (ii) income generation through the sale of agroforestry products. In addition, agroforestry provides an opportunity for women to participate in forest management which is usually recognized as men's work  **Figure 1. Agroforestry concept[30]**
2.3 Technology Characteristics/ Highlights: Few bullet points, i.e., low/high cost; advance technology; low technology.	• Medium cost (medium cost in all level of implementation) • Medium technology • hard Technology
2.4 Institutional and Organizational Requirement:	Ministry of Forestry and Research (MOFR),and Ministry of Agriculture and Livestock (MAL)
3.0 Implementation assumption	

[30] https://www.fao.org/3/XII/0447-B5.htm

3.1 Endorsement by Experts: How the technology will be implemented and diffused across sectors	• agroforestry systems protect and maintain soil productivity and reduce the need to clear new forest areas. To successfully promote agroforestry, the MAL and MoFR must collaborate in planning and implementing it. • The practical knowledge and skill on agroforestry is needed for MOFR official and community members • To develop capacity of MOFR and communities in planning, managing, and monitoring agroforestry activities. • To develop a model of agroforestry, including the process of planning and management, by compiling lessons learned through the pilot activities • Agroforestry addresses issues such as land scarcity, sustainable land use and the diversification of income0generating opportunities for people. Indigenous multipurpose trees have the potential to impact on peoples' livelihoods but they need to be developed as complementary to forest plantations. This approach will create a conciliatory scenario for the production of wood, fruits and nuts.
3.2 Adequacy for current climate: Explain the technology could have some improvements in country environment	Agroforestry is a land use system recognised worldwide for its long term sustainability. It can be defined as a dynamic, ecologically based, natural resources management system that, through the integration of trees in farms and in the landscape, diversifies and sustains production for increased social, economic and environmental benefits for land users at all levels. Essentially, agroforestry systems protect and maintain soil productivity and reduce the need to clear new forest areas.  **Figure 2: Agroforestry ecosystem impact to the climate[31]**
3.3 Size of beneficiaries group: Technology that provides small benefits to larger number of people will often be favored over those that provide larger benefits, but to fewer people.	Beneficiaries group including the land owner, and public as forest preserve the environmental balance surround residential areas and the urban areas

[31]https://www.researchgate.net/figure/Agroforestry-traits-and-their-potential-impact-on-processes-of-reductions-in-water-soil_fig1_337543298

4.0 Costs	
4.1 Cost to implement mitigation options: Capital Cost	➢ Cost for agroforestry implementation is USD 1,500 per Ha[32]. For the initial project implementation for 1000 Ha, cost needed is USD 1.5 M ➢ Awareness and Workshop: 1 M ➢ Total Cost = USD 2.5M
4.2 Additional costs to implement mitigation option, compared to "business as usual"	➢ Additional cost including community awareness and technical workshop
5.0 Benefits	
5.1 Development impact, indirect /benefits	• Reduction of pressure on forest. • More efficient recycling of nutrients by deep0rooted trees on the site. • Better protection of ecological systems.
5.2 Economic benefits:	• new income generation through the sale of agroforestry product
5.3 Social benefits:	• smallholder plantations are established there should correspondingly be an increase in employment in rural communities. • An improved ecotourism focus is envisaged – to treasure different ecosystems, especially those that offer income0generating opportunities. Villagers' participation as tour guides, and similar positions, offers an employment opportunity
5.4 Environment benefits:	• enhancing the crop diversity and reducing dependency on natural forest • Agroforestry provides many benefits that includes favorable microclimate, reduction in erosion, enhanced biodiversity, increased water quality, more infiltration leading to effective groundwater recharge, enhanced and elongated dry flow, improvement in habitat, soil fertility
6.0 Local context	
6.1 Opportunities and Barriers: Barriers to implementation and issues such as the need to adjust other policies.	**Opportunities** ➢ Regulation in supporting the application of agroforestry ➢ International aid in implementing agroforestry ➢ Research and development in agroforestry with some university to determine the best technic of agroforestry in Solomon Islands **Barriers** ➢ Lack of skill and practical knowledge on agroforestry ➢ Unpredictable climate change ➢ No proper transportation infrastructure and services that connected the agroforestry area and market (urban area)

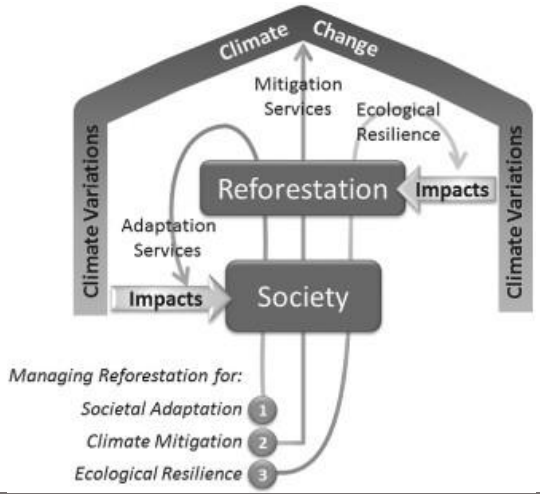
[32] https://www.washingtonpost.com/news/theworldpost/wp/2018/09/11/agroforestry/

6.2 Status: Status of technology in the country	**<u>Technology Status</u>** Currently Solomon Islands already applied agroforestry but still need the application on the wider area and more distributed across the islands in all provinces
6.3 Timeframe: Specify timeframe for implementation	36 months
6.4 Acceptability to local stakeholders: Where the technology will be attractive to stakeholders	Yes

Mitigation Technology 4 Reforestation and Rehabilitation

Reforestation and Rehabilitation	
1.0 Sector	Forest
2.0 Technology Characteristics	
2.1 Technology Name:	Reforestation and Rehabilitation
2.2 Introduction:	Background In 2016 and 2017, around 65% of the county's export earnings came from forestry, mainly through sale of round logs, which accounts for 20% of the state revenue (CBSI, 2017). Records of round log export was already above 1 million cubic meters in 2005 (SIG, 2018a), which is more than four times the sustainable rate estimated at 250,000 cubic meters per annum. At the current harvesting rate, timber resources are expected to last only 102 more decades before exhaustion (RAMSI, 2012). Observing the historical and current trend of the logging industry, increased growth in commercial agriculture, mining and hydro electricity generation as per sector ministries' plans and expected expansion of gardening areas and settlements due to population growth, it can be expected that deforestation and forest degradation activities will continue to increase in the short and mid0term. Reforestation and rehabilitation will enhancement of forest carbon stocks: The creation or improvement of carbon pools and reservoirs and their ability to sequester and capacity to store carbon.  **Figure 1: Reforestation Concept [33]**
2.3 Technology Characteristics/ Highlights: Few bullet points, i.e., low/high cost; advance technology; low technology.	• Medium cost (medium cost in all level of implementation) • Medium technology • hard Technology
2.4 Institutional and Organizational Requirement:	Ministry of Forestry and Research (MOFR)

[33]http://geoengineeringinquiries.blogspot.com/2016/01/afforestation-and-deforestation.html

3.0 Implementation assumption	
3.1 Endorsement by Experts: How the technology will be implemented and diffused across sectors	• The MFR existing reforestation programme has an objective to plant 500ha of forest0land per year with a focus on commercial species (teak and mahogany are most prevalent). The programme has seen success in areas with higher numbers of forest officers and locations close to nurseries. • During periods of donor support reforestation reached nearly 200ha per annum (pa) but are currently closer to 300ha pa. • The program is also working on rehabilitation of logged over forest areas through enrichment planting using local indigenous tree species. At present, 90 hectares of logged over forest area has been piloted both in the Western and Isabel Provinces. This program is still at the pilot stage but has the potential for expansion due to the large areas of logged over forest within the Solomon Islands and the potential for rapid regeneration.[34]
3.2 Adequacy for current climate: Explain the technology could have some improvements in country environment	During tree growth, CO2 is captured from the atmosphere and stored in living biomass, dead organic matter and soils. Forestation is thus a biogenic negative emissions technology that plays an important role within climate change abatement efforts. Reforestation has several advantages and co0benefits that are associated with forest0based mitigation which include biodiversity, flood control as well as quality improvement for soil, water and air. Carbon can be stored in forests for a very long time; however, permanence is vulnerable due to natural and human disturbances. Based on global tropical boundary limitations, an estimated total area of 500 Mha is argued to be suitable for forestation deployment. This would allow for a global carbon dioxide removal potential of 0.5–3.6 GtCO2 year−1 by 2050. Removal costs are estimated at $5–$50/tCO2. 

[34] https://solomonislands-data.sprep.org/system/files/2014_Solomon%20Islands_REDD%20Roadmap_p.pdf

	Figure 2: impact of reforestation in climate change mitigation[35]
3.3 Size of beneficiaries group: Technology that provides small benefits to larger number of people will often be favored over those that provide larger benefits, but to fewer people.	Beneficiaries group including the land owner, and public as forest preserve the environmental balance surround residential areas and the urban areas
4.0 Costs	
4.1 Cost to implement mitigation options: Capital Cost	➢ Cost for reforestation and rehabilitation is USD 3,000 per Ha[36] including site preparation, seedling and maintenance. For the initial project implementation for 2,000 Ha, cost needed is USD 6 M ➢ Additional cost including feasibility study, mapping, awareness and workshop: 2 M ➢ Total Cost = USD 8 M
4.2 Additional costs to implement mitigation option, compared to "business as usual"	➢ Additional cost including community awareness and technical workshop
5.0 Benefits	
5.1 Development impact, indirect /benefits	• reforestation allows for the accelerated development of forest structure, species composition, and canopy that provides many benefits including wildlife habitat, clean and abundant water, carbon sequestration, forest wood products for consumers, forested recreation opportunities, and maintenance of soil productivity through soil erosion reduction. • Reforestation presents unique opportunities to address emerging issues associated with climate change by conserving and managing genetic diversity to adapt to a changing climate, as well as sequestrating carbon to counter greenhouse gas emissions.
5.2 Economic benefits:	• Reforestation projects also provide plenty of employment opportunities for the local population. A high number of people are needed to carry out the exhausting manual work. • In turn, this can lower unemployment rates of the local population and provide them with a higher average income. • Thus, especially in areas where unemployment is a big problem, reforestation projects can not only improve our ecological footprint, but also provide job opportunities so that fewer people have to suffer from poverty
5.3 Social benefits:	• Engaging in reforestation projects can also lead to social cohesion among the local population. By planting trees, everyone can contribute his or her part

[35] https://www.researchgate.net/figure/Conceptual-framework-of-climate-smart-reforestation-reforestation-management-contributes_fig1_274895728

[36] https://www.washingtonpost.com/news/theworldpost/wp/2018/09/11/agroforestry/

	to make our planet a little bit more liveable and to assure a good future for the next generations. • In turn, people will be willing to work together for this big goal, which in turn will also strengthen the social cohesion since people will spend plenty of time together in the process of reforestation
5.4 Environment benefits:	• One important advantage of reforestation is that we can slow down global warming. Since trees are natural carbon dioxide storage spaces. • Prevent the desertification • reforestation in order to restore those natural habitats so that animals and plants can relocate in order to maintain the natural balance between the local flora and fauna and human
6.0 Local context	
6.1 Opportunities and Barriers: Barriers to implementation and issues such as the need to adjust other policies.	**<u>Opportunities</u>** ➢ Regulation in supporting the application of reforestation and rehabilitation ➢ International aid in implementing reforestation and rehabilitation ➢ Support from the local community in implementing reforestation and rehabilitation technology **<u>Barriers</u>** ➢ Lack of skill and practical knowledge on effective and efficient reforestation ➢ Unpredictable climate change ➢ community limitations in accessing status data on the progress of reforestation activities
6.2 Status: Status of technology in the country	**<u>Technology Status</u>** Currently Solomon Islands already applied reforestation and rehabilitation but still need the application on the wider area and more distributed across the islands in all provinces
6.3 Timeframe: Specify timeframe for implementation	36 months
6.4 Acceptability to local stakeholders: Where the technology will be attractive to stakeholders	Yes

Annex 3 Technology Factsheets for Coastal Erosion Adaptation

Adaptation Technology 1: Coastal vegetation restoration

Coastal vegetation restoration.	
1.0 Sector	Coastal Erosion Sector (CES)
2.0 Technology Characteristics	
2.1 Technology Name:	Coastal vegetation restoration (CVR)
2.2 Introduction:	**Background** Soil Erosion is the process by where soft shorelines (sand, gravel, or cobble) disappear, and land is lost or carried away often into the sea or rivers. Erosion generally comes in two forms. (i) A natural part of the coastal environment where a soft shore moves and changes in response to cyclic climatic conditions, and (ii) Erosion can be induced by human interference of natural sand movement and budget patterns. Erosion can be slow and ongoing over many years or fast and dramatic following large storm events. Many erosion problems in the Pacific today occur because of poor planning, inappropriate shoreline development, overcrowding, beach mining for building material and due to reef degradation. **See Figure 1.1.1** coastal erosion in the Solomon Islands. **Figure 1.1.1: Coastal Erosion**  To mitigate the above problem, introduction of coastal vegetation restoration is critical. Some common coastal vegetation habitats are maritime forests, scrub thickets, grassy upland prairies, fresh0water swamps, fresh0water marshes, mangrove swamps, salt0water marshes, and grassy or forested dunes. Each type of coastal vegetation has its own unique features that can retard land loss. **Climate Rationale for the technology** For the past 20 years, the Solomon Islands have been a ***hotspot for sea level rise***. Here the sea has risen at almost three times the global average, around 7010 mm per year since 1993. This higher local rate is partly the result of natural climate

	variability. There are more than 5,000 villages across the country. Majority of these villages settled less than 1.5 kilometers along the shore lines. This increases the exposures of these rural villages, thus the level of their vulnerability to impact of climate change especially the impact of coastal flooding, soil erosion, seal level rise and storm surges. Due to increasing impact of climate change, it is unequivocal that its consequences will be aggravated more than the past, particularly on these coastal communities along the Island. Replanting of vegetation and beach nourishment is therefore seen as supportive strategy that can be used to increase resilience and adaptation around the Island. **Coastal vegetation Restoration** is therefore critical to protect communities including facilities such as clinics, schools, homes, and general businesses populace. Coastal vegetation restoration strategy may also provide opportunity for the communities to re nourish the beaches, replant vegetation as form of natural re0enforcement against coastal erosion and SLR, see figure 2 below. Working together with the Ministry of Environment, climate change, Disaster Management and Meteorology with participating communities would identify the coastal areas which are in urgent need to restore their beaches from coastal erosion. **Figure 1.1.2: Coastal Vegetation restoration Technology**  The population in the country currently stands more than 720,000 people and the destruction of the coastal areas through human actions are also increasing. This calls for this technology to include civic component – i.e., ensure awareness of public on the need to look after the beaches and not to destroy them as the island faces the reality of climate change across the country.
2.3 Technology Characteristics/ Highlights: Few bullet points, i.e., low/high cost; advance	medium cost (potentially high initial cost) Low technology (requires landfills, grasses, or planting of trees at some locations) Hard Technology

technology; low technology.	**<u>Technology brief descriptions</u>** • There is potential for the government to participate in mangrove and native tree replenishment. • Such trees would be less expensive but needs proper management and skills • Some communities in the Solomon Islands have already participated in this technology.
2.4 Institutional and Organizational Requirement:	• Selected communities could oversee this technology if it implemented. • The Ministry of Environment, climate change, Disaster Management and Meteorology will oversee such project if implemented.
3.0 Operations and maintenance	
3.1 Endorsement by Experts:	• To increase community resilience and prevent coastal erosion, the replanting of vegetation and refurbishment of coastal areas at selected vulnerable sites across the country is important. • This would prevent soil erosion and ensure continuity of business along the coastal areas even during strong winds, storm surges and catastrophic events. • Coastal communities would feel protected against the exposure and vulnerability that climate change and extreme storm events brought if there is no buffer of vegetation and natural beaches these identified sites. • Households and communities would concentrate on their normal day to day operations and not have to worry about their homes and businesses been carried away in the next disaster events.
3.2 Adequacy for current climate: Are there negative consequences	• Fits well for both the current and future expected climate change across the country,

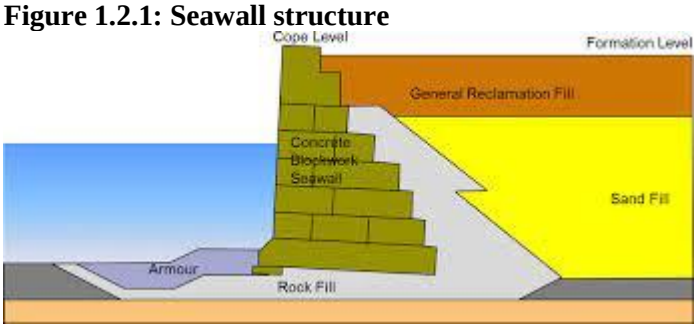
of the adaptation option in the current climate? Some adaptation may be targeted at the future climate but may have costs and consequences under the current climate.	• Since the forecasts are predicting future SLR with increasing intensity and frequency of storm surges which may cause further coastal erosion and washing away of beaches, • such beach vegetation replanting and nourishment at identified vulnerable locations around the island would be beneficial to the communities at large.
3.3 Size of beneficiaries group: Technology that provides small benefits to larger number of people will often be favored over those that provide larger benefits, but to fewer people.	**<u>Beneficiaries of such Technology</u>** ➢ Beneficiaries include the household sectors, business houses, government departments, schools, health, and private sectors. ➢ The beach vegetation and nourishment would ensure the general community at large is protected. ➢ There will be no individual or group of people who would be primary beneficiaries of such developments. ➢ While homes located closer to the identified locations may directly benefit from such undertakings, the positive externality to the community at large is immeasurable. ➢ The benefits are distributed and shared among almost everyone on the Islands.
4.0 Costs	
4.1 Cost to implement adaptation options: Cost measures	➢ Initial cost includes the cost "grounds work' (landfills), cost of V&A reports and beach replenishment or nourishment. ➢ The MECDM although over sees the environment management in the country, it does not have the capacity to provide some of the costs as mentioned above. Therefore, the technology would require the following costs to fully implement this adaptation option:

	The cost of groundworks (landfills) USD 4M Additional costs (V&A, EIA, & Beach nourishment) USD$6M **Total cost = USD10M**
4.2 Additional costs to implement adaptation option, compared to "business as usual"	➢ The additional costs which may be required to implement this technology includes cost for beach nourishment and replanting of trees to ensure long term resilience is achieved at these coastal areas. ➢ All costs are factored into the initial costs as detailed above.
5.0 Benefits	
5.1 Development impact, indirect /benefits	The new initiative would reduce coastal erosion and bring confidence in the communities along the coastal areas that their properties are safe and can continue with development initiatives at these sites. Below are some of the major benefits for implementing this technology. • Safety and security of the community alone the coast lines: it is the primary motivator for the implementation the beach vegetation replenishment and nourishment, meaning more households/ public depends on the secure and safer environment from coastal erosion. • Contributing to food security by households participating in backyard gardening since they now have access to safer land, growing some of their basic crops supplementing their budgets. • There wouldn't be disruptions on major infrastructures such as roads, electricity and perhaps water supply manual distribution on the Island. • More funding will spend on economic development by the government rather than just building a seawall or barriers which would be seen uneconomical to this cash trapped nation.
5.2 Economic benefits: Employment – Jobs Investment – Capital requirements	Investment into coastal area vegetation and restoration at selected areas across the country would create tens or hundreds of jobs for the next 12 to 16 months. • This will ensure that locals participate in landfilling, soil nourishment and rehabilitation of the beaches during the implementation and maintenance stages of the technology. • The general community will continue to live and operate their business at the coastal areas thus contributing to the economic growth of the country. • The locals that participate in this technology would earn the income and support their families to meet school fees and other livelihood expenses.

