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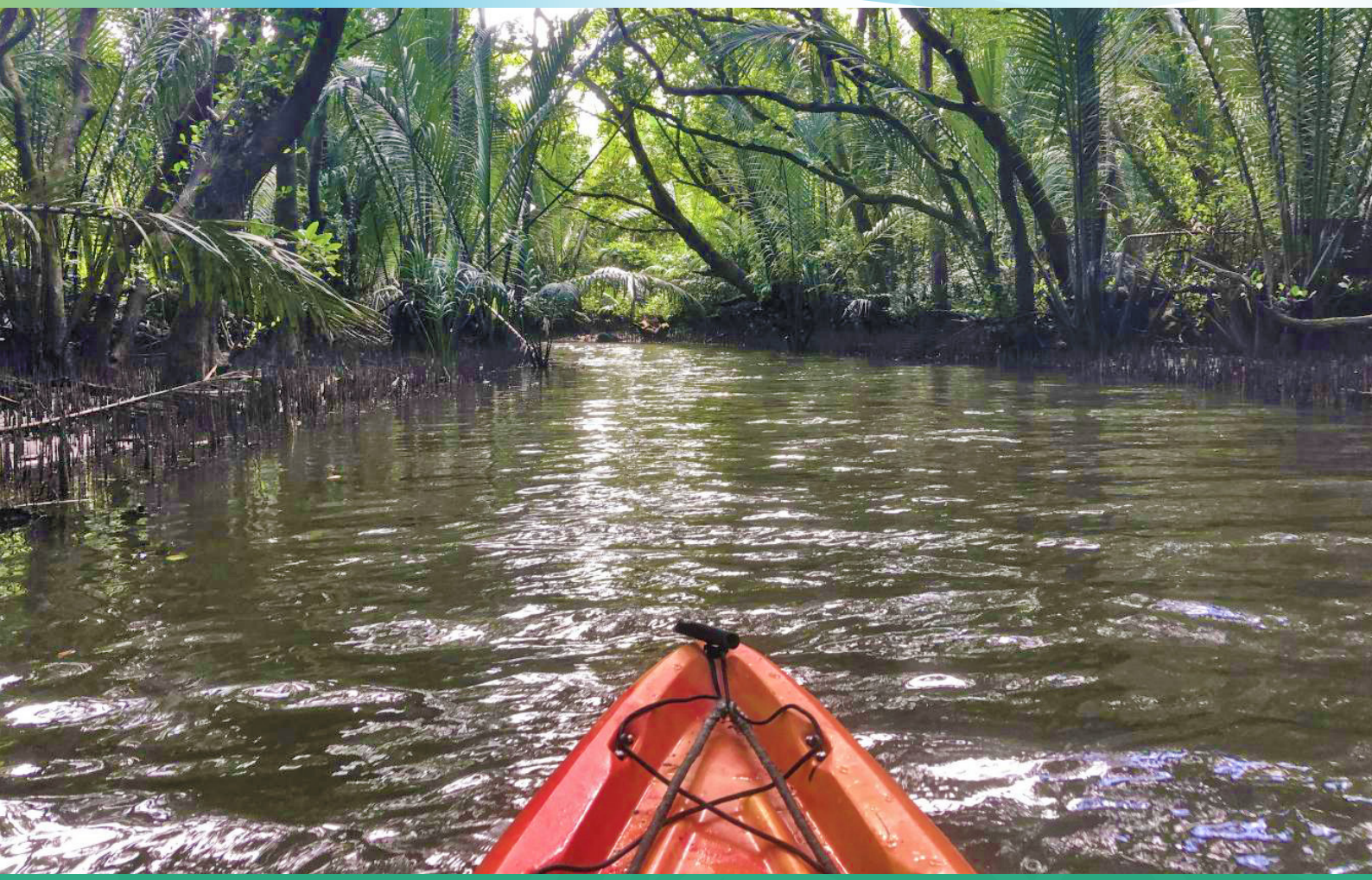

Tofol Site Diagnostic Analysis Report

Kosrae State, Federated States of Micronesia

Pacific R2R Ridge to Reef

gef

UNDP
Empowered lives.
Resilient nations

Tofol Site Diagnostic Analysis Report
Kosrae State, Federated States of Micronesia

Prepared by
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Abbreviations

IW	International Waters
SPC	Pacific Community
R2R	Ridge to Reef
GEF	Global Environment Facility
FSM	Federated States of Micronesia
STAR	System for Transparent Allocation of Resources
SoC	State of the Coast
IDA	Island Diagnostic Analysis
SIDs	Small Island Developing States

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Executive Summary

The FSM IW R2R project demonstration site is the Tofol-Mutunnenea watershed catchment stretching from the ridge to the reef. The site is in Lelu, and it contains one mangrove channel flowing directly through the Awane Marine Protected Area. There are three rivers that are found on the demonstration site, and they include the Tofol, Srungansralu and Innem Rivers. The three rivers receive rainfall from the Mahkontowe Conservation Area, and they drain large amounts of freshwater into the Lelu Bay.

