Report of ICZM Framework Policy for the mangroves and coastal community in Solomon Islands (ed. June 2024)

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Policy Framework for ICZM Mangrove Plan in Solomon Islands

Contents

Abbreviations

ICZM	Integrated Coastal Zone Management
MFR	Ministry of Forestry & Research
MECDM	Ministry of Environment, Climate Change, Disaster Management and Meteorology
MFMR	Ministry of Fisheries and Marine Resources
MAL	Ministry of Agriculture and Livestock
MID	Ministry of Infrastructure and Development
MWYCA	Ministry of Women, Youth, Children Affairs
MHMS	Ministry of Health and Medical Services
MEHRD	Ministry of Education and Human Resources Development
SINU	Solomon Islands National University

I. Introduction

Mangrove in Solomon Islands is a resource that is mainly used by resource owners. In the Solomon Island's context, resource owners are those that own the land under the land tenure system. More than 85% of land is still under customary land tenure (McDonald 2006) which means local people or tribes govern the activities that were carried out on their land including mangroves. Particularly, livelihoods are supported by the tribal ownership of land and all customary landholdings group members have rights to access resources for subsistence or generate income (Wairiu 2006). Granting access by customary land system complicates the capacity building mechanism for resource management in the communities. For example, finding the right tools and developing frameworks that is inclusive at the same time successful.

However, there are currently no registered protected areas of mangrove in Solomon Islands (Albert and Schwarz 2013).

Table 1. Status in Solomon Islands

Land area	28,900 sq km
Total Forest extent (1990)	24,000 sq km
Population (1995)	378,000
GNP (1992)	710 US$ per capita
Mean monthly temperature range	27-31 °C
Mean annual rainfall	3,048 mm
Spring tidal amplitude	0.4 – 0.9 m
Alternative estimate of Mangrove area (Ellison, 1995)	642 sq km#
Area of Mangrove on the map	No data
Number of protected areas with Mangrove	0

Source: Spalding et al. (1997)

Table 2. Existing regulations related to Mangrove in Solomon Islands

Related legislation and guidelines	**Related policies and documents**
• Solomon Islands Constitution-The Independence Order (1978) • Environment Act (1998) - Environment Regulation (2008) • Protected Areas Act (2010) - Protected Area Regulation (2012) - Environment (amendment) Regulation (2014)	• East Rennell, World Heritage properties (1998)[1] • Logging and mining prohibited in protected areas[2] • National Development Strategy 2016-2035 - National vision: "Improving the Social and Economic Livelihoods of all Solomon Islanders"

[1] https://whc.unesco.org/en/list/854/

[2] https://www.reddplussolomonislands.gov.sb/index.php/resources/related-legislation/protected-areas-act-2010.html

• Wildlife Protection and Management Act (1998) - Wildlife Protection and Management Regulations (2008) • Wild Life Protection and Management (Amendment) Act (2017) - Wild Life Protection and Management (Amendment) Regulations (2019) • Fisheries Act (1998) • Forest Resources and Timber Utilization Act (2000) • Fisheries Management Act (2015) • Mines and Mineral Act (1997) • Rivers Waters Act (1996) • Environmental Health Act (1980) • Consumer Protection Act (1995) • Biosecurity Act (2013) • Provincial Government Act (1997) • Town and Country Planning Act (1979) • Honiara City Act (1999) • Customary Land Records Act (1994) • Charitable Trusts Act (1964) • National Disaster Council Act (1989) • The Meteorology Act (1985)	• Solomon Islands Community Based Coastal and Marine Resource Management Strategy 2021 – 2025 • Solomon Islands National Ocean Policy (2018) • Solomon Islands National Information Strategy to Empower All Communities to Better Manage their Marine Resources (2015) • National Biodiversity Strategic Action Plan 2016 – 2020 • National Climate Change Policy 2023 – 2033 (VALIDATION) • National Waste Management & Pollution Strategy 2017-2026 • Solomon Islands Coral Triangle Initiative National Plan of Action • National Environment Management Strategy 2020 -2023 • National Disaster Management plan 2018

II. Overview of current status

Mangrove (forest) area

Mangroves in Solomon Islands are occurring in sheltered coastal bays and along river mouths (FAO 2005).

- **Type 1**: Low, stunted, 2.5 m tall forest dominated by *Rhizophora apiculata*
- **Type 2:** Heights up to 25 m and it is composed of *Bruguiera parviflora, B. sexangula, Rhizophora apiculata and R. stylosa*

Table 3. Mangrove Forest Definition from Forest Types in Solomon Islands

Land Use Subtype	Global Ecological Zone	Forest Type	Disturbance	Short Description
Natural Forest	Tropical Rain Forest	**Mangrove forest (Saline Swamp Forest)**	Intact	Forest on land subjected to tidal influences such as estuaries and foreshores with no clearly visible indications of human activities and ecological disturbance.
			Degraded	Forest on land subjected to tidal influences such as estuaries and foreshores with visible indications of human disturbance.