5.3 Social benefits: Income0 Income generation and distribution Education – Time available for education Health – Number of people with different diseases.	• The Social benefit of this technology on the households is that they are secured and protected from impact of SLR and coastal erosion. The little money they earn could now be invested in other income generating activities to improve their livelihood rather than worrying about the coastal erosion. • The coastal areas which are vulnerable to coastal erosion and SLR will now have some buffer against salt water intrusion. The responsible authorities must ensure that primary and secondary schools across the island are safe and secure from such impact of SLR. This will ensure the youths and the weak are protected from the SLR and soil erosion. • Subsequently, health and gender issues will be considered and filtered through every process of decision making in this project.
5.4 Environment benefits: Reductions in GHG emissions, local pollutants, Ecosystem degradation etc.	➢ Soil erosion caused by SLR will be controlled and managed at these sites because of coastal land vegetation and beach nourishment etc. ➢ Replanting of vegetation at these sites may also contribute towards reduction of the GHG and pollution into the atmosphere. ➢ It will also improve the beach environment and ecosystem and directly reduce the soil degradation. ➢ The beach pollution will also be controlled as there will be proper management and control over the project implemented area.
6.0 Local context	
6.1 Opportunities and Barriers: Barriers to implementation and issues such as the need to adjust other policies.	<u>Opportunities</u> ➢ Coastal vegetation restoration is a technology that can be employed in conjunction with other adaptation measures such as coastal zone management ➢ Locally managed marine area including and sea wall construction etc. In the case of the Solomon Islands there must be a lot of investment and commitment into these options to make them viable. ➢ Coastal vegetation restation and beach nourishment would increase the opportunities for effective resilience with different purposes (domestic, agriculture use, etc.) **<u>Barriers.</u>**

	➢ Barriers include lack of access to finance to invest in land fillings along the vulnerable coastal areas, ➢ Lack of policies by the National government surrounding management of beaches and awareness by communities on the devastation impact of climate change etc. ➢ This option would be relatively cheaper compared to other adaptations options. 0 Technical requirements such as V&A, EIA and structural design may increase implementation and maintenance costs. ➢ Although coastal land vegetation and beach nourishment may be accruing some initial costs, it is cheaper on the longer run. 0 A low level of public awareness is critical to support the technology.
6.2 Status: Status of technology in the country	**<u>Technology Status</u>** ➢ Certain communities have already participated in programs design to protect coastal soil erosion within the country. ➢ However, the rate of soil erosion is worrisome and thus calls for prioritizing of this technology at selected vulnerable sites across the Islands. ➢ Timeframe is continuous.
6.3 Timeframe: Specify timeframe for implementation	36 months
6.4 Acceptability to local stakeholders: Where the technology will be attractive to stakeholders	Yes

Adaptation Technology 2: Sea wall construction (Hard structure)

Sea wall (Hard structure)	
1. Sector	Coastal Erosion (CE)
2. Technology Characteristics	
2.1 Technology Name:	Construction of sea wall for resilience at selective sites across the provinces.
2.2 Introduction:	**Background** A seawall is typically a sloping concrete structure; it can be smooth, stepped0faced or curved0faced. A seawall can also be built as a rubble0mound structure, as a block seawall, steel, or wooden structure. The common characteristic is that the structure is designed to withstand severe wave action and storm surge. Seawall construction is a fast0growing industry. **See figure 1 below**. It's a great way to improve residential and commercial properties that are bordered by water. Many property owners are seeing the advantages to having seawall construction done, to protect the environment and their own property. **Figure 1.2.1: Seawall structure**  One of the primary environmental concerns today is land erosion. As sea levels rise, coastal erosion increases. Awareness of this is rising on a social consciousness level, as we become more educated about the interaction of land and water on our planet. However, coastal communities are particularly aware of the effects of erosion. For them, it has a very direct effect on the livelihoods and continue existence at their communities. **Climate Rational for the technology** The melting of the glaciers and ice sheet together with the warming of the ocean will continue to negatively impact the Pacific Island countries because of their proximity to coastlines. As ocean water warms it expands causing the sea level rise (SLR), salt water inundation and coastal area erosion. Satellite data indicates that Solomon Islands experienced SLR by about 70 10 mm per year since 1993. This is larger than the global average of 2.8–3.6 mm per year. This higher rate of SLR may also be related to natural

	fluctuations that take place year to year or decade to decade caused by phenomena such as the El Niño0Southern Oscillation. Due to increasing impact of climate change, it is unequivocal that its consequences will be aggravated more than the past, particularly on these coastal communities along the Island. **Sea wall construction** is therefore seen as supportive strategy that can be used to increase resilience and adaptation around the Island. Sea wall construction is therefore critical to protect communities including facilities such as clinics, schools, homes, and general businesses populace. Sea wall construction may also provide opportunity for the communities to restore the beaches, replant vegetation as form of natural re0enforcement against coastal erosion, see **Figure 2 below**. Working together with the MECDM, participating communities would identify the sites which are in urgent need to restore by building these structured sea walls. **Figure 1.2.2: Sea wall in Tulagi, Central Island province**  The population across the country now stands over 720,000 people and the destruction of the coastal areas through human actions are also increasing. Thus, through this technology, they should also include a civic component which responsible authorities would do awareness on the need to look after the beaches and not to destroy them as we face the reality of climate change across the region and particularly this the country.
2.3 Technology Characteristics/ Highlights: Few bullet points, i.e. low/high cost; advance technology; low technology.	• High cost (potentially high initial cost) • Low technology (requires cements, movement of ground, concretes, etc.) • Hard Technology

2.4 Institutional and Organizational Requirement:	The MECDM together with Ministry of Lands, Housing and Survey (MLHS) will provide the Institutional and organizational support to the formulation and implementation of this project.
3.0 Operations and maintenance	
3.1 Endorsement by Experts:	To increase community resilience and prevent coastal erosion, the use of sea wall structures and refurbishment of coast line areas at selected vulnerable sites across the island is important. This would ensure continuity of business along the coastal areas even during strong winds, storm surges and catastrophic events. Coastal communities would feel protected against the exposure and vulnerability that climate change and extreme storm events brought if there is no wall build at these identified sites. Business houses would concentrate on business operations and not have to worry about their homes been carried away in the next few years.
3.2 Adequacy for current climate: Are there negative consequences of the adaptation option in the current climate? Some adaptation may be targeted at the future climate but may have costs and consequences under the current climate.	Fits well for both the current and future expected climate change across the Island. Since the forecasts are predicting future SLR with increasing intensity and frequency of storm surges which may cause further coastal erosion and washing away of beaches, such sea wall constructions at identified vulnerable locations around the island would be beneficial to the communities at large.
3.3 Size of beneficiaries group: Technology that provides small benefits to larger number of people will often be favored over those that provide larger benefits, but to fewer people.	Beneficiaries include the household sectors, business houses, government departments, schools, health, and private sectors. The sea wall structure build would ensure the general community at large is protected. There will be no individual or group of people who would be primary beneficiaries of such developments. While homes located at the identified locations may directly benefit from such undertakings, the positive externality to the community at large is immeasurable. The benefits are distributed and shared among almost everyone on the Islands.
4. Costs	
4.1 Cost to implement adaptation options: Cost measures	Initial cost includes the cost of the sea wall structure, cost of design, cost of EIA, cost of V&A reports and beach replenishment or nourishment. The MECDM although over sees the environment management in the country, it does not have the capacity to provide some of the costs as mentioned above. Therefore, the technology would require the following costs to fully implement this adaptation option: The cost of Sea wall structures USD8.5M, Additional costs (V&A, EIA, Design, & materials) 3.5M Total cost = **USD12.0M**

4.2 Additional costs to implement adaptation option, compared to "business as usual"	The additional costs which may be required to implement this technology includes cost for beach nourishment and replanting of trees to ensure long term resilience is achieved at these coastal areas. The cost is factored into the initial costs above.
5.0 Benefits	
5.1 <u>Development impact, indirect /benefits</u>	The new initiative would reduce coastal erosion and bring confidence in the communities along the coast lines areas that their properties are safe and can continue with development initiatives at these sites. Below would likely be some of the major benefits on the communities. • Safety and security of the community alone the coast lines: it is the primary motivator for the implementation this sea wall structure, meaning more households/ public depends on the secure and safer environment from coastal erosion. • Contributing to food security by households participating in backyard gardening since they now have access to safer land growing some of their basic crops supplementing their budgets. • There wouldn't be disruptions on major infrastructures such as roads, electricity and perhaps water when it is reticulated. • More funding will spend on economic development by the government rather than just building a seawall or barriers which would be seen uneconomical to this cash trapped nation.
5.2 Economic benefits: **Employment –Jobs** **Investment** – Capital requirements	Construction of the sea wall various locations around in the country would create tens of jobs to Solomon Islanders for the next 12 to 18 months. • This will ensure that locals participate in construction, maintenance, and rehabilitation of the beaches during the implementation stages. • The general community will continue to live and operate their business at the coastal areas thus contributing to the economic growth of the country.

	• Mostly locals that participate in this technology would earn the income and support their families to meet school fees and other related expenses.
5.3 Social benefits: **Income** Income generation and distribution **Education** – Time available for education **Health** – Number of people with different diseases.	• The Social benefit of this technology on the households is that they are secured and protected from impact of SLR and coastal erosion. The little money they earn could now be invested in other income generating activities to improve their livelihood rather than worrying about the coastal erosion. • The sea wall will be constructed at areas which are vulnerable to coastal erosion and SLR. The responsible authorities must ensure that primary and secondary schools across the island are safe and secure from such impact of SLR. This will ensure the youths and the weak are protected from the SLR and soil erosion. • Subsequently, health and gender issues will be considered and filtered through every process of decision making in this project.
5.4 Environment benefits: Reductions in GHG emissions, local pollutants, Ecosystem degradation etc.	Coastal erosion caused by SLR will be controlled and managed at these sites because of Sea wall structure construction etc. Replanting of vegetation at these sites may also contribute towards reduction of the GHG and pollution into the atmosphere.
6. Local context	
6.1 Opportunities and Barriers: Barriers to implementation and issues such as the need to adjust other policies.	Sea wall construction is a technology that can be employed in conjunction with other adaptation measures such as Coastal zone management – and locally managed protected area etc. In the case of Solomon Islands there must be a lot of investment and commitment into these options to make them viable0 Sea wall construction increase the opportunities for effective resilience with different purposes (domestic, agriculture use, etc.) 0 Barriers include lack of access to finance for purchasing of these structures and awareness by communities etc. According to IPCC report, sea wall (hard structure) is an example of mal adaptation at the local communities. Furthermore, higher amount of initial investment may involve compared to other adaptations options. 0 Technical requirements such as V&A, EIA and structural design may increase implementation and maintenance costs. – Although sea wall structural construction may be costly and expensive,

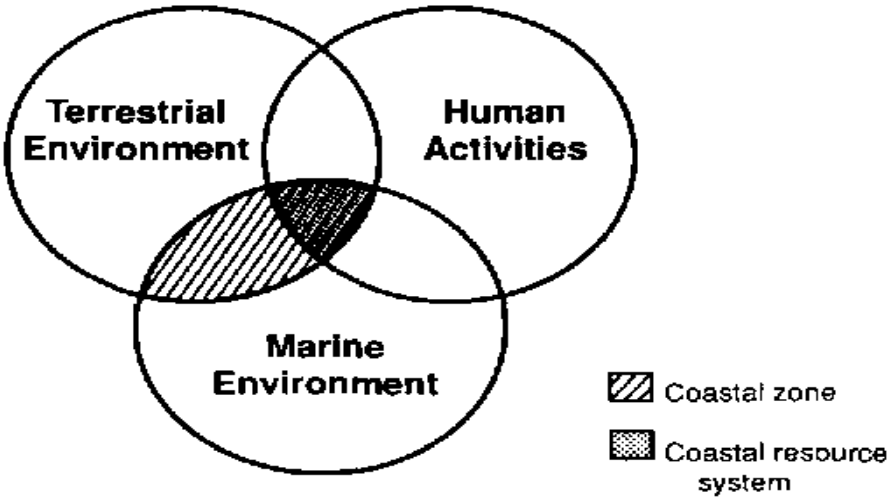
	it is cheaper on the longer run. 0 A low level of public awareness is critical to support the technology.
6.2 Status: Status of technology in the country	Certain communities have already constructed some structures of sea wall around the Island. However, the rate of soil erosion is worrisome and thus calls for prioritizing of this technology at selected vulnerable sites across the Island.
6.3 Timeframe: Specify timeframe for implementation	36 months
6.4 Acceptability to local stakeholders: Where the technology will be attractive to stakeholders	Yes

Adaptation Technology 3 : Integrated Coastal Zone Management – Coastal erosion Sector

Integrated Coastal Zone Management	
1. Sector	Coastal Erosion Sector
2. Technology Characteristics	
2.1 Technology Name:	Integrated coastal zone management (ICZM).
2.2 Introduction:	**<u>Background</u>** Integrated coastal zone management (ICZM) is a dynamic, multidisciplinary, and iterative process to promote sustainable management of coastal zones. It covers the full cycle of information collection, planning (in its broadest sense), decision making, management and monitoring of implementation. ICZM uses the informed participation and cooperation of all stakeholders to assess the societal goals in a given coastal area, and to take actions towards meeting these objectives. ICZM seeks, over the long term, to balance environmental, economic, social, cultural, and recreational objectives, all within the limits set by natural dynamics. 'Integrated' in ICZM refers to the integration of objectives and to the integration of the many instruments needed to meet these objectives. It means integration of all relevant policy areas, sectors, and levels of administration. It means integration of the terrestrial and marine components of the target territory, in both time and space. The idea of ICZM is to participate in a holistic approach towards beach restoration, thus nourishment of resources from surrounding shores (Paeniu, et

al (2015). [37], within the coral reefs and along the beach and further inland is the primary objective of this technology to pursuit as nature solution to the impact of climate change particular soil erosion and coastal flooding. The idea is to prevent the removal and subsequent extraction of beach resources through sand mining and de0vegetation of coastal habitats. inshore and exploitation of marine resources. **See figure 1 below**.

Figure 1.3.1 Objective of Integrated Coastal Zone Management



<u>Climate Rational for ICZM technology.</u>

Satellite data indicates that Solomon Islands experienced SLR by about 7010 mm per year since 1993. This triples the global average of 2.8–3.6 mm per year. This higher rate of SLR may also related to natural fluctuations that take place year to year or decade to decade caused by phenomena such as the El Niño0Southern Oscillation. Engaging in Locally Managed Marine Area (LMMA) as a mode of ICZM together with beach nourishment is critical to protect communities from soil erosion but at same time participating in conserving the marine resources from exploitation as food security for future generations. Integration of LMMA together with vegetation replanting strategy may also provide opportunity for the communities to nourish the beaches, replant vegetation as form of natural re0enforcement against coastal erosion and SLR.

Benefit of ICZM technology

Establishment of an ICZM enables communities to make decisions on which fishing methods and other activities can or cannot be carried out in their waters. Substantial involvement of communities and/or local governments in decision0making and implementation. It also increases the volume of fish in the managed areas and thus lead to increase in catches when permitted to fish (Aswani & Furusawa (2007).

[37] Paeniu, L., Iese, V., Jacot des Combes, H., De Ramon N'Yeurt, A., Korovulavula, I. T., Koroi, A., ... & Devi, A. (2015). Coastal protection: Best practices from the Pacific.