The ridge to reef concept and its role in natural resource governance and management supports land-sea connectivity. In this connection, the project is cross-sectoral covering the overall upstream and downstream stretch of Tofol Watershed, thereby providing the basis for collecting and understanding important ecosystem goods and services in the watershed and using the baselines to better identify and implement priority management measures.

At the end of the diagnostic consultations, stakeholders agreed that the priority environmental problems were: Invasive species; Coastal erosion; and Solid & Liquid Waste. Other problems identified were habitat loss, deforestation, riparian clearing, land degradation, contaminated water, climate change, species loss or decline, poor infrastructure development, chlorination, sedimentation, coral reef degradation, eutrophication, contaminated land, freshwater stress, resource extraction and air pollution.

The stakeholders also discussed and agreed on a list of possible reforms and actions addressing the above priority problems and these are outlined in this report.

1.0 Introduction

Overview

The Pacific Ridge to Reef Programme is a Global Environment Facility (GEF) multi-focal area programme guiding coordinated investment of GEF grant funding across its focal areas of biodiversity conservation, land degradation, climate change adaptation and mitigation, sustainable land management, sustainable forest management, and international waters in Pacific Small Island Developing States (SIDS). It is a multi-agency initiative involving the United Nations Development Programme, the United Nations Food and Agriculture Organization, and the United Nations Environment Programme as GEF implementing agencies.

Executed regionally by the Pacific Community through the GEF Pacific Ridge to Reef International Waters project (GEF Pacific R2R IW), the operations of the R2R Programme are supported in areas of science-based planning, human capital development, policy and strategic planning, results-based management, and knowledge sharing. Implemented through the GEF Pacific R2R IW project, the R2R IW national pilot projects are designed to strengthen R2R integration by establishing synergies between sector agencies and the GEF National R2R STAR Projects, governments and communities, civil society, and the private sector.

FSM IW-R2R Project is one of the pilot demonstrations of the Regional IW R2R Project. The FSM IW-R2R Project is implemented in partnership between the Department of Environment, Climate Change and Emergency Management and the Kosrae Conservation and Safety Organization to deliver specific outputs and achieve mainstreamed R2R approach. FSM's IW-R2R project will focus on demonstrating innovative approaches to Integrated Ridge to Reef Catchment, establishing a Watershed Management Plan for demonstration site and building the state and local capacity for Integrated Ridge to Reef Catchment Management to enable best practices in coastal waters, land, and public health protection. The demonstration site for the FSM IW R2R project stretches from Tofol to Mutunnenea Area, located in the village of Lelu of Kosrae State.

Generally, Kosrae has twenty two (22) perennial streams and a number of rivers including the larger rivers such as the Finkol, Innem, Tofol and Okat rivers. Because of the steepness of Kosrae's mountain slopes, the streams discharge quickly but slow down as they reach the lowlands. The upper sections of these streams and rivers have very clear and clean water, but, as they flow into the lowlands, these streams collect sediments, which are discharged into the sea.

Purpose

This report presents the results and outcomes of the stakeholders' diagnostic consultations with the purpose to identify and prioritising key ecosystem threats to the Tofol-Mutunnenea watershed catchment stretching from the ridge to the reef. This includes the immediate and underlying root causes of such ecosystem threats. The stakeholders also discussed priority options for reform and action practically possible to address such threats.

2.0 Methodology of Diagnostic Analyses in Tofol

2.1 Identify and agree on the scope, objectives and responsibilities pertaining to the focus area under investigation

The stakeholders workshop was conducted on the 19th August 2021 in Kosrae, FSM. It was held a day after the Tofol Catchment Diagnostic Analysis workshop. The meeting was opened by the Kosrae Conservation & Safety Organization Executive Director Andy George. Workshop participants attended were representatives from the R2R Technical Committee and included a range of Government Ministries, non-government organisations and civil society organisations (see Annex 2). Women and youth group representatives were part of the workshop.

