



Solomon Islands Ridge to Reef Island Diagnostic Analysis Report



Solomon Islands Ridge to Reef Island Diagnostic Analysis Report

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



Suva, Fiji, 2021

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Original text: English

Citation Kereseka, J. 2021. Solomon Islands Ridge to Reef Island Diagnostic Analysis Report. Prepared for the Ministry of Environment Climate Change Disaster Management and Meteorology, Solomon Islands Government, Honiara. Produced and published by GEF Pacific International Waters Ridge to Reef Regional Project, Pacific Community (SPC), Suva, Fiji , 71 pp.

Reviewed by George Naboutuiloma, Samasoni Sauni, Fononga Vainga Mangisi-Mafileo, Aliti Vunisea, John Carreon and Jose Antonio.

Edited by Seema Deo (Footprints in the Sand Consulting)

Cover Photo : Sedimentation at the Kangava BMSI Port, Kangava Bay, Rennell Is

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

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

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

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Printed by Quality Print, Suva, Fiji, 2021

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ABBREVIATIONS

CPTH	Code of Practice for Timber Harvesting
ENSO	El Niño-Southern Oscillation
ESSI	Ecological Solutions Solomon Islands
FREL	Forest Reference Emission Level
GDP	Gross Domestic Product
GEF	Global Environment Facility
GNI	Gross National Income
ICM	Integrated Coastal Management
IDA	Island Diagnostic Analysis
IUCN	International Union for Conservation of Nature
IWRM	Integrated Water Resources Management
LEAF	Learning Ecological Activities Foundation for Children
MECDM	Ministry of Environment, Climate Change, Disaster Management & Meteorology
MFMR	Ministry of Fisheries and Marine Resources
MHMS	Ministry of Health and Medical Services
MoFT	Ministry of Finance and Treasury
MPN	Most Probable Number
MWYCFA	Ministry of Women, Youth, Children and Family Affairs
NBSAP	National Biodiversity Strategic Action Plan
NPoA	National Plan of Action
PMCU	Project Management Coordination Unit
RSIPF	Royal Solomon Islands Police Force
SAF	Strategic Action Framework
SINOP	Solomon Islands National Ocean Policy
SOE	State of the Environment
SPREP	Secretariat of the Pacific Regional Environment Programme
STAR	System for Transparent Allocation of Resources

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ACKNOWLEDGEMENTS

The development of the Island Diagnostic Analysis (IDA) for the Solomon Islands is a result of many months of consultation by the lead consultants, Telios Corporate and Consultancy Services. We would like to acknowledge the leadership of the Pacific Community (SPC) Solomon Islands International Waters Ridge to Reef Project Office through the Environment and Conservation Division within the Ministry of Environment, Climate Change, Disaster Management and Meteorology (MECDM). Special acknowledgement to all stakeholders who provided information and data which are reflected in this report.

1.0 EXECUTIVE SUMMARY

The GEF/SPC International Waters Ridge to Reef Solomon Islands Project implemented under the Ministry of Environment, Climate Change, Disaster Management & Meteorology (MECDM) offers a systematic approach to address environmental issues in our country and support socio-economic development. The IW R2R project identifies environmental threats, obstacles, and constraints which are urgently needed addressing to conserve and manage our natural resources. The project also provides a holistic intervention for protecting the coastal ecosystems through the application of ridge to reef approaches and integrating land, water, forest, and coastal management.

The IW R2R project will identify and prioritise coastal areas and sites that need protection linking environmental degradation in the uplands (“ridge”) or land-based activities causing pollution that impact aquifers, groundwater and coastal ecosystems through waste discharge and sedimentation, by restoring the shoreline and protecting marine ecosystems (“reef”), thereby mitigating storm surges, indiscriminate excessive exploitation of biodiversity and degradation of coastal habitats and ecosystems.

All IDA reports under the R2R Regional IW R2R Project include gender and social considerations, considering local governance mechanisms and roles, responsibilities of men, women, and other sectors of society on the use and management of resources.

Solomon Islands is geographically located close to the centre of biological diversity and therefore a global hotspot of biological endemism and one of the most biodiverse countries in the Pacific. This attracts commercial companies to harvesting natural resources in the country. The high degree of endemism also means that any substantial loss of habitat is likely to lead to extinction of species of flora and fauna. In terms of marine resources, the overall reef health in Solomon Islands was good, although there remain challenges. Solomon Islands is part of the Coral Triangle Initiative (CTI), which is taking efforts to conserve and sustainably manage coral reef ecosystems.

Accordingly, many Solomon Islanders rely on their natural environment for their livelihood – they fish in the sea for food, grow crops to eat, use plants for medicine and harvest trees for building and fuel. The country’s biodiversity is under threat from logging, over-exploitation, and pollution from improper waste disposal and clearing of land, for agriculture, mining, housing, invasive species, climate change and other extreme events. Human activities are the main cause of biodiversity loss and many of these losses are irreversible and undocumented. However, most of these threats are a direct result of lack of a decentralised and localised management structure that meets uniform, large-scale (i.e., national) conservation objectives. Additionally, the governance framework is inadequate and outdated preventing integration between all sectors for ridge to reef development.

In developing the IDA report for Solomon Islands, national stakeholders have identified national priority issues that have contributed to the degradation and depleted state of the natural environment. There were many issues raised, however, the prioritisation process identified six national priority issues to be the basis for the strategic action planning exercise. The prioritised national issues are poor solid waste management, land degradation, deforestation and forest degradation, water pollution, invasive species, and coral degradation. The reforms and actions in the strategic action plan will address these six national priority issues.

In terms of **poor solid waste management**, managing waste and controlling pollution will require national effort that includes high-level political leadership, effective policy and legal frameworks, development of appropriate institutional capacity and changing attitudes starting at individual to community, provincial and national level. An important factor is the need for political will and support for investment for appropriate infrastructure, sustainable financing, and innovative means for public–private partnerships in urban areas such as Honiara. Some of the recommendations highlighted in the SOE report are also included in the report.

Land Degradation actions and reforms include restoration and rehabilitation, successful implementation of the Sustainable Forest Management (SFM) that requires well established and functional governance, monitoring and enforcement mechanisms. In addition, the implementation of the Integrated Forest Management (IFM) Project will also contribute to the effective management of forest resources.

Deforestation and Forest Degradation has multiple causal factors, which needs combined efforts of relevant government agencies to address together. Actions and reforms include updating forestry legislation, regulations, and empowering key agencies to carry out enforcement.

There are existing regimes available to address **water pollution**. Some of the actions and reforms that could be undertaken include collaboration between agencies and harmonisation of legislation, enforcement of existing legislation, development, and implementation of water quality standards, and increased budgetary support to conduct continuous water quality assessment and monitoring.

Main actions and reforms to address the problem of **invasive species** includes research, prevention, early detection and rapid response, public education and awareness and strengthening ballast water management.

Coral reef degradation actions and reforms include building capacity for provincial fisheries officers to monitor and control overharvesting and trade of commercial marine resources, including corals. The officials also undertake awareness raising by disseminating relevant materials and information to coastal communities and strengthen engagement with communities in locally marine managed areas.

2.0 INTRODUCTION

Over the years environmental degradation continues to be a challenge due to rapid land use change, intensive logging, mining, intensive agriculture practices, invasive alien species, unsustainable fishing, poor waste management, unsustainable development activities and the impacts of climate change and natural disasters. These activities and practices result in the gradual and detrimental impacts on the quality and integrity of rivers, streams, marine environment, and related natural ecosystems. Increased economic activities and expanding populations in coastal centres, towns and communities of the Solomon Islands have resulted in the large amount of waste produced including sewage and industrial effluent. Unfortunately, raw sewage and industrial effluents produced in all the major towns are directly released into estuaries and other coastal habitats. This is particularly evident in Honiara and across other urban centres across the country. Away from coastal towns, pollution of coastal water is also caused by fertiliser residue in run-off from agricultural areas especially on the major islands where large agricultural practices occur. Pollution from liquid and solid wastes and uncontrolled developments coupled with lack of urban planning, lack of sewerage treatment and poor regulatory compliance results in untreated sewage being disposed directly to rivers and coastal ecosystems.

Due to socio-economic development, each sector has had and will continue to have a distinct impact on the environmental integrity of coastal communities across the country. Communities are heavily reliant on resources, and the various uses of resources for social and economic livelihoods for men, women, and other community segments necessitate discussions on resource constraints and factors. This includes political instability, governance and land tenure issues, over-exploitation of natural resources and limited infrastructure access and development. Across many sectors, environmental degradation remains a threat. The destruction of marine habitats, forest degradation, pollution and over-exploitation of natural resources all highlight the environmental challenges confronting rural communities in the Solomon Islands. While the government is promoting sustainable development practices across most sectors, there are still contesting issues that make it difficult to attain this goal.

The national vision for environment and conservation for the country is to ensure the environment and natural resources of the Solomon Islands are protected, managed, and sustainably used for the maximum benefit of the Government and people of the country. To achieve this vision, measures need to be taken to address threats, obstacles and constraints of issues affecting the management of natural resources. Many of these issues will be addressed through the cross-sectoral planning and management initiatives from community to provincial and at the national scale.

This report was formulated as part of the GEF Pacific International Waters Ridge to Reef Project (IWR2R) in seeking to undertake an Island Diagnostic Analysis Report (IDA) to identify, quantify, and set priorities for environmental problems that are cross-sectoral (or from ridge to reef) in nature. The report will be an important basis for decision making to mainstream the ridge to reef approach in natural resource management and planning. Critical to that is understanding the present situation of the natural resources and its corresponding stressors to help ensure effective management and thus securing sustainable flow of goods and services.

The International Waters Ridge to Reef Project

The ridge to reef approach aims to provide a holistic intervention for protecting the coastal area by targeting environmental degradation in the uplands (“ridge”) or land-based activities causing pollution that impact aquifers, groundwater and coastal ecosystems through waste discharge and sedimentation, by restoring the shoreline and protecting marine ecosystems (“reef”), thereby mitigating storm surges, indiscriminate excessive exploitation of biodiversity and degradation of coastal habitats and ecosystems.¹

The GEF Pacific IWR2R Project was designed around this approach and aims to test the mainstreaming of ‘ridge to reef’ (R2R), and climate resilient approaches to integrate land, water, forest, and coastal management in the Pacific Island countries (PICs) through strategic planning, capacity building and piloted local actions to sustain livelihoods and preserve ecosystem services.

Objective of the International Waters Ridge to Reef Project

The project was designed to build an enabling environment at national level for linking integrated water resources management (IWRM) with integrated coastal management (ICM) using a ridge to reef (R2R) approach.² Indeed, the basis of the GEF Programmatic Approach is to gain synergies across GEF Focal Areas and Implementing Agencies. In an area as diverse and vast as the Pacific island’s region, coordination and integration are key success factors. Leveraging national STAR project outcomes, building multi-institutional coordination across multifocal areas and adoption of national ICM frameworks needs the resources of the project.

The preparation and delivering on diagnostic analyses for ICM/IWRM reforms and investments is one important deliverable for the overarching strategic results framework of the project document.³ Outcome 1.2: National diagnostic analyses for ICM conducted for prioritizing and scaling-up key ICM/IWRM reforms and investments.⁴ Indicator 1.2.1: By end of the project, number of diagnostic analyses conducted for priority coastal areas.⁵ Target 1.2.1: 14 diagnostic analyses for ICM/IWRM and CCA investments conducted to inform priority areas for scaling-up in each of 14 participating PICs. Indicator 1.2.2: Number and quality of ICM-IWRM investments incorporating baseline environmental state and socio-cultural information for the prioritisation of investment sites.⁶ Target 1.2.2: Up to 14 ICM-IWRM investments, utilising methodology and procedures for characterising island coastal areas for ICM investment developed by the project.⁷ Additional to these and directly related elements are the following outcome that the products of diagnostic reporting will contribute to: Outcome 3.1: National and regional strategic action frameworks for ICM/IWRM endorsed nationally and regionally.⁸

¹ Secretariat of Pacific Community 2016.

² *ibid.*

³ *ibid.*

⁴ *ibid.*

⁵ *ibid.*

⁶ *ibid.*

⁷ *ibid.*

⁸ *ibid.*

Scope of this report

This report has been prepared through multiple national stakeholders' consultations. The organisations and institutions that took part in the national stakeholder consultations include the following (see appendix detail list of stakeholders):

- Ministry of Environment, Climate Change, Disaster Management and Meteorology
- Ministry of Lands, Housing and Survey
- Ministry of Finance and Treasury (Statistics Division)
- Ministry of Fisheries and Marine Resources
- Ministry of Women Youth Children and Family Affairs
- Ministry of Health and Medical Services
- Ministry of Forestry
- Ministry of Ministry of Police, National Security and Correctional Services
- Worldwide Fund for Nature (WWF)
- Solomon Islands National University
- PACRES Project - Secretariat of the Pacific Regional Environment Programme (SPREP)
- LEAF Project - Japanese International Cooperation Agency (JICA)
- Integrated Ocean Governance Project - International Union for Conservation of Nature (IUCN)
- Honiara City Council

The reporting and analyses were undertaken by local experts identified by the ministry responsible for implementing the IW R2R project in the Solomon Islands. In the analysis and reporting, gender and social inclusion aspects of the resource use and management had been considered. Furthermore, local experts were identified to conduct seminars/workshops which was part of the development phase for the formulation of this IDA Report. The seminars/workshops sought national input to identify, quantify and set priorities for environmental problems that are cross-sectoral (or from ridge to reef) in nature. The initial IDA preparation workshop was conducted on February 24th, 2021, at Kairos Conference Centre, Hyundai Mall, Honiara. Validation workshop was conducted on August 20th, 2021, together with Strategic Action Plan Workshop at Kairos Conference Centre, Hyundai Mall, Honiara.

3.0 METHODOLOGY

The development of this IDA report is an immediate output of the GEF Pacific IW R2R project, and it is also a deliverable under the R2R science to policy framework. A consultative approach was undertaken using existing data and information, which was analysed in an interdisciplinary/holistic manner. The process of developing this IDA was derived from the Global International Waters Assessment (GIWA), the GEF Transboundary Diagnostic Analysis, and Pacific IWRM Diagnostic Analysis methodologies. The methods used in this IDA development process are:

(i) Collection and analysis of data/information/ Desktop Review

Analysis of existing data and information using an interdisciplinary and holistic approach through a consultative approach involving discussions with all sectors of communities including women, youths, and marginalised groups. There were also efforts to include landowners, community leaders to gauge existing uses and management of resources. Most of the existing data had been collated during development of the State of the Environment (SOE) Report for Solomon Islands in 2019. Further background data and information was retrieved from reports such as National Biodiversity Strategic Action Plan (NBSAP), National Waste Management and Pollution Control Strategy 2017–2026 (NWMPCS) and Rapid Coastal Assessment of Mataniko River Catchment (RAPCA).

(ii) Identification of priority environmental problems

The process of identifying national environmental problems is crucial and most of the data have been collected and analysed through scientific research. An IDA workshop was conducted whereby stakeholders were asked to identify problems that currently affect the natural environment. Moreover, a priority criteria matrix (see Annex 1) was used for prioritising identified environmental problems and the sources of these problems. The next step involved prioritising of identified environmental problems (Annex 2). This was done during the IDA workshops followed as well as through an assessment of available data and ranking according to the impacts it has on the environment, livelihood, and socio-economic wellbeing.

(iii) Analysis of causal chains

Causal chain analysis involves identifying root causes of the environmental problems observed in nature. From the IDA workshop, causal chain analysis was done through categorising of sectors to identify immediate causes, underlying causes, and root causes or pressures that linked to numerous social/economic/governmental causes, at different scales and levels. The causal chain was developed using flow diagrams to identify the environmental problems and was later analysed and supported with a narrative and quantitative and/or qualitative data.

(iv) Identification of priority options for reform and action

Identification of priority options for reform and action was the last process to determine next steps and the way forward through identifying of key leverage points. This significant step paves the way for the process of strategic action framework (SAF) development. In this process, stakeholders from various disciplines identify and prioritise opportunities, solutions, and interventions for reform. A criteria matrix was used during the workshop to produce the expected and desired outcome, expected impact, and feasibility of implementation expected in the SAF process. This was the basis for the formulation of the Strategic Action Framework (SAF) for Ridge to Reef.

4.0 DESCRIPTION OF COUNTRY

4.1 Physical and Geographic characteristics

The Solomon Islands consists of a double chain of six major islands (*Choiseul, New Georgia, Santa Isabel, Guadalcanal, Malaita, Makira*) and approximately 990 smaller islands, atolls, and cays.⁹ The country lies between latitudes 5° S and 12° S and Longitudes 152° E and 170° E in the southwest Pacific between Bougainville, at the eastern tip of Papua New Guinea (PNG), and to the northwest of Vanuatu.¹⁰ This archipelago has a total land area of 28,369 sq km and is scattered over an expanse of almost 1600 km. It has an exclusive economic zone of 1.34 million sq. km and is home to one of the richest and most diverse marine ecosystems in the world. The entire country is part of the East Melanesian Biodiversity Hotspot on account of the astonishing range of ecosystems and biodiversity it harbours, including 37 Key Biodiversity Areas (KBAs).¹¹



Fig 1. Map of Solomon Islands (Adapted from ANU 2021)

The country has an equatorial maritime climate that is characterised by somewhat uniform temperatures ranging from 22°C to an average maximum of 31°C and high humidity throughout the year.¹² The mean annual rainfall ranges from 3000 mm to 5000 mm varying significantly between locations as a result of the topographical features of the islands and their orientation to the prevailing winds.¹³ Abundant rainfall occurs mainly during the period of the west to

⁹ Solomon Islands Government. 1993.

¹⁰ *ibid.*

¹¹ University of the South Pacific. 2012.

¹² *ibid.*

¹³ *ibid.*

northwesterly monsoonal winds, usually from January to March and is often associated with tropical cyclones. The southeast trade winds are from May to October and can at times result in heavy rainfalls mainly on the windward side of the country.

The Solomon Islands is an island arc that was formed within an intra-oceanic environment through the complex interactions between the Australian and Pacific plates and is part of the greater Melanesian arc system. Active volcanoes and intense seismic activities are characteristics of island arcs. The Solomon Islands arc is part of the Pacific “Ring of Fire” and most of the seismic activities occur along the northwestern and southwestern parts of the arc. The country features a diversity of landforms ranging from large rugged mountainous islands surrounded by uplifted coral terraces and fringed with coral reefs to small bare sand and coralline atolls¹⁴. These islands are rich in biodiversity and vegetation types ranging from lowland forests, hill forests, montane forests to freshwater swamp and riverine forests, saline swamp forests and grassland reflecting the geological formations and origins.¹⁵ Water resources vary across the islands from sizable rivers on the larger mountainous islands to thin freshwater lens in small low-lying atolls and islets.¹⁶

4.2 Socio-economic situation

The 2019 National Population and Housing census provisional population count recorded the population of Solomon Islands to be about 721,455.¹⁷ Out of the total population there were 369,252 males (51.2%) and 352, 204 females (48.8%).¹⁸ This depicts an increase of 30.8%, an increase of 17,000 people per year since the 2009 census.¹⁹ The country recorded a mean annual growth rate of 2.7% with an overall population density of 24 persons per square kilometre.²⁰ In comparison with the 2009 census report, the annual growth rate has slightly decreased (3.0% in 2009), however, population density has increased (18 persons per sq. km.)²¹ Honiara is the capital city of Solomon Islands and has recorded the fastest annual growth of 5.8%, an increase of 5700 people per year and also recorded the highest population density of 5950 people per square kilometre compared to the rest of the provinces.²²

The Solomon Islands economy is worth around USD1 billion in real GDP.²³ Primary commodities palm oil, copra, cocoa, logs, tuna and minerals continue to make up the bulk of foreign exchange receipts mainly to Asia, with China as the nation’s biggest export trading partner.²⁴ The domestic sector is very much a subsistence economy with 70% of the population still living in rural areas and sustenance and livelihood for the majority, including most in the urban centres, is catered for by utilising the natural forests, sea resources and land for food production, income, housing

¹⁴ *ibid.*

¹⁵ *ibid.*

¹⁶ *ibid.*

¹⁷ Solomon Islands National Statistics. 2020.

¹⁸ *ibid.*

¹⁹ *ibid.*

²⁰ *ibid.*

²¹ *ibid.*

²² *ibid.*

²³ Central Bank of Solomon Islands 2020.

²⁴ *ibid.*

and medicine.²⁵ About 60.4% of the female population is in employment compared to 72.2% of men, with over three quarters of these women participating in subsistence work (76.2%) compared to men (58.1%).²⁶ Women make up less than 30% of the public sector and hold 6% only of senior public service positions.²⁷ In the subsistence sector women are mostly responsible for the production of the majority of subsistence foods and also make up the vast majority of market vendors; men are more involved in the more financially lucrative cash crops.

National inflation rate in recent years has been increasing at a constant rate. Food, equipment, and fuel continue to generate the largest share of imports with Australia as Solomon's biggest import trading partner amongst other regional nations, New Zealand, Malaysia and Singapore.²⁸ As a developing country, foreign aid plays significantly in national GDP especially with government spending. While foreign aid adds to Gross National Income (GNI), issues with aid allocation and the integrity of governance and institutions remain the greatest barrier to long term success for the country. Solomon Islands currently ranks 136/190 countries by the World Bank in the ease of doing business, and the latest CPI (2019) ranks it at 42/100 reflecting this ongoing challenge with its fiscal environment, and viability to pull foreign investment.²⁹

The fluctuation of commodity prices and high dependence on trading partners means Solomon Islands is very vulnerable to global financial markets. With the current COVID pandemic, economic growth was forecast to tilt downward to between -3% and -5% in 2020 according to the CBSP report 2019, should the effects of the pandemic continue, but expected to recover in 2021³⁰.

Economic challenges remain. Unsustainable logging continues to play a big part towards export receipts, subsistence economy is still an informal sector and export is resource driven, making it highly vulnerable to global markets. Secondary industries and value-added productions are still scarce. Invest Solomons reports that, while exports are improving, the balance of payments remains in deficit and with a large external public debt, necessitating prudent fiscal management for any positive economic outlook in the future.

Gender relations in Solomon Islands are heavily male-dominated, and this perpetuates discrimination against women and girls. Inequalities in control of decision making, economic resources, and access to health care, education, and leisure time restrict the rights and freedoms of girls and women, resulting in unequal benefits for them from the development process. These inequalities do not stem solely from traditional customs and systems but have been reinforced to some extent by colonial and religious systems.³¹ Male dominance has also been exacerbated by recent conflicts in Solomon Islands when the population was subjected to militarisation and violence that fuelled hyper-masculine behaviours, including violence against women.³²

²⁵ *ibid.*

²⁶ *ibid.*

²⁷ *ibid.*

²⁸ *ibid.*

²⁹ World Bank. 2020.

³⁰ above n23.

³¹ Moser. 2006.

³² *ibid.*

4.3 Ecology and Climate Change

The Solomon Islands is one of the richest countries in terms of its biodiversity. Its terrestrial biodiversity is ranked the second highest in the world, with the country being home to 4500 plant species, 26 native mammals and 19 reptile species that are endemic. It is a hotspot for bird diversity.³³ The marine biodiversity is no different, the ocean swarming with one of the richest concentrations of reef fishes.³⁴ The Solomon Islands marine environment hosts one of the highest diversity of corals second only to Raja Ampat Islands of eastern Indonesia.³⁵

Because of the country's high levels of endemism and rich biodiversity it has been listed in the "Global 200" as one of the globally outstanding eco-regions for biological diversity. However, despite the global recognition, a range of factors such as poorly regulated development practices, destructive fishing practices, anthropogenic activities and climate change is threatening this unique biodiversity.³⁶

More than 80% of the population resides in low vulnerable coastal rural areas relying heavily on subsistence agriculture and fishing for food and income, with limited access to utilities and government services. Solomon Islanders associate themselves strongly with the marine environment, with seafood providing 50% – 90% of proteins.³⁷ Biodiversity thus makes a huge contribution to the country's blue/green economy. The contribution of fisheries (particularly the export of tuna) to livelihoods and the economy is enormous with additional marine products such as curios and jewelry, aquaria fish and corals.³⁸ Aquaculture is increasing, with a focus on seaweed, coral, and clams for the ornamental trade, but more recently Nile tilapia (inland).³⁹ Mangroves provide firewood and food as well as timber for carvings, canoes and ornaments.

Climate change is a severe threat to low-lying coasts and atoll ecosystems due to sea level rise, storms, and temperature changes. Tropical cyclones are frequent from November to April although the seasonal cycle is greatly affected by the El Niño-Southern Oscillation (ENSO), which in 1997/1998 led to prolonged droughts, causing food and water shortages.⁴⁰ Lying in the Pacific "Ring of Fire" and cyclone zone makes the country vulnerable to natural disasters (volcanoes, earthquakes, tsunamis) and extreme weather events, which are exacerbated by climate change. Annual sea level rises of up to 10 mm have been recorded, causing the submergence of the lowest lying islands, and forcing relocations of communities from vulnerable coastlines⁴¹

²⁵ ibid.

²⁶ ibid.

²⁷ ibid.

²⁸ ibid.