	As examples, ICZM can benefit a country or region through any or all of the following: 1. Facilitating sustainable economic growth based on natural resources 2. Conserving natural habitats and species 3. Controlling pollution and the alteration of shorelands and beachfronts 4. Controlling watershed activities that adversely affect coastal zones 5. Controlling excavation, mining and other alteration of coral reefs, water basins, and sea floors 6. Rehabilitating degraded resources 7. Providing a mechanism and tools for rational resource allocation
2.3 Technology Characteristics/ Highlights: Few bullet points, i.e. low/high cost; advance technology; low technology.	• medium cost (potentially high but medium initial cost) • Low technology (requires land owning group identification) • Soft and Hard Technology • Soft technology includes the policies surrounding ICZM
2.4 Institutional and Organizational Requirement:	There needs to be soft technology Regulation about the ICZM and coastal area removal of beaches The responsible authorities include: MECDM, Ministry of Fisheries and Marine Resources and respective communities.
3.0 Operations and maintenance	
3.1 Endorsement by Experts:	To increase community resilience and prevent coastal erosion, replanting of vegetation refurbishment of coastal areas and establishment of LMMAs or MPAs within the selected ICZM sites across the island is important. This would ensure integrated strategies against soil erosion and marine resource management. It further ensures continuity of business as usual along the coastal areas even during strong winds, storm surges and catastrophic events and food security at these implementation areas. Coastal communities would feel protected against the exposure and vulnerability that climate change and extreme storm events brought if there is no buffer of vegetation and natural beaches at these identified sites. Both private and business houses would concentrate on their normal day to day operations and not have to worry about their homes and businesses been carried away in the next disaster events, and at the same time conservation of marine resources for future uses.
3.2 Adequacy for current climate: Are there negative consequences of the adaptation option in the current climate? Some adaptation	Fits well for both the current and future expected climate change across the country. Since the forecasts are predicting future SLR with increasing intensity and frequency of storm surges which may cause further coastal erosion and washing away of beaches, such integrated beach revegetation and nourishment and ICZM at identified vulnerable locations across the country would be beneficial to the communities at large. The ICZM would assist conserve the marine resources for future use as we face impacts of climate change.

may be targeted at the future climate but may have costs and consequences under the current climate.	
3.3 Size of beneficiaries group: Technology that provides small benefits to larger number of people will often be favored over those that provide larger benefits, but to fewer people.	Beneficiaries include the household sectors, business houses, government departments, schools, health and private sectors and communities at the ICZM sites. The beach vegetation and nourishment would ensure the general community at large is protected. There will be no individual or group of people who would be primary beneficiaries of such developments. While homes located closer to the identified locations may directly benefit from such undertakings, the positive externality to the community at large is immeasurable. The benefits are distributed and shared among almost everyone on the Islands.
4. Costs	
4.1 Cost to implement adaptation options: Cost measures	Initial cost includes the cost of the ICZM regulation drafting and consultation. The MECDM and MFMR although are responsible for overseeing the environment and marine resource management across the country, they do not have the capacity to provide some of the costs as mentioned above. Therefore, this ICZM technology would require the following costs to fully implement this adaptation option: Additional costs (V&A, EIA, & beach nourishment) .5 Cost of LMMA, MPA regulations within the ICZM areas & monitoring 5.5 **Total cost = USD6.00**
4.2 Additional costs to implement adaptation option, compared to "business as usual"	The additional costs which may be required to implement this technology includes cost for beach nourishment, replanting of trees to ensure long term resilience is achieved at these coastal areas and cost of monitoring the LMMAs/MPAs within the ICZM sites. The cost is factored into the initial costs above.
5.0 Benefits	
5.1 <u>Development impact, indirect /benefits</u>	The ICZM and coastal area restoration and beach nourishment would reduce coastal erosion and bring confidence in the communities along the coastal areas that their properties are safe and can continue with development initiatives at these sites. At the same time provide food security and conservation of marine resources. Below are likely be some of the major benefits on the communities from the technology. • Safety and food security of the community alone the coast lines: it is the primary motivator for the implementation the beach vegetation

	replenishment and nourishment, meaning more households/ public depends on the secure and safer environment from coastal erosion. • Contributing to food security by households participating in backyard gardening since they now have access to safer land, growing some of their basic crops supplementing their budgets. Reallocate funding to spend on other economic development by the government rather than just building a seawall or barriers which would be seen uneconomical and deemed mal adaptation by IPCC, reputable body in climate change. • The marine resources and environment are also protected with the inclusion of LMMA and MPA into this integrated approach of conservation across the country. This investing in resources for future generations.
5.2 Economic benefits: Employment – Jobs Investment – Capital requirements	Investment into ICZM establishments across the provinces would create tens and hundreds of jobs to locals for the next 12 to 24 months. • This will ensure that local land owing groups participate in managing their resources. • The general community will continue to live and operate their business at the coastal areas thus contributing to the economic growth of the country. • Solomon Islanders that participate in this technology would earn the income and support their families to meet school fees and other livelihood expenses. • The integration of the approach ensures that community's benefit from these resources.
5.3 Social benefits : Income Income generation and distribution Education – Time available for education Health – Number of people with different diseases.	• The Social benefit of this technology on the households is that they are secured and protected from impact of SLR and coastal erosion. The little money they earn could now be invested in other income generating activities to improve their livelihood rather than worrying about the coastal erosion. • The coastal areas which are vulnerable to coastal erosion and SLR will now have some buffer against salt water intrusion and conservation of their marine resources. The responsible authorities must ensure that primary and secondary schools across the island are safe and secure from such impact of SLR. This will ensure the youths and the weak are protected from the SLR and soil erosion.

	• Subsequently, health and gender issues will be considered and filtered through every process of decision making in this project.
5.4 Environment benefits: Reductions in GHG emissions, local pollutants, Ecosystem degradation etc.	Soil erosion caused by SLR will be controlled and managed at these sites because of coastal land vegetation and beach nourishment etc. Replanting of vegetation at these sites may also contribute towards reduction of the GHG and pollution into the atmosphere. A healthy marine resource habitat will also produce more oxygen into the air which is critical for our survival.
6.0 Local context	
6.1 Opportunities and Barriers: Barriers to implementation and issues such as the need to adjust other policies.	ICZM is a technology that can be employed in conjunction with other adaptation measures such as coastal zone management, sea wall and barrier constructions, coral reef rehabilitation etc. In the case of the Solomon Islands there must be a lot of investment and commitment into these options to make them viable. ICZM and beach nourishment would increase the opportunities for effective resilience with different purposes (domestic, agriculture use, etc.) Barriers include lack of access to finance to invest in land fillings along the vulnerable coastal areas, policies by the National government surrounding management of beaches including ICZM and awareness by communities on the devastation impact of climate change etc. This option would be relatively cheaper compared to other adaptations options. Technical requirements such as V&A, EIA and structural design may increase implementation and maintenance costs. Although coastal land vegetation and beach nourishment may be accruing some initial costs, it is cheaper on the longer run. A low level of public awareness is critical to support the technology.
6.2 Status: Status of technology in the country	Certain communities have already participated in programs design to protect coastal soil erosion throughout the country. However, the rate of soil erosion is worrisome and thus calls for prioritizing of this technology at selected vulnerable sites across the provinces, mainly low laying islands. ICZM will be the drivers to protect the coastal areas from erosion. Timeframe is continuous.
6.3 Timeframe: Specify timeframe for implementation	36 months
6.4 Acceptability to local stakeholders: Where the technology will be attractive to stakeholders	Yes

Adaptation Technology 4 : Sand bag technology – Coastal erosion management

Sand bag technology soil erosion	
1. Sector	Coastal erosion Management
2. Technology Characteristics	
2.1 Technology Name:	Production of Sand bag technology
2.2 Introduction:	**Background** The sandbag seawall is a protective measure to stop erosion especially along the coastal line areas. This is relatively cheaper and effective way of construction of sea wall than concrete structure because they are made up with sand, more abundantly found across the country. Furthermore, because of the way the sandbag seawall is constructed, the repairs required are extensive and involve replacing most of the existing wall. "The works could take up to three (3) to six (6) months to complete depending on the six and length of the sea wall. **Figure 1.4.1. Sand bag technology**  About 85 percent of the country's population live in more than five thousand (5,000) villages across the country. Majority of these villages settled within 1.5km along the coast lines and river banks. A good number of these villages are continuously threatened by sea level rise (SLR) and coastal soil erosion. Soil erosion is the washing away of the upper layer of soil either into the ocean or downhill depending on the location, it is a form of soil degradation. There are many reasons for coastal soil erosion across the provinces and villages in the country. These include human activities such as removal of beaches and destruction of the natural habitat in pursuit of development, SLR, coastal flooding and storm surges. The afore mentioned climatic events embed with the melting of the glaciers and ice sheet which continues to accelerate the warming of the ocean, these lowlying

	villages will continue to absorb the multiple impact of climate change because of their proximity to coast line areas. **<u>Climate Rationale for this technology</u>** Satellite data indicates that the country (Solomon Islands) experienced SLR by about 7 to 10 mm per year since 1993. This triples the global average of 2.8–3.6 mm per year. This higher rate of SLR may also related to natural fluctuations that take place year to year or decade to decade caused by phenomena such as the El Niño Southern Oscillation. Due to increasing impact of climate change, it is unequivocal that its consequences will be aggravated more than the past, particularly on these coastal communities. Introduction of sand bags to build barriers against soil erosion along the coastal areas could be perhaps seen as supportive strategy that can be used to increase resilience, adaptation, and food security at diverse locations. Engaging in sand bags together with beach nourishment is critical to protect communities from soil erosion but at same time participating in conserving the marine resources from exploitation as food security for future generations. **<u>Rational for this technology</u>** Integration of Sand bag barrier together with vegetation replanting strategy may also provide opportunity for the communities to nourish the beaches, replant vegetation as form of natural reinforcement against coastal erosion and SLR. The technology is cheaper and is nature based solution, because of usage of the sand in the bag. Working together with MECDM and Ministry of Provincial government the participating communities would identify the coastal areas which are in urgent need to restore their beaches from coastal soil erosion. The population of the country is more than 720,000 people and the destruction of the coastal areas through human actions are also accelerating. This calls for civic awareness on this integration approach to be inserted as part of this technology – i.e., ensure awareness of public on the need to look after the beaches and villages for future generations.
2.3 Technology Characteristics/ Highlights: Few bullet points, i.e., low/high cost; advance technology; low technology.	• medium cost (potentially high but medium initial cost)

	• Low technology (requires landfills on beaches and revegetation) • Hard Technology
2.4 Institutional and Organizational Requirement:	There needs to be soft technology Regulation about establishment of villages and removal of sand at coastal areas. The responsible authorities include: MECD & MLHS.
3.0 Operations and maintenance	
3.1 Endorsement by Experts:	To increase community resilience and prevent coastal erosion, sand bag production embed with of vegetation refurbishment of coastal areas and establishment of conservation at selected vulnerable sites across the provincial communities are important. This would ensure integrated strategies against soil erosion and marine resource management. It further ensures continuity of villages along the coastal areas even during strong winds, storm surges and catastrophic events and food security at local levels are certain. The sand bags act barriers against the exposure and vulnerability that climate change and extreme storm events brought if there is no buffer of vegetation and natural beaches at these identified sites. Both private and business houses would concentrate on their normal day to day operations and not have to worry about their homes and businesses been carried away in the next disaster events, and at the same time conservation of marine resources for future uses.
3.2 Adequacy for current climate: Are there negative consequences of the adaptation option in the current climate? Some adaptation may be targeted at the future climate but may have costs and consequences under the current climate.	Fits well for both the current and future expected climate change across the provincial villages. Since the forecasts are predicting future SLR with increasing intensity and frequency of storm surges which may cause further coastal erosion and washing away of beaches, such integrated beach revegetation and nourishment and production of sand bag to be established as barriers against soil erosion at identified vulnerable locations around the provinces and villages would be beneficial to the communities at large. The sand bag barrier against soil erosion would prevent coastal flooding assist communities build resilience at the local levels.
3.3 Size of beneficiaries group: Technology that provides small benefits to larger number of people will often be favored over those that provide larger benefits, but to fewer people.	Beneficiaries include the household sectors, business houses, schools, health, private sectors, and communities who have owned and settled within the targeted zone. The beach sand bag barrier technology would provide opportunity for vegetation and nourishment to ensure the general community at large is protected. There will be no individual or group of people who would be primary beneficiaries of such developments. While homes located closer to the identified locations may directly benefit from such undertakings, the positive externality to the

	community at large is immeasurable. The benefits are distributed and shared among almost everyone within the vicinity of the prospective project.
4. Costs	
4.1 Cost to implement adaptation options: Cost measures	Initial cost includes the cost of "grounds work' (landfills), sand bag construction, cost of V&A reports and beach nourishment site, cost of the land acquisition for such project if is publicly intended. The MECDM and MFMR although are responsible for overseeing the environment and marine resource management in the country, they do not have the capacity to provide some of the costs as mentioned above. Therefore, this integrated technology would require the following costs to fully implement this adaptation option: The cost of groundworks and sand bag production (landfills) USD 7.5M Additional costs (V&A, EIA, & beach nourishment) .5 Cost of regulation and monitoring .5 **Total cost = USD8.5M**
4.2 Additional costs to implement adaptation option, compared to "business as usual"	The additional costs which may be required to implement this technology includes cost for beach nourishment, replanting of trees to ensure long term resilience is achieved at these coastal areas. The cost is factored into the initial costs above.
5.0 Benefits	
5.1 <u>Development impact, indirect /benefits</u>	The sand bag barrier development, embedded with new integrated and coastal revegetation restoration would reduce coastal soil erosion and bring confidence to the communities along the coastal areas that their properties are safe and can continue with proposed development initiatives. At the same time provide food security and conservation of marine resources. Below are likely be some of the major benefits on the communities from the technology. • Safety and food security of the community alone the coast lines: it is the primary motivator for the implementation the beach vegetation replenishment and nourishment, meaning more households/ public depends on the secure and safer environment from coastal erosion.

	• Contributing to food security by households participating in backyard gardening since they now have access to safer land, growing some of their basic crops supplementing their budgets. Reallocate funding to spend on other economic development by the government rather than just building a seawall or barriers which would be seen uneconomical to this cash trapped nation.
5.2 Economic benefits: Employment –Jobs Investment – Capital requirements	Investment into coastal area vegetation restoration and provision of sand bag barrier development at various locations across the provinces would create tens and hundreds of jobs to local Solomon Islanders for the next 12 to 24 months. • This will ensure that Solomon Islanders participate in sand bag production, landfilling, soil restoration, rehabilitation of the beaches and monitoring and surveillance over implemented sites. • The general community will continue to live and operate their business at the coastal areas thus contributing to the economic growth of the country. • Solomon islander's that participate in this technology would be able to spend their much needed income on other family commitments and rather than spending on re-enforcement barriers to household resilience to the impact of climate change.
5.3 Social benefits: Income Income generation and distribution Education – Time available for education Health – Number of people with different diseases.	• The Social benefit of this technology on the households is that they are secured and protected from impact of SLR and coastal erosion. The little money they earn could now be invested in other income generating activities to improve their livelihood rather than worrying about the coastal erosion. • The coastal areas which are vulnerable to coastal erosion and SLR will now have some buffer against salt water intrusion. The responsible authorities must ensure that primary and secondary schools across the island are safe and secure from such impact of SLR. This will ensure

	the youths and the weak are protected from the SLR and soil erosion. • Subsequently, health and gender issues will be considered and filtered through every process of decision making in this project.
5.4 Environment benefits: Reductions in GHG emissions, local pollutants, Ecosystem degradation etc.	Soil erosion caused by SLR will be controlled and managed at these sites because of coastal land vegetation restoration etc. Replanting of vegetation at these sites may also contribute towards reduction of the GHG and pollution into the atmosphere. A healthy marine resource and environment will also produce more oxygen into the air which is critical for our survival.
6.0 Local context	
6.1 Opportunities and Barriers: Barriers to implementation and issues such as the need to adjust other policies.	Sand bag barrier construction is a technology that can be employed in conjunction with other adaptation measures such as coastal zone management, sea wall and barrier constructions, coral reef rehabilitation etc. In the case of Solomon Islands there must be a lot of investment and commitment into these options to make them viable. Integrated coastal land vegetation, beach nourishment and sand bag barrier development would increase the opportunities for effective resilience with different purposes (domestic, agriculture use, etc.) Barriers include lack of access to finance to invest in land fillings along the vulnerable coastal areas, policies by the national government surrounding management of beaches including awareness by communities on the devastation impact of climate change etc. This option would be relatively cheaper compared to other adaptations options. Technical requirements such as V&A, EIA and structural design may increase implementation and maintenance costs. Although coastal land vegetation and beach nourishment may accrue some initial costs, it is cheaper on the longer run. A low level of public awareness is critical to support the technology.
6.2 Status: Status of technology in the country	Certain communities have already participated in programs design to protect coastal soil erosion across the provinces. However, the rate of soil erosion is worrisome and thus calls for prioritizing of this technology at selected vulnerable sites across the provinces. Sand bag barrier construction will be the drivers to protect selective coastal areas from erosion. Timeframe is continuous.
6.3 Timeframe: Specify timeframe for implementation	24 months at selected sites

6.4 Acceptability to local stakeholders: Where the technology will be attractive to stakeholders	Yes

Adaptation Technology 5 : Climate Change Trust Fund

Climate Change Trust Fund	
1. Sector	Coastal Zone Management
2. Technology Characteristics	
2.1 Technology Name:	**Climate Change Trust Fund technology**
2.2 Introduction:	**<u>Background.</u>** A trust fund is a legal entity that holds property or assets on behalf of another person, group, or organization. It is an estate planning tool that keeps your assets in a trust managed by a neutral third party, or trustee. A trust fund can include money, property, stock, a business, or a combination of these instruments or assets. A climate Change trust fund is therefore a legal entity which is established by law for the country to invest in money purposively to meet short and long term funding requirements for adaptation and mitigation activities to the impact of climate change. There are generally three types of Trust Funds available in this technology. There are: (i) Revolving Fund A revolving cash fund is a specific amount of money used to purchase inexpensive items. It is called revolving cash because as money is expended it is constantly being replaced. (ii) Sinking Fund – In more traditional circles, "sinking fund" refers to money set aside to pay off long term debt such as a bond. The term “sinking” likely refers to the decreasing level of debt remaining as it gets paid off. (iii) Endowment Fund Endowed funds differ from others in that the total amount of the gift is invested. Each year, only a portion of the income earned is spent while the

remainder is added to the principal for growth. In this respect, an endowment is a perpetual gift.

Climate Rationale for the Technology

About 85 percent of the country's population live in more than five thousand (5,000) villages across the country. Majority of these villages settled within 1.5km along the coast lines and river banks. A good number of these villages are continuously threatened by sea level rise (SLR), storm surges, saltwater inundation, and climate related extreme events. For example, SLR stands at 7 to 10mm mean on annual basis, this tripled the global annual mean. Additionally, there is an estimated 7 to 9 cyclones per year across the PICs including Solomon Islands, with greater intensity, frequency, and duration of these events.

Establishment of Climate Change Trust Fund

For the communities to respond effectively to the impact of climate change, the government must formulate and design adaptive strategies proportionately to the level of risk climate change events have exposed these communities to. One of which, as stated in the NDC is the establishment of Climate Change Trust Fund as technology to up scale the investment which donor partners and government have been injecting on adaptation and mitigation at the local level across the country.

Figure 1.5.1 Climate Change Trust Fund Endowement

At the national level, Climate Change Trust Fund provides supplementary financial support to both pipeline and current adaptation and mitigation efforts through scaling up of community based solar electrification projects and implementing coastal protection measures. The CCTF should constituted of two elements: an endowment account comprising 80% of the initial capital, which will be invested in a low risk financial instrument (or bank account) and an operational account which will be used to finance projects for both adaptation and mitigation of nature.