The workshop was facilitated by local consultant Trenton Skilling with support from Andy George and Carlos Cianchini and included the following sessions:

a. Overview of the workshop objectives, anticipated outcomes, process, and structure
b. Presentation of the current health and state of Kosrae Watershed Ecosystem Goods & Services
c. Identifying environmental problems that are of priority to Kosrae

Figure 1. Workshop participants

d. Prioritisation of identified environmental problems
e. Identification of impacts, consequences and key sectors contributing to priority environmental problems
f. Development of Causal Chains for priority environmental problems
g. Identification of options for reform & actions

2.2 Identify and analyse the issues, problems, and impacts (and the environmental and associated socio-economic impacts) using problem-tree and causal-link analyses

Identification of Environmental Problems

The facilitator introduced the topic, highlighted the objectives and the anticipated outcomes of the workshop, and the idea of environmental problems. The group noted detailed explanation of an environmental problem in the context of whole-of-island or ridge to reef approach. This means the discussion of problems in this exercise would be broad covering Kosrae State and within R2R framework. To moderate discussion, the facilitator asked that each participant list the problems individually before sharing during plenary discussion. The aim of the exercise is for the group to identify and list all environmental problems in no order of priority.

The technical information regarding the environment, flora and fauna and other related topics guided the stakeholders' discussions (e.g., Zoa, 2021, Cianchini, 2021).

Table 1: List of environmental problems identified during Group Brainstorming session:

Habitat Loss	Coastal erosion
Deforestation, riparian clearing	Chlorination
Solid and Liquid waste	Sedimentation
Land Degradation	Coral Reef Degradation
Contaminated Water	Eutrophication
Climate change	Contaminated Land
Species loss & decline	Freshwater stress
Invasive Species	Resource extraction
Poor Infrastructure Development	Air pollution

2.3 Prioritisation of Environmental Problems

Each participant was given a score sheet for the criteria and environmental problems and ranked them according to their own perceptions and knowledge of the problem.

From this prioritisation the top identified environmental problems were:

- Invasive species
- Coastal erosion
- Solid & Liquid Waste

The key environmental impacts, environmental and socio-economic consequences of each priority environmental problem were identified, together with the economic sectors that cause them. These were mapped by two groups of 7 to 8 people.

2.4 Causal Chain Analysis

Three mixed groups of five men and women were formed. Each group was assigned one of the top three priority environmental problems to review and develop its causal chain analysis. Each group was tasked to identify the following for their environmental problem:

- The immediate causes
- The underlying resource uses and practices that contribute to each immediate cause
- The underlying social, economic, legal, and political causes of each immediate cause
- Link the resource uses and practices, and social, economic, legal, and political causes
- Determine the root causes

Completed causal chain analysis and tables showing environmental impacts and socio-economic consequences for each of the four priority environmental problems in Kosrae are shown below:

2.4.1 Invasive Species

Table 2: Invasive species environmental impacts, socio-economic consequences and corresponding sectors and locations

Environmental Problem	Environmental Impacts and socio-economic consequences	Sector	Locations
Invasive Species	Loss of endemic food crops, soil erosion and loss of fertility, disrupted ecosystem composition, degraded nearshore breeding grounds and decrease in commercial fish species	Shipping Agriculture Infrastructure and development Community practices	Inshore marine areas Areas of extensive land degradation Whole of Kosrae
	Loss of species, cultural heritage, genetic diversity		
	Reduction of recreational value, loss of income from fisheries and traditional use of forest resources, loss of access to subsistence food sources, increase in imported food consumption		