Source: Solomon Islands Government (2019)

According to Pallai and Sirikolo (2001), the term "Mangrove" is now applied to trees that are restricted to the intertidal zone. These plants are strictly littoral, occurring on protected and sheltered shores where environmental conditions are conducive to their growth. The term "mangal" is employed to denote the community. The most luxuriant mangrove flora in the Solomon Islands is found in association with estuaries on sheltered shores of the larger islands. Mangrove stands also flourish along riverbanks where salt water penetrates. Mangals may completely fringe some of the smaller sheltered islands or they may extend discontinuously along the coastline. Mangroves colonising less favorable habitats are characterized by a lack of species diversity and stunted plant growth.

Table 4. Mangrove Area Status in Solomon Islands

Land area	27,556 sq km
Population	+700,000 people
Mangrove area	50,000 ha
Total Mangroves Plant Species	40 species

Source: Personal communication with Mr. Myknee Sirikolo, National Herbarium under the Ministry of Forestry and Research, 27 February 2024

Table 5. Mangrove species list in Solomon Islands

Spalding et al. (1997)	**Pallai and Sirikolo (2001)**
	Acanthus ebracteatus
	Acanthus ilicifolius
Aegiceras corniculatum	*Aegiceras corniculatum*
Avicennia alba	*Avicennia alba*
	Avicennia eucalyptifolia
Avicennia marina	*Avicennia marina*
	Avicennia officinalis
Bruguiera gymnorrhiza	*Bruguiera gymnorrhiza*
Bruguiera parviflora	*Bruguiera parviflora*
Bruguiera sexangula	*Bruguiera sexangula*
Ceriops tagal	*Ceriops tagal*
	Cynometra ramiflora
Excoecaria agallocha	*Excoecaria agallocha*
Heritiera littoralis	*Heritiera littoralis*
Lumnitzera littorea	*Lumnitzera littorea*
Nypa fruticans	*Nypa fruticans*
Osbornia octodonta	*Osbornia octodonta*
Rhizophora apiculata	*Rhizophora apiculata*
Rhizophora mucronata	*Rhizophora mucronata*
Rhizophora stylosa	*Rhizophora stylosa*
Rhizophora x lamarckii	
Scyphiphora hydrophyllacea	*Scyphiphora hydrophyllacea*
Sonneratia alba	*Sonneratia alba*
Sonneratia caseolaris	*Sonneratia caseolaris*
	Sonneratia ovata
Sonneratia x gulngai	
Xylocarpus granatum	*Xylocarpus granatum*
Xylocarpus mekongensis	*Xylocarpus mekongensis*

Table 6. Updated Mangrove species list in Solomon Islands (36 species)

Scientific Name	**Common Name**	**Family**	**Plant Type**
Arcostichum speciosum	Mangrove Fern	Pteridaceae	Fern