	The drive behind the Fund is to empower both the government and communities to take ownership of climate related activities implemented at both levels. The Fund allows for government to shift from short term project based initiatives to more long term programmatic pathways that can be sustained via sustainable climate financing mechanisms. The population of the country is more than 720,000 people and the CCTF could play critical role in providing the ongoing small adaptive and resilience activities on the ground. This is to ensure that the national government focus more on strategic directions and leave these relatively minimal activities handle by the fund.
2.3 Technology Characteristics/ Highlights: Few bullet points, i.e., low/high cost; advance technology; low technology.	• medium cost (potentially high but medium initial cost) • Low technology (requires financial policies regulations on how to run the fund). • Org Technology
2.4 Institutional and Organizational Requirement:	There is a need to develop soft technology specifically on how to manage and operate the Climate Change Trust Fund.
3.0 Operations and maintenance	
3.1 Endorsement by Experts:	The CCTF is critical for upscaling local communities to building resilience and adaptation at the local level. The government could seek technical experts and advises on how to operate this technology prior to establishment and there are many locals who are capable in managing these types of facilities.
3.2 Adequacy for current climate: Are there negative consequences of the adaptation option in the current climate? Some adaptation may be targeted at the future climate but may have costs and consequences under the current climate.	The cost and economic ramification of the impact of climate change is projects to increase over the coming years. Thus, having a CCTF would be providing financial pathway to assisting communities in the future.
3.3 Size of beneficiaries group: Technology that provides small benefits to larger number of people	Beneficiaries include the household sectors, business houses, schools, health, private sectors, and communities across the country.

will often be favored over those that provide larger benefits, but to fewer people.	
4. Costs	
4.1 Cost to implement adaptation options: Cost measures	The initial cost in establishment include: Engagement of consultants (Local and International) to develop the policies and guidelines for the establishment and operationalization of the technology. Therefore, this integrated technology would require the following costs to fully implement this adaptation option: The cost of consultants) USD500K Additional cost of Establishment USD$3M **Total cost = USD3.5M**
4.2 Additional costs to implement adaptation option, compared to "business as usual"	There is minimal additional cost required to the initial costs explained above.
5.0 Benefits	
5.1 Development impact, indirect /benefits	Trust funds are used as a financing mechanism to implement national and international cooperation and development measures. One or more donors pool their financial contributions in a trust fund set up to respond to major challenges, such as the specific needs triggered by natural disasters, conflicts, or significant pandemics. This CCTF ensures that the communities will have access to funding when its necessary and needed. Communities could also participate in build back better strategies after climatic induced events. For example, flooding that destroyed most of Mataniko river side homes, the communities could have access to funds to assist them with home and livelihood rebuilding.
5.2 Economic benefits: Employment –Jobs Investment – Capital requirements	Investment into Trust Fund will have great impact on to the economy. The funds invested will have multiple effect on the communities. It will assist with job creation, tax income for the government, livelihood improvement and empowerment. • Provides short term and long term climate financing at the local levels.

	• International Donors including the government must provide relevant capital for the establishment of the fund.
5.3 Social benefits: Income Income generation and distribution Education – Time available for education Health – Number of people with different diseases.	The Social benefit of this technology on the households is that their adaptation needs will be quickly and effectively addressed at times of distress or after experiencing climatic extreme events. The coastal areas which are vulnerable to coastal erosion and SLR will now have some buffer against salt water intrusion. The responsible authorities must ensure that primary and secondary schools across the island are safe and secure from such impact of SLR. This will ensure the youths and the weak are protected from the SLR and soil erosion. Subsequently, health and gender issues will be considered and filtered through every process of decision making in this project.
5.4 Environment benefits: Reductions in GHG emissions, local pollutants, Ecosystem degradation etc.	Soil erosion caused by SLR will be controlled and managed at these sites because of coastal land vegetation restoration etc. Replanting of vegetation at these sites may also contribute towards reduction of the GHG and pollution into the atmosphere. A healthy marine resource and environment will also produce more oxygen into the air which is critical for our survival.
6.0 Local context	
6.1 Opportunities and Barriers: Barriers to implementation and issues such as the need to adjust other policies.	There is potential that such trust fund could grow and provide greater better financial leverage for the government and donor partners to meeting rehabilitation needs after climate induced disaster events. Barrier – there must be propre policy and guidelines established for such creation.
6.2 Status: Status of technology in the country	This is still a new concept in the country, although been already established in other countries already.
6.3 Timeframe: Specify timeframe for implementation	24 months at selected sites

6.4 Acceptability to local stakeholders: Where the technology will be attractive to stakeholders	Yes

Adaptation Technology 6 : Sea wall (Nature based solution)

Sea wall (Nature based solution)	
1. Sector	Coastal Erosion (CE)
2. Technology Characteristics	
2.1 Technology Name:	Construction of nature -based sea wall for resilience at selective sites across the provinces.
2.2 Introduction:	**<u>Background</u>** Nature -based solution (NbS) refers to a suite of actions or policies that harness the power of nature to address some of our most pressing societal challenges, such as threats to water security, rising risk of disasters, or climate change. Sea wall NbS is typically designing of the eco system providing the community as barriers against coastal erosion, SLR, storm surges and other extreme events. Compared to concrete structured, sea wall is built as a rubble mound structure, as a block seawall, steel, or wooden structure by NbS is designed and build by the ecosystem itself. Though, both structures are designed to withstand severe wave action and storm surges. One of the fundamental gains from NbS sea wall is, it is environmentally friendly while concrete structures have severe negative impact on the environment including human beings. **Figure 1.6.1** below is a NbS sea wall in Fiji. **Figure 1.6.1: Seawall structure**  **<u>Climate Rational for the technology</u>** The melting of the glaciers and ice sheet together with the warming of the ocean will continue to negatively impact the

	Pacific Island countries because of their proximity to coastlines. As ocean water warms it expands causing the sea level rise (SLR), salt water inundation and coastal area erosion. Satellite data indicates that Solomon Islands experienced SLR by about 70 10 mm per year since 1993. This is larger than the global average of 2.8–3.6 mm per year. This higher rate of SLR may also be related to natural fluctuations that take place year to year or decade to decade caused by phenomena such as the El Niño Southern Oscillation. Due to increasing impact of climate change, it is unequivocal that its consequences will be aggravated more than the past, particularly on these coastal communities along the Island. **Sea wall (NbS)** is therefore seen as supportive strategy that can be used to increase resilience and adaptation across the provinces. NbS Sea wall design is therefore critical to rehabilitating the environment, food security and human existence at the potential implemented sites. **Figure 1.6.2: Sea wall in the Western Province**  The population across the country now stands over 720,000 people and the destruction of the coastal areas through human actions are also increasing at alarming rate. Thus, through this technology, the communities should also include a civic component which responsible authorities must engage in awareness on the need to incorporate the ecosystem as form of NbS sea wall we face the reality of climate change across the region and particularly this the country.
2.3 Technology Characteristics/ Highlights: Few bullet points, i.e. low/high cost; advance technology; low technology.	• High cost (potentially high initial cost) • Low technology (requires the ecosystem, rocks at some areas, movement of ground, re0planting of native trees, etc.)

	• Hard Technology
2.4 Institutional and Organizational Requirement:	The MECDM together with Ministry of Lands, Housing and Survey (MLHS) will provide the Institutional and organizational support to the formulation and implementation of this project.
3.0 Operations and maintenance	
3.1 Endorsement by Experts:	To increase community resilience and prevent coastal erosion, the use of NbS Sea walls along the coastal line areas at selected vulnerable sites across the provinces is important. This would ensure continuity of business along the coastal areas even during strong winds, storm surges and catastrophic events. Coastal communities would feel protected against the exposure and vulnerability that climate change and extreme storm events brought if there is no wall build at these identified sites. Business houses would concentrate on business operations and not have to worry about their homes been carried away in the next few years. Furthermore, the NbS sea wall provides some assurance of hope and confidence that the environment is safe and some certainty of food security if they are protected as part of the suit.
3.2 Adequacy for current climate: Are there negative consequences of the adaptation option in the current climate? Some adaptation may be targeted at the future climate but may have costs and consequences under the current climate.	Fits well for both the current and future expected climate change across the country. Since the forecasts are predicting future SLR with increasing intensity and frequency of storm surges which may cause further coastal erosion and washing away of beaches, such NbS sea wall constructions at identified vulnerable locations around the island would be beneficial to the communities at large.
3.3 Size of beneficiaries group: Technology that provides small benefits to larger number of people will often be favored over those that provide larger benefits, but to fewer people.	Beneficiaries include the household sectors, business houses, government departments, schools, health, and private sectors. The NbS sea wall design would ensure the general community at large is protected. There will be no individual or group of people who would be primary beneficiaries of such developments. While homes located at the identified locations may directly benefit from such undertakings, the positive externality to the community at large is immeasurable. The benefits are distributed and shared among almost everyone on the Islands.
4. Costs	

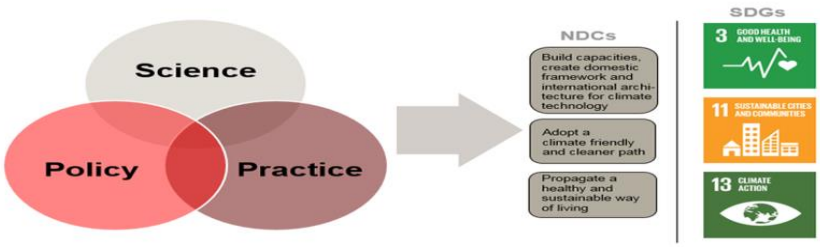
4.1 Cost to implement adaptation options: Cost measures	Initial cost includes the cost of the sea wall structure, cost of design, cost of EIA, cost of V&A reports and beach replenishment or nourishment. The MECDM although over sees the environment management in the country, it does not have the capacity to provide some of the costs as mentioned above. Therefore, the technology would require the following costs to fully implement this adaptation option: The cost of Sea wall structures USD4.5M, Additional costs (V&A, EIA, Design, & materials) 3.5M Total cost = **USD8.0M**
4.2 Additional costs to implement adaptation option, compared to "business as usual"	There wouldn't be additional costs incurred onto the costs as detailed above. All costs are factored into the initial costs above.
5.0 Benefits	
5.1 <u>Development impact, indirect /benefits</u>	The new NbS sea wall initiative would reduce coastal erosion and bring confidence in the communities along the coast lines areas that their properties are safe and can continue with development initiatives at these sites. Below would likely be some of the major benefits on the communities. • Eco system is restored along the implemented coastal line communities. There is high confidence of wellbeing and food security. • Safety and security of the community alone the coast lines: it is the primary motivator for the implementation this sea wall structure, meaning more households/ public depends on the secure and safer environment from coastal erosion. • Contributing to food security by households participating in backyard gardening since they now have access to safer land growing some of their basic crops supplementing their budgets. • There wouldn't be disruptions on major infrastructures such as roads, electricity and perhaps water when it is reticulated. • More funding will spend on economic development by the government rather than just building a

	seawall or barriers which would be seen uneconomical to this cash trapped nation.
5.2 Economic benefits: **Employment –Jobs** **Investment** – Capital requirements	Construction of the NbS sea wall various locations around in the country would create tens to hundreds of jobs to Solomon Islanders for the next 12 to 18 months. • This will ensure that Solomon Islanders participate in construction, maintenance, and rehabilitation of the beaches during the implementation stages. • The general community will continue to live and operate their business at the coastal areas thus contributing to the economic growth of the country. • The locals that participate in this technology would earn the income and support their families to meet school fees and other related expenses.
5.3 Social benefits: **Income** Income generation and distribution **Education** – Time available for education **Health** – Number of people with different diseases.	• The Social benefit of this technology on the households is that they are secured and protected from impact of SLR and coastal erosion. The little money they earn could now be invested in other income generating activities to improve their livelihood rather than worrying about the coastal erosion. • The sea wall will be constructed at areas which are vulnerable to coastal erosion and SLR. The responsible authorities must ensure that primary and secondary schools across the island are safe and secure from such impact of SLR. This will ensure the youths and the weak are protected from the SLR and soil erosion. • Subsequently, health and gender issues will be considered and filtered through every process of decision making in this project.
5.4 Environment benefits:	Coastal erosion caused by SLR will be controlled and managed at these sites because of the NbS Sea wall design at the local level. Addition to the revitalization of the

Reductions in GHG emissions, local pollutants, Ecosystem degradation etc.	ecosystem the replanting of vegetation at these sites may also contribute towards reduction of the GHG and pollution into the atmosphere.
6. Local context	
6.1 Opportunities and Barriers: Barriers to implementation and issues such as the need to adjust other policies.	NbS Sea wall technology could be employed in conjunction with other adaptation measures such as Integrated Coastal zone Management and coastal vegetation restoration. In the case of Solomon Islands there must be a lot of investment and commitment into these options to make them viable NbS Sea wall implementation could increase the opportunities for effective resilience with different purposes (domestic, agriculture use, etc.) Barriers include lack of access to finance for promotion and awareness of communities etc. According to IPCC report, sea wall (hard structure) is an example of mal adaptation at the local communities. Thus, communities must made aware of this technology. Furthermore, higher amount of initial investment may involve compared to other adaptations options. Technical requirements such as V&A, EIA and structural design may increase implementation and maintenance costs. – Although NbS sea wall design may not be a popular option in the country it is cheaper on the longer run. A high level of public awareness is critical to support the technology.
6.2 Status: Status of technology in the country	Certain communities have already participated in forms of NbS sea wall across the country. However, the rate of soil erosion is worrisome and thus calls for prioritizing of this technology at selected vulnerable sites across the provinces.
6.3 Timeframe: Specify timeframe for implementation	36 months
6.4 Acceptability to local stakeholders: Where the technology will be attractive to stakeholders	Yes

Annex 4 Technology Factsheets for Relocation Adaptation

Adaptation Technology 1: Climate induced community relocation Policy

Climate Change Induced community relocation policy	
1. Sector	Climate migration Adaptation
2. Technology Characteristics	
2.1 Technology Name:	**"Climate Change Induced community relocation policy"**
2.2 Introduction:	**Background** Sealevel rise has caused the loss of several lowlying Pacific Islands, along with severe erosion and impact on livelihoods. Coastal aquifers – often the primary source of freshwater for islands– are facing decreased water quality from salinization due to both sealevel rise and increased flooding from coastal storms. This scenario is not only true for small island counties but also evidenced in some lowlying areas of the Solomon Islands. Moreover, with the last decade a study in the Solomon Islands has confirmed that the country has lost between 5 to 10 islands already in the western and eastern parts of the country. This is due to unprecedented sea level rise and coastal soil erosion across the country. As form of adaptation to this growing pressure on the lowlying communities, the government must come up with a national policy on climate change relocation. The policy must look at options and alternatives of relocation or communities in the country and how government, NGOs and other humanitarianbased organization address the issue at the local levels. Such policy should embrace science and practice. **Figure 2.1.1 Climate Change Policy**  **Climate Change Rationale** • Satellite data indicates that Solomon Islands experienced SLR by about 7 to 10 mm per year since 1993. This triples the global average of 2.8–3.6 mm per year. Beside this SLR and coastal erosion, saltwater inundation, storm surges, flooding and unprecedented king tights may lead to relocation or resettlement to higher grounds. For instances, the heavy rain and subsequent flooding along the Mataniko riverside in April 2014 had

	damaged homes and part of Honiara City, the capital of the Solomon Islands. • The above incident has triggered relocation of many homes along the Mataniko riverside to April Ridge, east of Honiara immediately after catastrophic event. Having said that, this relocation process was said to be stalled as there wasn't any government formal relocation policy established by the national government to formal the process. Ever since that failed relocation initiative, this policy has been a work in progress for the successive governments. • Thus, this technology calls for the national government to formulate and national policy and supported by a framework for community relocation due to impacts of both climatic and none climatic or extreme environmental events in the country. • The population on the Island is more than 720,000 people and policy on climate and no climatic induced events would assist respective communities to adapt to these ever-growing negative impacts. This calls for support and engagement from the highest level government, provincial and local levels.
2.3 Technology Characteristics/ Highlights: Few bullet points, i.e., low/high cost; advance technology; low technology.	• medium cost (potentially high but medium initial cost) • Low technology • Soft Technology,
2.4 Institutional and Organizational Requirement:	There needs to be soft technology cabinet and policy paper on the formulation of this climate change relocation policy. The responsible authorities include: MECDM,Ministry of Finance and Treasury (MoFT) and the Central Bank of Solomon Islands.
3.0 Operations and maintenance	

3.1 Endorsement by Experts:	Relocation due to impact of climatic induced events is always a concern for the national government and impacted communities across the country. In absence of policy or framework to facilitate such undertaking will always a hinderance to this initiative. Thus, it is imperative that the government through the MECDM and MHLS develop a policy to enhance many relocations initiative across the country.
3.2 Adequacy for current climate: Are there negative consequences of the adaptation option in the current climate? Some adaptation may be targeted at the future climate but may have costs and consequences under the current climate.	Fits well for both the current and future expected climate change across the country. Since many forecasting institutions are predicting future SLR with increasing intensity and frequency of storm surges which may cause further coastal erosion and washing away of beaches, flooding including environment extreme events. Climate Change induced Relocation is critical across the country. Such policy would see smooth implementation of relocation exercises across the country.
3.3 Size of beneficiaries group: Technology that provides small benefits to larger number of people will often be favored over those that provide larger benefits, but to fewer people.	Beneficiaries include the household sectors, business houses, schools, health and private sectors and communities who will be relocating under this new policy. There will be primarily no individual beneficiaries of such policy development. The communities who now in desperate need to relocate will be the first to benefit from such policy development.
4. Costs	
4.1 Cost to implement adaptation options: Cost measures	There is no initial cost in this technology. The MECDM and the MLHS will have to engage in a firm or individual who will provide legal service to draft such a policy development. The policy development would cost 1.2m Awareness and consultancy cost .8m **Total cost = USD2M**
4.2 Additional costs to implement adaptation option, compared to "business as usual"	Awareness and civic education, Land recording .5M
5.0 Benefits	

5.1 Development impact, indirect /benefits	Some vulnerable communities who are in dire need of relocation will be the first direct beneficiary of this climate induced relocation policy. Resource owners – The resource or landowning group should also be the beneficiary of such policy. This will ensure that the land to which the community is relocated are properly acquired and owned. The provincial and national government policies advocators will be indirect beneficiaries through this policy implementation. This will have a positive impact on their governance and social responsibility to affected communities at large. Donor partners will also benefit through this policy implementation – they will have atleast donate and invest their tax payer's money into a regulated and coordinated relocation program.
5.2 Economic benefits: Employment –Jobs Investment – Capital requirements	• The Climate induced Relocation policy will promote the following. (i) Land and Resource owners – Economic benefit to landowning groups. (ii) Individual households – Economic benefit to their livelihood from new business opportunities at new site, (iii) Employment – Individuals who participates in this process form of employment.
5.3 Social benefits: Income Income generation and distribution Education – Time available for education Health – Number of people with different diseases.	• The policy if implemented will have multiple effective on the communities: • The communities would be guided by such as policy when considering adopting relocation initiative as adaptation strategies. • Subsequently, health and gender issues will be considered and filtered through every process of decision making in this project.
5.4 Environment benefits: Reductions in GHG emissions, local pollutants, Ecosystem degradation etc.	• Such a policy would clearly stipulate how communities would deal with the physical environment in a relocation strategy.