²⁹ World Bank. 2020.

³⁰ above n23.

³¹ Moser. 2006.

³² ibid.

³³ The Nature Conservancy. 2006.

³⁴ ibid.

³⁵ ibid.

³⁶ Solomon Islands Government. 2019.

³⁷ Arena et al. 2015.

³⁸ ibid.

³⁹ ibid.

⁴⁰ Solomon Islands Government. 2008.

⁴¹ Albert S, Leon X J, Grinham R A, Church A J, Gibbes R B, Woodroffe D C, (2016.), Interactions between sea-level rise and wave exposure on reef island dynamics in the Solomon Islands, Environment Research Letters, 11 054011 , IOP Science.:<https://iopscience.iop.org/article/10.1088/1748-9326/11/5/054011>

Climate change impacts compound other threats, particularly land degradation, with pronounced impacts on natural ecosystems and agricultural lands. Loss of cultivated area or productivity may result in an increased reliance on imported foods; this has occurred through the decline in the yields of sweet potato, the main staple crop in rural areas. Conversion of mangrove forests has made coastlines even more vulnerable to storms; prolonged dry seasons combined with loss of forests are affecting freshwater biodiversity and water availability; and high rainfall washes sediment from poorly managed land into rivers and coastal ecosystems.

5.0 RIDGE TO REEF MANAGEMENT

5.1 Natural resources

The Solomon Islands culture, economy and livelihood are all benefits derived from the natural physical environment. Solomon Islands natural resources include coastal, land and water resources. The country's biodiversity and the ecosystems provide important goods and services benefitting nature and local communities. Traditional culture, uses and management of natural resources are also very diverse. Many traditional resource management strategies exist, and they are key components to a successful conservation plan for the Solomon Islands.

Marine and Coastal Resources

Marine and coastal resources in the Solomon Islands include the exceptionally high coral diversity. A total of 496 species of hard coral records were reported from the Solomon Islands, which was the second highest diversity globally after the Raja Ampat islands of Indonesia.⁴² The Nature Conservancy rapid marine assessment exercise, which conducted a comprehensive baseline survey of coral reefs, concluded that overall reef health in the Solomon Islands was good.⁴³ A general observation from recent reports concluded that the overall condition of most reefs is good, and reef condition, the diversity of marine life remains mostly intact.⁴⁴

In 1999, the WorldFish Center conducted a study to identify any effects of runoff on fringing reefs by comparing abundance, diversity, survival and recruitment of corals adjacent to logged and unlogged catchments on Vangunu Island and Kolombangara Island.⁴⁵ The study found a wide range of threats to the coral reefs ranging from over-exploitation of coral reef fisheries, exporting marine commodities, coral mining, lime production, to habitat loss which include log pond construction, ship groundings, coastal development, among others. However, it concluded that despite the numerous threats facing the coral reef ecosystem in Solomon Islands, it remains in relatively good condition and seem to be resilient to the impacts of natural disaster and climate change.

The Solomon Islands is part of the Coral Triangle and through this participation has developed a National Plan of Action, which details a people-centred and integrated resource management approach that relies on a core of community-based management as a national strategy to improve

⁴² above n33.

⁴³ *ibid.*

⁴⁴ *ibid.*

⁴⁵ Van der Ploeg J, Jupiter S, Hughes A, Eriksson. H, Boso D and Govan H, (2020). Coral reef conservation in Solomon Islands: Overcoming the policy implementation gap. WorldFish, Penang, Malaysia.

food security, adaptive capacity (climate change and other pressures), conservation of target or threatened species and habitats appropriate to the Solomon Islands context.

The Fisheries Management Act 2015 and regulations provide basis for fisheries controls and their enforcement. Some of the responses that have been identified by the state of environment report 2019 to manage coastal and marine resources are to implement the Solomon Islands National Oceans Policy, complete and implement marine spatial plan, implement, and enforce size limits for overfished species and require developers to establish coastal water quality monitoring and remediate any adverse effects.

In October 2020, the Minister for Fisheries and Marine Resources, under section 17(2) of the Fisheries Management Act 2015, approved the Fisheries Management Plan (coral) 2020.⁴⁶ The Management Measures included in this plan includes limitation on issue of export licenses.⁴⁷ This management measure is to enable a limited export trade of coral under a licensing system.⁴⁸ Another management measure is the requirement for an assessment to ensure that the quantity of coral to be exported complies with the non-detriment finding for coral.⁴⁹ An assessment team must carry out an assessment at the licence area proposed in the application for an export licence to ensure that harvesting of the coral in the area is sustainable.⁵⁰

Biodiversity

The Solomon Islands is a global hotspot of biological endemism and one of the most biodiverse countries in the Pacific. There is a high degree of endemism (plants and animals that occur nowhere else in the world) which means that any substantial loss of habitat is likely to lead to extinction of species of flora and fauna. The Solomon Islands biodiversity is of global significance and is listed in the Global 200 of the world's most outstanding ecoregions for biodiversity. One of the main reasons for this listing is that the Solomon Islands has globally significant levels of endemism, including 26 of its 47 native mammal species and 19 of 80 reptile species being found nowhere else on earth ⁵¹.

The Solomon Islands is also a global centre of bird endemism, and the "Solomon Group" is one of 76 Endemic Bird Area's (EBAs) identified by Birdlife International as being of critical importance for global bird conservation.⁵² The Solomon Islands is also home to the world's largest skink, the world's largest insect eating bat and hosts some of the world's largest rats.⁵³

The Solomon Islands boasts the second highest coral biodiversity in the world and was included as part of the Coral Triangle, a scientifically defined area of high species richness spanning almost 6 million km² of the Indo-Pacific.⁵⁴ The Coral Triangle is sometimes referred to as the "Amazon of the Seas" and is considered an epicentre of tropical marine diversity on the planet.⁵⁵

⁴⁶ Solomon Islands, Fisheries Management Act 2015

⁴⁷ *ibid.*

⁴⁸ *ibid.*

⁴⁹ *ibid.*

⁵⁰ *ibid.*

⁵¹ above n36.

⁵² *ibid.*

⁵³ *ibid.*

⁵⁴ Sulu, R., Hay, C., Ramohia, P., Lam, M. (2002). Coral reefs in the Pacific: Status and monitoring, Resources, and management. The status of Solomon Islands Coral Reefs. International Coral Reef Initiative. Noumea, New Caledonia.

⁵⁵ *ibid.*

The coastal and marine biodiversity provides the bulk of livelihood options for many communities in the country. Some of the species present in our waters such as the whales, dolphin and dugongs, turtles and sharks formed significant cultural values. Habitats such as coral reefs, mangroves, seagrass, and algae are home to thousands of species in our coastal environment where we fish to support our subsistence life and earn income for our basic needs. The ecosystem supports and protects us from sea-level rise and other changes instigated by climate change.

An example of the efforts to increase the local knowledge of species and biodiversity was an expedition by Ecological Solutions of Solomon Islands (ESSI) a local NGO that undertook biological surveys at different sites along the ridge to reef corridor between the lower reaches of the Kolobangara River to the top of Choiseul Island's central mountains in the Solomon Islands.⁵⁶ This was the first baseline biodiversity inventory of Mt Maetambe-Kolobangara River Corridor, and it provided an updated checklist of species in the area.⁵⁷

One of the key findings of the recent State of Environment Report (2019) is that logging is the most significant threat to biodiversity and the establishment of protected areas can help address this threat.⁵⁸ The NBSAP identified waste as one of the major underpinning threats to biodiversity and human health. The urban centres stand as a good indicator where streams, rivers, land, and coastal areas are covered with solid waste. Waste from discharged oils, chemical and sediments pollutes the river systems and coastal environment.

Forest Resources

Natural forest types in the Solomon Islands are distinguished as six distinct vegetation or forest types.⁵⁹ These are Saline Swamp Forest; Freshwater Swamp and Riverine Forest; Lowland Rainforest; Hill Forest; Upland Rainforest on Hills (Montane Rainforest); and Non-Forest and Other Areas.⁶⁰ Over the years, unsustainable commercial logging of natural forest has changed the vegetation cover of the main islands in the country. It has been observed that the forest cover has decreased – indicating a significant loss in forestry resources including biodiversity. These logged-over areas have lost significant natural and ecological value in terms of their functioning as habitats for biodiversity, sinks for the sequestration of atmospheric carbon, and watershed catchment areas. Some endemic forest species that are unable to adapt to new environments face possible extinction.

The Ministry of Forestry (MoF) of the Solomon Islands Government (SIG) is responsible for the overall management of the forest resources of the Solomon Islands. The Forest Resources and Timber Utilisation Act, which guides the Ministry, provides for the conservation of forests and the improved management of forest resources, control of timber harvesting, encouragement and facilitation of sustainable forestry activities, establishment of plantations, and domestic processing of timber.⁶¹

⁵⁶ Boseto, D. and Pikacha, P. 2015. Choiseul Biological Expedition October 2014 Solomon Islands: Summary Report, Ecological Solutions, Solomon Islands

⁵⁷ *ibid.*

⁵⁸ above n36.

⁵⁹ Solomon Islands Government 2018), Solomon Islands National Forest Reference Level, Submission for the UNFCCC Technical Assessment 2019

⁶⁰ *ibid.*

⁶¹ Solomon Islands Forest and Timber Utilization Act 1979

In its effort to sustainably manage the country's forest, the SIG in 1996, introduced a Code of Practice for Timber Harvesting (CPTH) specifically designed to improve and minimise negative effects of large-scale logging.⁶² The code incorporates best practices within the forest industry and promotes high environmental standards.⁶³ The code was revised in 2002 with focus on key standards, being identified as the highest priority.⁶³ These include location of roads and landings, width of road lines, rules for roading, landing size, felling, and skidding within buffers, temporary crossings, rules for skidding, maximising log value and avoiding timber waste, weather restrictions, decommissioning of skid tracks, landings and log ponds, and monitoring of logging operations.⁶⁵

In addition, the Environment Act and Regulations through the EIA process is an important tool that is used to manage developments that will impact our forest resources. Following an EIA study, development consent is issued to developers with conditions applied. These conditions include compliance with the Environment Management Plan, which is part of the Development Consent approval process.

Soil and Freshwater Resources

Soils were studied under tropical rain forest in mountainous inland regions on the islands of Guadalcanal, Kolombangara, Santa Isabel, San Jorge, and San Cristobal⁶⁷. In the areas studied, soils on stable sites are deep and intensely weathered and leached. On steep slopes soils are shallow and unstable, with much colluvial rock debris. Most soils are strongly acidic to acid (pH 3 to 5) clays and have very low plant nutrient contents.⁶⁸ On soils from basic igneous and ultrabasic metamorphic rocks, weathering and leaching have resulted in loss of virtually more readily weatherable constituents and extreme relative accumulation of oxides, principally of aluminium, iron, and titanium.⁶⁹ Rendzinas are found on recently exposed coral limestone, but older limestone areas have strongly leached soils like those on basic igneous rocks.⁷⁰

The Solomon Islands' soils are related to similar soils in Hawaii, Samoa, New Caledonia, New Zealand, Australia, the West Indies and south-east Asia.⁷¹ In general, the most strongly leached Solomon's soils have reached a stage of degradation beyond that of similar soils described from other regions.⁷² There is apparently an almost closed organic cycle of nutrient turn-over under rain forest, with most of the available plant nutrients concentrated in organic-matter-enriched surface soil horizons and with little contribution to plant growth from underlying mineral horizons.⁷³

⁶² Solomon Islands Code of Logging Practice 1996

⁶³ *ibid.*

⁶⁴ *ibid.*

⁶⁵ *ibid.*

⁶⁶ Lee, E.K, (1969). Some soils of the British Solomon Islands Protectorate, Royal Society, Volume 255, Issue 800.: <https://royalsocietypublishing.org/doi/10.1098/rstb.1969.0009>

⁶⁷ *ibid.*

⁶⁸ *ibid.*

⁶⁹ *ibid.*

⁷⁰ *ibid.*

⁷¹ *ibid.*

⁷² *ibid.*

⁷³ *ibid.*

There is little evidence of close relationships between soils and vegetation except in soils derived from serpentine, which have a forest dominated by *Casuarina papuan* (Naru Tree). Large-scale destruction by fire of Casuarina Forest on soils from serpentine has resulted in loss of surface horizons by erosion, failure of the forest to regenerate and formation of laterite on the bare soil surface.⁷⁴ Small-scale destruction of forest for native gardens appears to have little long-term effect on soils or vegetation.

Water resource availability in the Solomon Islands varies considerably for each island. It ranges from sizeable rivers to small streams, from high mountainous and dense rainforest islands to rainwater harvesting, and thin freshwater lens of underground aquifers of the small low-lying atolls and islets. Freshwater resources are used for a range of purposes, including household uses, sanitation, agriculture, industry, and hydro power generation. Freshwater in rivers and lakes also supports local biodiversity.

In 2020, a rapid coastal assessment of Mataniko river catchment was conducted by the SPC Regional IW R2R Project and the MECDM. The presence of the giant mottled eel, *Anguilla marmorata*, is evidence of the connectivity between the stream, Mataniko River and the ocean.⁷⁴ Eels have a catadromous life cycle where they live in freshwater but travel to the ocean to spawn, after which the larvae return to the stream to settle.⁷⁵ The six goby species and four crustacean species recorded in Ngoti stream have an amphidromous life cycle where they lay eggs in the stream, but once eggs are hatched, larvae are transported to the ocean where they spend four to twelve weeks before returning to the stream as juveniles, again proving the stream–ocean connectivity⁷⁶.

The Ngoti stream system that feeds into the Mataniko river upstream was assessed and the freshwater fauna of the stream and terrestrial fauna of the surrounding environs were surveyed.⁷⁷ The stream system supports a large number of freshwater taxa, which would indicate a healthy system and the species present such as *Anguilla marmorata* indicate connectivity between the stream and ocean via the Mataniko river.⁷⁸ The forty-four (44) taxa of freshwater fauna recorded in the Ngoti stream system that feeds into the Mataniko River is very impressive when compared to neighbouring catchments.⁷⁹ The total number of freshwater fishes in Guadalcanal is 47 species from 39 genera and 23 families. This survey of the Ngoti stream system recorded 11 species of fish, which represents 23% of known freshwater fish species on Guadalcanal compared to the 1% recorded in Kovi catchment.⁸⁰

⁷⁴ Sobey, M. (2020) Rapid Coastal Assessment of Mataniko River Catchment Report, Honiara, Guadalcanal Island, Solomon Islands. Suva, Fiji SPC, 38 pp

⁷⁵ *ibid.*

⁷⁶ *ibid.*

⁷⁷ *ibid.*

⁷⁸ *ibid.*

⁷⁹ *ibid.*

⁸⁰ *ibid.*

5.2 National Protected Areas

Progress has been made over the past decades on the theme of protected areas management. For instance, all land above 400 meters (mountains), water catchments and taboo areas are legally protected under the Forests and Timber Utilization (Felling License) Regulations 2005.⁸¹ Moreover, the Protected Areas Act 2010 provides for the declaration and management of protected areas or areas where special measures need to be taken to conserve biological diversity and prospecting research and related matters.⁸² The Act provides guidelines for the selection, establishment and management of protected areas. It stipulates the need to furnish scientific evidence to support the application for an area to be declared a protected area and proof of local support for the application. It also regulates the research that can be done in such areas under the Protected Areas Regulations 2012.⁸³

In 2017, the Arnavon Community Marine Park (ACMP) was declared as the country's first national protected area under the Protected Areas Act and Regulations. The Arnavon Islands consist of four small islands located in the Manning Strait between Isabel and Choiseul Province. The Islands are home to the largest rookery of the critically endangered hawksbill turtles in the south Pacific region. In 1995, the Arnavon Community Marine Conservation area was established in partnership with government and the communities of Kia, Katupika and Waghena to protect the remaining hawksbill turtle population and the area's unique flora and fauna. This protected area encompasses 16 hectares of land and sea.

In terms of terrestrial protected area, the land of the Sirebe Tribe in Choiseul Province was the first forest protected area in the Solomon Islands that was declared under the Protected Areas Act 2010 and Regulations 2012 on the 26th of November 2019. The area is located along the Kolombangara River in the Mount Maetambe Kolombangara River Corridor, recognised as a key biodiversity hotspot in the country.

Following the first protected area declaration, a second forest protected area declaration was made on the 29th of January 2020 for the Siporae Tribal Forest Conservation Area in Choiseul Province. The protection and management of this forest land forms part of the Kolombangara River catchment area. The Siporae Tribe decided to protect their land as they realised that most forests in Solomon Islands are now threatened by unsustainable logging and mining and thus this declaration gives hope that part of this fundamental natural resource is protected to safeguard essential services for the tribal members and to conserve biodiversity and cultural heritage.

In 2009, there were 113 active Marine Protected Areas, including the 157.8 km² Arnavon Community Marine Conservation Area, the largest marine protected area in the Solomon Islands.

5.3 Island Vulnerability

The Solomon Islands geographic location in the Pacific Ring of fire and cyclone zone makes it very vulnerable to natural disasters and extreme events. This vulnerability is exacerbated by its low socio-economic status which has also placed it in the United Nations list of Least Developed Countries. More than 80% of the population resides in low vulnerable coastal rural areas relying

⁸¹ Solomon Islands, The Forests and Timber Utilization (Felling License) Regulations 2005

⁸² Solomon Islands Protected Areas Act 2010

⁸³ Solomon Islands Protected Areas Regulation 2012.

heavily on subsistence agriculture and fishing for food and income. Most coastal and inland villages do not have access to electricity and roads, and government services to the rural areas are often limited. Vulnerability to climate change extends to ecosystems and water resources as a result of the relatively high exposure of parts of the country to increasing intensity of tropical cyclones, earthquakes, tsunamis, and generally poor governance leading to overuse of natural resources.

The first vulnerability and adaptation report (V&A) by the government was through the Initial National Communication (INC) to the UNFCCC (2004). The report was based on limited national data sets, information at hand and qualitative assessments. The report recognised the limited understanding on the vulnerability of the country to climate change and sea level rise and the need to put in place suitable plans, policies, and measures. Priority vulnerable areas identified included: 1) Subsistence and Commercial Agriculture, 2) Human Health, 3) Coastal Environments and Systems, 4) Water Resources, 5) Marine Resources (Solomon Islands Government 1994).⁸⁴ The INC V&A report presented “adaptation response strategies”, a number of which have been recently implemented.⁸⁵

The National Development Strategy (NDS) 2017–2035 makes explicit reference to climate change as a threat to the livelihood of Solomon Islanders.⁸⁶ Consequently, the NDS has a policy objective aimed at integrating national environmental issues in a holistic way so as to adapt to climate change and variability, halt deterioration of the ecosystems, restore damaged ecosystems and ensure their survival in the long term to benefit Solomon Islanders.

5.4 Institutional Arrangements

The MECDM has a core function to provide an enabling environment for the sustainable socio-economic development of the Solomon Islands through the application of necessary safeguards with regards to: ⁻⁸⁷

- Sustainable use of natural resources;
- Reducing the risk and impact of climate change and other hazards to communities;
- Leading and managing disaster preparedness and their consequences; and
- The provision of meteorological services.

Paramount to this function is the commitment of the relevant government agencies and all our stakeholders including development partners, regional agencies, non-government organisations and the public at large.⁸⁸

In the Solomon Islands, large permanent protected areas are not common. Instead, resource management appears to take place in a more decentralised manner (i.e., local scale), which may be more efficient in situations where customs are heterogeneous, and resources are

⁸⁴ Solomon Islands Government 2004. Solomon Islands Initial National Communications, Honiara, Solomon Islands.

⁸⁵ *ibid.*

⁸⁶ Solomon Islands Government 2016). National Development Strategy 2016-2035, Honiara, Solomon Islands.

⁸⁷ Solomon Islands Government 2015) Ministry of Environment, Climate Change, Disaster Management & Meteorology Corporate Plan 2015-2017.

⁸⁸ *ibid.*

governed through customary tenure. A key challenge for the Solomon Islands lies in the reconciling of a decentralised local management structure with meeting uniform large-scale (i.e., national) conservation objectives. Customary and constitutional laws are both recognised in Solomon Islands. This is particularly challenging because the Constitution outlines a complex interrelationship between constitutional and customary law and makes law makers and the courts responsible for ensuring that justice is done, and that customary law is not inconsistent with the Constitution. This is important in the sense that women, where there is matrilineal heritage of land, may hold very different positions and status as opposed to those in patrilineal provinces.

Currently there is no specific institutional arrangement for a ridge to reef management approach. However, the key government agencies that could form part of such arrangement includes the Ministry of Environment, Ministry of Fisheries and Marine Resources, Ministry of Lands and Survey, Ministry of Forestry, Environmental NGOs, Honiara City Council, and provincial councils dealing with waste management.

The current institutional arrangement is highly fragmented to enable effective ridge to reef implementation. Given the fragmented responsibilities, coordination continues to be a challenge across sectors. Additionally, the governance framework is inadequate and outdated, preventing integration between all sectors for ridge to reef management. However, there are good examples of specific management plans under revised legislation that can be adopted for ridge to reef management. Land tenure and access to resources is important in considering management and sustainable resource use. Although five of the nine Solomon Islands provinces traditionally engage in matrilineal property inheritance, women's traditional property rights are increasingly ignored or marginalised, especially when they come into conflict with the demands of large-scale logging and extractive industries⁸⁹.

5.5 Public and Stakeholder Participation

The Solomon Islands ridge to reef participation has begun through an initial consultation for the development of the Ridge to Reef Conservation Plan for Solomon Islands in 2010. A gap analysis of the natural resources of Solomon Islands, reviewing both terrestrial and marine habitats and the degree to which they fall under existing conservation management was conducted.

In 2012 the Ridge to Reef Conservation Plan for Choiseul Province was developed. Its approach is to harmonise the local knowledge of the Lauru people with a modern conservation planning approach.⁹⁰ It recognises that what we do on the land has a profound effect on our streams, rivers, and nearshore areas.⁹¹ The plan was recognised by the community leaders of Lauru and the Choiseul Provincial Government giving emphasis on the need to plan wisely to protect and sustainably manage their natural resources.⁹²

⁸⁹ Sikor, T. and C. Lund, 2009. 'Access and Property: A Question of Power and Authority.' *Development and Change* 40: 1–22. doi.org/10.1111/j.1467-7660.2009.01503

⁹⁰ Geoff Lipsett-Moore, Richard Hamilton, Nate Peterson, Edward Game, Willie Atu, Jimmy Kereseke, John Pita, Peter Ramohia and Catherine Siota, (2010). *Ridge to Reef Conservation Plan for Choiseul Province, Solomon Islands*. TNC Pacific Islands Countries Report No. 2/10. 53 pp.

⁹⁰ *ibid.*

⁹¹ *ibid.*

⁹² Solomon Islands Government 2019. *Solomon Islands Ocean Policy*, Ministry of Environment, Climate Change, Disaster Management & Meteorology, Honiara, Solomon Islands.

The Solomon Islands ridge to reef project through SPC in 2016 has improved stakeholder participation in the ridge to reef management approach. The Mataniko River Communities are involved in the project activities and decision making on the implementation process.

In 2015, the SIG held an inaugural national ocean summit to discuss existing and future management of the Solomon Islands' Ocean (ref.??). It was recognised, at that time, that there was a need to have both an integrated, cross-ministerial approach to ocean management and that no overarching legislative or policy framework existed to facilitate such an approach. At the recommendation of this Ocean Summit, in April 2016, the Solomon Islands cabinet established the "Ocean 12".

The Ocean12 is the national steering committee for the Solomon Islands' integrated ocean governance efforts. The Ocean 12 is a Permanent Secretary-level steering committee co-chaired by the Ministries of Fisheries and Marine Resources, of Environment, Climate Change, Disaster Management & Meteorology; of Foreign Affairs and External Trade; and the Office of the Prime Minister and Cabinet. In total it comprises of the twelve Ministries with the most direct influence in the use and management of the Solomon Islands' Ocean. The Ocean 12 established a Technical Working Group (TWG) with technical officers as members from the same Ministries.

The Solomon Islands National Ocean Policy is a strategic roadmap for integrated management and governance of our oceans. The development of the National Ocean Policy aims to define and strengthen integrated ocean governance at various levels and across sectors, to achieve national, regional, and global ocean related sustainable development goals on socio-economic development, food security, climate change resilience and adaptation, environmental protection and conservation of biodiversity, protection from natural disasters and national security.⁹³

The Protected Areas law requires public and stakeholder participation. Preparation of successful applications to create a protected area needs to meet legal requirements of the protected areas law. For instance, the law requires an agreement to be made with neighbouring tribes about the boundaries of the protected area.⁹⁴ Traditional customs are a major part of the Solomon Islands and these affect participation of men, women, and other vulnerable groups in communities in stakeholder consultations. It impacts on gender relations and affects benefits to different sectors of communities that may be derived from projects like the R2R.⁹⁵ Though it is not strictly required by the law, it is recommended that a chiefs' hearing be held to identify the boundaries.