Avicennia alba	Stilted Grey Mangrove	Avicenniaceae	Tree
Avicennia eucalyptifolia	Stilted Grey Mangrove	Avicenniaceae	Tree
Avicennia marina	Stilted Grey and White Mangrove	Avicenniaceae	Tree
Avicennia officinalis	Stilted Grey Mangrove	Avicenniaceae	Tree
Bruguiera gymnorhiza	Large- Leafed Orange Mangrove, Bruguiera	Rhizophoraceae	Tree
Bruguiera hainsii	Bruguiera, Orange Mangrove	Rhizophoraceae	Tree
Bruguiera parviflora	Bruguiera, Small-Leafed Orange Mangrove	Rhizophoraceae	Tree
Bruguiera sexangula	Bruguiera, Upriver Orange Mangrove	Rhizophoraceae	Tree
Ceriops tagal	Ceriops, Rib- Fruited Yellow Mangrove	Rhizophoraceae	Tree
Aegiceras corniculatum	River Mangrove	Myrsinaceae	Shrub/Tree
Nypa fruticans	Nypa Palm, Mangrove Palm	Arecaceae	Palm
Rhizophora apiculata	Rhizophora, Corky Stilt Mangrove	Rhizophoraceae	Tree
Rhizphora X lamarckii	Hybrid Stilt Mangrove	Rhizophoraceae	Tree
Rhizophora mucronata	Upriver Stilt Mangrove	Rhizophoraceae	Tree
Rhizophora stylosa	Long-Style Stilt Mangrove	Rhizophoraceae	Tree
Dolichandrone spathacea	Dolichandrone, Trumpet Mangrove	Bignoniaceae	Tree
Sonneratia alba	Sonneratia, White-Flowered Apple Mangrove	Sonneratiaceae	Tree
Sonneratia caseolaris	Sonneratia, Red-Flowered Apple Mangrove	Sonneratiaceae	Tree
Sonneratia ovata	Sonneratia, Apple Mangrove	Sonneratiaceae	Tree
Sonneratia x gulngai	Sonneratia, Gulngai-Hybrid Apple Mangrove	Sonneratiaceae	Tree
Xylocarpus granatum	Xylocarpus, Cannonball Mangrove	Meliaceae	Tree
Xylocarpus moluccensis	Xylocarpus, Cedar Mangrove	Meliaceae	Tree
Barringtonia racemosa	Barringtonia, Brackishwater Mangrove	Lecythidaceae	Tree
Lumnitzera littorea	Lumnitzera, Red- Flowered Black Mangrove	Combretaceae	Tree
Heritiera littoralis	Heritiera, Keeled-Pod Mangrove	Sterculiaceae	Tree
Ceriops decandra	Ceriops, Clumped Yellow Mangrove	Rhizophoraceae	Tree
Cynometra ramiflora	Wrinkle-Pod Mangrove	Caesalpiniaceae	Tree
Pemphis acidula	Pemphis, Reef Barrier Mangrove	Lythraceae	Shrub/Tree
Excoecaria agallocha	Milky Mangrove, Excoecaria	Euphorbiaceae	Tree
Scyphiphora hydrophyllacea	Yamstick Mangrove	Rubiaceae	Shrub
Osbornia octodonta	Myrtle Mangrove	Myrtaceae	Shrub/Tree
Acanthus ebracteatus	Acanthus, Bractless Holly Mangrove	Acanthaceae	Shrub/Herb
Acanthus ilicifolius	Acanthus, Spiny Holly Mangrove	Acanthaceae	Shrub/Herb
Clerodendrum inerme	Clerodendron	Verbenaceae	Shrub/Tree
Bruguiera cylindrica	Bruguiera, Reflexed Orange Mangrove	Rhizophoraceae	Tree

Source: Personal communication with Mr. Myknee Sirikolo, National Herbarium under the Ministry of Forestry and Research, 27 February 2024 (will publish in 2025)

Malaita seems to have rich mangrove cover – significant stands area at Lau Lagoon (North Malaita), LangaLanga Lagoon (West Malaita), Are Are Lagoon (Southwest Malaita), Northern Maramasike Passage (between small Malaita and Malaita), which contain the largest contiguous area of Mangroves. Pallai and Sirikolo (2001) surveyed 6 sites LangaLanga Lagoon; south of Auki, viz Raulu Creek (main land), Kwaro Islands, Surabuta (mainland), Tabuilo Island, Loa Creek (main land), and Rade River (main land). Mangroves of the lagoon area are being felled by nearby villagers for traditional use and by commercial suppliers of firewood in Auki; Mangroves are being logged in the area. *Bruguiera*

*gymnorrhiz*a and *Rhizophora apiculate* are dominated species in Malaita (Pallai and Sirikolo 2001).

Indicators for decreasing Mangroves area

Villagers said that they knew that the mangroves were under threat, stating the firewood overharvesting as the main reason (Warren-Rhodes et al. 2011). Global climate change and sea level rise are serious long-term threats the mangrove forests are facing today. Many islands of the Pacific region, such as Tuvalu, are just a few meters above the sea level. The level of sea water is very crucial to the functioning of mangrove ecology, and sea level rise will affect every aspect of the ecosystem (Bhattarai and Giri 2011). Changes in air, and sea-surface temperature, stresses from storms, variations in precipitation as well as anthropogenic disturbances, will adversely affect the mangrove ecosystem in coming decades (Bhattarai and Giri 2011). The islands of the Pacific region lie in one of most seismically active regions of the world. Mangrove forests in these islands are not only affected by seasonal hurricanes and cyclones, but also by seismic disasters such as tsunamis (Bhattarai and Giri 2011).

Tourism[3]

The COVID-19 pandemic significantly impacted the tourism industry in the Solomon Islands, despite the country having no community transmission cases. International border closures led to a halt in tourism arrivals, forcing many operations to close. Economic assistance, including funding from the New Zealand Government and the Solomon Islands Government, helped key tourism businesses maintain operations and retain staff. In March 2021, a domestic tourism initiative called 'Iumi Tugeda Holidays' was launched, supported by the private sector and aimed at promoting travel within the Solomon Islands. Post-pandemic tourism projections are being monitored in alignment with the Pacific region's recovery trends. Relevant resources for updates include the South Pacific Tourism Organization, Pacific Asia Travel Association, and the United Nations World Tourism Organization's Tourism Recovery Tracker (International Finance Corportation 2021).