6.0 Local context	
6.1 Opportunities and Barriers: Barriers to implementation and issues such as the need to adjust other policies.	• This is an opportunity to create history and formulate a land mark policy to enhance many climates induced disasters into the future.
6.2 Status: Status of technology in the country	• Some communities have already participated in relocation, but they never coordinated by a policy and framework by the national or provincial government.
6.3 Timeframe: Specify timeframe for implementation	• Lifelong implementation,
6.4 Acceptability to local stakeholders: Where the technology will be attractive to stakeholders	Yes

Adaptation Technology 2: Permanent resettlement technology

Permanent Relocation	
1. Sector	Climate Migration Adaptation
2. Technology Characteristics	
2.1 Technology Name:	Permanent or off-site relocation
2.2 Introduction:	**<u>Background</u>** Resettlement or Permanent relocation refers to transfer of homes and properties from one location to a much safer location with no intention of returning to the original or primary residence (Kleit & Manzo,2006)[38]. Permanent relocation may include a period of temporary relocation while a household locates a leadsafe dwelling unit to occupy as their new primary residence. Permanent relocation of a household includes service animals that accompany and provide services to a person with a disability. Pets are not considered service animals and are not eligible.

[38] Kleit, R. G., & Manzo, L. C. (2006). To move or not to move: Relationships to place and relocation choices in HOPE VI. *Housing Policy Debate*, *17*(2), 271-308.

In the context of Solomon Islands permanent relocation would refer to climatic or extreme environmental induced events which triggers relocation of a community to a new safe and higher location from impacts of climatic and extreme environment events.

As we all know there is growing pressure on the lowlying communities and the government must initiate permanent or off-site relocation to its vulnerable communities. Thus, this technology intends to provide pathway for vulnerable or impacted communities from climatic and extreme environmental events to safer locations.

Policy framework for this technology

Currently, there is no policy framework which is purposively established to regulate climate induced relocation process across the country, although there were already incidences of climate induced events which resulted in some self-initiated relocation initiatives (Ha'apio, et al, 2018)[39] across the country.

For example, literature has documented a few case studies which triggered some form of relocation by communities who were affected, without proper coordination at the national and provincial levels to facilitate such selfimposed relocation strategies. Although communities moved but some decided to return to their original location due to various reasons including no proper understanding of the type of relocation undertaken.

Figure 2.2.1 King Tight, Solomon Islands

Source: SPREP

Thus, this technology calls for the national government to formulate and support national policy on relocation and look at "permanent off-site

[39] Ha'apio, M., Wairiu, M., Gonzalez, R., & Morrison, K. (2018). Transformation of rural communities: lessons from a local self-initiative for building resilience in the Solomon Islands. *Local Environment, 23*(3), 352-365.

	relocation" as one of the technologies to consider when initiating community-based relocation due to impacts of both climatic and none climatic or extreme environmental events in the country. The population of the country is more than 720,000 people any relocation technology thoughtfully implemented on climate and non-climatic induced events would assist respective communities to adapt to these ever-growing negative impacts. This calls for support and engagement from the highest level government, provincial and local levels.
2.3 Technology Characteristics/ Highlights: Few bullet points, i.e. low/high cost; advance technology; low technology.	• medium cost (potentially high cost) • Low technology policy mechanisms • Soft and Hard Technology – Building of infrastructures.
2.4 Institutional and Organizational Requirement:	There needs to be soft technology to regulate the permanent off-site relocation, The responsible authorities include: MECDM, MPGIS, MLHS.
3.0 Operations and maintenance	
3.1 Endorsement by Experts:	To increase community resilience and prevent coastal erosion and reduce exposure to these climatic events, permanent off site relocation is a genuine strategy to adopt. However, it must be done according to the approve policy, taking into account, the culture, environment, livelihood, and many other factors of the vulnerable communities. As such experts within the MECDM, MLHS and MPGIS together with local experts and international partners will be available to support such policy implementation. This permanent off – site relocation strategy, because of its permanent nature must be throughout carefully before any implementation. The benefit of this the new location brings about new hope, new business opportunity, new transformative strategies of doing business and new community pathway towards building long term resilience and adaptation.
3.2 Adequacy for current climate: Are there negative consequences of the adaptation option in the current climate? Some adaptation may be targeted at the future climate but may have costs and	Fits well for both the current and future expected climate change across the Island. Since the forecasts are predicting future SLR with increasing intensity and frequency of storm surges which may cause further coastal erosion and washing away of beaches and increasing level of extreme events. Relocation is settling at a new site, which is "safe at higher ground" and provides hope and new meaning in life to vulnerable households and communities. Some negative implications with this technology:

consequences under the current climate.	• Relocated communities seems to have the fear of been removed from their original land (mother land). • Usually, they fear their right to ownership of land and property at this original village or site • Loss of cultural and traditional sites
3.3 Size of beneficiaries group: Technology that provides small benefits to larger number of people will often be favored over those that provide larger benefits, but to fewer people.	• Beneficiaries will be mostly the community at large. Any implementation of such policy must not be discriminatory.
4. Costs	
4.1 Cost to implement adaptation options: Cost measures	Initial cost would be establishment of a relation policy to implement this technology. The MECDM, Ministry of Provincial government and Institutional strengthening (MPGIS) and MLHS although are responsible for overseeing the environment, provincial settlements, and land related issues in the country, they do not have the capacity to provide some of the costs as mentioned above. Therefore, this integrated technology would require the following costs to fully implement this adaptation option: The cost of groundworks USD 8.3M Additional costs (V&A, EIA, & beach nourishment) 1M Cost of regulation and monitoring .7M **Total cost = USD 10M**
4.2 Additional costs to implement adaptation option, compared to "business as usual"	Additional cost of awareness and civic education.
5.0 Benefits	
5.1 <u>Development impact, indirect /benefits</u>	• The new Permanent off-site relocation will benefit community through various ways: In terms of development:

	• The new site would adopt build back better strategy, meaning their homes and infrastructure will be built with high standard, or maximum building code, • Opportunity for better planning and infrastructure design • Opportunity to build education and health facilities,
5.2 Economic benefits: Employment –Jobs Investment – Capital requirements	• Investment into this technology will have economic ripple effect on the community. • Land owning groups – Income for the lease or acquisition of their land (if acquired) will benefit the resource owners • Work force – young men and women will have employment from the initiative (relocation program) • The household involved will have direct benefit to livelihood programs and activities
5.3 Social benefits: Income Income generation and distribution Education – Time available for education Health – Number of people with different diseases.	• The social benefit of such initiative includes New Income generation opportunities, new opportunity for education of children at the site and new opportunity to build back better with improved health facilities and house living standards .
5.4 Environment benefits: • Reductions in GHG emissions, local pollutants,	• The permanent relocation strategy will ensure that the environment is intact and there is little destruction of such nature. • This means there will be more oxygen produced into the air thus contribution towards reduction of GHG emission. • Opportunity to introduce new NbS ecosystem infrastructures such as sea walls at the local levels.

• Ecosystem degradation etc.	
6.0 Local context	
6.1 Opportunities and Barriers: Barriers to implementation and issues such as the need to adjust other policies.	There is an opportunity for the community to collaborate to plan and execute an effective permanent relocation facility. This opportunity also extends to formulation of better model design and execution. • Beside the opportunities that exist, there are also some barriers that one must overcome to effectively implement such technology. • Foremost, there is no national policy on climate change induced community relocation in the country. This makes permanent relocation still yet not possible in the country.
6.2 Status: Status of technology in the country	• The relocation policy is new concept to the country; thus, it requires high level of government participation or buy into this policy. • Timeframe is continuous.
6.3 Timeframe: Specify timeframe for implementation	36 Months
6.4 Acceptability to local stakeholders: Where the technology will be attractive to stakeholders	Yes

Adaptation Technology 3: Safe home Technology

Safe home Temporary site relocation	
1. Sector	Climate migration Adaptation
2. Technology Characteristics	
2.1 Technology Name:	Safe home – or Temporary site relocation technology

2.2 Introduction:	**Background** Temporary relocation is the transfer of households from your permanent resident to a new site for a period less than 12 months. This relocation can be off-site or onsite depending on the project. These may also include onsite units which are temporary units that residents are provided that have features like a hotel room, such as bedding, water supply, road access but are not necessarily a hotel accommodation. According to the Director CCD[40], these are climate change resilience model homes for the Solomon Islands. Compared to permanent relocation or off-site relocation technology as covered in the previous Technology Fact Sheet (TFS), this relocation means to occupy a housing facility but with no intention of permanent settlement. Temporary off-site relocation is just for a short time frame when communities are working on strengthening their primary location or settlement. See Figure 2.3.1 climate change resilient building. **Figure 2.3.1 Climate Change Resilient Building, UNEP**  **Rational for Climate safe homes.** As we all know there is growing pressure on the lowlying communities and the government must initiate either, permanent or off site relocation or temporary off-site relation of to its vulnerable communities. Thus, this technology intends to provide pathway for vulnerable or impacted communities from climatic and extreme environmental events to temporary safer locations. The affected communities for examples, communities in parts of the Malaita or Temotu Provinces could have access to these facilities. The facilities could provide shelter for temporary basis as families are reluctant to move permanently from their primary residence or communities. While at this new safe home they could attend to better education, health, shelter, and food supplies. See Figure 2.2.2 climate change safe home New Zealand design. **Figure 2.3.2 Climate Change resilient home, NZ Design.**

[40] Director Climate Change Division (2021). Ministry of Environment, Climate Change, Disaster Management, and Meteorology, Honiara, Solomon Islands.

	 Thus, this technology also calls for the national government to formulate and support national policy on relocation and look at "permanent off-site relocation or temporary off-site relocation" as some of the technologies to consider when initiating community-based relocation due to impacts of both climatic and none climatic or extreme environmental events in the country. **<u>Benefit of this technology to the community.</u>** The population of the country is more than 720,000 people any relocation technology thoughtfully implemented on climate and no climatic induced events would assist respective communities to adapt to these ever-growing negative impacts. This calls for support and engagement from the highest level government, provincial and local levels. • medium cost (potentially high cost) • Low technology policy mechanism • Soft and Hard Technology – Building of infrastructures. There needs to be soft technology to regulate the permanent off site relocation, The responsible authorities include: MECDM, MPGIS, MLHS. Adoption of Temporary off-site relocation together with vegetation replanting strategy may also provide opportunity for the communities to nourish the beaches, replant vegetation as form of natural re-enforcement against coastal erosion and, the participating communities would identify the coastal areas which are in urgent need to restore their beaches from coastal erosion and at the same protecting the sea boundary from fishing and over harvesting.
2.3 Technology Characteristics/ Highlights:	• medium cost (potentially high but medium initial cost)

Few bullet points, i.e. low/high cost; advance technology; low technology.	• Low technology (requires landfills on beaches and revegetation) • Soft and Hard Technology
2.4 Institutional and Organizational Requirement:	The MECDM, MLHS and MPGIS all must look into this technology requirement.
3.0 Operations and maintenance	
3.1 Endorsement by Experts:	To increase community resilience and enhance fast tracking of relocation initiatives to potential new sites, the Temporary off-site relocation is critical to facilitating the process. As such experts within the MECDM, MLHS and MPGIS together with local experts and international partners will be available to support such policy implementation. This temporary off – site relocation strategy, because of its temporary nature must be throughout carefully before any implementation. The benefit of this the new location brings about new hope, new business opportunity, new transformative strategies of doing business and new community pathway towards building long term resilience and adaptation
3.2 Adequacy for current climate: Are there negative consequences of the adaptation option in the current climate? Some adaptation may be targeted at the future climate but may have costs and consequences under the current climate.	Fits well for both the current and future expected climate change at diverse locations across the provinces. Since the forecasts are predicting future SLR with increasing intensity and frequency of storm surges which may cause further coastal erosion and washing away of beaches, Temporary off-site relocation could be seen as the first step towards find lasting solutions to the climate induced disasters across the provinces.
3.3 Size of beneficiaries group: Technology that provides small benefits to larger number of people will often be favored over those that provide larger benefits, but to fewer people.	Beneficiaries include the household sectors, business houses, government departments, schools, health and private sectors and communities who experiences such relocation. The households that are in dire need of temporary accommodation after extreme events, or impact of climate change.
4. Costs	

4.1 Cost to implement adaptation options: Cost measures	The national government and donor aid partners must prepare to meet the cost of this technology. The likely cost will include: The cost of groundworks (landfills) USD 4.3m Additional costs (V&A, EIA, & beach nourishment) 1 Cost of monitoring & implementation .7 **Total cost = USD6M**
4.2 Additional costs to implement adaptation option, compared to "business as usual"	No additional cost to this technology.
5.0 Benefits	
5.1 Development impact, indirect /benefits	The new safe homes will have access to infrastructure such as improved roads, new schools, medical centers, community halls and etc. • The new safe home relocation will benefit community through various ways: In terms of development: • The new site would adopt build back better strategy, meaning their homes and infrastructure will be built with high standard, or maximum building code, • Opportunity for better planning and infrastructure design • Opportunity to build education and health facilities,
5.2 Economic benefits: Employment –Jobs Investment – Capital requirements	• Provide employment to locals, through construction of such facility, provide job opportunities for other services such as medical services, education, end etc.
5.3 Social benefits: Income0 Income generation and distribution Education – Time available for education Health – Number of people with different diseases.	• The Social benefit of this technology on the households is that they are secured and protected from impact of SLR and coastal erosion. Income will be used to plan for their long term relocation. . • Education facilities will be provided at this site for the children of the affected communities. • Subsequently, health and gender issues will be considered and filtered through every process of decision making in this project.

5.4 Environment benefits: Reductions in GHG emissions, local pollutants, Ecosystem degradation etc.	• There will be opportunity to implement NbS initiatives at these sites. • These NbS will assist reduce the impact of GHG emissions. • Opportunity to reduce pollution and other mal adaptation factors such as sea walls and poor adaptation strategies.
6.0 Local context	
6.1 Opportunities and Barriers: Barriers to implementation and issues such as the need to adjust other policies.	Opportunities to replicate this model to other communities across the country. Barriers: lack of finance, policies and enabling framework for such investment.
6.2 Status: Status of technology in the country	No safe homes to climate change impacts yet build in the country.
6.3 Timeframe: Specify timeframe for implementation	Life time
6.4 Acceptability to local stakeholders: Where the technology will be attractive to stakeholders	Yes

Adaptation Technology 4 : Enabling framework for community regeneration Technology

Enabling framework for community regeneration Technology	
1. Sector	Climate migration Adaptation
2. Technology Characteristics	
2.1 Technology Name:	Enabling infrastructure for climate induced community regeneration technology
2.2 Introduction:	**<u>Background</u>**

	Most of the international climate finance institutions could not allocate funding support towards relocation because of its debatable nature. This is still an issue of contention even at the Conference of Parties (COP) level. This probs most of the developing countries to rally and raise their voices at this annual United Nation Summit to recognize their needs and endorse funding for climate change issues which greatly affected mostly the small and vulnerable states including climate change relocations. Because of this hardline position by the international community have against this relocation initiative, many small pacific island countries including Solomon Islands have taken the approach to pursue providing enabling framework to their vulnerable communities by investing in infrastructures such as, roads, wharves, power lines, water supplies, health centers and schools at identified sites to attract and enabled vulnerable communities to settle and these new sites. **Refer Fig 2.4.1** below is an example of such site to attract vulnerable communities to relocate from their original communities. **Figure 2.4.1 Enabling Framework**  To facilitate the actual relocations process, the government should invest in providing the environment which will attract the impacted communities and households to this site. The enabling environment includes construction of infrastructures such as roads, bridges, wharves, schools, hospitals, health centers etc. **<u>Benefit of such Technology.</u>** The population on the Island is more than 720,000 people and the destruction of the coastal areas through human actions are also accelerating. This calls for civic awareness on this integration approach to be inserted as part of this technology – i.e., ensure awareness of public on the need to decide on the type of relocation strategy adopted.
2.3 Technology Characteristics/ Highlights: Few bullet points, i.e. low/high cost; advance technology; low technology.	• medium cost (potentially high but medium initial cost) • Low technology (requires landfills on beaches and revegetation) • Soft and Hard Technology

	• Soft technology includes the policies surrounding relocation.
2.4 Institutional and Organizational Requirement:	The following Ministries will play leading roles in the whole arrangement: • Ministry of Environment, Climate Change . Disaster Management and Meteorology – They are responsible for Climate Change Adaptation initiatives across the country. • Ministry of Provincial Government and Institutional Strengthening – They are responsible for the provincial government level negotiations and implementations. • Ministry of Lands, Housing & Survey – The Ministry is responsible for land administrative matter throughout the country. • Ministry of Finance and Treasury May provide financial support to the initiative.
3.0 Operations and maintenance	
3.1 Endorsement by Experts:	• The GCF and mainly all donor aid partners do not support relocation of homes due to the impact of climate change. Never the less, we could still package this as funding support towards enabling framework and such proving opportunity to attract affected communities to move to these new locations or sites.
3.2 Adequacy for current climate: Are there negative consequences of the adaptation option in the current climate? Some adaptation may be targeted at the future climate but may have costs and consequences	• Fits well for both the current and future expected climate change across the Island. Since the forecasts are predicting future SLR with increasing intensity and frequency of storm surges which may cause further coastal erosion and washing away of beaches, such technology is critical to push family units into relocation to these new sites. • Land dispute – To prevent land dispute as potential barrier to this technology, there must be proper consultation, high level

under the current climate.	engagement and local level participation involved in this whole process.
3.3 Size of beneficiaries group: Technology that provides small benefits to larger number of people will often be favored over those that provide larger benefits, but to fewer people.	• The respective communities and households will be the beneficiaries of this technology implementation. • There will be no single beneficiary, it will be whole of the community benefit from this technology.
4. Costs	
4.1 Cost to implement adaptation options: Cost measures	The cost of providing enabling environment for potential relocation will be relatively costly , as the government or donor partners will provide infrastructures such as: Roads, water supply, education facilities, health center, power or energy, wharves etc. The major costs likely to incur are details as below: The cost of groundworks (landfills) USD 6.3M Additional costs (V&A, EIA, & beach nourishment) .5M Cost of Implementation & Monitoring .7M **Total cost = USD7.5M**
4.2 Additional costs to implement adaptation option, compared to "business as usual"	There will be likely no additional cost by the government if it has provided all the above major costs. However, individual households have to invest in their home construction at the selected site.
5.0 Benefits	
5.1 <u>Development impact, indirect /benefits</u>	• Development Impact that will likely have on the community includes opportunity to build back better at this potential site by households, opportunity to do proper community planning of houses and community facilities, opportunity to raise their standards of living to higher level. • Opportunity for the community to collaborate more effectively amongst themselves. • Opportunity for better coordination by National government, provincial government, and the local level in the technology implementation.,

5.2 Economic benefits: Employment –Jobs Investment – Capital requirements	• Job creation at the new sites, • Opportunity to build better, thus improving the general housing and standard of the communities engage in this technology • Capital is relatively huge, but government must provide initial investment with donor partners support such initiatives.
5.3 Social benefits : Income Income generation and distribution Education – Time available for education Health – Number of people with different diseases.	• The Social benefit of this technology on the households is that they are secured and protected from impact of SLR and coastal erosion. • The little money they earn could now be invested in other income generating activities to improve their livelihood rather than worrying about the coastal erosion. • The coastal areas which are vulnerable to coastal erosion and SLR will now have some buffer against salt water intrusion and conservation of their marine resources. • The responsible authorities must ensure that primary and secondary schools across the island are safe and secure from such impact of SLR. This will ensure the youths and the weak are protected from the SLR and soil erosion. • Subsequently, health and gender issues will be considered and filtered through every process of decision making in this project.
5.4 Environment benefits: Reductions in GHG emissions, local pollutants, Ecosystem degradation etc.	• New settlement will provide opportunity to apply NbS in its ecosystem planning and design. • Proper execution of this technology will increase vegetation and thus directly contributing towards reduction of GHG emissions. • Reduction of Ecosystem degradation.
6.0 Local context	
6.1 Opportunities and Barriers: Barriers to implementation and issues such as the need to adjust other policies.	• There is an opportunity for better development and planning for future projects of similar nature. • Potential opportunity to replicate this same technology across the country.