Access to and control of land-based resources vary between patrilineal and matrilineal groups, thus there is need to ensure the participation of all sectors of the communities.⁹⁶ Differences are reflected in traditional divisions of labour as well as gender-differentiated access to agricultural areas, water sources and plants and trees for medicinal and handicraft materials. In decision making, women can be influential in "behind the scenes" negotiations, but this is more likely in matrilineal than patrilineal groups.⁹⁷ In both kinship systems, however, men generally dominate negotiations with outsiders such as representatives from the government, private companies, donors, or civil society organisations.⁹⁸ A step-by-step process that will assist in achieving those requirements include the following:⁹⁹

⁹³ above n82.

⁹⁴ Asian Development Bank 2015. Solomon Islands country gender assessment, Asian Development Bank, Mandaluyong City, Philippine.

⁹⁵ *ibid.*

⁹⁶ *ibid.*

⁹⁷ *ibid.*

⁹⁸ above n82.

⁹⁹ *ibid.*

1. Develop the protected area proposal and consult with community leaders.
2. Prepare for the protected area landowner consultation meeting.
3. Hold the landowner consultation meeting.
4. Hold the first management committee meeting.
5. Prepare map of the proposed protected area.
6. Obtain information about the land from the Government.
7. Conduct the neighbour consultation by arranging a chiefs hearing.
8. Organise preparation of the management plan.
9. Prepare a budget.
10. Complete the application form and submit the application.
11. Work with the Ministry of Environment.

If the application is accepted, then the Minister declares the area to be protected area using the form in the regulation.¹⁰⁰ Once this happens the area is protected area and all the restrictions in the area applies.

¹⁰⁰ *ibid.*

6.0 NATIONAL PRIORITY ISSUES

6.1 Priority Issue 1: Poor Solid Waste Management

a) Description of the problem and its national importance

Effective solid waste management has been a major concern for Solomon Islands for some time. The concerns about waste have been raised by various stakeholders and community members in the city and the wider provinces. The concerns have resulted in the country formulating the National Waste Management and Pollution Control (NWMPC) Strategy 2017–2026. This strategy recognises that the generation and disposal of wastes has direct and indirect linkages to human welfare and economic development.¹⁰¹ For instance, potential for contamination of food supplies can have impacts on local markets or revenue from export crops.¹⁰² Moreover, there are numerous health and environmental hazards that arise when wastes are poorly managed and disposed.¹⁰³

The challenges of solid waste management in the country face multiple and complex issues such as improper waste receptacles, collection schedule not adhered to, lack of waste segregation or minimisation of waste to dump, dumps live past their normal life span due to inability to find another suitable site for sanitary landfill, land tenure problems, rapid growth of population, lack of data on waste volumes and, of course, the human attitude problems.¹⁰⁴ The challenges require an institutional and practical approach from all national, provincial and community stakeholders which includes the government ministries, private sectors, civil society and different community groups such as men, women, youth and children.

Due to geographical location and size of the country, the waste challenges for island communities are considerably overwhelming. In addition, lack of land being made available for waste management solutions such as transfer stations, waste treatment and disposal sites, and recycling and reuse facilities.¹⁰⁵ Other obstacles include the topography and location of some communities, as well as resourcing and infrastructure limitations.¹⁰⁶ The result is that many communities, especially those in remote locations, have limited or no access to sustainable waste management solutions. Waste is then dumped, burned, or buried in the surroundings, leaving it susceptible to dispersal into the environment.¹⁰⁷

b) Major environmental impacts and socio-economic consequences

Poor solid waste management, including inefficient municipal waste management systems, create serious negative environmental impacts and socio-economic consequences such as infectious disease, land and water pollution, obstruction of drains, loss of biodiversity and aesthetic degradation.¹⁰⁸

¹⁰¹ Solomon Islands Government 2017. National Waste Management and Pollution Control (NWMPC) 2017-2026, SPREP, Apia, Samoa.

¹⁰² *ibid.*

¹⁰³ *ibid.*

¹⁰⁴ Wander, A., Sagapolutele, F., Foxe, A., Prince, A. (2018. Solomon Islands Waste Data Report, CEFAS, UK

¹⁰⁵ *ibid.*

¹⁰⁶ *ibid.*

¹⁰⁷ *ibid.*

¹⁰⁸ above n101.

If not well managed, the increasing volumes of waste will impact on the health of people, the tourism industry, economy, infrastructure, and the environment.¹⁰⁹ This is most evident in Honiara, the capital city with the highest population and concentration of people. Auki Town and Gizo Town are two other sites with large population density compared to other provincial centres. Women, children and the most vulnerable in communities are usually the most affected in these situations, thus the need for collection of sex-disaggregated data in all work implemented to monitor impacts of interventions implemented on the target communities.¹¹⁰

The marine environment is also vulnerable to pollution and all forms of wastes disposed at sea or from land-based development and activities. Pollution suffocates coral reefs and threatens sea creatures like turtles that mistakenly swallow plastics thinking it is food. Shorelines around the country are usually covered with debris that was washed ashore by the strong by currents and polluting the coastlines, lagoons, and beaches.

Wastes cause public health nuisance if not removed from residential areas regularly. For instance, organic wastes produce a bad odour if not removed in time. Uncollected wastes create a breeding ground for bacteria, vectors, and pests such as cockroaches, rats, flies, and malaria and dengue mosquitoes. If not properly disposed, items such as tins, containers, or plastic bags, can collect and hold water during rainy periods, which will increase the incidence of malaria and dengue fever. Broken bottles and empty tin cans littered on the ground cause injuries. Open burning of wastes or plastics release harmful chemicals such as dioxins that persist in the environment for a long period of time and are closely linked to severe health risks such as heart and respiratory ailments such as asthma or even cancer.¹¹¹

Littering of waste and improper disposal requires regular clean up and this takes up more government funds for clean ups that could have been used to support schools and health facilities. It is costly to provide a regular waste collection service, manage landfills and effectively manage waste from the source.

Waste management interventions need to be gender and socially inclusive with women, youth and other groups taking over certain areas of the work thus the adoption of a more holistic approach to the problem.

c) Linkages with other national problems

The growth of new industries such as tourism, mining, increased manufacturing, rapid urban development, and acceleration of natural resources extraction from marine and terrestrial resources has brought new challenges on the broader environment and specifically from solid waste and pollution. Tourism is an industry that promotes cleanliness and preservation of the environment. It heavily depends on the natural scenic beauty and healthy environment. The impacts of wastes on the tourism sector heavily impacts the image of Honiara as an attractive destination.

The 2019 census revealed an annual urban growth of 4.7% that exceeds the national population growth of 2.3%; this has huge implications for waste and pollution and the ability for urban areas to manage it.¹¹² Increasing population means increase in volume of waste generated. This means

¹⁰⁹ *ibid.*

¹¹⁰ *above n104*

¹¹¹ *above n36.*

¹¹² *above n17.*

there needs to be more supporting infrastructure for waste storage such as waste bins, waste collection equipment such as vehicles, treatment facilities and disposal facilities.

Climate change and disaster management are two critical emerging issues for waste management and pollution control. Waste from landfill emits methane, a greenhouse gas. Reductions in industrial energy use and emissions due to recycling and waste reduction along with potential energy recovery from waste are possible. While all these represent opportunities in terms of harvesting methane, the consequence of accumulated wastes and limited capacity in the Solomon Islands means that methane harvesting will be a difficult issue to address. Managing waste from natural disasters has also proven to be very costly for the Solomon Islands; recent tsunamis in Gizo and Lata and the flooding of Mataniko River, Honiara, cost the government millions of dollars.¹¹³

Other pollution drivers such as rapid population increase, increased economic development activities, the shift from subsistence to cash economy, rapid urbanisation, natural disasters, and mining, underscore the importance of addressing waste and pollution head on.¹¹⁴

The schematic illustration below shows the relationship between the underlying causes of poor solid waste management and the immediate consequences.

d) Immediate, underlying and root causes



Fig 2: Summary of the Poor Solid Waste Management Casual Chain

¹¹³ above n104

¹¹⁴ ibid.

The immediate causes of poor solid waste management were identified during the workshop as follows.

- Poor garbage collection system
- Lack of proper waste management facilities (e.g., treatment plant, landfill, waste bins, waste recovery/recycling centre)
- Uncontrolled Developments e.g., industries
- Littering and improper disposal practices.

Underlying all these causes, is the lack of wider community consultations and broader participation in the planning and implementation stages of the developments or projects.

For Honiara, it was estimated that 59% (74.3 tons) of waste generated is collected by HCC and individuals that take their wastes to Ranadi landfill; about 10% is recycled; and about 28% (35.3 tons) is disposed illegally into the environment¹¹⁵.

In the provinces, only a few centres have a collection system, whereas most of them do not have a collection system in place and it is done on an unplanned basis. Littering and illegal dumping (e.g., in coastal areas, vacant land, drainage systems) is rampant and aptly demonstrated in the blockage of drainage systems. Ranadi landfill has already reached its safe useful capacity; it is polluting the environment, is an eye-sore and a source of nuisance and disease vectors. Consequently, it is critical that a new landfill site be identified by the responsible agencies such as HCC and the Government. Many of the provincial centres also do not have proper disposal sites and are practicing open waste dumps.

The underlying causes of poor solid waste management are identified as lack of community engagement during planning, no proper planning in urban areas, limited funding (e.g., budget constraints), lack of enforcement and limited awareness. There is need for proper planning of community and other stakeholder engagement to ensure wider ownership and responsibility for poor solid waste management practices. An example, collection system is poor due to no proper planning of how the collection should work and also because of limited funding to purchase collection equipment and infrastructures. Limited funding also applies to lack of proper waste management facilities. In addition, lack of enforcement and limited awareness causes littering and improper disposal practices. On-going awareness with communities and contextualising the problem is needed so the people themselves take responsibility, thus shifting the management work to the users of resources.

The root causes of poor solid waste management include human behaviour and attitude, poor leadership, lack of prioritisation from responsible authority, unregulated imports of non-biodegradable products and harmful chemicals and change of cultural diets. Though there are ongoing awareness programmes, littering is still a problem because of behaviour and attitudes. Behaviour change and shifts in attitude take time, thus there has to be continuous work on stakeholder inclusion and identification of strategies to ensure long term solutions. Lack of prioritisation results in no budget allocations for waste management systems and thus resulting in poor collection and disposal systems and infrastructures. The unregulated imports also result in importation of diverse products that becomes difficult to manage when it becomes waste.

¹¹⁵ above n104

a) Knowledge gaps

Preventing pollution, especially plastics, from entering the environment, requires focused efforts on behaviour change (for example, reducing reliance on single-use plastics), improvements in waste management and developing a more sustainable life cycle for wastes such as plastics. The steps to improve poor systems of waste management or mismanagement of waste rely on quantifying the scale of the problem and the sources of plastics leakage and other wastes into the system. To date, this quantification has not happened. Gaps in local capacity, as well as details of infrastructure and management systems, must be quantified and linked to the poor waste management practices.¹¹⁶ In identifying these gaps, there is need for a wider assessment of key stakeholders and gender considerations within these stakeholder groups.

One of the major challenges in implementing waste management strategies and plans and which continues to persist even in other sectors, is the coordination between government agencies and key stakeholders and the allocation of resources to waste and pollution. All provinces throughout the country have waste and pollution work led by environmental health officers who have limited budgets and scope of work. On a positive note, waste and pollution are mainstreamed as part of health issues, however, there are no accompanying technical, financial, and human resources to support this.¹¹⁷

b) Conclusions and recommendations

Managing waste and controlling pollution for the Solomon Islands will require national effort that includes high-level political leadership, effective policy and legal frameworks, development of appropriate institutional capacity and changing attitudes starting at individual to community, provincial and national level. The approach needs to be done within the Solomon Islands context where interconnectivity between different ecosystems from the upland forests to the coastal environment, rivers, lagoons, and ocean is a reality. This ecosystem connectivity is intricately linked to the livelihood of most of the country's population whose daily subsistence continues to be dependent on their natural environment and resources.¹¹⁸

An important factor is the need for political will and support for investment for appropriate infrastructure, sustainable financing, and innovative means for public–private partnerships in urban areas such as Honiara.

Some of the recommendations identified in the 2019 SOE report and should be pursued are as follows:¹¹⁹

- Fund and implement National Waste Management and Pollution Control Strategy 2017–2026.
- Develop, fund, and implement Waste Management Plans for all Provincial Centres to improve waste management.

¹¹⁶ *ibid.*

¹¹⁷ *ibid.*

¹¹⁸ *ibid.*

¹¹⁹ above n36

- Develop and enforce Environmental Ordinances
- Encourage and support Public Private Partnerships
- Encourage and promote environmental education.
- Develop and implement economic instruments/measures for sustainable Solid Waste Management.

6.2 Priority Issue 2: Land Degradation

a) Description of the problem and its national importance

The 2019 IPCC report defined “Land Degradation” as a negative trend in land condition caused by direct or indirect human induced processes including anthropogenic climate change, expressed as long-term reduction or loss of at least one of the following: biological productivity, ecological integrity, or value to humans.¹²⁰ Land degradation can be considered in terms of the loss of actual or potential productivity or utility because of natural or anthropogenic factors, it is a decline in land quality or reduction in its productivity.¹²¹

Land degradation is an important national problem because land in the Solomon Islands is treasured, and people regard land as their ‘true’ identity. Land provides them with the necessities of life such as food, water, raw materials, firewood, and a place within which to live. As such any actions that alienate, degrade, redistribute, or otherwise impact on land affects livelihood, identity, and culture.

Solomon Islands has a land area of 28,000 km² with 4023 km of coastline and it is the second largest in the Pacific after Papua New Guinea.¹²² There are two land tenure systems in the Solomon Islands, (a) the customary land tenure system, and (b) the registered (alienated) land tenure system.¹²³ Customary ownership of land underpins decisions on use of land, including foreign investment such as logging and mining, commercial agriculture, urban planning and conservation, with land reclamation as an emerging issue. Patterns of land use are determined largely by the customary land tenure system, which controls about 85% of the total land area in the Solomon Islands.¹²⁴ The current traditional system of land ownership provides a welfare safety net for the vast majority of the country’s populace and supports the robust village-based subsistence farming. At the same time, customary ownership is a major constraint that hampers economic development and integrated land use management and planning.¹²⁵

¹²⁰ Intergovernmental Panel on Climate Change 2009. IPCC Special Report on Climate Change and Land: Land Degradation, Geneva, Switzerland.: <https://www.ipcc.ch/srcccl/chapter/chapter-4/>

¹²¹ *ibid.*

¹²² above n37

¹²³ Maetala R. 2008. Matrilineal Land Tenure Systems in Solomon Islands: The cases of Guadalcanal, Makira, and Isabel Provinces. In Elise Huffer, ed. Land and Women: The Matrilineal Factor: The Cases of the Republic of the Marshall Islands, Solomon Islands and Vanuatu. Suva: Pacific Islands Forum.

¹²⁴ *ibid.*

¹²⁵ *ibid.*

Land tenure systems in Solomon Islands are dynamic, with multiple pathways for making, contesting and sanctioning claims through kastom, Christianity and the state.¹²⁶ Women are rarely listed as land trustees or timber rights holders, and they are largely absent from records of public hearings, suggesting that their role within the formal legal system is constrained.¹²⁷ Solomon Islanders gain and maintain access to resources in a variety of ways, it is primarily senior male leaders who are involved in making and adjudicating claims to land as property; and it is often senior male leaders who stand to gain the most from the legitimization of property by political and legal institutions such as chiefs and courts.¹²⁸

b) Major environmental impacts and socio-economic consequences

Land degradation will have adverse impact on agronomic productivity, the environment and its effects on food security and the quality of life. Soil degradation is the loss of the land production capacity in terms of soil infertility, soil biodiversity and degradation. It is caused by improper land use or unsustainable land management for industrial, urban development, agriculture, and deforestation.

The state of environment report (2019) identifies land uses in terms of agriculture, forestry and mining developments with indicators of the status and trends of activities under these developments.¹²⁹ Impacts caused by agricultural activities are driven by livestock production and land under cultivation.¹³⁰ Expansion of the area of cropping has impacts in terms of change of land use (loss of forests and its impact on biodiversity, flora and fauna), water quality and cultural/heritage and conservation sites.¹³¹ Large scale cropping activities use chemical treatments (fertilisers and pesticides) that can have downstream effects on the environment and human health.¹³²

Environmental impacts of land degradation extend beyond the land surface itself, affecting marine and freshwater systems as well as people and ecosystems far away from the local sites of degradation. For instance, soil erosion occurs due to land degradation from unsustainable removal of forest vegetation and results in sedimentation of rivers or water bodies that connect to the marine environment.

Food security is affected due to land degradation. This is the result of productivity impacts due to a decline in land quality on site where degradation occurs (e.g., erosion) and offsite where sediments are deposited. Increased rates of soil erosion can lead to reduction in crop yield. The loss of cultivated area or productivity may result in an increased reliance on imported foods for the country as a whole. Access to and control of land-based resources vary between patrilineal and matrilineal groups. Differences are reflected in traditional divisions of labour as well as gender-differentiated access to agricultural areas, water sources and plants and trees for medicinal and handicraft materials. In decision making, women can be influential in “behind the scenes” negotiations, but this is more likely in matrilineal than patrilineal groups. In both kinship systems, however, men generally dominate negotiations with outsiders such as representatives from the government, private companies, donors, or civil society organisations.¹³³

¹²⁷ *ibid.*

¹²⁸ Hall, D., P. Hirsch, and T.M. Li, 2011. *Powers of Exclusion: Land Dilemmas in Southeast Asia*. Singapore: NUS Press

¹²⁹ above n36

¹³⁰ *ibid.*

¹³¹ *ibid.*

¹³² *ibid.*

¹³³ above n123

Loss of medicinal plants and herbs is a social impact of land degradation. Rural populations in the Solomon Islands depend on plants and herbs for medicine because access to clinics and health centres is often difficult in many outer islands and rural areas. Indirect social impact of land degradation affects health and wellbeing. The health of a population declines due to reduced food crops as a result of unproductive land. In addition, people have to go further inland to identify land for gardens because of change of land use for agriculture, forestry, or urban developments.

c) Linkages with other national problems

Forest degradation is land degradation that occurs in forest land. Deforestation is the conversion of forest to non-forest land and can result in land degradation. Deforestation due to logging activity is associated with a range of other adverse environmental and social effects including loss of biodiversity and sedimentation into rivers and marine environment resulting in deteriorating water catchments and water sources. In the Solomon Islands, unsustainable harvest for timber and fuel wood has resulted in severely degraded landscapes, heavy soil erosion and large areas denuded of vegetation cover.

Poor land use practices particularly from logging and large monocultures and mining in some islands (e.g., Guadalcanal) directly threaten riverine and coastal ecosystems, including coral reefs and seagrass beds (affecting dugong and many other species). For example, the water supply to Honiara is often closed due to high turbidity caused by logging in the catchment.

With population increase, the practice of shifting cultivation now has shorter fallow periods for land to recover. Similar pressure is also exerted on coastal ecosystems such as mangroves, coral reefs, and fisheries as demand for food, building materials and natural resources increases. This pressure from subsistence livelihoods on biodiversity, ecosystems and productive land is further exacerbated by threats from invasive species which are occupying more and more lands (which may themselves establish more easily on degraded habitats) and climate change impacts.

Land degradation compounded by the impacts of climate change have profound implications for natural resource-based livelihood systems and communities. Degraded land, because of poor land management, could become infertile because of climate change. Land degradation and climate change act as threat multipliers for already precarious livelihoods, leaving them highly sensitive to extreme climatic events, with consequences such as poverty and food insecurity and, in some cases, migration, conflict and loss of cultural heritage.

Rural women are highly active in subsistence agriculture and fisheries and may sell or barter excess produce at local markets. Rural women and men often engage in similar agricultural work but there is nevertheless a persistent gendered division of labour. Rural women have fewer opportunities than their male counterparts to access wage employment or develop businesses despite their significant involvement in family-run aquaculture ventures and cash cropping of coconuts, cocoa, and seasonal crops. Despite their high involvement in agriculture, women are not involved in land management decision making.

d) Immediate, underlying and root causes

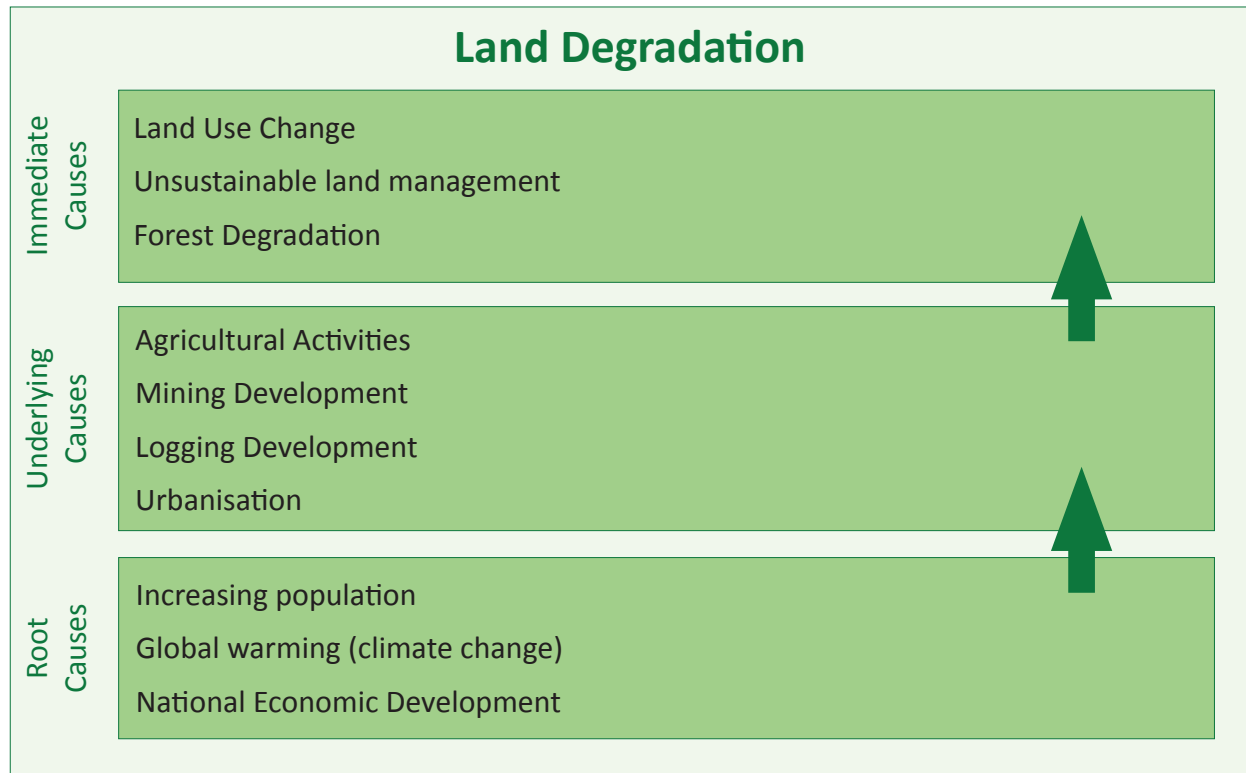


Fig 3: Summary of the Land Degradation Casual Chain

The drivers of land degradation and land improvement are many and they interact in multiple ways. Land degradation is driven by the entire spectrum of factors, from very short and intensive events, such as individual rainstorms of a few minutes removing topsoil, or initiating a gully or a landslide, to long term slow depletion of nutrients or loss of soil particles. Land degradation results from a complex chain of causes, making the clear distinction between direct and indirect drivers difficult.

Immediate causes of land degradation include land use change, unsustainable land management and forest degradation. Land use change is a result of agricultural activities including different types of farming practices, forest clearing for gardening or commercial timber harvesting and urban development. Unsustainable land management includes practices like tilling, crop rotation, logging or thinning.

The underlying causes of land degradation include agricultural, mining, logging, and urbanisation. All these development activities cause change in land use, unsustainable management, and forest degradation. For instance, the logging industry in the Solomon Islands has caused a lot of damage to land resulting in soil erosion and sedimentation.

Root causes of land degradation include increasing population, global warming (climate change) and national economic development. Increasing population results in urbanisation, which then leads to change of land use. In the context of climate change, an additional complex aspect is brought by the reciprocal effects that both processes have on each other (i.e. climate change influencing land degradation and vice versa). The climate-change-related drivers of land degradation are gradual changes of temperature, precipitation, and wind, as well as changes of the distribution and intensity of extreme events.

Other and more indirect drivers or the root causes of land degradation can be a wide range of factors such as demographic changes, technological change, changes of consumption patterns and dietary preferences, political and economic changes, and social changes. It is important to stress that there are no simple or direct relationships between underlying drivers and land degradation, such as poverty or high population density, that are necessarily causing land degradation. However, drivers of land degradation need to be studied in the context of spatial, temporal, economic, environmental, and cultural aspects.

e) Knowledge gaps

Climate change impacts on land and food security. Knowledge on land degradation processes and human-induced climate change has attained a great level of maturity. However, their combined effects on food security, notably food supply, remain underappreciated and quantitative information is lacking. Along with socio-economic drivers, climate change accelerates land degradation due to its influence on land-use systems, potentially leading to a decline in agri-food system productivity, particularly on the supply side. Increases in temperature and changes in precipitation patterns are expected to have impacts on soil quality, including nutrient availability and assimilation. Those climate-related changes are expected to have net negative impacts on agricultural productivity, particularly in tropical regions, though the magnitude of impacts depends on the models used. Gender analysis of climate change and adaptation measures is identified as an area for action in the government's 2012–2017 National Climate Change Policy.¹³⁴ Gender-sensitive measures that address mobility constraints for rural women, create credit opportunities and safe and accessible markets for women and ensure that government consultations and projects include women's perspectives may buffer against the impacts of climate change on the agriculture sector and rural livelihoods in Solomon Islands.¹³⁵ To be sustainable, any initiative aimed at addressing food security – encompassing supply, diversity and quality – must take into consideration the interactive effects between climate and land degradation in a context of other socio-economic stressors¹³⁶. These impacts need to be further assessed and studied in the Solomon Islands.