Fishing[4]

The Solomon Islands, comprising a population of 599,419, presents a distinctive fisheries landscape characterized by the significant roles of subsistence and offshore industrial fishing. Subsistence fishing holds crucial importance for nutrition, especially in remote rural areas where 90% of the population resides. In 2016, the total fisheries production was 66,400 tons, with tuna and tuna-like fishes constituting over 85% of the catch. Moreover, aquaculture, though currently limited, showcases successful initiatives such as seaweed farming, particularly Kappaphycus alvarezii, which yields approximately 11,000 tons annually.

The National Fisheries Policy of the Solomon Islands spans a decade from 2019 to 2029 and adopts a comprehensive, cross-sectoral approach. Key strategic objectives involve ensuring good nutrition and socio-economic benefits through the development of inshore and inland fisheries, strengthening the management of offshore fisheries resources, and supporting rural livelihoods through sustainable aquaculture. The policy places emphasis on developing inland and coastal aquaculture to enhance food security, promoting small-scale fisheries, implementing measures against commercial exploitation, and enforcing fisheries laws to combat illegal activities. It also underscores sustainable use and

[3] https://www.ifc.org/en/insights-reports/2021/solomon-islands-tourism-industry-guides-for-investors-and-government
[4] https://www.fao.org/fishery/fr/facp/slb; https://www.fao.org/faolex/results/details/en/c/LEX-FAOC188935/; https://www.fao.org/fishery/en/countrysector/naso_solomon

conservation efforts, protection of endangered species, and the promotion of value-added fisheries products for export.

Initiated in the late 1960s, aquaculture in the Solomon Islands gained momentum in the early 1980s with private prawn farms. Seaweed farming, initially trialed in the late 1980s, faced challenges due to herbivorous fish grazing but expanded with European Union funding. By 2003, over 20 tonnes of dried seaweed, ready for export, were produced. The Aquaculture Section, established in 2001, focuses on generating alternative income sources for coastal communities. The section, consisting of five staff, primarily employs the Indonesian style for seaweed farming, with Eucheuma sp. being the red seaweed species cultivated since 1988.

Despite being a non-traditional activity, aquaculture in the Solomon Islands is recognized for its income-generating potential. Challenges, including a lack of expertise, land and reef disputes, and historical foreign investment issues during ethnic tensions, are being addressed. The government encourages aquaculture farming, and the Aquaculture Section, in collaboration with the World Fish Centre, conducts ongoing research on inshore resources. The evolving National Fisheries Development Plan outlines measures to facilitate local participation in aquaculture and attract foreign investment, indicating a commitment to harnessing the full potential of this sector for economic development.

Table 7. Fisheries production in Solomon Islands waters, 2014

	Aquaculture	**Freshwater**	**Coastal Commercial**	**Coastal Subsistence**	**Offshore locally based both Solomon Islands**	**Offshore foreign-based and foreign flagged vessels**
Volume (tons)	1530 tons & 20,000 pieces	2300	6468	20,000	41,523	36,573
Value (USD)	773,263	3,800,786	12,848,296	33,027,523	57,520,263	79,228,378

Source: Gillett (2016), FAO (2004)

Table 8. Volume and value of the tuna catch by the Solomon Islands domestic fleet

	2010	**2011**	**2012**	**2013**	**2014**
Total volume in national waters	195,995	173,482	95,523	127,993	107,999
National fleet volume in national waters	26,907	28,192	28,635	26,418	71,425
Foreign fleet volume in national waters	169,087.79	145,289	66,888	101,574	36,573
Total value in national waters (USD)	388,656,357	377,391,745	291,167,750	309,980,334	322,210,525

National fleet value in national waters (USD)	80,265,435	57,113,221	63,407,189	56,785,179	229,000,668
Foreign fleet value in national waters (USD)	308,390,921	320,278,524	227,760,561	253,195,155	93,209,856
Foreign fleet value in national waters adjusted for bycatch sales and transshipment costs (USD)	262,132,283	272,236,745	193,596,477	215,215,882	79,228,378

Source: Gillett (2016), FAO (2024)

Table 9. Composition of the 2015 tuna catch in Solomon Islands waters (all gear)

	Albacore	**Bigeye**	**Skipjack**	**Yellowfin**	**Total**
Catch (tons)	12,335	5622	79,644	38,764	136,365
Percentage of catch	9.0%	4.1%	58.4%	28.4%	100.0%

Source: FFA (2015), FAO (2024)

Aquaculture[5]

Coastal Aquaculture:

The focus of the Coastal Aquaculture section is on seaweed farming, introduced in 1988 and later commercialized through the EU Commercialization of Seaweed Production in Solomon Islands (CoSPSI) project (2002-2008). With ongoing support from initiatives like the Mekem Strong Solomon Islands Fisheries (MSSIF) program, seaweed farming reached its peak production of 1500 tons in 2014. Currently, Wagina in Choiseul Province stands out as the largest seaweed producer. The Ministry continues to promote and expand seaweed farming, contributing to livelihoods and economic development.