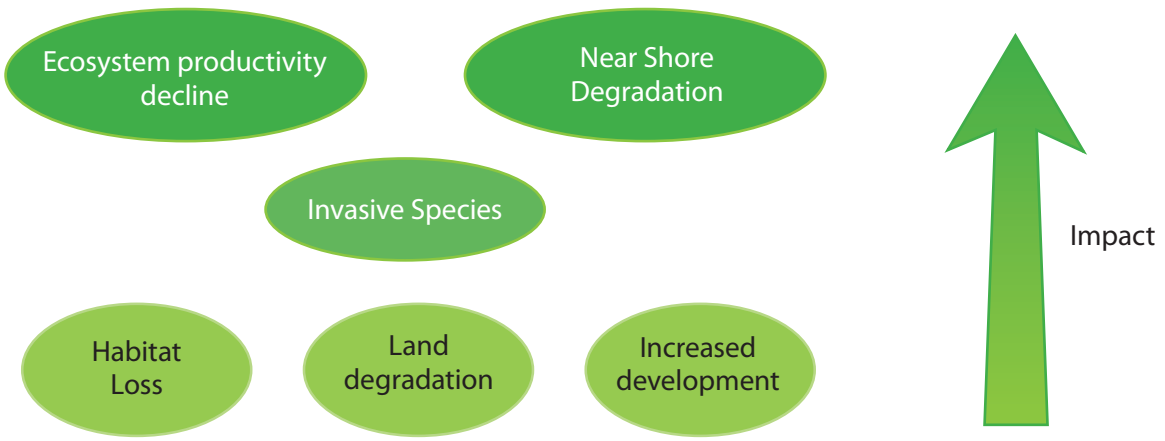
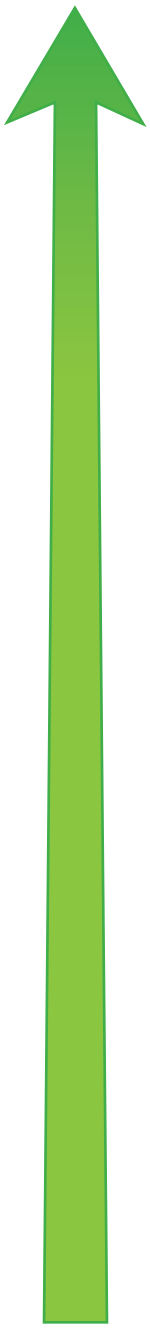


Figure 2: Links between identified environmental problems for invasive species.

Causal Chain Analysis – Invasive Species



Socio-Economic Impact

Loss of food and resources (medicine, building material, income), reduced interest in farming, increase consumption of imported food, increase health hazards

Environmental Impact

Loss of endemic food crops, soil erosion and loss of fertility, disrupted ecosystem composition, degradation of habitats

Environmental Issue

Invasive Species

Primary Causes

- Historical introduction of foreign opportunistic species
- No natural predators for introduced species
- Deforestation and land clearing
- Newly cleared land available for fast growing invasive species to thrive
- Continued introduction of alien species (some as bio-agents)
- Land/road developments

Underlying Causes

- Increase priority on development (road and other public projects)
- Demand for construction materials and land

Root Causes

- Inadequate control management measures or monitoring for spread
- Lifestyle expectations changing faster than the measures to manage change
- Underdeveloped legislation or enforcement of development

2.4.2 Solid & Liquid Waste

Table 3: Solid and liquid waste environmental impacts, socio-economic consequences and corresponding sectors and locations

Environmental Problem	Environmental Impacts and socio-economic consequences	Sector	Locations
Solid & Liquid Waste	Risks to public health through contaminated water, decrease in soil fertility, decreased agricultural products, increase in potential of water borne diseases, reduced amenity	Agriculture – community and commercial Transportation & Infrastructure Industry – private sector Urbanisation – increase in settlements, roads, sanitation	Tofol Landfill Settlement areas Port Sewage Outfall
	Degradation of aquatic ecosystems through increases in nutrient load, increase in potential of algal bloom at coastal sites		
	Decrease in bio-resources (fish stocks), leading to loss of subsistence food source and income, additional cost to government		