	• If the same technology is to be replicated, there is an opportunity to do it better than at that new site. • There may be financial constraints or limitations for funding this type of investment technology
6.2 Status: Status of technology in the country	This is new and should be promoted.
6.3 Timeframe: Specify timeframe for implementation	36 months
6.4 Acceptability to local stakeholders: Where the technology will be attractive to stakeholders	Yes

Adaptation Technology 5 : Relocation Trust Fund

Climate change induced relocation Trust Fund	
1. Sector	Climate migration Adaptation
2. Technology Characteristics	
2.1 Technology Name:	**Climate Change induced relocation Trust fund**
2.2 Introduction:	**<u>Background</u>** Almost daily you heard about record breaking storms, flooding, rain bombs, heat waves, hurricanes, sea level rise, droughts, and wildfires. As a result, more and more people are thinking, "should they consider relocation or migration because of climate change." Climate change relocation is relatively a more difficult option to take than climate change migration. First, relocation is far less complicated. Relocation is simply relocating out of a climate change and global warming high risk area to a lower risk area. Climate change migration to a global warming safer area is far more complex. There are dozens of global warming and other related factors that must be evaluated carefully, from

	your age, the relocation demographics, to how long you are hoping to survive before making such decision. From either of the perspective explained above in Solomon Islands context, to support any form of relocation or migration funding must be made available to facilitate such strategy. Whether it be forced or planned relocation due to the impact of climate change including extreme events. One way of providing fund to support such initiative is establishment of a trust fund. A legal entity that holds property or assets on behalf of another person, group, or organization purposively for relocation. It is an estate planning tool that keeps your assets in a trust managed by a neutral third party, or trustee. A trust fund can include money, property, stock, a business, or a combination of these instruments or assets. A climate Change relocation trust fund is therefore established by law for the country to invest in money purposively to meet short and long term funding requirements for specifically relocation due to the climate change induced extreme events. There are generally three types of Trust Funds available in this technology. There are: (iv) **Revolving Fund** A revolving cash fund is a specific amount of money used to purchase inexpensive items. It is called revolving cash because as money is expended it is constantly being replaced. (v) **Sinking Fund** – In more traditional circles, "sinking fund" refers to money set aside to pay off long term debt such as a bond. The term "sinking" likely refers to the decreasing level of debt remaining as it gets paid off. (vi) **Endowment Fund** Endowed funds differ from others in that the total amount of the gift is invested. Each year, only a portion of the income earned is spent while the remainder is added to the principal for growth. In this respect, an endowment is a perpetual gift. **<u>Benefit of such technology</u>**

	The population of the country is more than 720,000 people and the destruction of the coastal areas through human actions are also accelerating. There are many communities who have participated in relocation already but are stalled with such noble intension due to no availability of fund to support such initiative. This calls for civic awareness on the importance of establishing a relation trust fund purposively to assisting households and communities who in dire need for either temporal or permanent relocation strategy. – i.e., ensure awareness of public and donor aid partners including Solomon Islands government the need to establish this relocation Trust fund initiative.
2.3 Technology Characteristics/ Highlights: Few bullet points, i.e. low/high cost; advance technology; low technology.	• medium cost (potentially high but medium initial cost) • Low technology (establishment of pool of cash) • Soft and Hard Technology
2.4 Institutional and Organizational Requirement :	The following government Ministries will participate in the whole process: • MECDM – They are responsible for the Climate Change Adaptation strategies in the country. • MoFT – They are responsible for the Trust Fund arrangement in the country. • Central Bank of Solomon Islands – The regulator of financial services in the country
3.0 Operations and maintenance	
3.1 Endorsement by Experts:	• The Ministry will have to negotiate with the MoFT for establishment of this relocation trust fund, this will have to be supported by donor aid partners etc.

	• Almost in every national Adaptation workshop, including the TNA there is clear indication that the government should establish some form of trust fund to support climate finance activities across the country at the local levels. • Thus, having established this facility it will pave the way for replication of similar establishment in other sectors.
3.2 Adequacy for current climate: Are there negative consequences of the adaptation option in the current climate? Some adaptation may be targeted at the future climate but may have costs and consequences under the current climate.	• This fits in well with the current level of relocation need currently felt in the country. • Presently there is no identified negative impact on the community with this technology. • Such technology will have multiple impact on the communities.
3.3 Size of beneficiaries group: Technology that provides small benefits to larger number of people will often be favored over those that provide larger benefits, but to fewer people.	• The communities and public who are affected will be the direct beneficiaries of this funding assistance. • Benefits are not individually targeted.
4. Costs	
4.1 Cost to implement adaptation options: Cost measures	There are likely capital and operation costs incurring from this undertaking: Capital Cost USD$3.5M Operational cost USD1.5M **Total cost = USD5M**
4.2 Additional costs to implement adaptation option, compared to "business as usual"	No additional cost is anticipated at the moment, beside the capital and operational costs stated above.
5.0 Benefits	

5.1 Development impact, indirect /benefits	• The multiple effect due to the investment from the relocation trust fund will have ripple impact on the communities. • Livelihood – It will assist households to fund their livelihood needs at the local levels. • Assist local households with adaptation needs and program at local levels.
5.2 Economic benefits: Employment –Jobs Investment – Capital requirements	• Job opportunities for young and professional Solomon Islanders in Trust and Fund management. • Provide pool of funds which communities could have access to increase the cash circulation in the country thus creating money through both formal and informal sectors. • The CBSI will require minimum capital assets requirement for establishments of the technology. This expense however is also included in the above cost structure.
5.3 Social benefits: Income generation and distribution Education – Time available for education Health – Number of people with different diseases.	• Employment and Income Creation is social benefit of this Technology. • Education – There will be skill and technical transfer through this technology implementation. • There is no identified health risk to the community on this technology.
5.4 Environment benefits: Reductions in GHG emissions, local pollutants, Ecosystem degradation etc.	• . Communities will participate in NbS ecosystem adaptive interventions • Reduction of the GHG emissions across the communities.
6.0 Local context	
6.1 Opportunities and Barriers:	

Barriers to implementation and issues such as the need to adjust other policies.	• Opportunity to have access to finance at the local levels • Policy development – to regulate the establishment of this technology
6.2 Status: Status of technology in the country	• This is a new technology in this country. • There are some trust funds established but not climate related trust funds.
6.3 Timeframe: Specify timeframe for implementation	36 months
6.4 Acceptability to local stakeholders: Where the technology will be attractive to stakeholders	Yes

Adaptation Technology 6 : Cash Transfer Programme

Cash Transfer Programme	
1. Sector	Climate migration Adaptation
2. Technology Characteristics	
2.1 Technology Name:	**Climate Change induced relocation Trust fund**
2.2 Introduction:	**<u>Background</u>** Cash transfer programmes provide assistance in the form of money to increase household income. Transfers may be given without requirements that household members meet specified conditions or be contingent upon compliance with a specified set of conditions. For vulnerable communities to adapt effectively to the impact of climate change communities must have access to funding as stipulated above. In the Solomon Islands context, there is currently no form of funding made available for this purpose by the national government. Nevertheless, after certain extreme events the government or donor partners assists the affected communities with essential items such as food, water, shelter, and clothes. The concept of cash program is establishing an body which manages and administers this

	cash transfer program to communities after extreme events including climate change. **<u>Benefit of such technology</u>** The population of the country is more than 720,000 people and the anthropogenic activities through human actions are also accelerating. There are many communities who have participated in various adaptation strategies already but are stalled with such noble intension due to no availability of fund to support such initiative. This calls for civic awareness on the importance of establishing a cash transfer program purposively to assisting households and communities who are in dire need for either temporal or permanent relocation strategy. – i.e., ensure awareness of public and donor aid partners including Solomon Islands government the need to establish this cash transfer program initiative.
2.3 Technology Characteristics/ Highlights: Few bullet points, i.e. low/high cost; advance technology; low technology.	• medium cost (potentially high but medium initial cost) • Low technology (establishment of pool of cash) • Soft and Hard Technology
2.4 Institutional and Organizational Requirement :	The following government Ministries will participate in the whole process: • MECDM – They are responsible for the Climate Change Adaptation strategies in the country. • MoFT – They are responsible for the Trust Fund/cash transfer program arrangement in the country. • Central Bank of Solomon Islands – The regulator of financial services in the country
3.0 Operations and maintenance	
3.1 Endorsement by Experts:	• The Ministry will have to negotiate with the MoFT for establishment of this cash transfer

	program, this will have to be supported by donor aid partners etc. • Almost in every national Adaptation workshop, including the TNA there is clear indication that the government should establish some form of trust fund or cash transfer program to support climate finance activities across the country at the local levels. • Thus, having established this facility it will pave the way for replication of similar establishment in other sectors.
3.2 Adequacy for current climate: Are there negative consequences of the adaptation option in the current climate? Some adaptation may be targeted at the future climate but may have costs and consequences under the current climate.	• This fits in well with the current level of relocation need currently felt in the country. • Presently there is no identified negative impact on the community with this technology. Such technology will have multiple impact on the communities.
3.3 Size of beneficiaries group: Technology that provides small benefits to larger number of people will often be favored over those that provide larger benefits, but to fewer people.	• The communities and public who are affected will be the direct beneficiaries of this funding assistance. • Benefits are not individually targeted.
4. Costs	
4.1 Cost to implement adaptation options: Cost measures	There are likely capital and operation costs incurring from this undertaking : Capital Cost USD$3.5M Operational cost USD1.5M **Total cost = USD5M**
4.2 Additional costs to implement adaptation option, compared to "business as usual"	No additional cost is anticipated now, beside the capital and operational costs stated above.
5.0 Benefits	
5.1 <u>Development impact, indirect /benefits</u>	• The multiple effect due to the investment from the relocation trust fund will have ripple impact on the communities.

	• Livelihood – It will assist households to fund their livelihood needs at the local levels. • Assist local households with adaptation needs and program at local levels.
5.2 Economic benefits : Employment –Jobs Investment – Capital requirements	• Job opportunities for young and professional Solomon Islanders in cash transfer program initiative. • Provide pool of funds which communities could have access to increase the cash circulation in the country thus creating money through both formal and informal sectors. • The CBSI will require minimum capital assets requirement for establishments of the technology. This expense however is also included in the above cost structure.
5.3 Social benefits : Income generation and distribution Education – Time available for education Health – Number of people with different diseases.	• Employment and Income Creation is social benefit of this Technology. • Education – There will be skill and technical transfer through this technology implementation. • There is no identified health risk to the community on this technology.
5.4 Environment benefits: Reductions in GHG emissions, local pollutants, Ecosystem degradation etc.	• . Communities will participate in NbS ecosystem adaptive interventions • Reduction of the GHG emissions across the communities.
6.0 Local context	
6.1 Opportunities and Barriers:	

Barriers to implementation and issues such as the need to adjust other policies.	• Opportunity to have access to finance at the local levels • .Policy development – to regulate the establishment of this technology
6.2 Status: Status of technology in the country	• This is a new technology in this country. • There are some trust funds established but not climate related trust funds.
6.3 Timeframe: Specify timeframe for implementation	36 months
6.4 Acceptability to local stakeholders: Where the technology will be attractive to stakeholders	Yes

Annex 5
List of General Stakeholder Involved According to Gender

NO	Name	Gender		Organisations/Departments	Email
		Male	Female		
1	Barnabas Bago	1		Ministry of Environment, Climate Change and Disaster Management	BBago@mecdm.gov.sb
2	Nelly Kere		1	Ministry of Environment, Climate Change and Disaster Management	nzkere@gmail.com
3	Simaima N		1	Solomon Islands Chamber of Commerce and Industry (SICCI)	service@solomonchamber.com.sb
4	Ronald I	1		Solomon Islands Port Authority (SIPA)	rivupitu@sipa.com.sb
5	Nesta Takana		1	Solomon Islands Port Authority (SIPA)	ntakona@sipa.com.sb
6	Don Belonde	1		Don Bosco	donboscobelonde@gmail.com
7	John Kaura	1		Pacific Casino Hotel	
8	Elma Panisi		1	Live & Learn	elmah.panisi@livelearn.org
9	Mathew Walekoro	1		The Ministry of National Planning and Development Coordination	MWalekoro@mnpdc.gov.sb
10	Rex Solo	1		International Organization for Migration (IOM)	rsolo@iom.int
11	Veira Puleka	1		Ministry of Environment, Climate Change and Disaster Management	service@solomonchamber.com.sb
12	Elizabeth		1	Tasahe Community	ebokosina@gmail.com
13	William Nunufana	1		Ministry of Environment, Climate Change and Disaster Management	WNutufana@mecdm.gov.sb;
14	Elma Ratiku		1	Ministry of Land , Housing and Survey	ERatiku@mlhs.gov.sb
15	Carlos Soso	1		Solomon Power	Carlos.Soso@solomonpower.com.sb
16	Chanel Iroi	1		Ministry of Environment, Climate Change and Disaster Management	c.iroi@met.gov.sb
17	Lorima Tuke	1		Save The Children	Lorima.tuke@savethechildren.org.au
18	Thaddeus Siota	1		Ministry of Environment, Climate Change and Disaster Management	TSiota@mecdm.gov.sb
19	Allen K Ofa	1		Solomon Islands Maritime Authority (SIMA)	allen.ofea@sima.gov.sb
20	David Oli	1		Solomon Islands Port Authority (SIPA)	doli@sipa.com.sb
21	Ashley Vasula	1		Solomon Islands Port Authority (SIPA)	avasula@sipa.com.sb
22	Arnold Augwaroa	1		Ministry of Forestry & Research / REDD+	aaugwawaroa@ mofr.gov.sb

NO	Name	Gender		Organisations/Departments	Email
		Male	Female		
23	Chris Wagatora	1		Ministry of Forestry & Research / REDD+	cwagatora@mofr.gov.sb
24	Lizzie Tegu		1	Ministry of Land , Housing and Survey	LTegu@mlhs.gov.sb
25	Malachi Bate'e	1		Ministry of Environment, Climate Change and Disaster Management	MBatee@mecdm.gov.sb
26	Marlchom Zion Row	1		Ministry of Environment, Climate Change and Disaster Management	MRow@mecdm.gov.sb
27	Moses Pelomo		1	Custom Garden	moses.pelomo@gmail.com.
28	James Samu	1		GPPOL Community	tetabjr@gmail.com
29	Yuyun Qomariyah		1	PacSol Engineering and Consultancy Ltd	yucyretha@gmail.com
30	Robson Hevalao	1		Ministry of Fisheries and Marine Resources	RHevalao@fisheries.gov.sb
Gender Total		**21**	**9**		
Gender Representative in (%)		**70%**	**30%**		

Annex 6
Working Group Workshop -1

Working Group Workshop 1 was held on 31 March 2022, with the agenda of mitigation and adaptation awareness on Technology Need Assessment, recorded 33 participants attended during the first workshop.