Research is underway on beche-de-mer (sea cucumber), led by Dr. Komatsu Toru of the Overseas Fisheries Cooperation Foundation (OFCF), focusing on larval feed requirements and seed production.

Inland Aquaculture:

The Inland Aquaculture section is dedicated to developing inland aquatic resources, particularly Mozambique tilapia. Recognizing the challenges of slow growth and low productivity, the Ministry is considering introducing the Genetically Improved Farmed Tilapia (GIFT) or Nile tilapia (Oreochromis niloticus), known for fast growth and high productivity. The government's decision in 2017 to

[5] https://www.fao.org/fishery/fr/facp/slb; https://www.fisheries.gov.sb/divisions/aquaculture; https://digitalarchive.worldfishcenter.org/bitstream/handle/20.500.12348/1141/WF_2799.pdf?sequence=1

introduce Nile tilapia reflects a commitment to enhancing food security and employment through sustainable aquaculture.

Preparatory works for the importation of GIFT tilapia, supported by the New Zealand Government through MSSIF and other partners, include infrastructure development, capacity building, partnerships, and policy strengthening.

Key Findings

The ACIAR project FIS/2009/061 has unveiled crucial findings pertaining to aquaculture and food security in the Solomon Islands. It highlights several key points. Aquaculture, with a specific emphasis on tilapia cultivation, is identified as a pivotal component for ensuring food security. However, concerns arise as the current species and farming systems may fall short in meeting the future demand for sustenance. To address this challenge, the project recommends exploring alternatives, such as incorporating native species like milkfish or introducing new species like Nile tilapia. This strategic shift is proposed to enhance the resilience and sustainability of aquaculture practices.

The research emphasizes the necessity for comprehensive studies on both milkfish and tilapia farming options. This includes conducting a risk analysis for the potential importation of improved strains of Nile tilapia, ensuring that the introduction of new species aligns with environmental and economic considerations. A key aspect of the project's findings is the potential for building viable businesses, ranging from household to commercial enterprises, by investing in more productive fish species and emphasizing low-cost production systems.

However, achieving the annual production target outlined in the research requires substantial investment in infrastructure and operational funds. Inland aquaculture, specifically, demands further investment in research, institutional capacity, and partnerships to realize its full potential. The Solomon Islands, acknowledging its vulnerability to climate change, aims to address future food security challenges. This involves understanding aquaculture demand and developing a strategic plan for sustainable inland aquaculture, aligning with broader efforts to mitigate climate-related risks and ensure long-term food security.

Agriculture[6]

The Solomon Islands, comprising around 1,000 islands in the south-west Pacific, grapples with significant challenges, ranking second in the UN's World Risk Index due to its exposure to natural disasters in the Pacific Rim of Fire. The majority of its 650,000 inhabitants reside in rural, vulnerable coastal areas, facing limited access to essential services. Despite abundant natural resources, the small rural economy, heavily reliant on agriculture, struggles to uplift the majority financially.

Agricultural Sector Development

The government's 10-year agriculture sector development plan aims for a sustainable, resilient, and profitable sector, aligning with the Hand-in-Hand Initiative. Priorities include governance management, food security enhancement, livestock production boost, and crop production strengthening. Poultry investments in three provinces target reducing import dependence, with a total investment of

[6] https://www.ifad.org/en/web/operations/w/country/solomon-islands;https://pafpnet.spc.int/policy-bank/countries/solomon-islands; https://www.fao.org/hand-in-hand/investment-forum-2022/solomon-islands/en; https://www.fao.org/faolex/results/details/en/c/LEX-FAOC214072/

US$15.2 million. Broiler farms, layer farms, and hatchery support are key components, benefiting hundreds of farmers directly and thousands indirectly. The coconut value chain is also a focus, with a US$25.3 million investment plan for plantation rehabilitation, virgin oil extraction, copra drying, and various interventions benefiting thousands of farmers.

World Bank Project Approval[7]

The World Bank has approved a US$15 million project to enhance agricultural production and market access in Guadalcanal, Makira, and Malaita provinces. Led by the Ministry of Agriculture and Livestock, the project targets 85,000 individuals, offering training, support services, and infrastructure for smallholder farmers. Emphasizing climate-smart agriculture and aligning with post-COVID-19 recovery, the project includes livestock and agriculture infrastructure improvements, knowledge enhancement, and measures for crisis response, contributing to overall resilience and development.

These initiatives represent a comprehensive approach to addressing the Solomon Islands' economic and social challenges, aiming to strengthen rural communities, promote sustainable agriculture, and enhance resilience in the face of natural disasters and external shocks.