Land degradation and impact on migration and conflict. Land degradation may trigger competition for scarce natural resources, potentially leading to migration and/or conflict, though, even with medium evidence, there is low agreement in the literature. Linkages between land degradation and migration occur within a larger context of multi-scale interaction of environmental and non-environmental drivers and processes, including resettlement projects, searches for education and/or income, land shortages, political turmoil, and family-related reasons. Land degradation–conflict linkages can be bi-directional. Research suggests that households experiencing natural resource degradation often engage in migration for securing livelihoods, which potentially triggers land degradation at the destination, leading to conflict there. While this indeed holds true for some cases, it may not for others, given the complexity of processes, contexts, and drivers¹³⁷.

¹²⁷ *ibid.*

¹³⁴ Solomon Islands Government 2012. Solomon Islands Climate Change Policy 2012-2017, Ministry of Environment, Climate Change, Disaster Management & Meteorology, Honiara, Solomon Islands.

¹³⁵ Food and Agriculture Organization. 2016. The state of the Solomon Islands biodiversity for food and agriculture: A Brief Report on the State of Biodiversity for Food and Agriculture in Solomon Islands, Honiara, Solomon Islands.

¹³⁶ *ibid.*

¹³⁷ above n120.

f) Conclusions and recommendations

Land degradation can be reversed through restoration and rehabilitation. Restoration programmes should be made part of the national economic development programme. Collaboration between forestry sector and Ministry of Environment should be key factors to undertake any successful restoration and rehabilitation programme. Furthermore, inter-agency cooperation and coordination must be promoted, especially between the energy and forest sectors, to replace firewood with fossil fuels, and to reduce demand for firewood to help forest recovery.

The successful implementation of Sustainable Forest Management (SFM) requires well-established and functional governance, monitoring and enforcement mechanisms to eliminate deforestation, illegal logging and other activities that are inconsistent with SFM principles. Moreover, following human and natural disturbances, forest regrowth must be ensured through reforestation, site rehabilitation activities or natural regeneration. Failure of forests to regrow following disturbances will lead to unsustainable outcomes and long-term reductions in forest area, forest cover, carbon density, forest productivity and land-based carbon sinks.

The current Integrated Forest Management (IFM) Project must be implemented successfully to support alleviated land degradation of forest land in the Solomon Islands.

Some of the recommendations identified for sustainable land use includes: -

- Promote crop and livestock husbandry practices that conserve natural resources, enhance soil fertility, and sustain production.
- In collaboration with other relevant institutions, assess land potential for zoning and prepare land use plans; and determine land capability and carrying capacity in various areas to prevent land degradation, soil erosion, depletion of water resources, and encroachment on forests.
- Increase productivity through use of improved technology to lessen pressure on land.
- Develop soil and land use database utilising GIS.
- Promote agro-forestry with the use of intercropping to reduce vulnerability to natural disasters, soil degradation and erosion and improve farm productivity.
- Discourage slash and burn methods that lead to soil and environment degradation.

6.3 Priority Issue 3: Deforestation and Forest Degradation

a) Description of the problem and its national importance

The Solomon Islands forests have been suffering from deforestation and forest degradation for decades. The Solomon Islands Forestry Sector is the major economic base in terms of foreign earnings and revenues for the government. With a land area of 28,000 km², the nation has progressively exploited its forest resources base through the logging and milling industry.¹³⁸

¹³⁸ above n36

The Solomon Islands forests, with 4500 species of plants, are recognised as one of the world's great centres of plant diversity, rich in unique palms, orchids and climbing pandanus as report in the 2008 SOE.¹³⁹ They have more unique restricted range and unique bird species by area than any other place on earth.¹⁴⁰ In Solomon Islands, 72 of the 163 land birds are found only here or in close neighbouring islands. Most provinces hold at least one unique bird found only on that province and up to 12 unique species in the case of Makira.¹⁴¹ Many of these species are also gravely threatened.¹⁴² Based on these grounds alone, the Solomon forests deserve global attention to support their plan for protection and sustainable management.

Rural Solomon Islanders depend heavily on over 600 forest products for their subsistence livelihood and are increasingly gaining income from the sale of forest products such as rattan and ngali nuts and plantation timbers.¹⁴³ Forests are also important for defining and maintaining cultural identities and cultural values of the Solomon Islands people. Women use forests for gathering food, firewood, and traditional medicines, and as a source of clean water. Such practices are threatened by large-scale forestry and mining, which tend to be environmentally damaging. Soil degradation, chemical contamination of waterways and siltation are common side effects of mining and logging. These impacts increase women's burdens, making it necessary to walk further for fuel and clean water. Where reefs become silted because of logging or mining, fish stocks are reduced, and food insecurity increases.¹⁴⁴

The dependency on round log export earnings is driving unsustainable forest degradation activities, known as logging, at the expense of long-term production and threatens the other natural resource base necessary to sustain the subsistence economy. Commercial logging for round logs has caused extensive habitat and biodiversity loss except in the most inaccessible mountain areas. The rate of logging continues to increase, impacting sensitive ecosystems that support livelihood such as water catchments and those areas prohibited by law such as area above 400 meters above sea level. Logging and other developments may provide positive opportunities for Solomon Islands women in terms of jobs for in administration, cleaning, and food services, as well as spin-off opportunities for local businesses and services. On the other hand, mining operations pose similar risks for women as logging camps and fishing ports. Where rural villages are near mining and logging camps, camp workers solicit rural women and girls for sex, creating risks of violence, unwanted pregnancies, and sexually transmitted disease.¹⁴⁵

Commercially viable native forests are almost exhausted, and there is an urgent need to protect and restore the remaining forest and biodiversity. Although riverine forests are legally protected, non-compliance by logging companies has led to occasional harvesting. The fast-increasing population demands more food and incomes that in turn put more pressure on the land and other resources.

¹³⁹ Solomon Islands Government 2008. Solomon Islands State of the Environment Report, Ministry of Environment, Climate Change, Disaster Management & Meteorology, Honiara, Solomon Islands.

¹⁴⁰ *ibid.*

¹⁴¹ *ibid.*

¹⁴² *ibid.*

¹⁴³ *ibid.*

¹⁴⁴ above n135

¹⁴⁵ above n95.

Six main types of forests are identified. They are grassland and non-forest, hill forests, freshwater swamp and riverine forests, montane forests, mangroves, and the lowland forests making up more than half of the Solomon Islands natural forests.¹⁴⁶ The Solomon Islands has six distinct forest types and approximately 5,000 plant species.¹⁴⁷

The forest types vary in extent across each province, but the species mix is generally uniform between the islands. The six forest types are described below:¹⁴⁸

- **Grassland and other non-forest areas** comprise mainly herbaceous species. The predominant species include *Imperata cylindrica*, *Dicranoptera linearis* and *Themeda australis*. Examples of commonly occurring species are *Mimosa invisa*, *Morinda citrifolia*, *Saccharum spontaneum*, *Polygala paniculata* and *Timonius timon*. Some of these species (e.g., *M. invisa*) are also very common in disturbed areas.
- **Saline swamp forests** are subject to tidal influence as they are found in estuaries and foreshores. Examples of commonly occurring species are *Barringtonia asiatica*, *Calophyllum epiphyllum*, *Casuarina equisetifolia*, *Terminalia catappa*, *Intsia bijuga*, *Inocarpus fagifer*, *Pandanus spp.*, *Barringtonia racemosa* and species of mangroves.
- **Freshwater swamp and riverine** forests are typically found in poorly drained soil at low altitudes with little micro-relief. Species such as *Inocarpus fagifer*, *Mextroxylon salomonense*, *M. sagu* and *Barringtonia racemosa* are found here, although some important timber species are also present (e.g., *Terminalia brassii* and *Dillenia salomonensis*).
- **Lowland rainforests** include forests at altitudes up to 5 m–70 m above sea level, often with complex structure due to the high number of species in upper or hill forest and patches of freshwater swamp forest.
- **Hill forests** occur at altitudes of 400 m–600 m above sea level and on well-drained soils. They exhibit a complex structure, with varying tree heights and canopy density. Some species in the lowland forest are also present here, as well as those species commonly found in the montane forest. Species forming this forest include *Pometia pinnata*, *Gmelina moluccana*, *Elaeocarpus sphaericus* and *Campanosperma brevipetiolata*.
- **Montane forests** occur at altitudes above 600 m above sea level, on ridge tops and mountain summits, but can be found in lower elevations under harsher conditions. These are characterised by a dense and compact canopy with small, light tree crowns. Species in this forest type are *Callophyllu kajewskii*, *Callophyllum pseudovitiense*, *Eugenia spp.*, *Dacrydium spp.*, and *Pandanus spp.*

The 2019 forest reference emission level report (FREL) by the Ministry of Forest identified that the natural forests make up 89.94% (Fig 4) of the land which covers the rugged mountain terrains and valleys. Distribution of forests varies across the Islands with the largest portion located on Guadalcanal, Isabel, and Western Province.¹⁴⁹

¹⁴⁶ Pauku R. (2009. Solomon Islands Forestry Outlook Study. Food and Agriculture Organization, Bangkok, Thailand.

¹⁴⁷ ibid.

¹⁴⁸ ibid.

¹⁴⁹ above n59

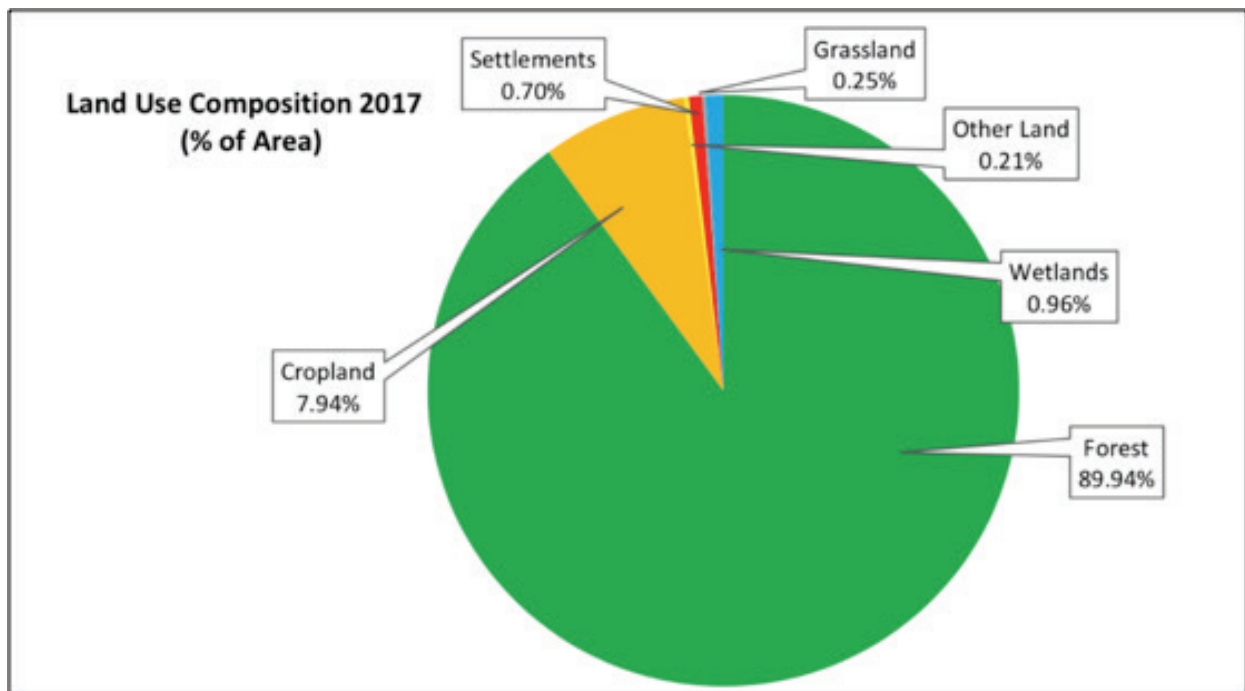


Fig 4. Land Use Composition (SI FREL 2019)

The key underlying drivers of deforestation (conversion of forests to non-forest use) are rapid increase in population growth and economic development, which puts pressure on the land and natural resources because of the need for food security, livelihood, and urbanisation.¹⁵⁰

The agriculture sector is one of the key drivers of deforestation as shown in Fig 5, and is also one of the primary contributors to the country's economy.¹⁵¹ With a land mass of approximately 28,000 km², only 0.62% is arable land and suitable for agriculture production.¹⁵² There are three types of agricultural farming being practiced: subsistence smallholder agriculture, semi commercial farming, and commercial farming.¹⁵³ With most of the populace living in the rural areas, their livelihood is very much dependent on subsistence agriculture for food security, and it remains the main driver of deforestation. The main forest type that is converted for subsistence agriculture is the lowland forest.¹⁵⁴

¹⁵⁰ *ibid.*

¹⁵¹ *ibid.*

¹⁵² Prior. J 2015. Solomon Islands National Rural Land Use Policy 2015-2020, Ministry of Agriculture and Livestock, Honiara, Solomon Islands

¹⁵³ *ibid.*

¹⁵⁴ above n59.

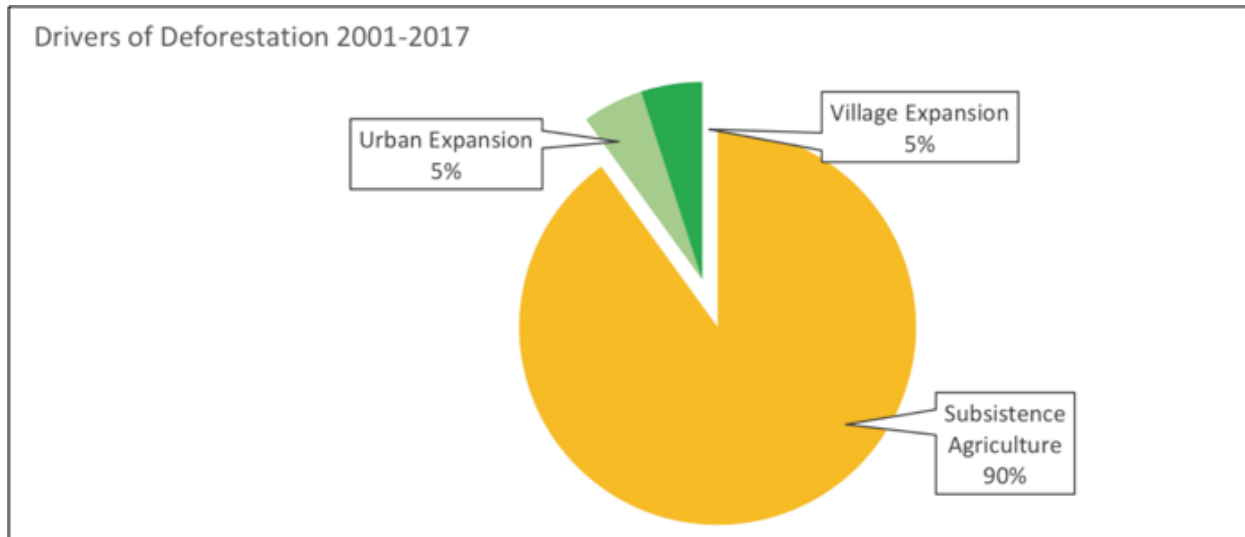


Fig 5. Drivers of Deforestation (SI FREL 2019)

The forestry sector has seen a rise in activities with the increase in portable logging and milling licenses. The logging industry has grown over the past couple of decades from being one of the country's primary commodities to being the largest export industry dominating the national economy. Figure 6 below shows that the logging industry accounts for almost 20% of the forest disturbance.¹⁵⁵

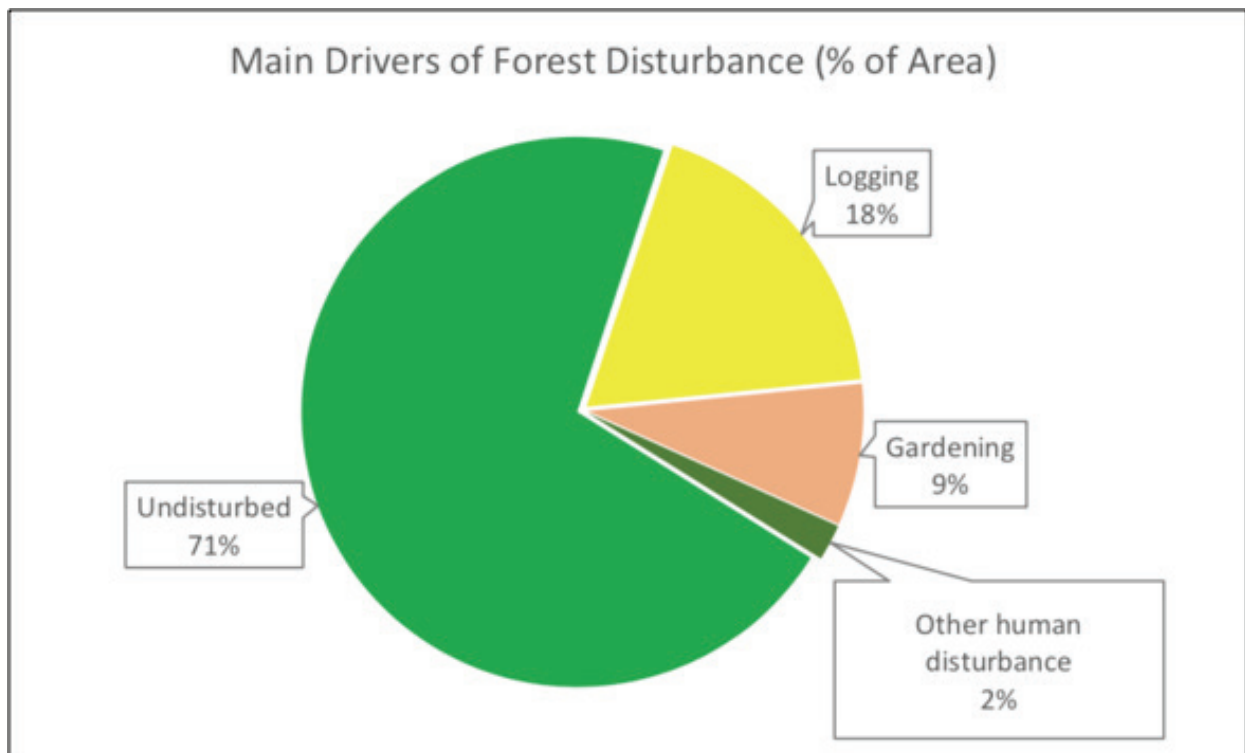


Fig 6. Main Drivers of Forest Disturbance (SI FREL 2019)

¹⁵⁵ *ibid.*

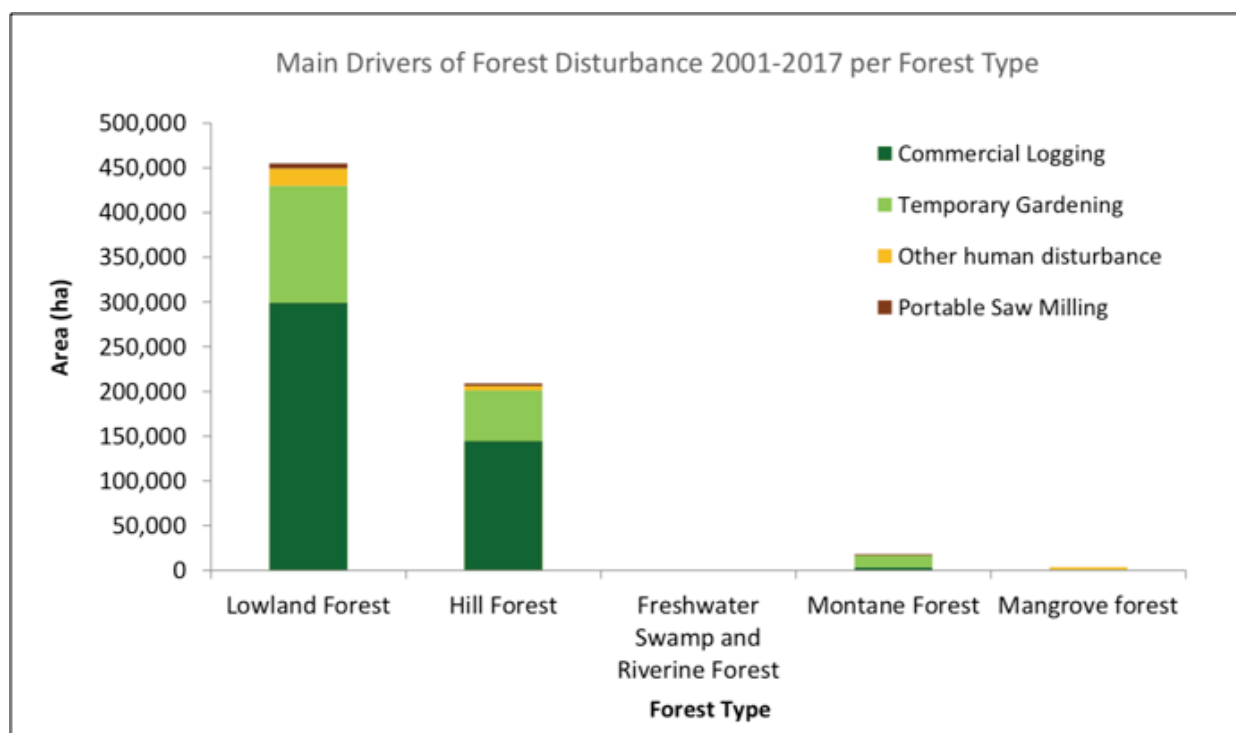


Fig 7. Main Drivers of Forest Disturbance per Forest Type (SI FREL 2019)

The lowland forest makes up more than 50% of the forest area. More than 65% of this forest has been deforested or degraded due to anthropogenic activities¹⁵⁶. Commercial Logging is identified as the biggest driver of forest disturbance as is highlighted in Fig 7 and is mainly targeting the lowland and hill forests.¹⁵⁷ Deforestation and Forest degradation has other implications on the ecosystems and humans, which have accumulated over the years, and the environment and communities are now bearing its impacts.¹⁵⁸

b) Socio-economic and environment impacts

Deforestation and forest degradation affects the ecosystems, ecosystem services, human health, well-being, and livelihood. Economic development is essential to any developing country, but the negative impacts are also many and are rarely recognised as such.

Major environmental impacts associated with deforestation and forest degradation include ecosystem degradation and ecological imbalance, loss of ecosystem services, habitat loss and fragmentation, biodiversity loss, soil erosion and reduced soil fertility, pollution of rivers, water ways and the ocean through sedimentation and siltation, climate change due to increase greenhouse gas emissions, and increased risk of natural disasters e.g., flooding and landslides.

Socio-economic consequences of deforestation and forest degradation can either be positive or negative. The intention of clearing the forest might be necessary or is needed, however the methods or practices are sometimes not environmentally sound, giving rise to negative impacts on the environment and eventually impacting human livelihood and well-being. In a recent study on logging in the Solomon Islands, it was found that the dynamics created by logging camps in remote areas, combined with limited industry accountability and few formal protective policies,

¹⁵⁶ ibid

¹⁵⁷ ibid.

¹⁵⁸ ibid.

as well as restricted access to service provision and protective services, leads to an environment where the drivers of vulnerability can go unchecked.¹⁵⁹ In particular, women and girls are at high risk to human trafficking, sexual exploitation and forced marriage. The report also states that community members are still reluctant to report forms of gender-based violence such as forced marriage and human trafficking to the police.¹⁶⁰

Logging, in addition to subsistence agriculture, is causing major habitat destruction, degradation of land and pressure on biodiversity with uncontrolled expansion of gardening (smallholder agriculture) into once virgin forests, habitats and watersheds. As of 2016, 15% of forest land had been 'disturbed' by temporary gardening, with impacts on biodiversity and ecosystem services from soil degradation, low soil fertility and productivity, deforestation and use of agro-chemicals and introduction of invasive species¹⁶¹. Local farmers are increasingly using chemical treatments (fertilisers and pesticides) that can have downstream effects on the environment and human health.¹⁶²

Positive socio-economic impacts include increased income generation from plantations/farms, improved standard of living, job opportunities in the mining, logging sector and infrastructure sectors, accessibility to healthcare facilities, village, and urban expansion. This is, however, undermined by the negative consequences, including food security, polluted water sources, encroachment into gardening areas therefore forcing communities to go further inland for gardening, social issues such as land disputes, change in social structure and way of living and increased health issues.

c) Linkages with other National Problems

Watershed loss and Water pollution – Treated water supply can only be accessed in urban centres like Honiara, Auki, Noro and Tulagi. Many households across the country are dependent on rivers, wells, boreholes, and piped water that is not treated. The SOE (2019) report highlighted that water quality is a major concern on the larger islands due to the increased activities from deforestation and land use activities.¹⁶³ Uncontrolled sediment runoffs are very common at logging sites that leads to marine pollution through sedimentation at the river mouths and on the coral reefs.¹⁶⁴

Rivers, lake, and wetland systems are experiencing a reduction in freshwater species richness from threatening processes such as flow alteration (e.g., logging and commercial plantation activities causing siltation), barriers (e.g., dam construction), habitat and water quality degradation (due to siltation), introduction of invasive species (e.g., tilapia, water hyacinth) and overharvesting. Trends relating to both the state of freshwater ecosystems and pressures that threaten these ecosystems are projected to improve in some respects and worsen in others. However, high sedimentation can affect these aquatic lives and negatively impact the lives of the people who depend on these ecosystems for fishing and other livelihood activities.