Solomon Islands Technology Needs Assessment (TNA) First (1) National Workshop Participant List

Date: 31st March 2022. Venue: Pacific Casino Hotel

NO	Name	Position	Organisations/Departments	Email	Signature
1	BARNABAS BAGO	NPC	MECDM/PMCU	BBago@mecdm.gov.sb	
2	CHRIS Wagatora	REDDT OFFICER	MOFR	cwagatora@mofr.gov.sb	
3	Arnold Angwarea	REDDT OFFICER ✓	MOFR	aangwarea@mofr.gov.sb	
4	Matthew Walekana	CPO	MNPDE	MWalekana@mnpde.gov.sb	
5	Michael Haapi CFA	MECD/		mhaapi@gmail.com	
6	CYRIL RACHMAN	Mitigation Dpert	SINU	cyril.rachman2020@gmail.com	
7	Carlos Soso	Planning Engineer	Solomon Power	carlos.soso@solomonpowers.com.sb	
8	SIMAMA NELSON	MSO	SICCI	services@solomonchamber.com.sb	

NO	Name	Position	Organisations/Departments	Email	Signature
9	Elizabeth		Taraha B Community	elookosina@gmail.com	
10	Vavia Rukekau	PCO.	PRD/MECDM	VTalulotu@mecdm.gov.sb	
11	William Nunufana	CCD	CCD/mecdm	WNunufana@mecdm.gov.sb	
12	MARLEHOM ZION ROW	SCCO CCD/MECDM	CCD/MECDM	MRow@mecdm.gov.sb	
13	THADDEUS SIOTA	DPCCD	CCD/MECDM	TSiota@mecdm.gov.sb	
14	Allen K. Ofea	PO/EPS	SIMA	allen.ofea@sima.gov.sb	
15	David Oli	SPO	Ports	doli@sipa.com.sb	
16	Ronald I	CRO	SI Ports	rivupitu@sipa.com.sb	
17	REX SOLO	P/O	IOM	rsolo@iom.int	
18	Ashley Vash	Energy	SIPA		

UNEP DTU PARTNERSHIP

gef

UN environment

NO	Name	Position	Organisations/Departments	Email	Signature
19	Nesta Takona	Accountant	SI Port Authority	ntakona@sipa.com.sb	
20	Lizzie Teg	Lands officer	Ministry of Lands	lTegu@mlhs.gov.sb	
21	Elmer Rafiki	Land officers	Ministry of Land	ERafiku@mlhs.gov.sb	
22	Don Belande	Community		donboscobelande@gmail.com	
23	Nelly K	CFO	PMCU/MECDM	nzkere@gmail.com	
24	Mosey Peloma		KGA	mosey.peloma@gmail.com	
25	Yugun G.	Principal Planner.	Pac Sol	yugyretha@gmail.com	
27	Nancy Raeka	TNA/SPO	PMCU/MECDM	NRaeka@mecdm.gov.sb	
28	Elmah Paini	Country Dir LLSI	LLSI	elmah.panisi@undp.org	
29	MALACHI BATEE	CCD	CCD	mbatee@mecdm.gov.sb	

NO	Name	Position	Organisations/Departments	Email	Signature
30.	JOHN KAULA	Electrician Supvsr	pacific Casino Hotel		
31.	JAMES SAMU		GPPOL COMMUNITY	Eetabjr@gmail.com	
32.	LORIMA T	CC/MGR	SCSI	lorimate@savechildren.org.au	
33.	CHANEL IROI	DST	MECDM	c.iroi@met.gov.sb	

Annex 7
Solomon Islands Technology Needs Assessment Project National Steering Committee Constitution

Solomon Islands Technology Needs Assessment Project National Steering Committee Constitution

1. Name of the Committee

The name of the Committee is the Technology Needs Assessment Project National Steering Committee (hereinafterreferred to as the TNA Project Steering Committee).

2. Objectives of the TNA Project Steering Committee

The objectives of the TNA Project Steering Committee are to oversee the progress of Technology Needs Assessment (hereinafter referred to as TNA) and ensure engagement with key stakeholders throughout the TNA process.

3. Structure and members of the TNA Project Steering Committee

The TNA Project Steering Committee shall consist of mainly senior staff within the Principal Ministry that oversees climate change and resilient activities across the country, the Ministry of Environment, Climate Change, Disaster Management, and Meteorology (MECDM). It then extends to other relevant line ministries such as the Ministry of Land and Housing Survey (MLHS), Ministry of Fisheries and Marine Resources (MFMR), Ministry of Forestry and Research (MFR) and Private Sector representatives through Solomon Islands Chamber of Commerce (SICCI) and NGOs.

4. TNA Project Steering Committee Membership

The TNA Project Steering Committee (TNAPSC) is comprised of the identified stakeholders relevantto the TNA process. Members of the TNA Project Steering Committee constitutes proposed representatives from applicable Ministries, Departments, and Agencies (MDAs), private sector organizations, academia, civil societies/NGOs, and finance institutions. These members include:

TNA Steering Committee Members

- Permanent Secretary- MECDM (TNAP SC Chair),
- Commissioner of Lands, MLHS,
- Deputy Secretary MECDM,
- Director Climate Change Division, MECDM,
- Deputy Secretary Ministry of Infrastructure Development (MID),
- Deputy Commissioner of Forest, MFR,
- Deputy Director Inshore of MFMR,
- National Programme Coordinator MECDM,
- Private Sector Representatives- SICCI,
- TNA National Coordinator- Secretariat.

5. Responsibilities of the members of the TNA Project Steering committees include:

- Overseeing the implementation of the project,
- Providing necessary data and information for the TNA,
- Engaging actively throughout the TNA process,
- Collaborating with the TNA Project Coordinator to ensure validation of the projectdeliverables and outputs based on agreed timelines,
- Coordinating with the broader stakeholders within the priority sectors and/or relevant thematic areas, as necessary during the TNA process,
- Ensures that the TNA project Reports send to the UDP are reflective of the outcomes of workshops and consultations held within the country.

6. TNA Sectoral Working Groups

Sectoral working groups shall be formed under the Project Steering Committee to allow for a wider participation of key stakeholders in the country. The sectors and members of working groups shall be defined by the Project Steering Committee. Working groups shall be organized by sectorsof expertise and/or transversally with equal gender representation - to the extent possible - acrossall groups. Members of working groups may include representatives from government departments responsible for policy formulation and/or regulation, regulatory agencies, business associations, specific companies and/or entrepreneurs, and other public, private, civil society organizations. The Chairs of the sectoral working groups will convene the working group meetingas necessary, upon proposal to the TNA Steering Committee.

Below is list of the current four (4) Sectoral working group membership:

Coastal Erosion Sub- Sector

- NPC, MECDM,
- Senior PC, MECDM,
- Private Sector Representative , SICCI,
- Climate Change Officer, SIPA,
- Hotel & Resorts, Pacific Casino Hotel
- Solomon Islands National University, FAFF,
- Adaptation Consultant, Private Sector

Relocation Sub-Sector

- Planning division, Ministry of National Planning and Development coordination (MNPDC)
- Climate Change Division, MECDM
- Biodiversity and Conservation Division, MECDM
- International Organization for Migration , UNDP
- Senior Land Officer, MLHS
- Country Manager, Live & Learn
- Solomon Islands National University, Environment Division

Transportation Sub- Sector

- Deputy Secretary Technical, MECDM,
- Senior Transport officer, Ministry of Infrastructure Development (MID)
- Senior Planning Engineer, Solomon Power Limited,
- Climate Change Division, MECDM,
- Commodity Export Marketing Authority,
- Engineering Department, SIPA,
- Climate Change and Risk Manager, Save the Children Solomon Islands

Forestry Sub- Sector

- Assistant Commissioner of Forest, Ministry of Forest, and Research
- Senior Forest Officer, REDD+, MFR
- Assistant COL, MLHS
- Resource Officer, GPPOL
- Principal Officer, CCD, MECDM

- Manager Custom Garden,
- Senior CCO, CCD, MECDM

7. Roles of the Sectoral Working Group.

Each working group shall be formed from the various stakeholders with relevant area of expertise and work experience. Each of the working group will assign a chairperson, who is responsible for:

- Arranging and organizing working group meetings as necessary
- Collecting opinions and feedbacks from working group members

Members of sectoral working groups are responsible for:

- Providing inputs to identify prioritized sector/subsectors for the fulfilment of the country's TNA.
- Providing inputs to identify prioritized technologies for adaptation and mitigation in each sector/subsector and validating the final selection of prioritized technologies.
- Providing inputs to develop the Technology Action Plan (hereafter referred to TAP) for each sector/subsector, including barriers and risks to introducing prioritized technologies and necessary measures to remove them.
- Reviewing TAP for each sector and providing technical feedback.

8. TNA Project Steering Committee Meetings

The TNAP SC members shall meet either in person or online a minimum of four times by the end of March 2023. The date, venue, and agenda of meetings shall be agreed by the Chair and the TNA secretariat or members. The Chairperson in collaboration with TNA Secretariat will agree on the mode of meetings.

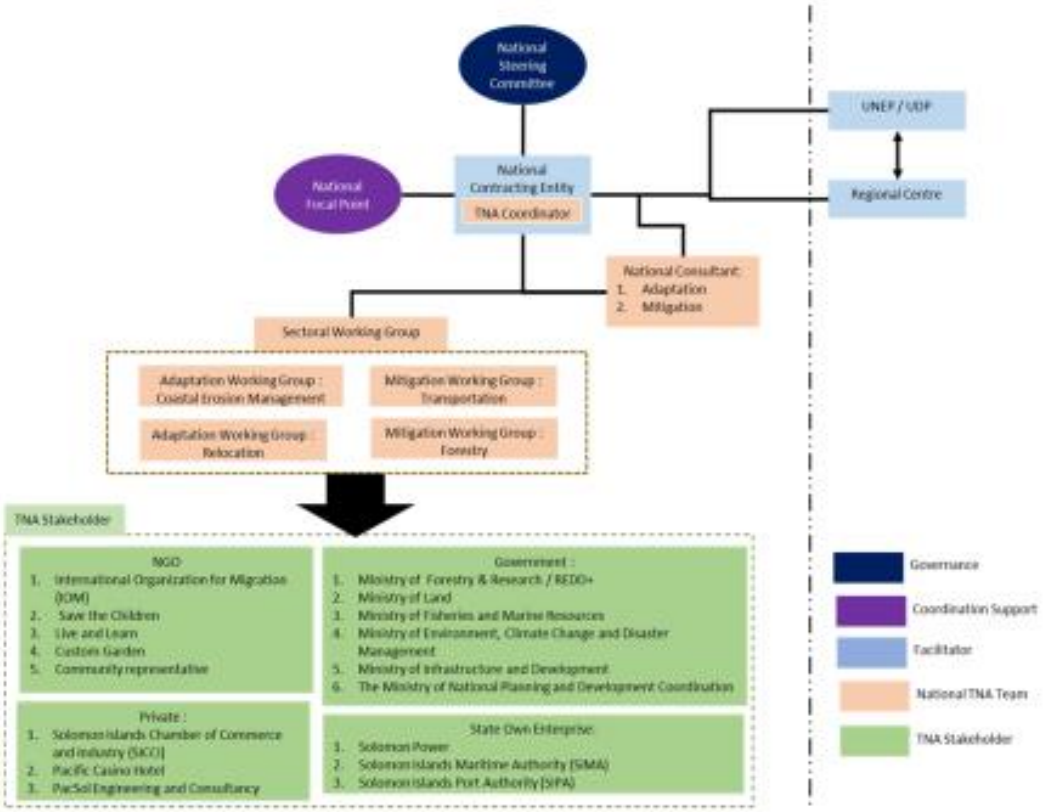
9. TNA Project Steering Committee Quorum

The TNAPSC is expected to have a minimum of eight (6) of the ten (10) representatives of the Committee (above 50 percent representation of Committee member entities) before proceedings commences.

10. All communications to the UNEP DTU Partnership must be channeled through the TNA

National Coordinator, within the Ministry of Environment, Climate Change, Disaster Management and Meteorology.

Figure 1 : Structure of the TNA National Steering committee within the country.



****END****

Annex 8
List of Adaptation Working Group

Name of Sector : Coastal Erosion
Group Facilitator : DR. Michael Ha'apio/ TNA Adaptation Expert

NO	Name	Position	Organisations/Departments	Email
1	Barnabas Bago	NPC	MECDM	BBago@mecdm.gov.sb
2	Nelly Kere	CPC	MECDM	nzkere@gmail.com
3	Simaima N	MSO	SICCI	service@solomonchamber.com.sb
4	Ronald I	CPS	Port	rivupitu@sipa.com.sb
5	Nesta Takana	Accountant	Port	ntakona@sipa.com.sb
6	Don Belonde	Civil Engineer	Don Bosco	donboscobelonde@gmail.com
7	John Kaura	Electrician supplier	Pacific Casino Hotel	

Name of Sector : Relocation
Group Facilitator : Nancy Raeka/ TNA Coordinator

NO	Name	Position	Organisations/Departments	Email
1	Elma Panisi		Live & Learn	elmah.panisi@livelearn.org
2	Mathew Walekoro	CPO	MNPDC	MWalekoro@mnpdc.gov.sb
3	Rex Solo	Project Officer	IOM/UNDP	rsolo@iom.int
4	Veira Puleka	PCO	BCD/ MECDM	service@solomonchamber.com.sb
5	Elizabeth	Civil Engineer	Tasahe Community	ebokosina@gmail.com
6	William Nunufana	CCD	CCD/MECDM	WNutufana@mecdm.gov.sb;
7	Elma Ratiku	Lands officer	MLHS (LAOG)	ERatiku@mlhs.gov.sb

Annex 9
List of Mitigation Working Group

Name of Sector : Transportation
Group Facilitator : Cyril Rachman / TNA Mitigation Expert

NO	Name	Position	Organisations/Departments	Email
1	Carlos Soso	Planning Engineer	Solomon Power	Carlos.Soso@solomonpower.com.sb
2	Chanel Iroi	DST	MECDM	c.iroi@met.gov.sb
3	Lorima Tuke	Director	Save The Children	Lorima.tuke@savethechildren.org.au
4	Thaddeus Siota	DDCCD	CCD/MECDM	TSiota@mecdm.gov.sb
5	Allen K Ofa	EPS	SIMA	allen.ofea@sima.gov.sb
6	David Oli	SPO	Port	doli@sipa.com.sb
7	Ashley Vasula	Energy	SIPA	avasula@sipa.com.sb

Name of Sector : Forestry
Group Facilitator : Yuyun Qomariyah / Urban and Regional Planner

NO	Name	Position	Organisations/Departments	Email
1	Carlos Soso	Planning Engineer	Solomon Power	Carlos.Soso@solomonpower.com.sb
1	Arnold Augwaroa	REDD+	MFR	aaugwawaroa@ mofr.gov.sb
2	Chris Wagatora	REDD+	MFR	cwagatora@mofr.gov.sb
3	Lizzie Tegu	Assistant Commissioner Lands	MLHS (LAOG)	LTegu@mlhs.gov.sb
4	Malachi Bate'e	Principal CC Officer	CCD/MECDM	MBatee@mecdm.gov.sb
5	Marlchom Zion Row	SCC Officer	CCD/MECDM	MRow@mecdm.gov.sb
6	Moses Pelomo		Custom Garden	moses.pelomo@gmail.com.
7	James Samu	Civil Engineer	GPPOL Community	tetabjr@gmail.com

Annex 10
Working Group Workshop - 2

Working Group Workshop 2 was held on 1 April 2022, with the agenda of Focus Group Discussion on Multi Criteria Analysis for mitigation and adaptation. Each group consist of 7 members from various background and facilitated by a facilitator. The result of the workshop was the draft list of technology prioritisation.

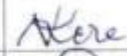
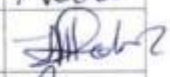
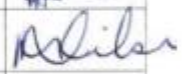

FORESTRY


SOLOMON ISLANDS
FIRST TNA WORKSHOP

Solomon Islands Technology Needs Assessment (TNA) First (1) National Workshop Participant List

Date: 1st April 2022. Venue: Pacific Casino Hotel

NO	Name	Position	Organisations/Departments	Email	SIGNATURE
1	Arnold Augwaroa	REDD+	MFR	aaugwaroa@mofr.gov.sb aaugwawaroa@mofr.gov.sb	
2	Barnabas Bago	NPC	MECDM	BBago@mecdm.gov.sb	
3	Carlos Soso	Planning Engineer	Solomon Power	Carlos.Soso@solomonpower.com.sb	
4	Chanel Iroi	DST	MECDM	c.iroi@met.gov.sb	
5	Chris Wagatora	REDD+	MFR	cwagatora@mofr.gov.sb	
6	Elma Panisi		Live & Learn	elmah.panisi@livelearn.org	
7	Lizzie Tegu	Assistant Commissioner Lands	MLHS (LAOG)	LTegu@mlhs.gov.sb	
8	Lorima Tuke	Director	Save The Children	Lorima.tuke@savethechildren.org.au	
9	Malachi Bate'e	Principal CC Officer	CCD/MECDM	MBatee@mecdm.gov.sb	
10	Marlchom Zion Row	SCC Officer	CCD/MECDM	MRow@mecdm.gov.sb	

NO	Name	Position	Organisations/Departments	Email	SIGNATURE
11	Mathew Walekoro	CPO	MNPDC	MWalekoro@mnpdc.gov.sb	
12	Moses Pelomo		Custom Garden	moses.pelomo@gmail.com.	
13	Nelly Kere	CPC	MECDM	nzkere@gmail.com	
14	Rex Solo		IOM/~~UNDP~~	rsolo@iom.int	
15	Thaddeus Siota	DDCCD	CCD/MECDM	TSiota@mecdm.gov.sb	
16	Simaima N	MSO	SICCI	service@solomonchamber.com.sb	
17	Elizabeth		Tasahe Community Rep	ebokosina@gmail.com	
18	Veira Puleka	PCO	BCD/ MECDM	Vtalubtna@mecdm.gov.sb v.t.puleka@gmail.com	
19	William Nunufana	CCD	CCD/MECDM	WNutufana@mecdm.gov.sb;	
20	Allen K Ofa	EPS	SIMA	allen.ofea@sima.gov.sb	
21	David Oli	SPO	Port	doli@sipa.com.sb	
22	Ronald I	CPS	Port	rivupitu@sipa.com.sb	

NO	Name	Position	Organisations/Departments	Email	SIGNATURE
23	Nesta Takana	Accountant	Port	ntakona@sipa.com.sb	
24	Elma Ratiku	Lands officer	MLHS (LAOG)	ERatiku@mlhs.gov.sb	
25	Don Belonde		Don Bosco	donboscobelonde@gmail.com	
26	Nancy Raeka	TNA/SPO	PMCU/MECDM	NRaeka@mecdm.gov.sb	
27	Yuyun Qomariyah	Principal Planner	PACSOL	yucyretha@gmail.com	
28	John Kaura	Electrician supplier	Pacific Casino Hotel		
29	James Samu		GPPOL	tetabjr@gmail.com	
30	Cyril Rachman	Mitigation Expert		cyril.rachman2020@gmail.com	
31	Michael Ha'apio	Adaptation Expert		drhaapiom@gmail.com	
32	Ashley Vasula	Energy	SIPA	avasula@sipa.com.sb	

NO	Name	Position	Organisations/Departments	Email	SIGNATURE
33					

Annex 11
Validation Workshop

The validation workshop was held on 10 June 2022, the result from the workshop was the final technology prioritisation for Adaptation and Mitigation