Table 10. Amount of Produce Exported, Revenue Generated, and biggest Importer in 2021

Produce	Revenue Generated (USD)	Biggest Importer
Rough Wood	$321M	China ($281M)
Palm Oil	$29.2M	Netherlands ($16.9M)
Sawn Wood	$12.8M	New Zealand ($6.47M)
Coconut Oil	$12.4M	Switzerland ($7.5M)
TOTAL	$375.4M	$311.87M

Source: https://oec.world/en/profile/country/slb

Coastal Development[8]

The Solomon Islands Community Based Coastal and Marine Resource Management Strategy, spanning from 2021 to 2025, focuses on achieving healthy marine and coastal resources, contributing to socio-economic needs and food security. The policy targets 25% improvement in community-based resource management (CBRM) across coastal areas by 2025. It emphasizes scaling up CBRM through awareness campaigns, training, and community engagement. The strategy integrates sustainable livelihoods, climate change adaptation, and monitoring systems to ensure effective coastal management.

In Tulagi, the Global Environment Facility supports a sea wall construction project addressing climate-induced coastal vulnerability. Beyond physical infrastructure, the project includes community-based activities and adaptive capacity building, serving as a model for climate mitigation and proactive disaster management in the Solomon Islands.

The Coastal Environment Impact Assessment for Honiara delves into potential consequences of

[7] https://www.worldbank.org/en/news/press-release/2022/03/17/boost-for-agricultural-production-and-cash-crops-in-solomon-islands

[8] https://www.fao.org/faolex/results/details/fr/c/LEX-FAOC217721/; https://www.ctc-n.org/technical-assistance/projects/establishment-integrated-coastal-zone-management-iczm-plan-protect-0; https://www.undp.org/pacific/stories/strengthening-coastal-resilience-tulagi; https://www.pacific-r2r.org/sites/default/files/2021-09/Honiara%20Coastal%20Environment%20Impact%20Assessment%20Solomon%20islands.pdf

coastal development. It identifies environmental implications and advocates for a database to monitor and mitigate impacts. The document recommends an integrated coastal management plan, emphasizing the importance of accurate information through remote sensing and GIS. Overall, it provides crucial insights and guidelines for sustainable coastal management, highlighting the necessity of proactive measures to address environmental impacts.

Industry and Commerce[9]

Solomon Islands prioritizes the conservation, management, and development of its tuna industry, considering it a crucial regional resource. The country boasts the second-largest Exclusive Economic Zone in the Pacific region, and fisheries, particularly tuna fishing, play a vital role in the national economy. Tuna fishing, including purse-seine, long-line, and pole-and-line sectors, dominates offshore fisheries. The annual catch of the four main tuna species in the Pacific is approximately 2.5 million tones, with 6% sourced from Solomon Islands waters. The estimated value of the country's tuna catch is about SBD 2400 million per year. The sector contributes significantly to employment, with over 5000 people in the formal sector.

Additionally, the oil palm industry, operated by Guadalcanal Plains Palm Oil Ltd. (GPPOL), is a major contributor to Solomon Islands' export revenue. GPPOL, operational since 2005, covers 7000 hectares of land, producing around 16,000 tons of oil palm kernels and exporting 40,000 tons of oil annually. With approximately 1300-1500 employees, the industry emphasizes the involvement of local landowning groups, accounting for 20% participation, and collaborates with Small-Medium Enterprises for economic growth.

In 2011, manufacturing contributed 5.92% to the Solomon Islands' GDP, with key industries including fisheries, forestry, and mining, focusing on food, beverages, tobacco, and wood products. Tuna and timber production significantly impact the economy, and challenges for the manufacturing sector include geographic dispersion, irregular electricity supply, and a shortage of skilled labor. Imports of fuels and chemicals mainly come from Singapore and Australia. Exports, including timber, fish, copra, palm oil, and cocoa, are directed primarily to China, contributing an estimated US$226.5 million to the country's economy in 2010.

Infrastructure[10]

Infrastructure development is a key focus for the prosperity of the Solomon Islands. The main shipping Port in the capital city and ongoing road improvements, especially the Kukum Highway, highlight the commitment to enhancing transportation. The international airport is accessible by a tar-sealed road, connecting to provincial government headquarters, domestic airports, and wharves. The Ministry of Infrastructure & Development is actively involved in infrastructure improvement projects across the country.

Power availability is notable in Honiara, and major projects, such as Guadalcanal Plains Palm Oil, generate their own power. The country's major provinces also have access to electrical power through

[9] https://www.commonwealthofnations.org/sectors-solomon_islands/business/industry_and_manufacturing/#; https://solomonislandsembassy.com/main-economic-drivers/

[10] https://www.commerce.gov.sb/departments-units/foreign-investment/functions-of-the-division/investment-promotion/why-invest-in-the-solomon-islands/infrastructure-for-your-business.html

Solomon Power. Swire Shipping provides international shipping services, connecting the Solomon Islands to East South East Asia, New Zealand, Australia, and Europe, while domestic shipping services further link Honiara to other provinces.