¹⁵⁹ International Organization for Migration, (2019). Logging industry in Solomon Islands Put women and girls at risk, Ministry of Women, Youth, Children and Family Affairs, Honiara, Solomon Island. <https://www.iom.int/news/logging-industry-solomon-islands-puts-women-girls-risk-iom>

¹⁶⁰ *ibid.*

¹⁶¹ Solomon Islands Government 2018. National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants, Honiara, Solomon Islands.

¹⁶² *ibid.*

¹⁶³ above n36

¹⁶⁴ *ibid.*

Habitat Biodiversity Loss and Invasive Alien Species (IAS) – The Solomon Islands is listed as one of the world’s most outstanding ecoregions for biodiversity due to its high level of endemism globally. Habitat loss associated with logging and land clearing for agriculture is a significant threat to terrestrial biodiversity. The introduction of IAS from logging machines and equipment is a key threat to national security for both economic and natural resource management issues and have already had a significant impact on agricultural production e.g., Rhinoceros beetle (coconuts), giant African snail (root crops – leafy materials). However, while the threats to agriculture are well documented, the threats posed to biodiversity and the wider environment are poorly understood even though the impact on different habitats suggests the spread of IAS threatens the integrity of terrestrial and coastal systems across the country. The extent of the problem is indicated by the fact that, 259 IAS are currently listed on the Global Register of introduced and invasive species for the Solomon Islands, and 303 species on the Solomon Islands national invasive species database. This includes 13 introduced species of ants (Formicidae), including the little fire ant *Wasmannia auropunctata*, which is listed among the 100 worst invaders globally.¹⁶⁵

The Pacific Island Ecosystem at Risk project (PIER) conducted by the US Forest Service also listed over 150 invasive and potentially invasive plant species for the Solomon Islands.¹⁶⁶ Both the giant African snail *Lissachatina fulica* and the Rhinoceros beetle *Oryctes rhinoceros* were accidentally introduced probably by the logging industry, while seeds of the highly invasive *Lantana camara* arrived and spread attached to the bodies of cattle.¹⁶⁷ This species (and others like the African tulip tree *Spathodea campanulata*) can cause severe land degradation, becoming the dominant understory in forests, while in pastures it forms dense thickets rendering the land useless for pasture.¹⁶⁸

Impact on coastal environment and coral reefs –deforestation and forest degradation can alter the marine environment by affecting water quality, such as sedimentation run-off into nearby waterways and to the coastal marine environment. Unfortunately, this has been a common occurrence throughout the Solomon Islands where logging operations are happening. If population growth and deforestation continue at high rates, threats to coral reefs are expected to increase significantly. Trends relating to both the state of coral reefs and the pressures that threaten coral reefs are projected to deteriorate.

d) Immediate, underlying and root causes

The causal chain for this issue is summarised in the chart below (Figure 8). The root cause or driver for this issue is mainly from the need for economic growth both individually and as a nation. Furthermore, the fragmented legislations and lack of enforcement of existing regulatory frameworks contributes to escalate the problem.

¹⁶⁵ Lowe S., Browne N, Boudjelas S, De Pooter M, (2000). 100 of the Worlds’ worst invasive alien species A selection from the Global Invasive Species Database. The Invasive Species Group (ISSG), 12pp.

¹⁶⁶ Pacific Island Ecosystems at Risk project (PIER), (2018). Plant Threats to Pacific Ecosystems: http://www.hear.org/pier/locations/pacific/solomon_islands/specieslist.htm

¹⁶⁷ *ibid.*

¹⁶⁸ *ibid.*



Fig 8. Summary of Deforestation and Forest Degradation Casual Chain

e) Knowledge gaps

Lack of updated National Forests Inventory – the last forest inventory – the Solomon Islands National Forestry Resource Assessment (2011) – for the Solomon Islands was undertaken in 2010. Since then, no attempt has been made to fully stocktake the country’s forest resources, especially on how much economically viable stock is available. The country’s flora, however, has been studied and documented through collaboration with development partners and research agencies. The Solomon Islands has extensive natural forest, of which 835,100 ha has been identified as commercially viable under existing legislation.¹⁶⁹ This area has been exploited at an unsustainable rate over the past decade with log exports predicted to be up to eight times the estimated annual sustainable cut. This situation is perpetuated by a high reliance on timber as a source of national and local revenue.

¹⁶⁹ Sinclair Knight Merz 2012. Solomon Islands National Forest Resources Assessment: 2011 Update, Melbourne, Australia.

Information on existing forest plantation and small holder plantation should be made available so that measures can be taken to strengthen the existing reforestation and plantation development programme by strengthening incentive mechanisms for reforestation and plantation development by landowners.

Forest data base and information system on logging license – although logging is predominantly done on a ‘legal’ basis with companies possessing licences to cut within designated areas, many of these licenses lack complete paperwork, or were agreed to without full due process and as such rendering them invalid or illegal. Similarly, the extraction of timber beyond stated management plans and against the existing Code of Logging Practice (CoLP) is also common with 36,100 ha of forest being identified as cut since 2005 outside of legal concession boundaries.¹⁷⁰

Data on rates of deforestation from logging – there is no updated data on rates of deforestation. The natural forests of the Solomon Islands cover approximately 2.2 million hectares (22,000 km²), or 80% of the nation’s land base.¹⁷¹ Of this just under 40% has been identified as commercially viable.¹⁷² These areas have been heavily logged with over 50% of the estimated 836,100 ha of commercial forest being cut pre-2011; the majority in the preceding decade. This felling is primarily under commercial felling licences with small-scale timber milling licenses also contributing.

Documented information on environment impacts from logging – while communities face the full impact of logging, there is very little attempt to document the depletion of forests and impacts on communities on issues such as access to good quality water and forest products and materials for housing and food, which are important for village wellbeing and livelihoods. Much of the deforestation over large tracts of land occurs on very steep land. Serious soil erosion, siltation, soil structure decline and loss of soil fertility threatens terrestrial and marine biodiversity, provisioning services such as renewable water supplies, and regulating services such as water filtration and purification and water quality regulation. The production potential of the land is also heavily diminished.

Information on monitoring and enforcement within the forest sector – there is no available information or data on the ability of the Ministry of Forest to monitor and enforce forestry regulations. Such initiatives should be conducted through multi-stakeholder consultations on proposed forestry legislation, undertaking assessments on the value of standing forest, strengthening the application of the development consent process in forests areas, strengthening the management of information on licenses, as well as improving downstream processing and market access for timber through training on timber processing, establishing an internationally recognised timber legality system and strengthening landowner led timber milling.

Non timber products and establishment of Forest Reserves – as noted earlier, the non-timber information on flora has been well studied; however, other than for timber and wood, the potential of other forest resources has not been well studied and documented. The Ministry of Forest sees its functions under the current regulations as focusing only on log export and timber. There is a gap in developing a framework for the establishment and management of forest reserves that can be included within legislation and building the capacity of MFR to undertake that role.

¹⁷⁰ ibid.

¹⁷¹ ibid.

¹⁷² ibid.

f) Conclusions and recommendations

It is important to understand the complexity and dynamics of this issue as multiple causal factors are at work and their interactions lead to deforestation and forest degradation. To better address this issue, it will need the combined efforts of all government agencies. Key issues include:

- Weak and outdated legislation covering forestry, which make enforcement difficult and provide a number of opportunities for bad practice and illegality.
- Limited human, financial and technical capacity within key ministries making enforcement of existing legislation difficult.
- A lack of accurate information, leading to an environment in which it is extremely difficult for perpetrators to be held to account for their actions.

It is recommended that the forestry sector legislations and regulations are harmonised, and key agencies empowered to carry out enforcement.

6.4 Priority Issue 4: Water Pollution

a) Description of the problem and its national importance

Pollution from both solid waste and sanitation and sewerage discharges is the major existing threat to waterways throughout the Solomon Islands. Many households in the country do not have access to water supply systems and still rely on streams and rivers to obtain water for drinking and domestic purposes (e.g., washing and bathing). Poor community awareness or attitudes, a high reliance on plastic as opposed to biodegradable or reusable products, and the lack of adequate waste collection and disposal services throughout most of the country, result in excessive disposal and accumulation of solid wastes to rivers and streams.

Additional pollution inputs directly to rivers and streams include contaminants from sanitation uses, industrial discharges, agricultural run-off, and watershed run-off (e.g., sediment inputs). These pose human health risks through the community's use of this ecosystem type, both directly (e.g., drinking, swimming) and indirectly (e.g., consumption of contaminated food). They also undermine the integrity and resilience of ecosystem components in the rivers and streams (i.e., flora, fauna, and their habitats), as well as of downstream marine ecosystems.

According to the SPREP Ecosystem & Socio-economic Resilience Analysis and Mapping (ESRAM) report for Solomon Islands, ecosystem services provided by rivers and streams are many and varied, with the main services from a community perspective including:¹⁷³

- Provision of water for drinking, domestic uses (i.e., bathing, laundry, cooking), industrial and irrigation needs;
- Provision of food for both subsistence and commercial purposes (e.g., fish, eels, molluscs/shells, crustaceans, kangkong);
- Support for both local and commercial fisheries, including aquaculture (e.g., tilapia aquaculture);
- Provision of opportunities for recreation and leisure (e.g., swimming, canoeing);

¹⁷³ BMT WBM. 2017. Solomon Islands Ecosystem and Socio-Economic Resilience Analysis and Mapping: Secretariat of the Pacific Regional Environment Programme, Apia, Samoa.

- support for biodiversity, food sources and local flora and fauna through the provision of a range of aquatic habitats;
- Provision of a means of transportation and travel, as well as storage (anchorage) for shipping vessels;
- Provision of raw materials for building and cooking material (e.g., gravel, sand, motu stones);
- Provision of a means of energy generation through hydropower (e.g., Tina River Hydro Project);
- Provision of various cultural values, depending on the location and local *kastom* (e.g., designate boundaries, baptisms, source of ornamental and handicraft materials); and
- Provision of a conduit for waste disposal and dispersal, particularly for sanitation and household waste.

Overall key ecosystem services associated with this ecosystem include:¹⁷⁴

- Provision of food – commonly used for cultivation of swamp taro, sago palm, fishing, and aquaculture activities (e.g., fishing for freshwater eels, aquaculture of tilapia at both local subsistence and commercial scales).
- Environmental and natural hazard regulation, such as filtration and purification of run-off from watersheds, and reducing flood flow rates.
- Provision of aquatic fauna habitat and support of biodiversity, including value as critical habitat for migratory bird species.
- Provision of raw materials.
- Support of tourism activities (e.g., bird watching) and provision of opportunities for transport and research and provides links with cultural heritage.

Pollution of the coastal and marine environment stems from two main sources:

Land-based sources through rivers, and streams – erosion and sedimentation of stream and river systems from logging operations, subsistence cultivation on sloping lands and land clearing for plantations affect water quality and thus degrade reefs, mangrove areas and coastal fisheries. There is poor understanding amongst loggers and communities of the effects of land clearing, logging, erosion, and run-off on downstream and receiving environments including reefs and fisheries.

One of the major sources of pollution into rivers and streams is the dumping of solid waste and surface run-off into rivers and waterways. Most of these solid wastes are plastic and PET bottles.

More than half the population in the Solomon Islands is connected to reticulated water supply, with frequent water outages during power failure and water bores vulnerable to contamination from human and solid waste, particularly in communities without formal drainage and septic systems. The impact of poor water and sanitation services falls disproportionately on women, who bear responsibility for cleaning, cooking, washing, caring for children and the sick.¹⁷⁵

¹⁷⁴ *ibid.*

¹⁷⁵ Asian Development Bank press release 2019. <https://www.worldbank.org/en/news/press-release/2019/05/16/safer-cleaner-water-and-sanitation-for-solomon-islanders>

Marine-based sources – In Honiara alone, at least 75% of sewage flows through a piped collection system directly into the sea without treatment.¹⁷⁶ Discharges from ships in the form of garbage, bilge water and other pollutants are also a major source of sea-based pollution.¹⁷⁷ An increase in these forms of pollution is already a concern as more ships are coming into and using the country's harbours and waters. Local ships are also contributing to these forms of pollution.¹⁷⁸

b) Environmental impacts and socio-economic Impacts

Rivers and streams

Rivers and streams, including both freshwater and tidal systems, occur throughout the Solomon Islands, particularly on the large islands, which have major rivers and watershed areas. The main exception is many of the very small and/or atoll type islands, where the topography does not support river or stream systems. Such waterways, and the ecosystems services they provide, are highly valued by the people of the Solomon Islands, such that the majority of settlements are located adjacent, or in proximity, to these ecosystems.

Together, the provision of river/stream derived food, water and sanitation disposal services are extremely high value services at a national scale. Adaptation to maintain these services in the face of climate change would be considered a high priority at a national scale, especially at locations where settlements are large or vulnerable, and highly dependent on local waterways. Despite providing high value ecosystem services, rivers and streams are subject to major disturbances and degradation from development and pollution. Most of these threats persist throughout the nation.

The primary existing threats can generally be classified as developments, pollution, extraction, and other threats, as follows:

- Development, including instream, bankside, and watershed developments, such as settlement development, mining, infrastructure, urbanisation, pollution from household sanitation and solid waste disposal, commercial and industrial inputs, run-off from farming and catchment development (i.e., pesticide, fertiliser and sediment loads), mining discharges, logging-related run-off (especially sediment loads from cleared land), vessel inputs (e.g., fuel and oil spills);
- Extraction activities, such as gravel extraction, fishing, and aquaculture, particularly where these activities are undertaken on a commercial scale; and
- Other threats such as habitat modification and disturbance (e.g., bank revetment works), flooding and extreme high rainfall events, slash and burn practices in close vicinity to waterways, invasive species (e.g., tilapia *Oreochromis* spp., water hyacinth *Eichhornia crassipes*), and growing human populations placing increasing pressure on waterway resources.

The lower end of streams and rivers that run through Honiara city is the most contaminated and polluted in the country. A baseline study conducted in 2015 for 15 sites along the length of the river and its tributaries found high levels of coliform increasing progressively from upstream to downstream Mataniko River.¹⁷⁹ Faecal coliform levels downstream exceeded the

¹⁷⁶ Telios Corporate and Consultancy Services. 2015. Mataniko Baseline Environmental Report. MECDM, Honiara, Solomon Islands

¹⁷⁷ *ibid.*

¹⁷⁸ *ibid.*

¹⁷⁹ *ibid.*

maximum detection limit of 2419.6 MPN/100 ml with the main source from sewage effluent from settlements along the river.¹⁸⁰ A recent study on sediment samples from White River and Mataniko river mouths also evidenced high toxicities, suggesting that some of the toxins are accumulative, or not continually present in the water column.¹⁸¹

Groundwater

Fresh to brackish ground water is thought to occur throughout most of the Solomon Islands. At a national scale, ground water is an essential ecosystem providing a water source for communities, including water for drinking and/or domestic uses. This is particularly important for communities on smaller islands, atolls, and cays with little in the way of alternative freshwater sources. In such cases, groundwater is a critical survival resource for communities. These locations include, for example, many communities in Renell and Bellona, and Temotu Provinces, as well as Ontong Java atoll.

Groundwater is also used as a commercial resource for income generation through the bottled water industry. Given the primary ecosystem service to communities is the provision of water for human consumption and domestic uses, the main threat of concern in this respect is contamination and declining water quality. This can occur as a result of natural disturbances (e.g., drought, tsunami or earthquakes causing saltwater infiltration) or human-derived pollution sources such as sewage, domestic wastes (e.g., grey water, domestic animals such as keeping pig pens near wells), and industrial discharges (e.g., mining). Growing human populations also increase the reliance on (and/or extraction of) groundwater.

Wetlands, lakes, and swamps

Enclosed fresh or brackish water bodies and swamps are common throughout the Solomon Islands. Swamp areas may support various vegetation types, such as freshwater swamp forest, herbaceous swamps, sago swamp forest, and swamp with cultivated crops. At the community level and on a day-to-day basis, wetlands and lakes are most highly valued for their role in providing food and food security.

Pollution, development, habitat modification and increased population growth are the main existing threats to the capacity of wetlands and lakes to continue to provide the above ecosystem services to communities. In some respects, wetlands and lakes are more prone to the effects of existing threats than are rivers and streams. This is because wetlands and lakes are often comparatively small in size (and therefore smaller relative to a given development or other threat) and have longer water retention times (i.e., lower capacity to flush pollutants).

Marine and Coastal Environment

The marine and coastal waters of the Solomon Islands are among the most pristine due to the geographic isolation of the country. However, the marine and coastal environment near populated and large urban centres are not so pristine. Pollution from waste discharge and solid waste disposal into the marine environment is more acute in urban centres and more in Honiara

¹⁸⁰ *ibid.*

¹⁸¹ Binetti, U, Silburn B, Russell J, van Hoytema N, Meakins B, Kohler P, Desender M, Preston-Whyte F, Fa'abasu E, Maniel M and Maes T. 2020. First marine litter survey on beaches in Solomon Islands and Vanuatu, South Pacific: Using OSPAR protocol to inform the development of national action plans to tackle land-based solid waste pollution. *Mar Pollut Bull.* 2020 Dec;161(Pt A):111827. doi: 10.1016/j.marpolbul.2020.111827. Epub 2020 Nov 16. PMID: 33213857.

city. Pollution is both land-derived (i.e., run-off, sewage inputs, solid waste disposal) and marine-derived from shipping and vessel operations (e.g., vessel fuel and oil spills, antifoulant, ballast, rubbish disposal). Solid wastes (i.e., rubbish) do not necessarily originate locally, but may be mobilised from external waters by currents (e.g., floating plastics, ghost nets, floating rafts of accumulated marine debris).

Women are heavily involved in both subsistence and commercial fisheries, which are important sources of income and food security for Solomon Islanders. Fisheries is the third highest GDP contributor in the natural resource sector (see Table 7) and the second highest gross income earner in subsistence activity (when fish and other seafood are combined), with a combined income of SBD 254 700 (approximately USD 30 106).¹⁸²

Sewage pollution is an acute problem in Honiara where domestic wastewater for 75% of the population is discharged through 14 outfalls along the shore.¹⁸³ The sewage, combined with the staggering volume of solid waste due to poor disposal practices of the residents, make for an extremely polluted river that poses a public health risk.

The pollution levels in high seas for the Solomon Islands is not well documented although there is evidence some level of pollution occurs from ocean going vessels and fishing vessels.¹⁸⁴ Recent studies with model simulations of dispersal pollutants from major river sources shows that pollutants are likely to spread in the ocean surrounding Honiara.¹⁸⁵ This dispersal is further affected by ocean currents and wind directions. A 100 m beach survey on Visale beach, Guadalcanal resulted in a total of 3259 items collected and counted.¹⁸⁶ 56% (1832 items) were made of metal. Drinks cans made up 78% (1436 items) of the total metal found.¹⁸⁷ Plastic and polystyrene made up 37% of the items and nearly half (42%, 503 items) of this was plastic and polystyrene pieces between 2.5 cm and 50 cm (OSPAR category 46).¹⁸⁸ See summary below in Figure 9.

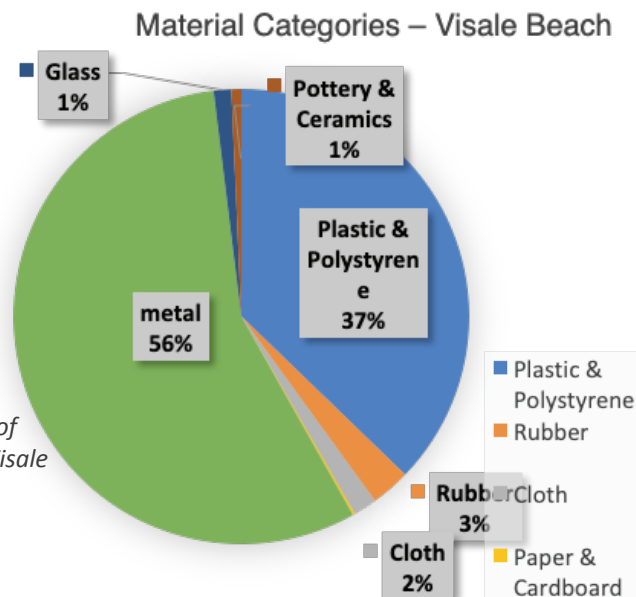


Fig 9. Waste composition of the survey conducted at Visale Beach, West Guadalcanal

¹⁸² Solomon Islands Government 2015. Final-Report SI-Demographic-and-Health-Survey, National Statistics Office and MHMS, Honiara, Solomon Islands.

¹⁸³ above n181.

¹⁸⁴ ibid.

¹⁸⁵ ibid.

¹⁸⁶ ibid

¹⁸⁷ ibid

¹⁸⁸ ibid.

The impacts of logging, mining, and other land-based extractive developments on water pollution and in coastal marine environment is a huge challenge in many rural communities. A snapshot of this is shown in Fig 9 where the types of waste that ended up along the coast differs in categories. Temporary logging wharfs built along the coastlines and in mangroves is a common sight throughout the country. During heaving rains, topsoil run-offs and sedimentation from inland often end up in rivers and streams and make their way into the coastal marine environment and coral reefs. Nutrient-rich sediment plumes have a negative effect on coral reefs as it reduces water quality that can impact coral reefs by restricting light that is required for coral growth and survival as excess nutrients may stimulate algal growth.¹⁸⁹

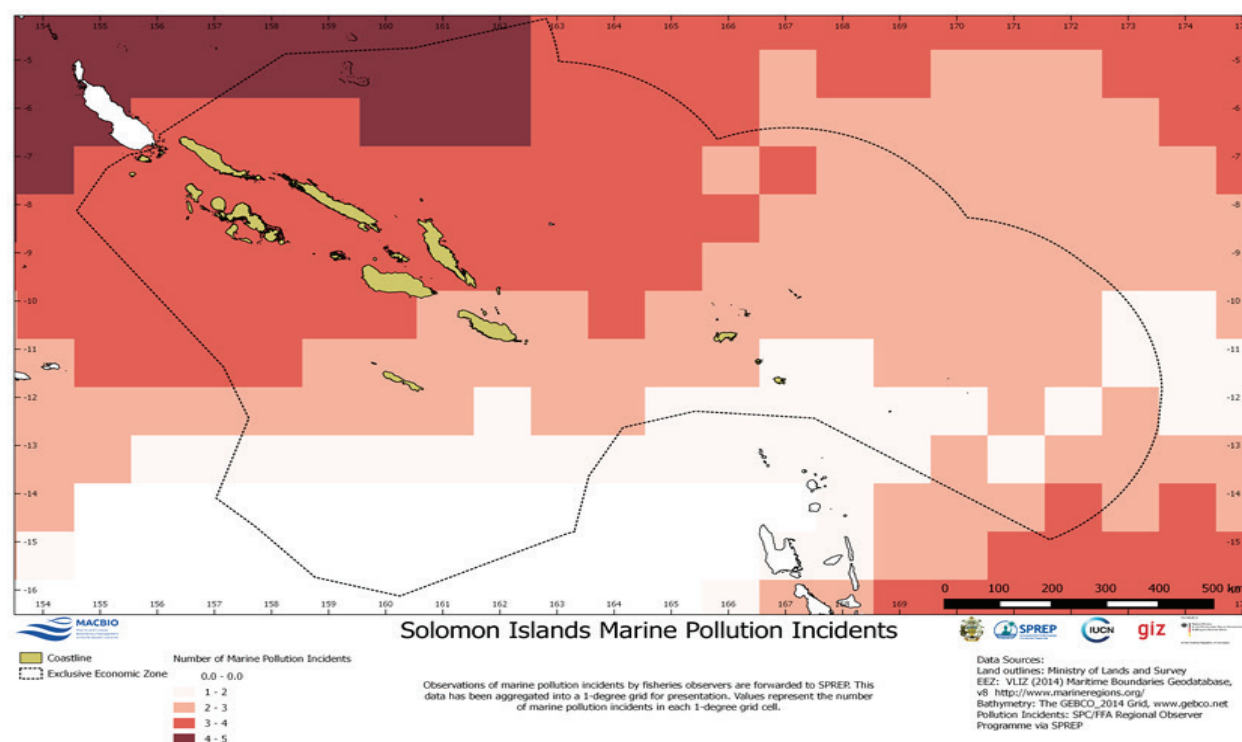


Fig 10. Solomon Islands Marine Pollution Incidents

In 2019, the MV Solomon Trader ran aground on a coral reef in Kagava Bay, Renell Island, Solomon Islands and started leaking heavy fuel oil from the stern. It was estimated that over 300 tonnes of heavy fuel oil were discharged, polluting the entire shallow fringing reef and marine environment of Kagava Bay.¹⁹⁰ The ecological impacts of both the grounding event and subsequent oil spill was significant in gaining international attention and calls for the mining on the island to be suspended.¹⁹¹

¹⁸⁹ Duke N.C., Udy J., Albert S., Love M., Ross A., Tibbetts I.R., Roelfsema C., Neil D., Marion G., Prange J., Corrin Care J., Carter W., Dart P., and Hough S. 2007. Conserving the marine biodiversity of Marovo Lagoon: development of environmental management initiatives that will conserve the marine biodiversity and productivity of Marovo Lagoon, Solomon Islands. The University of Queensland, Brisbane. 173p.