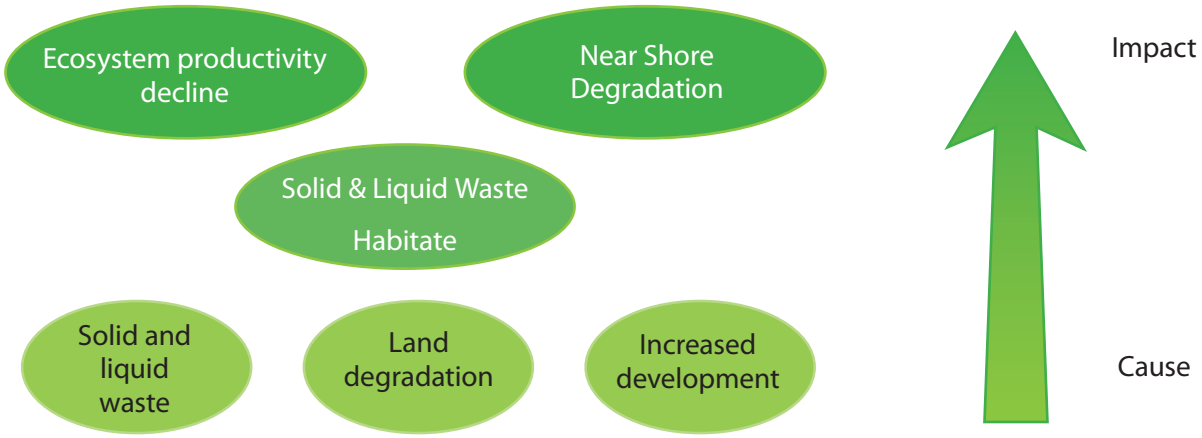
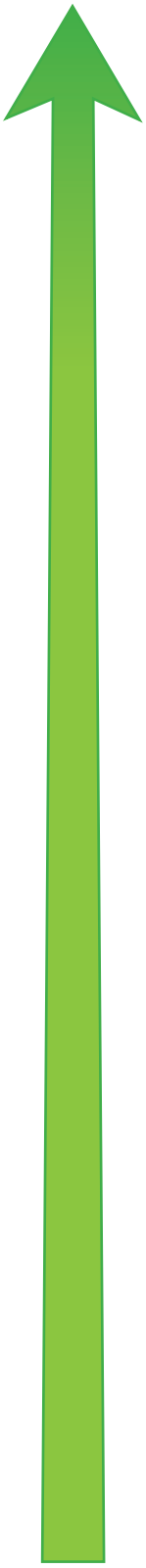


Figure 3: Links between identified environmental problems for solid and liquid waste.

Causal Chain Analysis – Solid & Liquid Waste



Socio-Economic Impact

Reduced access to food, loss of income, additional cost to government, negative impact on tourism and health, reduced amenity

Environmental Impact

Nutrient enrichment, decrease soil fertility potential for eutrophication, habitat loss, sedimentation, reduced ecosystem services, increased water borne disease

Environmental Issue

Solid & Liquid Waste

Primary Causes

- Importation of non-biodegradables
- Improper disposal of waste
- Wastewater leakage
- Excessive use of foam products
- Illegal dumping

Underlying Causes

- Poor wastewater infrastructure
- Demand for imported products for convenience
- Lack of awareness
- Poor waste management capacity
- Convenience/lifestyle change

Root Causes

- No recycling for products other than aluminium, battery, glass, etc
- Existing recycling program is inconsistent
- Waste management is not a priority for many on the island
- No storage capacity to safely store used oil on island or to send used oil offshore for disposal.
- Customs and traditions for community feasts and gatherings (excessive use of non-biodegradable products such as foams and plastics during community feasting or events).

2.4.3 Coastal Erosion

Table 4: Coastal erosion environmental impacts, socio-economic consequences and corresponding sectors and locations

Environmental Problem	Environmental Impacts and socio-economic consequences	Sector	Locations
Coastal Erosion	Loss of infrastructure, loss of access to food and resources, reduced income for women, Salt Water Intrusion and inundation	Urbanisation – increase in settlements, roads, sanitation Community practices – beach mining	Coastal areas all over Kosrae
	Loss of habitat and species diversity		
	Decrease in cultural heritage and available land		