Water supply systems in urban centers are being upgraded by Solomon Water, a State-Owned Enterprise, to meet the needs of commercial activities. Road networks, spanning nearly 2000 km across 30 islands, are improving, with the Ministry of Infrastructure leading the efforts. Aviation services have seen improvements, with multiple airlines offering comfortable flights, and Solomon Airlines serving both international and domestic routes.

Honiara and Noro Ports are the primary international sea ports, managed by the Solomon Islands Ports Authority. The introduction of a new international port at Point Cruz in 2016 reflects ongoing efforts to enhance sea port infrastructure. Telecommunication services have seen advancements, with operators like Solomon Telekom and Bmobile covering a wide range, including provincial headquarters, villages, and undersea cable projects underway to improve internet services. Overall, the Solomon Islands are making significant strides in infrastructure development to support various sectors and economic activities.

Table 11. Status of trade in Solomon Islands

Imports of goods and services (current US$)	$765,157,558 (2022)
Exports of goods and services (current US$)	$411,423,271 (2022)
Total Merchandise Trade (% of GDP)	61.227% (2022)
FDI, net inflows (BoP, current US$)	$40,718,833 (2022)
Commercial Service Exports (current US$)	$60,896,929 (2022)

Source: https://globaledge.msu.edu/countries/solomon-islands/economy

Table 12. Economic Indicators in Solomon Islands

Inflation, consumer prices (annual %)	5.518% (2022)
External debt stocks, total (DOD, current US$)	$483,164,953 (2021)
Total tax rate (% of commercial profits)	32% (2019)
Real Interest Rate (5 year average %)	3.975% (2021)
Manufacturing, value added (% of GDP)	9.681% (2020)
Current Account Balance (BoP, current US$)	($218,533,833) (2022)

Source: https://globaledge.msu.edu/countries/solomon-islands/economy

Table 13. Gross Domestic Product (GDP) in Solomon Islands

GDP, PPP (current international)	$1,922,286,531 (2022)
GDP Growth Rate (annual %)	-4.062% (2022)
GDP Per Capita, PPP (current international)	$2,654 (2022)

Source: https://globaledge.msu.edu/countries/solomon-islands/economy

Oil and Petrolium[11]

In the Solomon Islands, the energy sector is centrally managed by the state-owned Solomon Islands Electricity Authority, holding a monopoly over the entire electricity market, overseeing power generation to distribution. The Ministry of Mines, Energy and Rural Electrification serves as the government entity responsible for supervising the country's electricity industry.

Unlike some nations, the Solomon Islands lacks indigenous sources of natural gas or oil, and it does not possess oil-refining facilities. As a result, all oil and gas requirements for the country are imported. The primary player in the downstream oil industry is the privately owned South Pacific Oil.

The Petroleum Division operates as the key agency overseeing onshore and offshore petroleum (oil, gas, and coal) exploration and development activities in the country. Functioning under the regulatory framework of the Petroleum Act, this government agency ensures sustainable discovery and extraction of petroleum, adhering to relevant laws concerning labor, public safety, and the environment.

Moreover, the Petroleum Division plays a pivotal role in asserting the Solomon Islands' claims to offshore maritime boundaries and Extended Continental Shelf Regions, including the North Fiji Basin, Charlotte Banks, Rennell Ridge, and the Ontong Java Plateau. These assertions align with the guidelines outlined in the United Nations Convention on the Law of the Sea. The division collaborates with other government ministries, agencies, and regional bodies to effectively fulfill this role.

[11] https://www.commonwealthgovernance.org/countries/pacific/solomon_islands/utilities/#:~:text=Utilities%20of%20Solomon%20Islands&text=The%20Solomon%20Islands%20has%20no,and%20lacks%20oil%2Drefining%20facilities;
https://www.mmere.gov.sb/index.php/alias-about-us/technical-divisions/petroleum.html
https://www.clipperoil.com/port_locations/fuel-in-solomon-islands/

III. Current and potential issues in Solomon Islands

Through 5-days workshop consultation process with various stakeholder groups - communities, non-government organizations, academics, and government agencies - the following issues were identified in the Solomon Islands. Potential implementers by sector for the Integrated Coastal Zone Management (ICZM) Mangrove Plan in the Solomon Islands are in the Annex I. The multi-stakeholders indicated that the ICZM Policy have to address these issues.