¹⁹⁰ Solomon Islands Government 2019. MV Solomon Trader Grounding and Oil Spill Environment Damage Assessment, Honiara, Solomon Islands.

¹⁹¹ *ibid.*



Fig 11. Sedimentation at the Kangava BMSI Port, Kangava Bay, Rennell Is

As observed current monitoring of marine and coastal water quality is restricted to incidents/localities, or through monitoring associated with development projects. An example is shown in Fig 11. It is important that developers (e.g., infrastructure, mining forestry) are required to establish baseline coastal water quality and monitor/remediate any adverse effects. There are clear links with people's health and wellbeing through direct effect of pollutants as well as flow-on effects in the food chain.

c) Immediate, underlying and root causes

The biggest challenge with water pollution is attitude problem. Behavioural change must begin with individuals. Pressure from increased population and changes in way of living from relying solely on the natural resources to becoming heavily dependent on important goods has seen the rise in solid waste, which ends up in our waterways and eventually the marine environment. Another root cause is from unsustainable development practices that are not penalized because of weak enforcement and from lack of collaboration between agencies responsible.

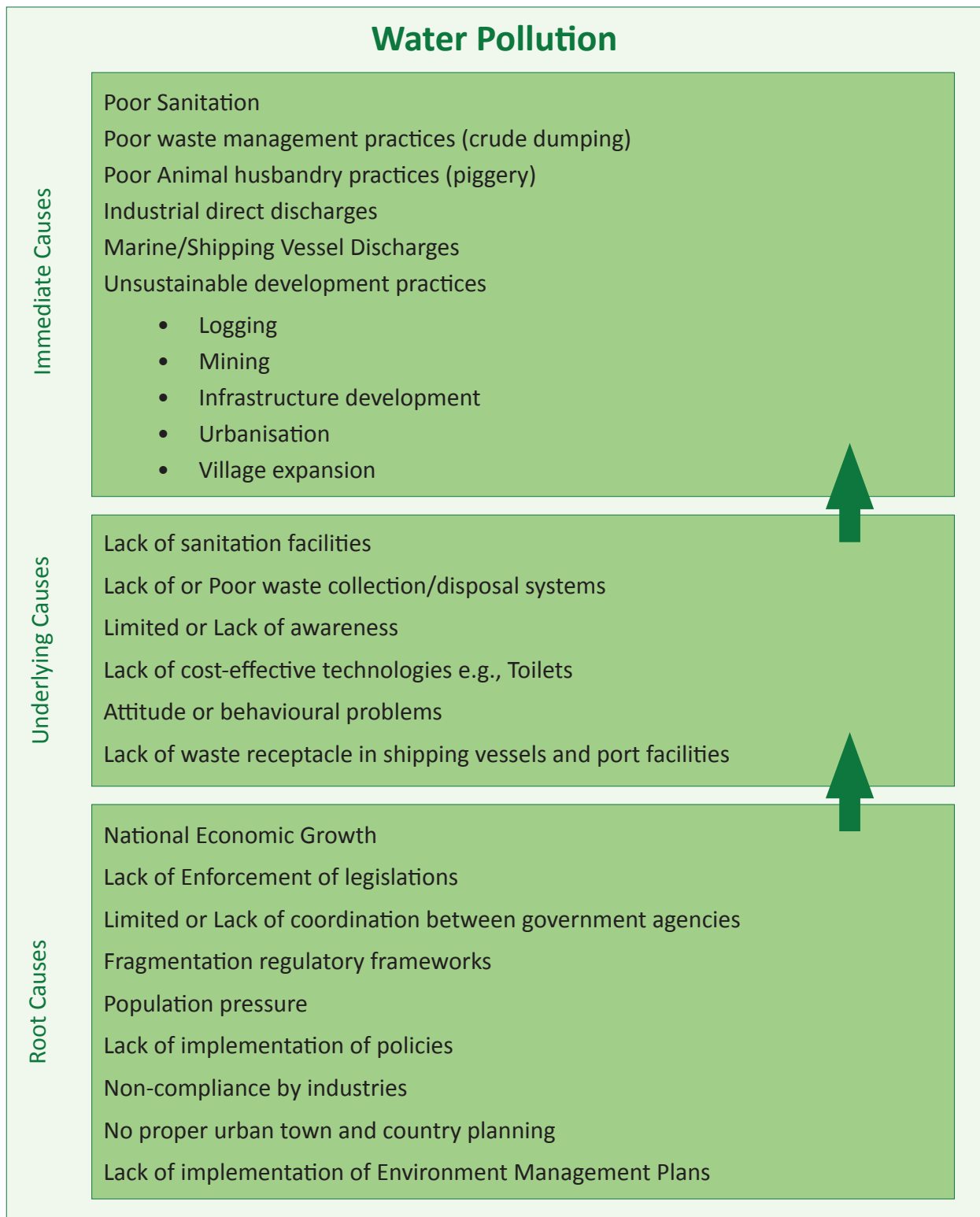


Fig 12: Summary of Water Pollution Casual Chain

Knowledge gaps

Water Quality Data and Standards – there is an absence of data on coastal water quality. There is anecdotal evidence of poor coastal water quality due to logging activities (e.g., sediment) and waste management in some localities. While a lot of efforts have been made to bring awareness and empower communities on the negative impacts of extractive developments, no attempts have been made to fully understand the extent of water quality and its impact on biodiversity and immediate environment.

There is an urgent need to develop some form of local water quality standards that will be the basis for data collection and assessments. These standards can then be used to monitor basic water quality parameters especially when human health and sensitive ecosystems are under threat.

Lack of Pollution Monitoring Capacity and Regimes – a lot of environment assessments undertaken for many developments focus on very specific sites and for that development only. Usually, water quality assessment is undertaken as baseline and no further monitoring occurs unless a major spill or loss of biodiversity is observed or reported. The current regimes are not sufficient to ensure that water quality throughout the country and for high population density is continuously monitored, budgeted for, and reported.

Water Resources Information Management System – the Solomon Islands is amongst the few countries that has abundance of access to freshwater. The common idea that water is always available is a myth as many of the urban centres do not have proper water systems and there are many communities on low lying atolls and coastal areas without access to clean water. The Water Resources Division responsible for water resources management has not developed clear policy on the protection of major watershed and catchments and more to establish an information management regime. Solomon Water, the main service provider in Honiara, for example, have had to deal with customary land-owning groups and water quality issues due to activities in the watershed affecting their sources by landowning groups. There is no available data on the major waterways, rivers for the whole country and even at provincial scale.

Research focus on aquatic and marine species and economic outcomes – the focus of many research and studies on both freshwater bodies and marine environment has been on species and the resources therein. In many cases this is driven by economic interest and conservation management purposes. However, very little attention has been given to the quality of their habitats, in particular water quality, which is critical for the survival of these species and resources. The result has been a huge gap of knowledge and information on the impacts of land-based activities on water quality for freshwater and marine environment and the impacts on the ecosystems and biodiversity.

Pollution from solid waters (plastics) – the impacts of plastics on water quality and pollution in water in general for the Solomon Islands is not well understood nor documented. No research has been done focusing on where all the plastics and PET bottles when disposed, for example, from Honiara or other urban centres, finally rests. This is a huge data gap, one that needs attention to ensure that its impacts are fully understood. Given the island context of the country and from observations, they mostly end up in the marine environment and the ocean. Recent studies on micro-plastics and pollution dispersal by current are not sufficient but already suggest that they all end up on the ocean floor or in the currents.

d) Conclusions and recommendations

Water pollution impacts on the Solomon Islands' freshwater bodies and the marine environment is significant but not fully understood. The pollution modes are both from liquid and solid wastes and mostly from land-based sources. The issues of pollution are reflective of the development challenges that the country faces in terms of capacity, isolation, and poor governance. Weak enforcement of existing environmental legislations and safeguards means that pollution will continue to threaten the country's pristine waters.

The country has some existing regimes to address pollution although available resources and technical capacity remains an issue. It is therefore recommended that the following measures be undertaken:

- Harmonisation of legislations and collaboration between agencies to address this issue
- Enforcement of existing legislations
- Development and implementation of water quality standards
- Increase budgetary support to conduct continuous water quality assessment and monitoring

6.5 Priority Issue 5: Invasive Species

a) Description of the problem and its national importance

Invasive Alien Species (IAS) are a global phenomenon and recognised as a driver of environmental change. It has also influenced other sustainable development backbone (economic and social), which can affect the well-being of people in a multitude of ways. To date, the IAS has received little attention in our local livelihoods and as a country.

The spread of marine invasive species beyond their native environment is of grave concern due to rapid growth in commercial shipping and recreational boating, activities that can help organisms 'hitchhike'. Marine invasive species are currently recognised as one of the major direct causes of biodiversity loss and changes in ecosystem provisioning and supporting services. The Solomon Islands is particularly vulnerable to the effects of invasive species, and after habitat destruction or modification, invasive species are responsible for more species extinctions than any other cause. Furthermore, the rate of extinction of native species has been higher on islands than anywhere else in the world.

From several viewpoints, controlling invasive species is becoming increasingly important for the Solomon Islands now. However, control and monitoring often incurs high costs, and may be met with social opposition, particularly where invasive species have acquired cultural values. Moreover, it has been argued that the introduction of some non-native species provides ecological benefits, for example in terms of providing shelter and food resources for native species. However, this was a national concern as people are the main factor to the spread of invasive species over the years as they move to colonise new lands intentionally and unintentionally bringing with them new species, some of which would become invasive.

b) Major environmental impacts and socio-economic consequences

IAS have disrupted ecosystems and threaten agricultural systems and crop productivity across the country more often in societies which already suffer from effects and impacts of climate change and food insecurity. Hence, IAS have reduced biodiversity and caused large losses to key crops and are depleting the natural resources that many people rely on for food, fuel, income, and medicines. Biodiversity is vital for the functioning of the ecosystems that provide vital resources such as food, water, fuel, income, building material and traditional medicines for the entire population. Invasive species change and destroy the natural environment and have a negative effect on both native species and the people who live and work there.

i. Environmental impacts

While only a small percentage of transported organisms become invasive, they have a tremendous impact on the health of plants, animals and even humans threatening lives and affecting food security and ecosystem health. It was well noted that the negative effects of IAS on biodiversity is not only by recent introduction, but the impact of IAS can be increased by climate change, habitat destruction and pollution. It was also understood that most isolated ecosystems such as islands are particularly affected. The loss of biodiversity will have major consequences on human well-being including decline of food diversity, leading to malnutrition and disease, thus impacting our culture¹⁹².

The declines and extinctions continue as IAS prey on native animals, damage crops and native vegetation, compete for resources, modify habitats on land and in rivers and coastal waters, and cause or spread disease. Introduced species become successful invaders because they are aggressive and able to adapt to a wide range of habitats and climates, while most native species are less competitive, breed more slowly and have limited tolerance to environmental factors. Rapid environmental changes such as increasing temperature or rainfall, or a change in the frequency of disturbance events like cyclones, could have serious impacts on native species while at the same time creating favourable conditions for the invaders¹⁹³.

In the Solomon Islands, IAS can be harmful to the native species in our environment and the garden plants and domestic animals we rely on for food. Invasive vines and other plants can overtake the natural forests and out-compete native plants. Thus, introduced animals even prey upon native animals in our forests and even cause extinctions. For instance, the extinction of the kukuvojo bird on Choiseul Province is thought to have been caused by introduced cats. The introduction of the slippery cabbage beetle (*Nisotra basselae*) has caused great damage to slippery cabbage. It is believed to have been introduced by accident from Papua New Guinea with pollinators that were introduced for palm oil. More recently, the Asiatic rhinoceros beetle has been introduced, a species that is a serious pest of coconut palms, attacking the growing fronds and can kill the palms when they attack and feed on the growing point.

The Giant African Snail (GAS) was introduced in 2006 probably from a logging company through transportation of machinery into Solomon Islands. GAS has been regarded as one of the world's

¹⁹² International Union for Conservation of Nature. n.d. Biological invasions: a growing threat to biodiversity, human health, and food security. IUCN's policy brief on invasive and alien species, biodiversity, human health, and food security.: https://cmsdata.iucn.org/downloads/policy_brief_in_invasive_and_alien_species_final. Pdf

¹⁹³ Nagle B. and Pagad S. 2010. Climate Change and Invasive Species in the Pacific: Retrieved: http://www.issg.org/pdf/helping_islands_adapt_docs/cc&iaspacific.pdf

worst invasive species, a serious pest on agricultural crops, having devastating impacts on gardens and livelihoods. *Wasmannia auropunctata* (little fire ant) was the other worst invasive species, the most widespread and damaging of introduced species that is currently taking control in the Solomon Islands. *W. auropunctata* reduced the abundance of the native ant fauna as well as other insect and reptile species. It attacks the eyes of emerging Melanesian Scrubfowl (*Megapodius eremita*) chicks on Savo Island in the Solomon Islands (a species from which local people harvest the eggs)¹⁹⁴.

The impact of IAS is not only on both terrestrial and marine biodiversity, but also has direct impact on the soil nutrient moisture of a catchment, leading to poor soil structure and further fertility decline. Some invasive species or non-native plant species caused deep changes to invaded forests. It is important to note that changes that are caused by some invasive plant species may adjust soil properties in a manner that benefits their own continued competitive growth and affects the ecosystem nutrient and carbon cycles since they occupy and dominate one habitat. The introduction of Teak plantation in the Solomon Islands from the forestry sector has resulted in the alteration of topsoil, causing moisture content in the topsoil to be lower than that in the bottom layer due to exposed and dry condition of the forest floor.

Whilst some IAS do not directly harm the soil texture, many invasive plant species do affect the soil structure through root exudates. Although few studies have been carried out in the Solomon Islands on IAS and its impacts on soil fertility, it was evident that plant invasion can affect nutrient cycling and ecosystem functions by altering plant characteristics, such as the quantity and quality of leaf litter entering the environment. For example, plant invaders can increase levels of soil organic matter through the production of leaf litter and leaching of root exudates, fuelling microbial activity associated with the nitrogen cycle and nitrogen fixation. Increased soil nitrogen concentrations may give invasive plants a competitive advantage over native plants that are better competitors in low-nitrogen soils.

ii. Social impacts

IAS have impacted human health through introduction of new diseases or increase previous diseases through cuts, wounds, bites, and allergies. The effects on human health are indeed a major problem that comes with large costs.

One of the major causes was undernutrition/malnutrition caused by lack of vitamins and minerals in the diet. Their negative impacts are expected to intensify with increased opportunities of invasions associated with climate change. The introduction of non-native species and range expansions of native species with changing land use and climate may have profound consequences for the ecosystems they occupy. It was recognised that one of the most dangerous effects of IAS is as a carrier of disease. For instance, the introduction of Malaria parasite by the explorers into the Pacific from Europe has dated back to 1800s.¹⁹⁵ These malaria parasites have been carriers of malaria sickness, which is a vector borne disease, and have passed from one person to another, resulting in increasing deaths over the past decades although the national government tried its best to eradicate this disease.¹⁹⁶

¹⁹⁴ Fasi J. 2009. Quantifying the dominance of little fire ant (*Wasmannia Auropunctata*) and its effect on crops in the Solomon Islands.http://issg.org/CII/Electronic%20references/pii/references/fasi_quantifying_the_dominance_of_the_little_fire_ant_and_its_effects_on_crops_in_the_solomon_islands.Pdf

¹⁹⁵ above n192

¹⁹⁶ ibid.

In many communities and societies across the Solomon Islands reliance on subsistence farming through traditional staples such as sweet potato, taro, and yams, and in some islands, breadfruit, has enabled people to live longer. People rely on these traditionally supplied dietary carbohydrates, e.g., Elephant foot yam (*Amorphophallus campanulatus*), *Tacca leontopetaloides*, sago (*Metroxylon sagum*, *M. bougainvillense* and *M. solomonensis*) the Polynesian or Tahitian chestnut (*Inocarpus fagiferus*), *Haplolobus floribundus* and *Corynocarpus sp.*¹⁹⁷ Many of these plants are still important food sources in certain areas, but they generally only provide seasonal or occasional food. There are plenty of species endemic or indigenous to the Solomon Islands for which the edible fruit is of prime importance. All can be described as multipurpose trees and therefore may have uses that some people may consider more important than the edible fruit.

There are minor fruits and berries that are picked. The diet of all communities traditionally includes many leafy vegetables that are collected from a range of both cultivated and wild plant foods are termed 'cabbage' in Solomon Islands Pidgin and they constitute most vegetable foods eaten in the country. Sources of such 'cabbages' include ferns, climbers, shrubs, and trees. However, today these traditional staples are under severe threat from IAS as the main silent killer in the natural environment apart from other factors like logging, mining, unsustainable land use, increasing population and climate change.

Invasive species, both plant and animal and on land and the sea, have severe impacts on food dietary. The imbalance of food intake has caused malnutrition across the Solomon Islands. The increased use of pesticides or chemicals in food gardens by farmers to keep away invasive species have resulted in low energy and nutrition consumption across societies today. Furthermore, due to the impacts of invasive species on food, humans have encountered challenges in maintaining healthy living in different societies across the Solomon Islands.

The malnutrition rate among children has increased because these invasive alien species have destroyed food crops in gardens, resulting in lack of a balanced diet all year round¹⁹⁸. Loss of food is a concern, not just from IAS, but other threats such logging, mining, soil, degradation, pollution etc.¹⁹⁹ The Ministry of Agriculture and the Ministry of Fisheries and other relevant stakeholders lack the resources to assist each community with food crops, seeds, fruit trees etc. With lack of assistance and introduction of other species like tilapia to possibly control mosquitoes, it causes population of native species to be reduced and migrate from its habitat to another. This has caused people to even go hungry because most people in rural communities' farm tilapia for commercial purposes rather than food security.

The impacts that IAS have on the country's biodiversity and on our environment are also increasing noticeably. The negative impacts of IAS on biodiversity are not only through their introduction via transport of goods and services, but are intensified by climate change, habitat destruction and pollution as mentioned earlier. IAS have also contributed to habitat fragmentation, alteration, and degradation.

¹⁹⁷ ibid.

¹⁹⁸ above n135

¹⁹⁹ ibid.

iii. Economic impacts

The problem of IAS is not simply the concern of ecologists or conservation biologists. Rather, it affects national economies, is an intimate part of global trade, threatens human health, and is a critical element of global climate change.

Whilst the understanding of invasive species is those introduced to the natural environment with negative ecological, economic, or social impacts, these negative impacts have been increasingly recognised in both the ecological and economic literature as awareness of the impacts of invasive species grows, and as globalisation increases the pathways and speed of invasions. In addition to the direct costs of the prevention, control, or mitigation of invasive, the economic costs also include their indirect ecological consequences and other non-market values. For example, invasive may lead to changes in ecological services that are locally important by disturbing the operation of the hydrological cycle including flood control and water supply, waste assimilation, recycling of nutrients, conservation and regeneration of soils, pollination of crops, seed dispersal, and so on. Such services have both current use value and option value (the potential value of such services in the future)²⁰⁰.

The economic impacts of invasive species are often difficult to estimate and must consider a number of interacting factors. First, there are direct resource losses, such as reduction in crop yield due to competition with a non-indigenous weed or herbivory by a non-indigenous insect. Secondly, there are costs associated with control of non-indigenous species, such as pesticide use, and labor dedicated to all methods of management. Third, there are costs of environmental degradation caused both by the invasive species themselves, as well as by human actions to control them (e.g., non-target effects of pesticide applications). Fourth, there could be considerable variation in damage and control costs between the years. As a result, most monetary estimates are only rough approximations to the actual costs, which also vary widely among the studies. Nevertheless, most estimates indicate large costs of biological invasions²⁰¹.

Attempting to repair invaded ecosystems is quiet economically costly. Removing biological invaders and repairing the environment may involve many hours of physical labor when invasive species must be trapped or uprooted, poisoned, transported, and destroyed. Ensuring that removal is adequate through monitoring, conducting research on the safety and effectiveness of removal methods, and reaching a consensus on how to proceed all cost money. Once invasive species are removed or controlled, follow-up work can last for decades or longer. There have been significant commercial income losses due to IAS impacts on agriculture and forestry. There was huge amount of money that was dump into research, data collection, and awareness to eradicate invasive alien species to date, however, invasive species continue to become increasingly on the rise across to other islands in the Solomon's.

Although, on the whole, non-native species introductions have resulted in great economic damage (crop loss, pest control, disease, etc.), the introduction of some non-native species has been economically positive. The careful use of biological control has been a beneficial alternative to the use of pesticides in pest control (although there are also numerous examples of poorly researched, inappropriate methods of biological control that have resulted in the widespread dispersal of harmful invasive species).

²⁰⁰ McNeely, JA. (2000). Global Strategy for Addressing the Problem of Invasive Alien Species: A result of the Global Invasive Species Programme (GISP): <https://www.cbd.int/doc/principles/ais-strategy-gisp.pdf>

²⁰¹ *ibid.*

It is true that some of the introduced agriculturally important plants and animals became invasive. However, agriculture and livestock farming has allowed humans to increase food production and product diversity, while tree farming has allowed a renewable resource for buildings and paper products. As reserves of fossil fuels are depleted, the importance of renewable biological resources is likely to increase even further. However, whenever a decision to introduce a non-indigenous species is made, the potential economic benefits should be carefully weighed against the potential risks of it becoming invasive.

c) Linkages with other national problems

The Solomon Islands is vulnerable to the threats posed by IAS because its economy typically relies heavily on agriculture, forestry, and fishing. Moreover, it is generally the rural communities who are most at risk, as their livelihoods are almost solely based on these economic sectors, while the poorest people may be dependent on biodiversity-based products for food, fuel, and construction material. In contrast, urban and/or wealthy people tend to be buffered from the effects of loss of biodiversity and ecosystem services by their increased access to alternate resources and their stronger purchasing power. It was becoming evident that the effects of invasive species on rural livelihoods are difficult and diverse. While many invasive species inflict a heavy burden on rural people, others are integrated into their livelihoods, either as cultivated species or through exploitation of wild populations for food, construction material, fuelwood, and even traditional medicine.

The issue of climate change is also triggering IAS to grow exponentially as the country already feeling the impacts associated with the climate change²⁰². Climate change facilitates the spread and establishment of many alien species. Conversely, climate change reduces the resilience to biological invasions. Extreme climatic events resulting from climate change, such as cyclones, floods and droughts can transport IAS to new areas and decrease the resistance of habitats to invasions.

Climate change is also opening new pathways of introduction of IAS. As the impact of sea level rise increases in the islands, it is not only displacing people, but it is also affecting the food gardens that people are heavily dependent on. Peoples' livelihood is threatened, causing them to relocate and increase the risk of alien species to move intentionally and unintentionally.

IAS threaten food security in general. In the outer islands such as Sikaiana and Lowd Howe in Malaita Outer Islands, Malaita Province, the taro leaf blight is continuing to destroy agricultural food crops mainly taro. As mentioned earlier, this impacts on human health as most people are now substituting their traditional food crops with imported goods. Increasing consumption of these imported goods is resulting in increasing rate of cardiovascular diseases in Solomon Islands²⁰³.

The country has also experienced major setbacks when it tries to control the increasing rate of pollution. Liquid waste has become a major problem in cities and peri-urban centres due to lack of treatment facilities in place. The most common was the untreated sewerage that flow into streams, rivers, drainage and at the coastlines. For instance, at the Mataniko River flowing through the heart of Honiara, it can be observed that this untreated effluent has caused increasing populations of highly undesirable invaders, one of the most infamous examples is green algae, *Caulerpa taxifolia*. The increasing green algae was a direct indication of high concentration of

²⁰² above n120

²⁰³ ibid.

untreated sewerage effluent in the rivers, streams and drainage system that leads to water clogs and undesirable habitat for native species.