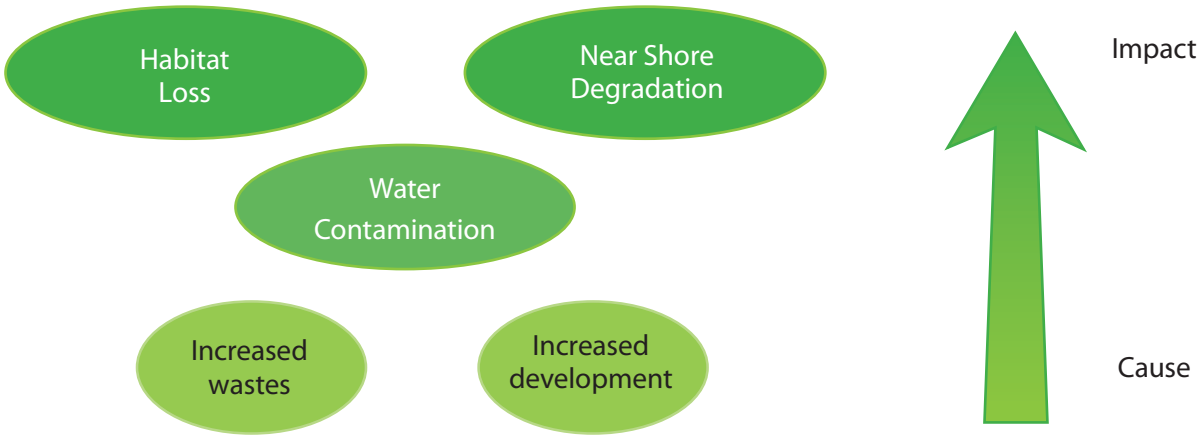
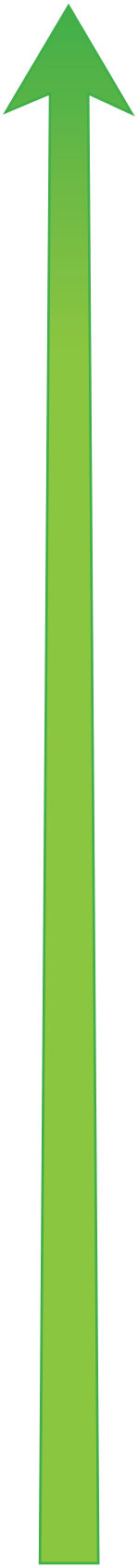


Figure 4: Links between identified environmental problems for water contamination

Causal Chain Analysis - Coastal Erosion



Socio-Economic Impact

Loss of infrastructure, loss of coastal properties such as homes, loss of access to food and resources, reduced income for men & women, loss of cultural heritage;

Environmental Impact

Land degradation, loss of habitat and species diversity, increase risks of coastal flooding & inundation, loss of land

Environmental Issue

Coastal Erosion

Primary Causes

- Change in wave dynamics and sea level
- Need to protect property from inundation
- Unregulated beach mining
- Coastal Development
- Mangrove harvesting
- Cutting down coastal trees

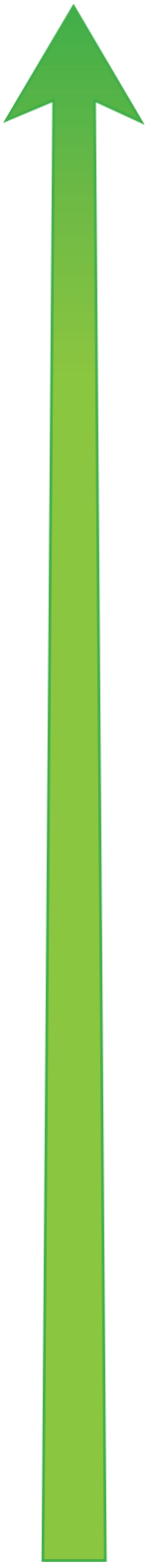
Underlying Causes

- Changes in climate conditions
- Poorly constructed coastal protection (sea walls)
- Mined materials for construction of housing, graves & tombs, public infrastructure, and beautification projects

Root Causes

- Change in lifestyle expectations to improve dwellings
- Mined materials from the beach are the cheapest option for construction and no identified alternatives
- Underdeveloped coordinated response to inundation of coastal areas/properties – coastal processes and risk areas not identified
- Poor coordination or planning for building activities that require mined materials
- Weak regulation and enforcement of illegal beach mining
- Limited alternatives to beach sand and gravels
- Infrastructure development a priority for the state & nation

Causal Chain Analysis – Flooding



Socio-Economic Impact

Increased Health & water- borne diseases; affect traffic flow in Tofol; decrease water quality; effects on school and government operations; decrease productivity; increased demands for imported food; increased costs for government, property damage for private and government

Environmental Impact

Crop damage, poor water quality, degraded habitats, sedimentation, river banks erosion, invasive weed/plants

Environmental Issue

Flooding

Primary Causes

- Direct discharge of waste into rivers
- Drainage system blockage due to sedimentation & trash
- Overgrown vegetation
- Land filling in wetlands
- Littering

Underlying Causes

- Deforestation & land clearing
- Poorly designed drainage systems
- Inadequate response to flooding
- Financial constraints to address direct causes
- Land tenure system

Root Causes

- Weak enforcement
- Financial constraints manage flooding
- Increased rainfall
- Limited capacity to design proper infrastructures
- Poor planning
- Government infrastructure development priority

Table 5: Flooding environmental impacts, socio-economic consequences and corresponding sectors and locations