Mitigation

Sector: Transportation

Rank 1: Sustainable Road (including Drainage & landscaping)
Rank 2: Electric Out-boat Motor (Amendment result)

Sector: Forestry

Rank 1: Multi-Purpose National Forest Inventory
Rank 2: Establish a network of terrestrial protected areas

Adaptation

Sector: Coastal Erosion

Rank 1: Sea wall-Nature based
Rank 2: Integrated coastal zone management

Sector: Relocation

Rank 1: Climate Change relocation policy
Rank 2: Permanent relocation

GEF Technology Needs Assessment Project

Second (2nd) National workshop participant list

Date: Friday 10th June 2022

Venue: Mothers Union Hall, All Saints, COM, Honiara

NO	Name	Position	Organization	Email address	Signature
1	Yuyun Qomariyah	Principal Planner	PacSol	yuyuretha@gmail.com	
2	Elvis Bwaá	Advocacy officer	SICCI	advocacy@solomonchamber.com.sb	
3	Michael Maepio	Consultant	MECDM.	mhaapio@gmail.com	
4					
5	Chris Gino Wagatora	REDD+ OFFICER	Ministry of Forestry	cwagatora@mofr.gov.sb	
6	Lorima Takeé	CC Asst SCSI.	SCSI	lorima.takee@savethechildren.org.au	
7	Carlos Soso	Planning Engineer	Solomon Power	carlos.soso@solomonpower.com.sb	
8	Nasha M. Irúmea	Ass. Lands officer	Ministry of Lands	NIrúmea@gmail.com	
9	Vera T. Pukkera	Principal C. Officer/CTE	MECDM/ECD	VTalukdu@mecdm.gov.sb	
10	MARLCHOM ZIAN ROW	SENIOR CLIMATE CHANGE officer	CCD/MECDM	MRow@mecdm.gov.sb	

NO	Name	Position	Organization	Email address	Signature
11	Nancy Diamana	GCF Project officer	SPREP/MECDM	nohsehh@gmail.com	
12	Sammy Aiahui	GCF Project Coordinator	SPREP/MECDM	psalumne@gmail.com	
13	Allen Kisi Ofea	P.O	SIMA	allen.ofea@sima.gov.sb	
14	Matthew Walekwa	CPO	MNPDC	Mwalekwa@mnpdc.gov.sb	
15	Nancy Raeka	SPO/TNA Coordinator	MECDM	NRaeka@mecdmgov.sb	
16	BARNABAS RAO	NPC/MECDM	MECDM	BRao@mecdmgov.sb	
17	Moses Pelomo	Member	KGA	moses.pelomo@gmail.com	
18	Wycliff Tupiti	NC/PMU	OPMC	wtupiti@gmail.com	
19	Ashley Vanda	Energy Dpt	Solomon Ports	avanda@spa.com.sb	
20	Nancy Raeka	TNA Coordinator/SPO	MECDM	NRaeka@mecdm.gov.sb	
21					
22					
23					
24					
25					

Annex 12
Validation for Amendment Result for Transportation

Transportation Sektor Rank Amendment

13 messages

Cyril Rachman <cyril.rachman2020@gmail.com> Mon, Jun 13, 2022 at 4:48 AM
To: Barnabas Bago <BBago@mecdm.gov.sb>, advocacy@solomonchamber.com.sb, NIro'omea@gmail.com, Wtupiti@gmail.com, avasuk@sipa.com.sb, "Marlchom Zion. Row" <MRow@mecdm.gov.sb>, Mathew Walekoro <MWalekoro@mnpdc.gov.sb>, "moses.pelomo@gmail.com" <moses.pelomo@gmail.com>, Veira Talilotu <VTalilotu@mecdm.gov.sb>, "Carlos.Soso@solomonPower.com.sb" <Carlos.Soso@solomonpower.com.sb>, "Lorima.tuke@savethechildren.org.au" <Lorima.tuke@savethechildren.org.au>, "allen.ofea@sima.gov.sb" <allen.ofea@sima.gov.sb>, Chris Wagatora <cwagatora@mofr.gov.sb>, "psalmme@gmail.com" <psalmme@gmail.com>, Nancy Raeka <NRaeka@mecdm.gov.sb>, Michael Ha'apio <mhaapio@gmail.com>, yuyun qomariyah <yucyretha@gmail.com>

Dear Colleagues,
According to the result of the meeting on June 10, 2022, the following is attached to the changes to the MCA for the transportation sector.
In a summary:

No	Types of Technology Mitigation	Total	Rank
1	Electronic vehicles (EV) Mini Bus and Vehicle Pooling station	7,350.00	3
2	Electronic Out-boat Motor	7,791.67	2
3	Sustainable Road (including Drainage & landscaping)	8,208.33	1
4	Sustainable Bridge	7,383.33	4
5	Artificial Harbour	6,300.00	5

Kindly requested your approval for the subject above

Looking forward to your favorable response

Thank you

Best Regards
Cyril Bernard Rachman
TNA Mitigation Expert

Transportation 13062022.docx
33K

yuyun qomariyah <yucyretha@gmail.com> Mon, Jun 13, 2022 at 8:46 AM
To: Cyril Rachman <cyril.rachman2020@gmail.com>
Cc: Barnabas Bago <BBago@mecdm.gov.sb>, advocacy@solomonchamber.com.sb, NIro'omea@gmail.com, Wtupiti@gmail.com, avasuk@sipa.com.sb, "Marlchom Zion. Row" <MRow@mecdm.gov.sb>, Mathew Walekoro <MWalekoro@mnpdc.gov.sb>, Moses Pelomo <moses.pelomo@gmail.com>, Veira Talilotu <VTalilotu@mecdm.gov.sb>, "Carlos.Soso@solomonPower.com.sb" <Carlos.Soso@solomonpower.com.sb>, Lorima.tuke@savethechildren.org.au, allen.ofea@sima.gov.sb, Chris Wagatora <cwagatora@mofr.gov.sb>, psalmme@gmail.com, Nancy Raeka <NRaeka@mecdm.gov.sb>, Michael Ha'apio <mhaapio@gmail.com>

Dear Mr. Rachman,
It's **approved** from my end

thank you

Kind regards,
Yuyun Q
Principal Planner of PacSol Engineering and Consultancy

Allen Ofea <allen.ofea@sima.gov.sb> Mon, Jun 13, 2022 at 9:04 AM
To: Cyril Rachman <cyril.rachman2020@gmail.com>, Barnabas Bago <BBago@mecdm.gov.sb>, "advocacy@solomonchamber.com.sb" <advocacy@solomonchamber.com.sb>, "NIro'omea@gmail.com" <NIro'omea@gmail.com>, "Wtupiti@gmail.com" <Wtupiti@gmail.com>, "avasuk@sipa.com.sb" <avasuk@sipa.com.sb>, "Marlchom Zion. Row" <MRow@mecdm.gov.sb>, Mathew Walekoro <MWalekoro@mnpdc.gov.sb>, "moses.pelomo@gmail.com" <moses.pelomo@gmail.com>, Veira Talilotu <VTalilotu@mecdm.gov.sb>, "Carlos.Soso@solomonPower.com.sb" <Carlos.Soso@solomonpower.com.sb>, "Lorima.tuke@savethechildren.org.au" <Lorima.tuke@savethechildren.org.au>, Chris Wagatora <cwagatora@mofr.gov.sb>, "psalmme@gmail.com" <psalmme@gmail.com>, Nancy Raeka <NRaeka@mecdm.gov.sb>, Michael Ha'apio <mhaapio@gmail.com>, yuyun qomariyah <yucyretha@gmail.com>

Good morning Cyril,

Thank you for the summary, approved from SIMA.

Kind Regards.

Allen Kisi Ofea

Principal Officer, Pollution and Safety Response

Environment Protection and Safety Department

P +677 7224524

E allen.ofea@sima.gov.sb|allenkisi21@gmail.com

Moses Pelomo <moses.pelomo@gmail.com> Mon, Jun 13, 2022 at 9:17 AM
To: yuyun qomariyah <yucyretha@gmail.com>

Good morning Yuyun,
Noted
Moses
[Quoted text hidden]

Lorima Tuke <lorima.tuke@savethechildren.org.au> Mon, Jun 13, 2022 at 9:44 AM
To: Cyril Rachman <cyril.rachman2020@gmail.com>, Barnabas Bago <BBago@mecdm.gov.sb>, "advocacy@solomonchamber.com.sb" <advocacy@solomonchamber.com.sb>, "NIro'omea@gmail.com" <NIro'omea@gmail.com>, "Wtupiti@gmail.com" <Wtupiti@gmail.com>, "avasuk@sipa.com.sb" <avasuk@sipa.com.sb>, "Marlchom Zion. Row" <MRow@mecdm.gov.sb>, Mathew Walekoro <MWalekoro@mnpdc.gov.sb>, "moses.pelomo@gmail.com" <moses.pelomo@gmail.com>, Veira Talilotu <VTalilotu@mecdm.gov.sb>, "Carlos.Soso@solomonPower.com.sb" <Carlos.Soso@solomonpower.com.sb>, "allen.ofea@sima.gov.sb" <allen.ofea@sima.gov.sb>, Chris Wagatora <cwagatora@mofr.gov.sb>, "psalmme@gmail.com" <psalmme@gmail.com>, Nancy Raeka <NRaeka@mecdm.gov.sb>, Michael Ha'apio <mhaapio@gmail.com>, yuyun qomariyah <yucyretha@gmail.com>

Looks good.

Lets keep move with it

Lorima

Chris Wagatora <cwagatora@mofr.gov.sb> Mon, Jun 13, 2022 at 9:54 AM
To: Cyril Rachman <cyril.rachman2020@gmail.com>, Barnabas Bago <BBago@mecdm.gov.sb>, "advocacy@solomonchamber.com.sb" <advocacy@solomonchamber.com.sb>, Wycliff Tupiti <wtupiti@gmail.com>, "avasuk@sipa.com.sb" <avasuk@sipa.com.sb>, "Marlchom Zion. Row" <MRow@mecdm.gov.sb>, Mathew Walekoro <MWalekoro@mnpdc.gov.sb>, "moses.pelomo@gmail.com" <moses.pelomo@gmail.com>, Veira Talilotu <VTalilotu@mecdm.gov.sb>, "Carlos.Soso@solomonPower.com.sb" <Carlos.Soso@solomonpower.com.sb>, "Lorima.tuke@savethechildren.org.au" <Lorima.tuke@savethechildren.org.au>, "allen.ofea@sima.gov.sb" <allen.ofea@sima.gov.sb>, "psalmme@gmail.com" <psalmme@gmail.com>, Nancy Raeka <NRaeka@mecdm.gov.sb>, Michael Ha'apio <mhaapio@gmail.com>, yuyun qomariyah <yucyretha@gmail.com>

Good morning Cyril,

Approved from this end (Ministry of Forestry).

Kind regards

Chris Giro Wagatora
REDD+ Implementation Unit
Ministry of Forestry & Research
P O Box G24 Honiara, Solomon Islands

Veira Talilotu <VTalilotu@mecdm.gov.sb> Mon, Jun 13, 2022 at 9:57 AM
To: Cyril Rachman <cyril.rachman2020@gmail.com>, Barnabas Bago <BBago@mecdm.gov.sb>, "advocacy@solomonchamber.com.sb" <advocacy@solomonchamber.com.sb>, "NIro'omea@gmail.com" <NIro'omea@gmail.com>, Wycliff Tupiti <wtupiti@gmail.com>, "avasuk@sipa.com.sb" <avasuk@sipa.com.sb>, "Marlchom Zion. Row" <MRow@mecdm.gov.sb>, Mathew Walekoro <MWalekoro@mnpdc.gov.sb>, "moses.pelomo@gmail.com" <moses.pelomo@gmail.com>, "Carlos.Soso@solomonPower.com.sb" <Carlos.Soso@solomonpower.com.sb>, "Lorima.tuke@savethechildren.org.au" <Lorima.tuke@savethechildren.org.au>, "allen.ofea@sima.gov.sb" <allen.ofea@sima.gov.sb>, Chris Wagatora <cwagatora@mofr.gov.sb>, "psalmme@gmail.com" <psalmme@gmail.com>, Nancy Raeka <NRaeka@mecdm.gov.sb>, Michael Ha'apio <mhaapio@gmail.com>, yuyun qomariyah <yucyretha@gmail.com>

Hi Cyril and colleagues,

In support of others for Transport sector for technology rank 1 & 2.

Have a pleasant week (from Environment and Conservation Division/MECDM)

Cheers

Veira

wycliff tupiti <wtupiti@gmail.com> Mon, Jun 13, 2022 at 10:38 AM
To: Cyril Rachman <cyril.rachman2020@gmail.com>
Cc: Barnabas Bago <BBago@mecdm.gov.sb>, advocacy@solomonchamber.com.sb, NIro'omea@gmail.com, avasuk@sipa.com.sb, "Marlchom Zion. Row" <MRow@mecdm.gov.sb>, Mathew Walekoro <MWalekoro@mnpdc.gov.sb>, "moses.pelomo@gmail.com" <moses.pelomo@gmail.com>, Veira Talilotu <VTalilotu@mecdm.gov.sb>, "Carlos.Soso@solomonPower.com.sb" <Carlos.Soso@solomonpower.com.sb>, "Lorima.tuke@savethechildren.org.au" <Lorima.tuke@savethechildren.org.au>, "allen.ofea@sima.gov.sb" <allen.ofea@sima.gov.sb>, Chris Wagatora <cwagatora@mofr.gov.sb>, "psalmme@gmail.com" <psalmme@gmail.com>, Nancy Raeka <NRaeka@mecdm.gov.sb>, Michael Ha'apio <mhaapio@gmail.com>, yuyun qomariyah <yucyretha@gmail.com>

Cyril and Team,

Thanks for the updated summary.

Approved!

Wycliff
[Quoted text hidden]

Mathew Walekoro <MWalekoro@mnpdc.gov.sb> Mon, Jun 13, 2022 at 11:39 AM
To: Cyril Rachman <cyril.rachman2020@gmail.com>, Barnabas Bago <BBago@mecdm.gov.sb>, "advocacy@solomonchamber.com.sb" <advocacy@solomonchamber.com.sb>, "NIro'omea@gmail.com" <NIro'omea@gmail.com>, Wycliff Tupiti <wtupiti@gmail.com>, "avasuk@sipa.com.sb" <avasuk@sipa.com.sb>, "Marlchom Zion. Row" <MRow@mecdm.gov.sb>, "moses.pelomo@gmail.com" <moses.pelomo@gmail.com>, Veira Talilotu <VTalilotu@mecdm.gov.sb>, "Carlos.Soso@solomonPower.com.sb" <Carlos.Soso@solomonpower.com.sb>, "Lorima.tuke@savethechildren.org.au" <Lorima.tuke@savethechildren.org.au>, "allen.ofea@sima.gov.sb" <allen.ofea@sima.gov.sb>, Chris Wagatora <cwagatora@mofr.gov.sb>, "psalmme@gmail.com" <psalmme@gmail.com>, Nancy Raeka <NRaeka@mecdm.gov.sb>, Michael Ha'apio <mhaapio@gmail.com>, yuyun qomariyah <yucyretha@gmail.com>

Mr. Rachman,

Thanks for the updates and great efforts in analysing the MCA for the transport sector really worthwhile for future investments.

Cheers

Matthew

Michael Ha'apio <mhaapio@gmail.com> Mon, Jun 13, 2022 at 11:45 AM
To: Cyril Rachman <cyril.rachman2020@gmail.com>
Cc: Barnabas Bago <BBago@mecdm.gov.sb>, advocacy@solomonchamber.com.sb, NIro'omea@gmail.com, wycliff tupiti <Wtupiti@gmail.com>, avasuk@sipa.com.sb, "Marlchom Zion. Row" <MRow@mecdm.gov.sb>, Mathew Walekoro <MWalekoro@mnpdc.gov.sb>, "moses.pelomo@gmail.com" <moses.pelomo@gmail.com>, Veira Talilotu <VTalilotu@mecdm.gov.sb>, "Carlos.Soso@solomonPower.com.sb" <Carlos.Soso@solomonpower.com.sb>, "Lorima.tuke@savethechildren.org.au" <Lorima.tuke@savethechildren.org.au>, "allen.ofea@sima.gov.sb" <allen.ofea@sima.gov.sb>, Chris Wagatora <cwagatora@mofr.gov.sb>, "psalmme@gmail.com" <psalmme@gmail.com>, Nancy Raeka <NRaeka@mecdm.gov.sb>, yuyun qomariyah <yucyretha@gmail.com>

Hi Cyril,

The amendment looks good to me. Please amend our main report and share with the TNA Coordinator for further perusal.

Kind regards,

Dr Michael Ha'apio, Ph.D. | Principal Consultant |

Idea Connection Pacific | Panatina Valley -East Honiara|

Honiara | Solomon Islands|

Phone : +677 7119875 | Email : mhaapio@gmail.com **or** drhaapiom@gmail.com

"Double VC Award for Best Research Publications,USP - 2015 & 2020."

Marlchom Zion. Row <MRow@mecdm.gov.sb> Mon, Jun 13, 2022 at 12:38 PM
To: Cyril Rachman <cyril.rachman2020@gmail.com>, Barnabas Bago <BBago@mecdm.gov.sb>, "advocacy@solomonchamber.com.sb" <advocacy@solomonchamber.com.sb>, Wycliff Tupiti <wtupiti@gmail.com>, "avasuk@sipa.com.sb" <avasuk@sipa.com.sb>, Mathew Walekoro <MWalekoro@mnpdc.gov.sb>, "moses.pelomo@gmail.com" <moses.pelomo@gmail.com>, Veira Talilotu <VTalilotu@mecdm.gov.sb>, "Carlos.Soso@solomonPower.com.sb" <Carlos.Soso@solomonpower.com.sb>, "Lorima.tuke@savethechildren.org.au" <Lorima.tuke@savethechildren.org.au>, "allen.ofea@sima.gov.sb" <allen.ofea@sima.gov.sb>, Chris Wagatora <cwagatora@mofr.gov.sb>, "psalmme@gmail.com" <psalmme@gmail.com>, Nancy Raeka <NRaeka@mecdm.gov.sb>, Michael Ha'apio <mhaapio@gmail.com>, yuyun qomariyah <yucyretha@gmail.com>

Adjustment approved

Regards

Marlchom Z. Row
Senior Climate Change Officer
Research and Communication Unit
Climate Change Division
MECDM