Water hyacinth (*Eichhornia crassipes*) has invaded tropical habitats worldwide as well as in the Solomon Islands. Water hyacinth blocks waterways, destroys aquatic wildlife and the livelihoods of local people and creates ideal conditions for disease and its vectors. Its dense growth blocks waterways and inhibits boat traffic, disrupting trade, fishing, and recreational activities. The plant is a weed of wetland crops such as rice and jute, and often clogs irrigation canals and pumps, so it also impacts agricultural production. The floating mats threatens and pose a health risk by creating suitable habitat for mosquitoes, snails, and other vectors of disease, and can damage road and rail bridges when swept downriver during floods as it was seen during the Mataniko River flooding that occurs in 2014.

d) Immediate, underlying and root causes

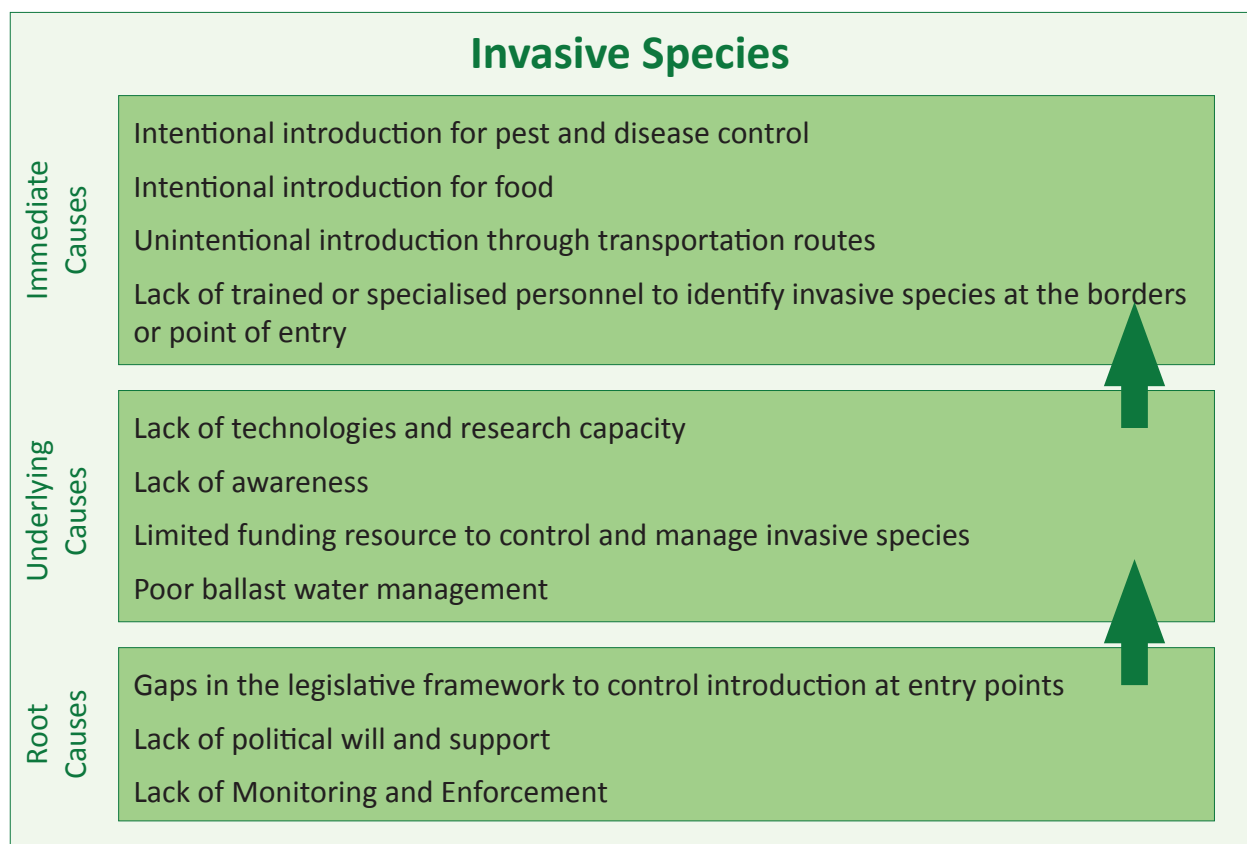


Fig 13: Summary of the Invasive Species Casual Chain

With the increasing global economy, there is also increase in transportation of goods and travels, which has facilitated the movement of live species over long distances and beyond natural boundaries. Most invasive species coming into the country are spread by the movements of goods and people intentionally or unintentionally. More business means more trade, more trade means more regular and new transport, which means increased risk from invasive species, which is becoming even more important to manage invasive species.

Whilst invasive alien species spread rapidly intentionally or unintentionally by humans because of efficient trade and transportation, the serious impacts it has on the country are severe.

Lack of monitoring and enforcement are one of the contributing factors to the increasing rate of introduced invasive alien species intentionally or unintentionally across borders and at entry

points through major pathways such as by air, sea, and other external pathways. For instance, by direct flights into Solomon Islands from other countries; from visiting yachts, commercial shipping, cruise ships; natural disasters, natural pathways like wind, floating vegetation, rafting and so forth that causes biosecurity risks. Movements of heavy machineries across the islands in terms of logging, mining, and other infrastructure developments have higher risk in invasive species moved from one place to another because of lack of proper monitoring and biosecurity checks carried out by government agencies responsible, and border control facilities and procedures have broken down. Lack of technologies and data was also a major setback to Biosecurity and quarantine in Solomon Islands.

Furthermore, whilst there has been invasive alien species that largely dominated ecological concerns, there has been a rapid increase in recent years in impacts of invasive alien species on the national economy. Most of the economic arguments around the costs and benefits of invasive alien species have also been used to highlight issue of invasive alien species. The Solomon Islands economy over the years are influenced by subsistence economy, this implies, assessing the true costs of invasive alien species is difficult and inaccurate. This is because the economic cost of invasive alien species goes beyond the direct market impacts (such as those a pest may have on agricultural yields) to include indirect nonmarket impacts (such as impacts on ecosystem functions).

Most estimates of the economic costs of IAS focus on the formal economy, not the informal. The informal economy is a significant component of the economic and social make up of developing. Almost 80 per cent of workers in the Solomon Islands operate in the informal economy, thus, the informal economy, particularly in the Solomon Islands, is a central aspect of people's livelihoods and is more the norm than the exception.²⁰⁴ Consideration therefore needs to be given to how invasive alien species influence livelihoods operating within the informal economy. With invasive species damaging food gardens and crops that people's livelihood depends on, there were no production or low productivity in the agricultural sector and fisheries sector that directly impact the exports commodity in the global market which often have severe effects on our economy. This was also because certain importing countries are refusing agricultural produce from Pacific Islands including the Solomon Islands that are known to have some of the world's dangerous invasive alien species.

The lack of political influence on this issue have raised concern to locals and farmers that this will have impacts and implications to the market as the more imported goods coming into the country, it also causes prices of local produce to be lower putting pressure on livelihoods.

e) Knowledge gaps

From the discussions on the issues of IAS in the Solomon Islands, there are gaps that have been identified. These gaps present priorities for research and other actions in the near future. Prevention, early detection, and rapid response are widely accepted as the best ways to safeguard islands from IAS impacts. However, a lack of public education on invasive alien species issues, poor cooperation between countries, a substantial lack of trained personnel to identify and seize invasive alien species at country borders, and few, if any, mechanisms to respond to emerging outbreaks of invasive alien species, present significant obstacles. Furthermore, lack of ecological and taxonomic information limits the ability to predict the impacts of invasive alien species or even simple identification of species as introduced or native to an area.

²⁰⁴ UN-Habitat - United Nations Human Settlements Programme (2012): Solomon Islands National Urban Profile Report.:http://www.fukuoka.unhabitat.org/projects/voices/pacific_islands/pdf/1_Solomon_Islands_National_Urban_Profile.pdf

The followings are important considerations to address the issue of IAS:

- Ballast water is recognised as a global pathway for invasive alien species transport. However, the fouling of marine organisms on ships and other mobile structures is another significant invasion pathway that requires greater attention.
- Relatively little quantitative data are available on the impacts of invasive alien species on island ecosystems. At present there are no adequate tools to predict which introductions will produce successful invaders, or even quantitative and qualitative data on which introductions fail and why. This uncertainty poses considerable difficulty for policymakers.
- Greater quantification will lead to better decision prevention policy. The following steps need to be taken to conduct research on how to incorporate stochastic processes important in the early stages of invasion into population models. Better population models may lead to more successful predictions of which species introductions will become invasive alien species. Improve knowledge of invasion risk and patterns of spread in order to prioritise species risk and reduce uncertainty by collecting higher quality data and improving modelling. To predict and prevent future invasions, pathways for the introduction of species to island ecosystems must be identified. This is one of the most important measures that can be taken; therefore, more information is needed to develop tools to identify pathways.
- A general assessment of the impacts of invasive alien species on islands is difficult since there is little quantitative data widely available. Experiments can be difficult to conduct on hard to access islands. Consequently, experimental data is often lacking and contributes to conservation failure in managing invasive alien species on islands.
- Islands have limited resources, making the protection of ecosystem services particularly important. Because the science of identifying and quantifying ecosystem services is in its infancy, better methods are needed. Therefore, the following research should be facilitated: Quantify ecosystem services on islands to improve prediction of invasions, to prioritize actions, and to better understand invasive alien species impacts. Conduct more ecological experiments, in the form of perturbations, field trials or adaptive management. Conduct research to enhance understanding of how exogenous factors (e.g., climate change, physical disturbance) exacerbate the impacts of invasive alien species. Determine whether a lag phase exists for the realization of invasive alien species. Conduct more research to understand how biological invasions on islands differ from continental invasions. Conduct complete biological inventories on island ecosystems, particularly on small islands. Consider bio inventories from invasive alien species source regions (for little known invertebrate groups in particular) to aid understanding of pathways of invasion²⁰⁵.

²⁰⁵ Meyerson, L. A., & Reaser, J. K. (2003). The Ecological and Socio-Economic Impacts of Invasive Alien Species on Island Ecosystems: Report of an Experts Consultation. In The Global Invasive Species Programme (GISP) on behalf of the Convention on Biological Diversity. Washington, DC.

6.6 Priority Issue 6: Coral Reefs Degradation

a) Description of the problem and its national importance

Coral reefs are some of the most diverse ecosystems in the world, supporting valuable ecosystem goods including fish, shells, coral and other marine products and services such as fisheries habitat, tourism, medicine, and coastal protection. It was recognised that coral reef degradation is intensifying worldwide. Governments around the world are struggling to deal with these accelerating threats, and the Solomon Islands is no exception. The majority of the people (80%) live in rural coastal communities and rely heavily on the resources that coral reefs provide for their daily subsistence and cash needs. Although coral reefs play an important role in ocean life, these habitats are also threatened.²⁰⁶ Nearly half of all women and 90% of all men in rural communities were engaged in fishing.²⁰⁷ Most rural fishers sold their catch solely to meet household needs; however, some fishers also sold their catch in urban areas. Small-scale coral reef-based commercial fisheries included the ornamental fish trade, the trochus fishery, the sea cucumber fishery (currently closed), and the reef fish fishery.²⁰⁸

Coral reefs are being threatened by an increase of stresses from human activities such as coastal development, pollution, overfishing, destructive fishing practices, and tourism activity. In addition to this stresses, long-term changes in the oceans and atmosphere interactions, as well as elevated sea temperatures and concentration of carbon dioxide, and stresses from heavy storms, earthquakes, volcanic eruptions, and highly variable seasons also affect coral reefs. Coral reefs and their associated marine life are one of the greatest natural treasures of the Solomon Islands. Both their quality and their quantity are impressive: The Solomon Islands is located at the centre of the world's coral reef diversity and, it holds approximately one-eighth of the world's coral reefs as it was in the coral triangle region.²⁰⁹ The beauty of these coral reefs attracts thousands of tourists worldwide who come to dive and snorkel amongst these natural treasures. However, damage to the reefs has often been caused by the increase in tourism itself.

The Solomon Islands' reef system, like those of many other countries, are under pressure from a combination of natural and human induced impacts such as climate change, increasing population and growing development. Over the passing years, rapid harvesting of coral for the aquarium, curio, and lime trade results in the removal of specific coral types which, causes degradation and destruction of reef habitat, further reducing ecosystem resilience.²¹⁰ Negative socio-economic effects were expected for communities' dependent on affected reef ecosystems for food and/or cash. In many rural communities in the Solomon Islands, there is often limited awareness of the long-term consequences of coral extraction activities.²¹¹ Ongoing unsustainable extraction of corals today have contributed to increased vulnerability and reducing the ability of the people of the Solomon Islands to reap the benefits of coral reefs nowadays.

²⁰⁶ above n54

²⁰⁷ *ibid.*

²⁰⁸ above n135

²⁰⁹ Hoegh-Guldberg, O., Hoegh-Guldberg, H., Veron, J.E.N., Green, A., Gomez, E. D., Lough, J., King, M., Ambariyanto, Hansen, L., Cinner, J., Dews, G., Russ, G., Schuttenberg, H. Z., Peñaflores, E.L., Eakin, C. M., Christensen, T. R. L., Abbey, M., Areki, F., Kosaka, R. A., Tewfik, A., Oliver, J. (2009). *The Coral Triangle and Climate Change: Ecosystems, People and Societies at Risk*. WWF Australia, Brisbane.

²¹⁰ *ibid.*

²¹¹ above n45

Although traditional management systems offer advantages for inshore fisheries management in Solomon Islands, over the past 30 years, modernization and socioeconomic change have contributed to their ineffectiveness in some instances. Some significant factors in this regard include (i) waning respect for traditional leadership and authority (; (ii) the influence of markets and resulting commoditization of resources (iii) changing consumption and demographic patterns (iv) adoption of new religious beliefs and the consequent demise of traditional belief systems and (v) use of modern, more efficient fishing gear.²¹² In many of these management initiatives women play a very small role even though they are the dominant fisheries in the coastal reef areas.

b) Major environmental impacts and socio-economic consequences

Stretching across six countries in Southeast Asia and Melanesia (Indonesia, the Philippines, Malaysia, Papua New Guinea, Solomon Islands and Timor Leste), the Coral Triangle contains the richest marine ecosystems on earth.²¹³ It is the epicentre for the biodiversity of not only corals and fish, but many other marine organisms as well, and thus, contains overwhelming amount of the world's marine diversity, reef-building coral species, and coral reef fish species.²¹⁴ Unfortunately, in the Solomon Islands, the coastal ecosystems are being severely threatened by the activities of humans and from rapid anthropogenic climate change affecting biodiversity and impacting people's livelihood.

i Environmental impacts

The coastal waters and the coral reefs have become the dumping sites for wastes and by-products of many human activities. Organic and inorganic pollution are direct results of human activity on land. It is not uncommon for sewage and animal wastes are not to be treated but discharged directly into the sea or into rivers which flow into the sea. Coral reef degradation has enormous effects on marine/coastal biodiversity in the country today. The decline in coral reef cover causes decline in fish biodiversity both in marine reserve and in areas open to fishing. Human activities such as the threat from dynamite fishing was prevalent in parts of the Solomon Islands although it was illegal under the Fisheries Act 1998 and under the Fisheries Management Act 2015, which states that no dynamite fishing is allowed and if a person is caught, he/she can be punished and a fine of SBD3,000.00. It was regarded as the most destructive fishing method commonly used in the Solomon Islands causing damage to the ecosystem and benthic habitat. The powder from the World War 2 ammunitions and explosives is destructive, causing thick corals to be reduced to rubble. This has also caused changes to the coral reefs associated species. This dynamite or blast fishing has resulted in fish poisoning which is coincidental and as a result this activity was a major cause of species migration and affecting coastal biodiversity including fish and marine population to be reduced²¹⁵.

Land based activities such as logging, mining, coastal development, deforestation, and land clearance for agriculture development have resulted in high rates of erosion and increased sediment loading of coastal waters which directly impacted the coral reef habitat. These sediments can remain in water deposited on coral cover and burying the entire corals and as a result mass coral bleaching occurs. Sedimentation was described as the main killer of coral reefs in the Solomon Islands due to the land-based activities.

²¹² Wairiu M., S. Tabo and J. Hasiau. 2003. 'Assessing community perspectives on governance in Solomon Islands.' RETA: Assessing community perspectives on governance in Pacific Region, A report for Asian Development Bank.

²¹³ above n208

²¹⁴ *ibid.*

²¹⁵ above n54

As human population growth escalates and development expands into the coastal area, it alters the features of the physical environment, thus, causing diseases and mortality in coral reef structures. Marine litter from shipping vessels that travel between islands are a major contributing factor to pollution that causes breakdown of coral reef structures. Chronic exposure to oil spillage has had deleterious effects on coral reefs in areas such as Renell Islands and in Temotu, but most such effects have been localised and oil pollution has commonly been regarded as having little lasting effects on coral reefs. Indeed, the massive oil spill that occurred in 2020 resulted in remarkably small impacts on the coral reefs of the region. Heavy metals (and other complex pollutants such as pesticides) have also been implicated in coral reef stress, but there are few conclusive data and no reported incidence of reef collapse due to such pollution in the Solomon Islands.

Furthermore, climatic factors are also responsible for coral reef degradation through coral bleaching. This happens mostly in the Solomon Islands, Papua New Guinea and other countries that are located close to the equator. Bleaching events were limited and patchy in the Solomon Islands, however, it has had severe impacts on coral reef habitats. Currently, anthropogenic stress is the major destructive factor causing long-term damage to coral reefs. This is unlikely to be reduced in the foreseeable future because development and large populations in the tropics are still growing.

A major unknown is the degree to which climate change will interact with anthropogenic effects to increase destruction of reefs already stressed, or to act independently to endanger those reefs not presently threatened by human activity. Climate change may affect coral reefs through variations in such factors as water temperature, increased concentrations of dissolved carbon dioxide, altered current and/or storm patterns, and increased runoff (with effects due to freshwater, sediment transport, and pollutant transport). In addition, climate change may result in shifts in human populations, putting previously unstressed coral reefs under the influence of human activity. Conversely, those reef areas which become uninhabitable will be released from considerable human pressure.

ii Social impacts

The marine environment contains the greatest diversity of invertebrates found around most islands in the Solomon Islands. Without corals, reef fish would have little protection from predators, and their feeding ground would be greatly affected so corals are needed to maintain healthy fish stocks on reefs. Due to the impacts of climate change and excessive developments inland and other threats from Humans or anthropogenic activities, coastal communities relied on fishing for subsistence and income is at risk.

The ongoing degradation of coastal ecosystems, overharvesting of valuable species, and climate change (including more extreme weather events, rising sea levels, increasing sea surface temperatures, and ocean acidification) are lowering the production of fish, which is the primary source of protein in the Solomon Islands including the pacific region which threatens food security and livelihood.

The health concern resulting from coral degradation has been from the threat of overfishing and destructive fishing. Coral fish are targeted for food, sport and for restaurants and for aquariums. As previously mentioned, dynamite fishing, which involves spraying or dumping powder from World War 2 explosives onto reefs to stun and capture (live) fish, kills coral polyps, and degrades the reef habitat, thus resulting in high exposure to fish poisoning. Furthermore, run-offs from land-based activities and agricultural use of pesticides, insecticides, herbicides, and fungicides also have a negative effect on human health.

Coral reefs naturally protect the coastline from tropical cyclones and storm surges by reducing the impact of large waves before they reach the shore. However, in areas where bleaching occurs and destructive fishing methods have been occurring, the impact of waves would be devastating as there would be nothing to stop the waves surging in resulting in coastal communities being flooded and damaged.

Before the development and rapid population growth, traditional communities living along the coastal areas were dependent on the reefs for a major part of their subsistence. These communities developed many methods for ensuring that the fish stocks were not depleted. Although times have changed with the availability of imported food in many of these countries, many people living adjacent to coral reefs continue to derive much of their animal food protein from the coral reefs.

Fishing techniques vary considerably, even within individual fishing communities. Traditional fishing methods are relatively labour intensive and combined with cultural traditions that had a conservation ethic and relatively stable populations, these acted to protect reefs from overuse in the past. With the increasing population, the availability of advanced technology, and a loss of cultural traditions have all served to place much greater pressures on reefs. The predominant methods continue to be line fishing, various uses of nets, the development of fishing traps and gleaning at low tide. In many regions, fishermen resort to spearfishing, either free-diving or more recently using compressed air equipment. These extensions of traditional methods have increased fishing efficiency, while the use of powered boats has extended the range of reefs accessible to fishermen. Women are reported to play a significant role in managing fisheries resources in environments where women themselves exploit such resources, such as in the case of shell beds in mangrove areas in the Solomon Islands. Excessive fishing pressure has also been identified throughout the Solomon Islands, leading to marked declines in fish stocks, thus the need to include women in stakeholder engagement and consultations that relate to resource use and management²¹⁴.

People living adjacent to coral reefs often use limestone as a source of building materials. In Malaita, there has been marked reef depletion in both living and dead coral blocks because of their use in building. There are many other examples of coral rock and sand extraction around the world, and most have been accompanied by environmental damage that was not predicted before or during the extraction process. Limited removal of coral for lime production is not particularly harmful and forms part of traditional culture as practised in parts of the Solomon Islands. Women theoretically play an important role in communities where the land ownership inheritance system is matrilineal. However, men (e.g., sons, brothers, or husbands of inheritors) decide on matters pertaining to land, with women usually having little voice in such matters²¹⁶

Others argue that women influence men's decisions in subtle, less obvious ways, and that in some cases women can firmly assert their views²¹⁷. Gender relations and disparities play a significant role in fisheries-related rural livelihoods, access to marine and coastal resources, and decision making as regards resource use.

²¹⁴ Aswani, S. and P. Weiant. 2004. Scientific Evaluation in Women's Participatory Management: Monitoring Marine Invertebrate Refugia in the Solomon Islands. Human Organization. 63. pp. 301–319.

²¹⁵ Stege K.E., Maetala R., Naupa A. and Simo J. 2008. Land and Women: The Matrilineal Factor. The cases of the Republic of the Marshall Islands, Solomon Islands and Vanuatu, Pacific Island Forum Secretariat, Suva, Fiji.

²¹⁷ Weeratunge N., Pemsil D., Rodriguez P., Chen O.L., Badjeck M.C., Schwarz A-M., Paul C., Prange J., and Kelling I. 2011. Planning the Use of Fish for Food Security in Solomon Islands: Final Report. WorldFish Center Project Report, 2011–2017. Penang, Philippines

iii Economic impacts

Export fisheries are also contributing to some of the degradation that is occurring on coral reefs in many developing countries, particularly in the Pacific region. This economic incentive is leading to the overharvesting of reef resources and increasing use of destructive practices that leads to the destruction of coral reefs.

Apart from export fishing, international forms of trade in reef products that create additional threats to reefs. Many of the curios (shells, coral, etc.) that are exported or sold within the country to tourists come from reefs. This trade continues with overharvesting threatening the remaining species, and thus, leading to people damaging coral reefs and harvesting coral reefs for financial gains.

Another developing beneficial industry is the collection of aquarium fish and live corals for markets in Europe and North America. Unfortunately, a widely applied technique uses cyanide to force fish out from the coral and stun them for easy capture. Poisoning results in extensive damage to corals and other reef invertebrates that are incidentally killed during the process. Traditional reef users in the Solomon Islands recognised this problem and banned the use of toxins for beche-de-mer and other species because of damage to adjacent corals. Although some juvenile reef fish can be harvested in substantial numbers without damage to the population, this is not true for long-lived invertebrates. Anemones and hard and soft corals are increasingly popular collection items; they live decades to centuries in nature with correspondingly low reproduction and recruitment rates but are subject to high mortality on transportation and can rarely be maintained in captivity longer than a few years.

Tourism should be the most environmentally caring way to generate income from coral reefs, as the greatest attractant for a tourist is a pristine reef with abundant fish populations. This is possible only under carefully controlled conditions of resort development and operation. Uncontrolled collecting, sport fishing and accidental damage (by waders, swimmers, and boat anchors) all have deleterious effects on reefs. The building and operation of the tourist facilities can be far more damaging, particularly if untreated sewage and other wastes contaminate the adjacent waters, however, there is a need for careful planning and design of resorts to avoid problems such as increased beach erosion.

c) Linkages with other national problems

The geomorphology of the Solomon Islands coral reefs is mainly fringing and alternating around all our islands.²¹⁸ The only areas lacking corals are on sandy beaches and near major river mouths. For decades, our coral reefs and the marine habitats have been exposed to external threats from other related human caused activities.

Poor governance and lack of political will at all levels are major contributors to the vulnerability of coral reefs across the country. The national government's ability to effectively protect and manage its natural resources has been hampered by weak or ineffective policies, a lack of enforcement of existing laws and regulations, and a lack of institutional resources and capacity. Incompetence and inaction are exacerbated by corruption, which has harmed the Solomon Islands' sovereignty. A clear example was the oil spill in Rennell Island that severely impacted the pristine coral reefs in Kongobainiu in February 2019, where more than 100 tonnes of heavy fuel oil leaked into the sea, creating the worst oil spill in the history of the country.²¹⁹ Although the

²¹⁸ above n54

²¹⁹ above n190

MECDM and the Solomon Islands Maritime Authority (SIMA) investigated the Rennell oil spill, they have not yet pressed any legal charges against the mining company or the owners of the vessel. The numerous companies and subcontractors involved in the Rennell oil spill allegedly makes it difficult to hold anyone accountable.