Environmental Problem	Environmental and Socio economic Consequences	Sectors	Location
Flooding	Crop damage; property damage; soil erosion; sedimentation; infrastructure damage ; mobility constraints; cause diseases; channel blockage	DT&I Agriculture Farmers Private sector	Agro-forest area Road Infrastructure Mangroves Administrative Center Shore line
	Cause traffic problems water/quality; education;/government operation; increase other demands (ex. Imported goods); additional expenses		

3.0 Options for Reforms & Actions

Two groups of women and men were formed at the end of the workshop to review the top environmental problems along with the impacts and causal chain for each problem and to identify where an intervention(s), ideas, opportunities, or solutions would have the most significant, positive influence. Each group came up with potential ideas and solutions and prioritized them as follows:

Environmental Problems	Ideas/Opportunities/Solutions
1. Invasive Species	• Strengthen enforcement & monitoring • Utilize traditional practices for control and management • Improve border control • Develop WASH Down protocols for farm equipment
2. Solid & Liquid Waste	• Increase trash collection coverage throughout Kosrae • Require use of incinerators for energy production • Expand recycling programs to include other wastes • Replicate and fully resource Fukuoka type landfill at the municipal level • Improve awareness programs using images and social media • Mandatory monthly inspection enforcement with fines • Require plastic ban with National Level • Impose tax on importation products • Dry litter Piggery method • Reuse of Waste products
3. Coastal Erosion	• Strengthen EIA Regulations and enforcement for beach mining • Involve communities in rehabilitation efforts • Enhance collaboration with relevant stakeholders • Capacity building development • Develop Zoning regulations • Build shoreline protection around Kosrae

8.0 References

Cianchini, C. J. 2021. Tofol Watershed Catchment Biological Rapid Assessment, Kosrae State, FSM. SPC, 13 pp

Zoa, N. 2021. Tofol Watershed Catchment Geological Assessment from Ridge to Reef, Kosrae State, Federated States of Micronesia. A report prepared for the FSM International Waters Project, SPC, 20 pp.

Annex 1: Programme

8/19/2021	
AM	Identifying and Prioritising Island Problems Determining environmental and socio-economic impacts
PM	Causal Chain Workshop

8/19/2021			
Time	**Session**	**Objective**	**Facilitator**
9.30am	Welcoming, signing in, and introduction of participants		Trenton, Andy, Carlos
9.45– 10:00 am	Objectives of the workshop and anticipated outcomes Current health and state of Kosrae State Catchments Ecosystem Goods & Services	 To present the current state of the environment in the all catchment[1] of Kosrae State	Faith, RPCU Science Team (Virtual), staff and consultants
10:00 – 11:00 am	Identification and Prioritisation of Environmental Problems in the Tofol Catchment	To reach a consensus between the IDA Development Team/stakeholders of the Priority Whole-of –Island Environmental Problems from a cross-sectoral perspective (ridge-to reef in nature)	
11:00-12:00 pm	Determining environmental and socio-economic impacts	To reach a consensus between the IDA Development Team/stakeholders of the key environmental and socio-economic impacts for each priority environmental problem from a cross-sectoral perspective (ridge-to reef in nature).	
12 – 1pm	**Lunch**		
1- 2pm	Developing causal chains	To reach a consensus between the IDA Development Team/IDA stakeholders of the immediate, underlying and root cause for each priority Environmental problem from a cross-sectoral perspective (ridge-to reef in nature)	Trenton & Andy
2-3:30pm	Options for Reforms & Actions	Brainstorm ideas and options for reform and action. Strategize the new ideas and opportunities– prioritizing alternatives	Trenton & Andy
3:30-4:30pm	Report Back & Closing		Trenton & Andy

1 Use Nick's powerpoint presentation as basis for introducing this topic – may have amend it considering allocated time for this session, particular focus extends to all catchments in Kosrae State, and materials available from other studies. The scientific and technical nature of discussion should provide the opportunity for stakeholders to be well informed on current state of ecosystem goods and services in all watershed catchments in Kosrae State.

Annex 2: Participant List

Island Diagnostic Analysis Workshop
Sign-In Sheet
August 19th, 2021 @ KNR

Full Name	Title & Affiliation	Sex (F/M)	Age	Email/ pH Detail	Signature
Tara Y. Tara	Malem RMC Chair	M	53	tarayf1ksa@gmail.com	
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Arthur Talley	MMC Chairman	M	53	fallegarthur68@gmail.com	
Abraham Phillip	MMC (Floor Leader)	M	57	3760-4435	
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Kenye Zackilyn Geng	DFMR (Admin. Assist)	F	24	gezackie07@gmail.com	
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Hans Skilling	KCSO Board	M	37	hansskilling@gmail.com	
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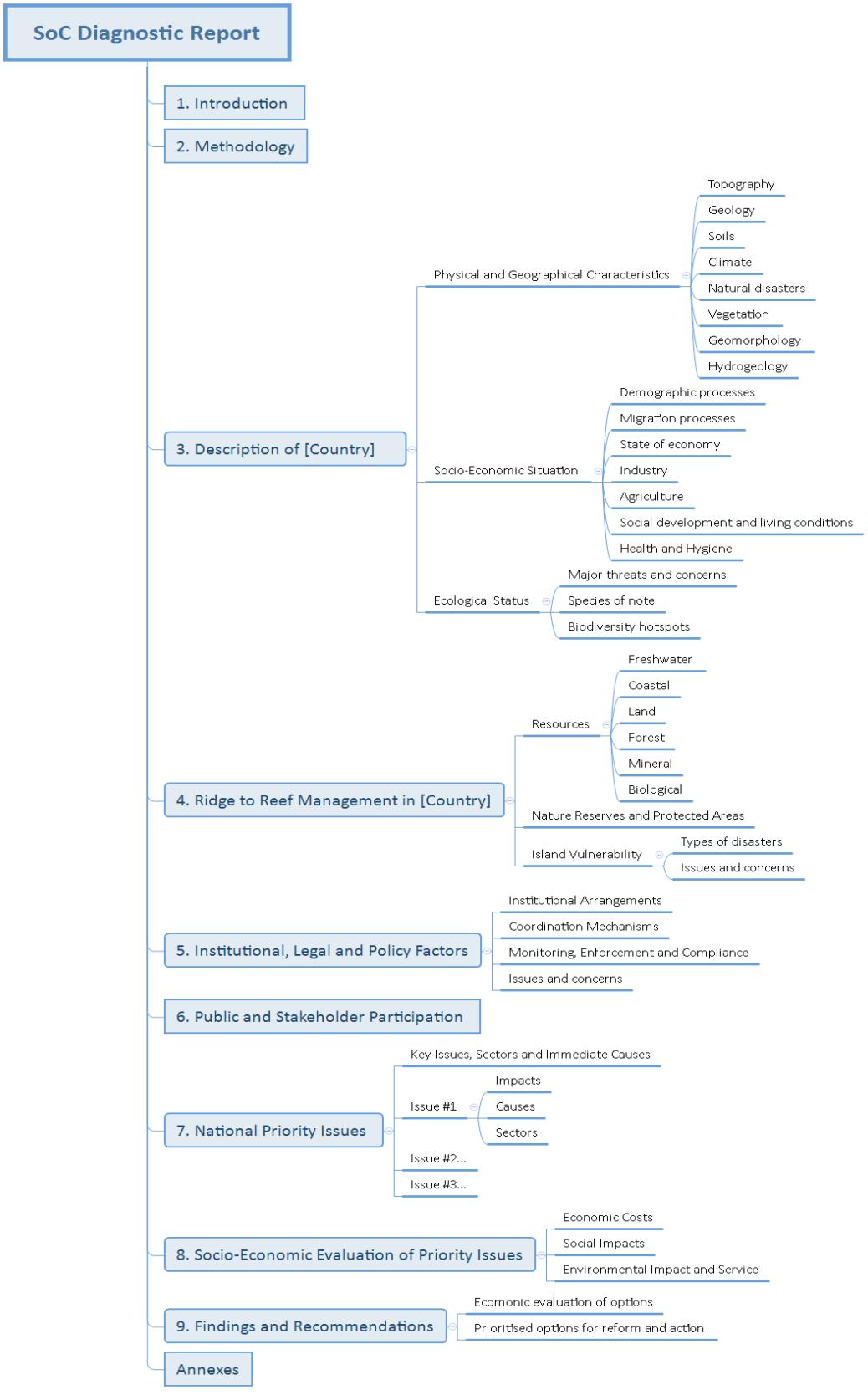
Annex 3: SoC Diagnostic Report Table of Contents



Annex 4: Group exercise on causal chain analysis of Kosrae proirity environmental problems