The constant grounding of ships is another problem that needs attention. Shipping is the main mode of transportation and very important for the Solomon Islands economy. Maritime infrastructure such as wharves, jetties, mooring buoys and leading marks, are in poor condition or in many areas entirely absent. As a result, boats occasionally run aground on coral reefs, destroying them. Some of the ships and vessels that have run aground have been reported, but there are quite a good number of groundings that are not reported. Most of the vessels/ ships were grounded on reefs during storms and due to narrow passage. Moreover, logging vessels and barges often caused massive damage to coral reefs as well during anchoring.

The direct effects from logging activities have accelerated sedimentation rate and as well as oil pollution into the marine environment a real concern. It was evident that there were large plumes of yellowish-red sediment at the river mouths of recently logged catchments.²²⁰ Seen on the ground, the catchments are criss-crossed with roughly formed roads and skidder tracks. Improper drainage leading to road-runoffs are flowing directly into streams and rivers during heavy rain causing excessive sediment also suffocates corals.

Disposal of sewerage is one of the major problems in urban centres. None of the urban centres in the Solomon Islands have any form of sewage treatment. The raw sewage is simply piped into the sea, and in some cases the end of the outfall is above the low tide mark and on the shoreline. Honiara, the largest urban centre, has about twelve sewage outfalls along its beach frontage and in most cases the submarine sections of the pipes have been broken by storms. Direct discharge of sewage has been ongoing for years and nothing has been forthcoming to resolve this issue although the state-owned Solomon Water have plans to build a treatment plant. However, this depends entirely on financial support from donors. There are no reefs identified along the Honiara coast in the vicinity of Honiara. However, for rural centres like Gizo, Auki, Kirakira and so on where new development is gradually expanding, the increase of sewerage discharge will also cause great impacts on coral reefs that are adjacent and proximate to the vicinity of rural-urban centres.

All these issues have taken a toll because of poor governance at all levels as mentioned earlier. There are weak or ineffective policies, lack of enforcement of existing laws and regulation, limited institutional resources and capacity has enable the national government to effectively protect and manage their natural resources. Part of the problem is that even with the best of intentions, the government has little ability to enforce any of its regulations especially in remote areas.

²²⁰ above n54.

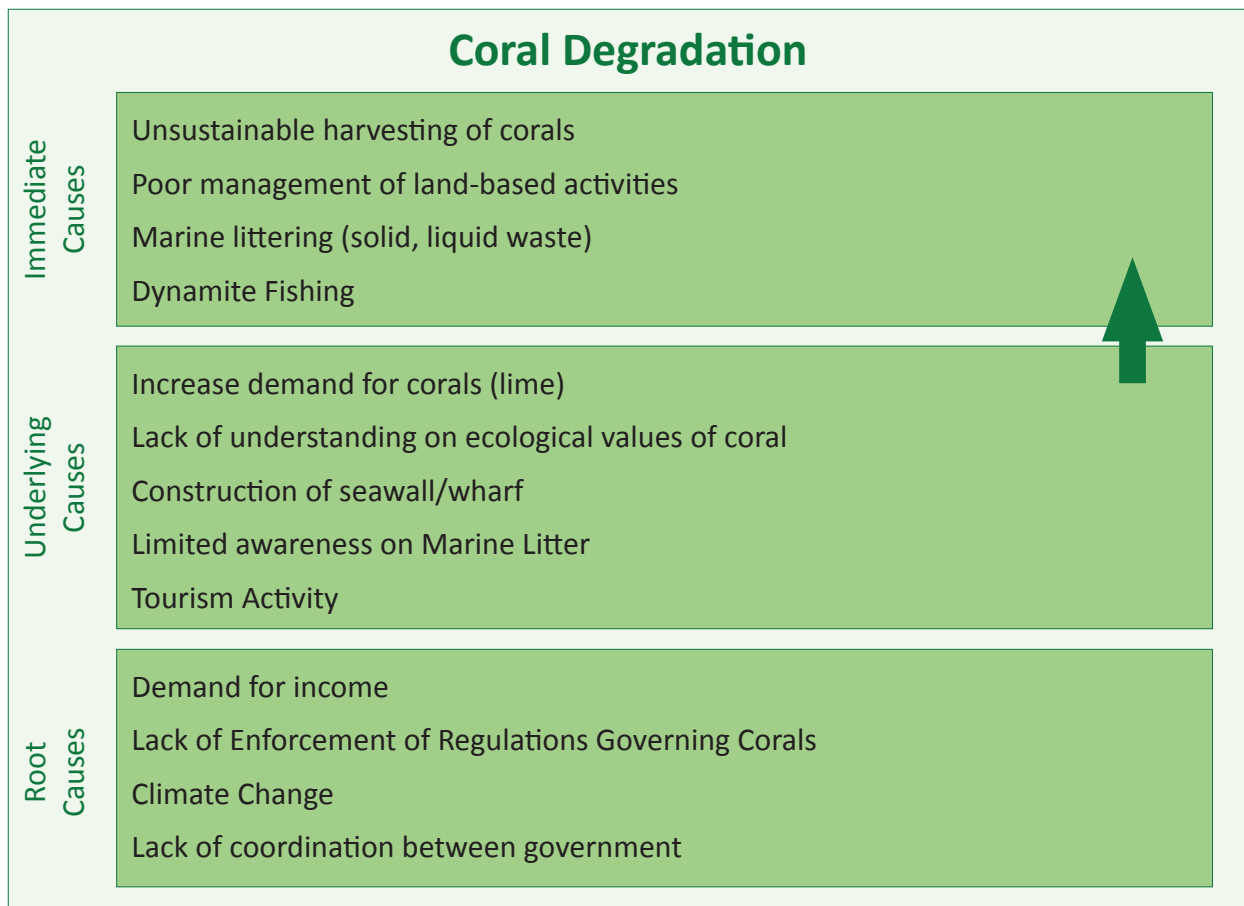


Fig 14: Summary of the Coral Degradation Casual Chain

Coral reefs are a key part of the ecological system that supports vitally important food supplies and resources for economic activities. They are found throughout most coastlines in the Solomon Islands, although these marine ecosystem and habitat plays an important role in people’s livelihood, coral reefs itself are degrading at a fast rate due to threats from natural and anthropogenic activities.

As human population increases, pressure for fishing resources increase as well as demand for income both in urban centres and in the rural areas. With the increase demand for income, there is an increase in the exploitation of these marine resource. Lack of awareness programs by relevant authority contributes heavily to the destruction of marine resources. Most people in the rural areas are not fully aware of the consequences and the impact of exploiting these resources, thus, these activities continued daily.

Given the rapidly increasing population in the Solomon Islands, this problem is likely to become more serious and widespread in the future as majority of the country’s population is unemployed and live-in rural areas. When there are opportunities in industry, mining, plantation work and tourism, people travel from their coastal villages to those places of employment to obtain the cash they need to purchase alternative foods, leaving less pressure on the reefs and marine resources.

The impacts and effects of climate change are causing deterioration in coral reefs structures. It is predicted that climate change will have severe impact on coral reefs because of higher water temperatures, ocean acidification, and will worsen other pressures on coral reefs.

Tourism is one of the lifeblood of the Solomon Islands, contributing more than 30% of the country's GDP apart from logging, mining, and fisheries.²²¹ However, the tourism industry depends entirely on a pristine environment and high-quality coral reefs. Most sources of tourist revenue are directly tied to pristine, healthy coral reefs. Scuba divers, for example, look for high-quality coral reef habitats, coral and fish diversity, and water clarity.²²² Half of all diving in the Solomon Islands occurs within the region's marine protected areas and along World War II wreckages/ vessels.²²³ Damage to the reefs has often been caused by the increase in tourism itself, through direct damage by careless tourists and through the unregulated construction and the irresponsible operation of tourist related facilities as evident here in Solomon Islands.

While sustainable tourism can be a viable and sustainable source of income for people along the coastal areas, the reefs, and the income that coral reefs provided to the local population are both threatened by mass tourism. The corals substrate can be damaged by fin kicks, pushing, or holding coral, dragging gear, and kneeling/standing on coral.²²⁴ Not all divers cause the same amount of damage. Careless or inexperienced divers can, however, contribute significantly to coral reef damage as they break corals with their fins, or by sitting on corals to take photographs. Trampling of corals is also common on shallow, near-shore reef flats and has led to extensive damage in areas with high levels of human use.²²⁵ Coral mortality can be high along the shoreline access points where people stand or wade to enter or exit the water. Even in cases where high mortality does not occur, the trampling can result in lower reproductive output for corals. Coastal developments is increasing along coastlines in rural areas and urban centres in the Solomon Islands. Coral reefs have been impacted by developments such as hotel construction, seawall construction, wharf construction, boat and ship passage, and recreational activities.

The production of lime powder to be chewed with betel nut is widely considered a significant threat to coral reefs in the Solomon Islands as it is widely used by the locals. Degradation of coral reefs for this purpose has taken its toll in many parts of the Solomon Islands over the past decades. However, government agencies and NGOs have tried to work with communities to save coral reef diversity through awareness programmes to minimise these threats and lessen these problems.

Lack of awareness and access to correct information by relevant authorities in some coastal communities has resulted in depletion of marine resources including coral reefs. vitality is critical to raise awareness about the importance of healthy coral reefs and coastal ecosystems, as well as the impacts of human activities. Since women are the more dominant fishers along the coastal fishing areas and reefs, their lack of access to information and awareness of the importance of healthy reefs will result in over exploitation of resources. Furthermore, lack of collaboration between relevant stakeholders such as Government agencies, CSOs, NGOs, Private sectors with communities also result in low awareness and low access to information to communities and by communities.

²²¹ above n23

²²² *ibid.*

²²³ *ibid.*

²²⁴ above n54

²²⁵ *ibid.*

d) Knowledge Gap

From the discussion surrounding the issue of coral reef degradation lot of knowledge and policy implementation gaps needs to be addressed to sustain and help restore the status of the reefs. It is evident that limitations to grassroots approach is increasingly clear. In the absence of state services, customary authorities are unable to address critical threats to coastal ecosystems, particularly the physical destruction, sedimentation and pollution caused by large-scale logging operations and the overharvesting of marine export commodities. There are existing environmental legislation and regulations, however, implementing these laws remains a persistent problem.

There were several policies implementations gaps that needs to be addressed to restore and save our coral reefs that is gradually degrading. Below are some of the knowledge gaps identified.

Lack of funds and ineffective enforcement: The inability of fisheries officers to enforce existing fisheries regulations, or even to monitor what is happening in such a huge archipelago, endangers coral reef resources. Currently, and for several years, the MFMR has had an acute shortage of operational funding. There is limited funding or completely no money for research and very little for testing compliance in near shore waters. Without sufficient funds to secure existing facilities and equipment against theft; to maintain its equipment; to provide boats, motors, fuel, and radio equipment; for travel and for aerial observations, then the Division is impotent. In terms of budget, there should be funds and budget allocation from national government, CSOs, NGOs and private sector to the Royal Solomon Islands Police Force (RSIPF) and Provincial Fisheries Officers, enforce Fisheries Management Act and Regulation 2018, the Environment Act 1998, Protect Areas Act 2010, Wildlife Protection and Management Act 1998, particularly the ban on importing, selling, and possessing gill nets with small mesh sizes (less than 8 cm). Build the capacity of Provincial Fisheries Officers to monitor and control trade hubs, such as markets, wharfs, and airports, to regulate trade in commercially valuable marine resources and endangered species. Fundamental to marine conservation is having the ability to monitor how the various human activities listed above impact on coral reefs and lagoons. Also required is a clear understanding of nearshore coastal processes, e.g., an understanding of circulation patterns. These tasks require expertise in a wide range of marine science disciplines and “in house” analytical facilities, e.g., for analysing seawater chemistry.

Dissemination of relevant information to coastal communities: One of the major leading causes is lack of awareness in coastal communities. Dissemination of awareness material and through media on marine resource management and environmental legislation does not reach coastal communities. In most communities, awareness programmes by stakeholders does not take into consideration providing communities with awareness materials, rather they present using electronic devices, which sometimes is good but rural communities are more likely to understand when pamphlets, brochures, posters, and books are provided to gather knowledge on ensuring the natural resources are protected from human activities threats.

In addition, to educate our rural dwellers with the right information, environmental curriculum should be taught in primary schools and secondary schools. By then, children will help educate their parents and household to be aware of the importance of the environment including marine ecosystems. Furthermore, it is important that awareness on climate change impacts on the environment should also be done across all communities, that people know and understand the impacts of climate change on the natural environment and its importance on how to mitigate and adapt from its effects, for instance, sea level rise, acidification, bleaching, increasing temperatures and as well as the impacts associate with natural disasters.

Community engagement in Locally Marine Managed Areas (LMMAs): A system of protected areas should be developed, with participation of customary landowners. Marine Protected Areas (MPAs) provide a comprehensive approach to addressing these threats and are one of the most promising solutions for the survival of coral reefs and the many benefits they provide to people. MPAs create a framework for sustainable use and resource management that is designed to sustain coral reef health. MPAs provide sites that allow for the preservation of biodiversity and the restocking of fish and shellfish populations. Also, MPAs can improve water quality by including adjacent watersheds to control the impacts of sedimentation and pollution.

Effective MPAs must be part of an integrated approach where coral reef communities are protected from multiple stresses, so they can recover faster from any single disturbance. Addressing sources of pollution, especially nutrient enrichment that can lead to increased algal growth and reduced coral settlement, is critical to ecosystem structure and function. In addition to limiting point-source pollution within an MPA, sources from beyond MPA boundaries should be controlled as much as possible through collaborations with appropriate authorities in adjacent areas. For example, MPA managers should work with land and watershed managers to develop and implement strategies to reduce land-based pollution, decrease nutrient and sediment runoff, eliminate the use of persistent pesticides, and increase filtration of effluent through run-offs to improve quality of coastal waters. Actions such as these should be coupled with research to investigate their effectiveness²²⁶, gender relations and disparities play a significant role in fisheries-related rural livelihoods, access to marine and coastal resources, and decision making on resource use.

²²⁶ Weeratunge et al. (Weeratunge, N., D. Pemsil, P. Rodriguez, O.L. Chen, M.C. Badjeck, A-M. Schwarz, C. Paul, J. Prange, and I. Kelling. 2011. Planning the Use of Fish for Food Security in Solomon Islands: Final Report. WorldFish Center Project Report, 2011–2017. Penang.

7.0 OPTIONS FOR REFORM AND ACTION

This section sets out the options for reform and action to address the six priority problems identified in the previous sections. These would be part of the next steps for IDA to inform the formulation of the Strategic Action Framework.

The table below outlines the priority issues and the options for reform and actions.

Problem	Options for Reform
Poor Solid Waste Management	<ol style="list-style-type: none"> 1. Require high level political leadership. 2. Effective policy and legal framework. 3. Develop appropriate institutional capacity. 4. Change attitudes through behavioural change programme beginning at individual to community, provincial and national level. 5. Political will and support for investment for appropriate infrastructure, sustainable financing, and innovative means for public-private partnerships. 6. Develop, fund, and implement waste management plan for all provincial centres to improve waste management.
Land Degradation	<ol style="list-style-type: none"> 1. Develop Restoration and Rehabilitation programmes. 2. Promote interagency cooperation and coordination. 3. Successful implementation of Sustainable Forest Management (SFM) through well established and functional governance, monitoring and enforcement mechanisms. 4. Successfully implement current Integrated Forest Management (IFM) Project to support land degradation of forest land. 5. Promote crop and livestock husbandry good practices. 6. Prepare and implement land use plans. 7. Use of improved technology to reduce pressure on land. 8. Develop soil and land use database utilising GIS. 9. Promote agroforestry and discourage slash and burn methods.
Deforestation and Forest Degradation	<ol style="list-style-type: none"> 1. Review, update and harmonise legislations governing the forestry sector to safeguard forest development. 2. Strengthen and empower the capacity of key ministries dealing with the forestry sector for better enforcement. 3. Develop and regularly update a forest database consisting of forest inventory, felling licenses and other relevant information concerning the forestry sector.

Water Pollution	<ol style="list-style-type: none"> 1. Review, Update and Harmonise legislations regarding water resources, developments, and pollution. 2. Improve the enforcement of existing legislation. 3. Enhance the capacity of key ministries to conduct continuous water quality assessments and monitoring. 4. Develop and implement water quality standards.
Invasive Species	<ol style="list-style-type: none"> 1. Enhance capacity of Key Line Ministries to conduct regular monitoring. 2. Improve data collection and documentation of invasive species. 3. Build the research capacity of the Ministry of Agriculture and Livestock and other line ministries.
Coral Degradation	<ol style="list-style-type: none"> 1. Monitor and Enforce land-based activities to reduce discharges into the waterways resulting in sedimentation and siltation. 2. Harmonise legislations to better protect the coral reefs. 3. Enhance the capacity of line agencies for better monitoring and enforcement.

8.0 SUMMARY AND CONCLUSION

This Island Diagnostic Analysis has identified, quantified, and prioritised six environmental problems that are cross sectoral and from ridge to reef. They are poor solid waste management, land degradation, deforestation and forest degradation, water pollution, invasive species, and coral degradation. The impacts of each priority problem were determined and discussed and analysed for their immediate, underlying and root causes. From the analysis, the issues that frequently were identified as the root cause are related to:

- 1. Legislations:** Solomon Islands Legislations are either outdated or contradict each other and thus the need for harmonisation of the existing ones and the review and update of the outdated ones.
- 2. Data availability and Management:** Data is unavailable or where it is available, it cannot be accessed or is outdated. There is a need for data sharing amongst the different government agencies and other partners.
- 3. Capacity Issues:** Limited or lack of human resources, Limited budgetary support, and lack of equipment's for monitoring
- 4. Implementation of existing plans and policies:** A lot of policies, action plans, strategies have been developed however due to capacity issues most of these have not been fully implemented.

It is anticipated that these analyses will be the decision tools for ICM/R2R investment whereby the Strategic Action Plan process will brainstorm ideas and options for reform and action. This will involve strategic thinking, planning and implementation of a Strategic Action Framework.

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APPENDICES

Appendix I

SOLOMON ISLANDS RIDGE TO REEF ISLAND DIAGNOSTIC ANALYSIS WORKSHOP, KAIROS CONFERENCE CENTER, 24th FEBRUARY 2021 PARTICIPANT REGISTRATION LIST

Ref	Names	Position	Organization
1	Jimmy. Kereseke	Safeguards Officer	Ministry of Communication & Aviation
2	Aipana. Raphael	Principal statistician	National Statistics Office, MOFT
3	Melissa Horokou	SCAO	Climate Change Division, MECDM
4	Debra Kereseke	Chief Environment Officer	Environment & Conservation Division, MECDM
5	Chris Teva	PACRES Project officer	SPREP/MECDM
6	Sammy Airahui	SIR2R NPM	SPC/MECDM
7	Nelly. Kere	Chief Programmes Officer	Programmes Management and Coordination Unit, MECDM
8	Rosemary. A	Deputy Director Environment	Environment & Conservation Division, MECDM
9	Ronnie. Posala	Fisheries Officer	Ministry of Fisheries & Marine Resources
10	David. Aram	Fisheries Officer	Ministry of Fisheries & Marine Resources
11	Grace. Iakoba	Local Project Officer	Learning and Ecological Activities Foundation for Children (LEAF)
12	Christian. Manepolo	Project Liaison Officer	IUCN/WWF
13	Fredrick. Dotho	Senior Conservation Officer	Environment & Conservation Division, MECDM
14	Thompson. Araia	Wod Training Officer	Ministry of Women, Youth, Children & Family Affairs
15	Patterson. Bobby	OEHO/MHMS	Environmental Health Division/MHMS

Appendix II

SOLOMON ISLANDS RIDGE TO REEF STRATEGIC ACTION PLAN WORKSHOP, KAIROS CONFERENCE CENTER, HYUNDAI MALL, HONIARA, 20th AUGUST 2021 PARTICIPANT REGISTRATION LIST

Ref	Names	Position	Organization
1	Jimmy. Kereseka	Safeguards Officer	Ministry of Communication and Aviation
2	Aipana. Raphael	Principal statistician	National Statistics Office, MOFT
3	Melissa Horokou	Senior Climate Adaptation Officer	Climate Change Division, MECDM
4	Debra Kereseka	Chief Environment Officer	Environment and Conservation Division, MECDM
5	Chris Teva	PACRES Project officer	SPREP/MECDM
6	Sammy Airahui	SIR2R NPM	SPC/MECDM
7	Ronny Horo	Foreign Relation Officer, Planning	Ministry of Police, National Security and Correctional Services
8	Rosemary. Apa	Private Sector Rep	Private Sector
9	Ronnie. Posala	Fisheries Officer	Ministry of Fisheries & Marine Resources
10	David. Aram	Fisheries Officer	Ministry Fisheries & Marine Resources
11	Ravin Dhari	Project Officer	IUCN/MECDM
12	Christian. Manepolo	Project Liaison Officer	IUCN/WWF

13	Fredrick. Dotho	Senior Conservation Officer	Environment & Conservation Division, MECDM
14	Thompson. Araia	Wod Training Officer	Ministry of Women, Youth, Children and Family Affairs
15	Patterson. Bobby	OEHO/MHMS	Environment Health Division/MHMS
16	Veira Pulekera	Principle Conservation Officer	Environment & Conservation Division, MECDM
17	Myknee Sirikolo	Director Herbarium	Ministry of Forest and Research (MoFR)
18	Moses Asitarau	Lecturer	Solomon Islands National University (SINU)
19	Fred Patison	Climate Finance Readiness Advisor	South Pacific Regional Environment Programme (SPREP)
20	Lizzie Tegu	Assistant Commissioner-Urban	Ministry of Lands and Housing Survey
21	Anterlyn Tuzakana	Chief Statistician	National Statistics Office, MOFT

Appendix III



State of the Coast - Diagnostic Analysis
Priority Criteria Matrix – Environmental R2R Problem



Country:	Date:
Environmental Problem:	
Site location:	

Criteria	Rating	Weighting (1 - 4)	Score
Size of the affected area (as percentage of the total national land area)	1- < 10sq.km 2- 10 to 100sq.km 3- 100 to 1000sq.km 4- 1000 to 10,000sq.km 5- >10,000sq.km	1 = no importance 2 = low importance 3 = moderate importance 4 = high importance	
Affected population (as percentage of national population)	1- < 1000 2- 1000 to 10,000 3- 10,000 to 100,000 4- 100,000 to 500,000 5- >500,000		
Extent to which the natural catchment, aquifer or receiving coastal and marine waters support the livelihood of local communities (e.g., subsistence or commercial farming, forestry, mining, tourism, fisheries)	1- very low importance (<10%) 2- low importance (10-30%) 3- average importance (30-50%) 4- important (50-80%) 5- very important (>80%)		

Extent to which the natural catchment, aquifer or receiving coastal and marine waters support the national development (e.g., commercial farming, forestry, mining, tourism, fisheries)	1- very low importance (<10%) 2- low importance (10-30%) 3- average importance (30-50%) 4- important (50-80%) 5- very important (>80%)		
Extent to which the site is a recognized government priority (refer to National Sustainable Development Strategy, or other strategic action plans e.g., NEAPs)	1- no, not a priority 2- yes, low priority 3- yes, medium priority 4- yes, high priority 5- yes, very high priority		
Extent to which the site is of regional and/or global significance and priority (see WWF ecoregions, IUCN categories, UNESCO world heritage sites, etc.)	1- no, not a priority 2- yes, low priority 3- yes, medium priority 4- yes, high priority 5- yes, very high priority		
Degree of Degradation at the site (e.g., type of degradation)	1- very low 2- low 3- average 4- high 5- extremely high		
Extent of degradation on catchment and/or aquifer and any receiving coastal and marine resources and systems	1- very low 2- low 3- average 4- high 5- extremely high		

Cultural or traditional value of the site	1- very low 2- low 3- average 4- high 5- extremely high		
Extent of community management at the site	1- very low 2- low 3- average 4- high 5- extremely high		
Other			
Other			

Please provide feedback on the criteria above:

Are they appropriate?

Would you add a criteria and ranking? If so, please define.

Would you remove a criterion? If so, please explain.

Appendix IV



State of the Coast - Diagnostic Analysis

Priority Criteria Matrix - Environmental R2R Problem

Country:	Date:
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Criteria	Weighting (1 - 4)	Habitat Loss...											
Whole-of-island nature of a problem – geographical and temporal scale.	1 = no importance 2 = low importance 3 = moderate importance 4 = high importance													
Future risk of the problem – (in 10 years)	1 = no importance 2 = low importance 3 = moderate importance 4 = high importance													
Relationship with other environmental problems.	1 = no importance 2 = low importance 3 = moderate importance 4 = high importance													

<p>Expected multiple benefits that might be achieved by addressing a problem.</p>	<p>1 = no importance 2 = low importance 3 = moderate importance 4 = high importance</p>												
<p>Progress in addressing this problem at the national level</p>	<p>1 = high progress 2 = moderate progress 3 = low progress 4 = no progress</p>												
<p>Urgency of addressing this problem</p>	<p>1 = no urgency 2 = low urgency 3 = moderate urgency 4 = high urgency</p>												