Table 14. Issues Identified with Stakeholders in the Mangroves Area, Solomon Islands

Sector		**Issues**
Land use change	Forestry	• Deforestation and degradation of mangrove areas • Illegal logging
	Mining	• Forest / vegetation cover removal • Soil contamination • Destruction and removal of cultural sites
	Energy	• Needs for greener/clean energy (renewable energy)
	Environment/Settlement issue	• Lack of Human resources/infrastructure/water management
Coastal development	Seawall, Reclamation	• Needs GIS based assessment
Agriculture		• Invasive species • Poor incentives • Unpredictable weather pattern affects food security • Pests/disease infestation, agriculture opportunity areas occupied, lack of research facilities, low budget allocation
Infrastructure	Harbor, port	• GIS based
Fishing/Fisheries		• Overfishing of marine resources • Ineffective regulation on the overharvesting sizes • Illegal fishing • Coastal Development, Population Pressure on resource, destructive fishing/harvest methods and gears
Gender		• Men always take lead in decision making
Others	Aquaculture	• Lack of management • Limited knowledge and skills • Not many people have the capacity/knowledge about aquaculture • Not priorities by the government

		• Low support mechanism for community project demand, economic viability, people's preference on seafood, low market opportunities
	Policy regulation	• Ineffective regulation
	Health	• Needs to improve sanitation in rural community
	Education	• Unsustainable development

The over-arching issues identified that sectors include:

Environment - Climate change including coastal erosion, increased coastal flooding; Ecosystems including mangrove forest, coral reef, etc.; Biodiversity including species diversity, abundance; Nature of the coast including open coast, estuarine coast, bank stability; Water Resources including salinity, water pollution, sediment load, etc.

Human – Governance; Population including density; Industries including agriculture, aquaculture; Infrastructure including harbour, Port.

Likelihood of risk – Fishing; Coastal Development; Agriculture; Transportation.

The major impacts and risks by each sector identified are Land use change, Coastal Development, Agriculture, and Transportation. However, regarding the economic, fishing-related issues are relatively higher than environment and social sectors.

Table 15. Challenges and future directions for mangrove ecosystems in Solomon Islands based on 5-days workshop with stakeholders

Ecosystem services/benefits	**Local uses of mangrove**	**Issues/challenges**	**Way Forward**
Cultural services Aesthetic services Nursery ground for fish	Ideal spot for open defecation Coastal barrier Medicinal use Source of income Food source (mud crab, shellfish and fish) Building materials Mangrove shells for cultural ornaments	Deforestation for building materials Development (expansion of villages, reclamation and for log points) Sea level rise, cyclones and storm surges Destruction of mangroves due to increase of population and population use Waste disposal	There should be mangrove management which integrate income generation and also conservation activity implemented. There needs to be alternative livelihoods in place for communities in order for them to conserve mangrove

		Mangroves used for fire-wood Lack of complete under-standing of mangroves on their importance and the implications of overhar-vesting Aquaculture farming (de-stroys mangrove forests for ponds) Lack of mangrove policies and or management. Cur-rently there is no policy on mangrove in Solomon Is-lands.	forests

Table 16. Mapping ecosystem areas, services, threats and conservation sites for 6 provinces in the Solomon Islands

Province	**Ecosystem areas (mangroves, corals and seagrass)**	**Ecosystem ser-vices**	**Threats to eco-systems**	**Conservation sites or prac-tices**
Makira	Located in the east of Makira and southern western region around western areas. Man-groves patches spread across the islands. Reefs are located around the main islands, Waisisi Bay, and mostly on the eastern coastal lines of the Island.		Logging activi-ties occur both on coastal low land and upland forest areas.	Marine Conser-vation area is lo-cated in the Northern re-gions for in-stance in Ugi and the three sister Islands. Activities in-clude tourisms activity, bird-watching
Isabel	Mangrove forest common along the coastlines around the Island. Seagrass habitats and dugong areas Survey on species composition conducted in 2019 indicated 20 Hectares forests of Tubi species)		Mining develop-ment was re-ported on the San Jorge and main islands of Isabel	The Arnavon Community Conservation site is located between Choi-seul and Isabel Province
Guadalca-nal	Honiara city located. Marau Sound (eastern Guadal-canal) identified as the largest population of mangrove	Provisioning – food, building materials, phar-maceutical	Logging activi-ties located in several parts of the islands.	Conservation sites are located in Maramasike Passage,

	forests with 3 existing ongoing activities. Mangrove forests was also identified at Wandara Bay Mangrove in small patches were reported in the Weathercoast areas.	(injuries) Regulating – purifies water, reduce coastal erosion, wind protection. Cultural services-beautiful islands good recreational sites, 1 resort (Tavanipupu) located in Marau, and good research opportunities Supporting services – buffer zones, capture sediments, carbon habitat for flora and faunas and capture nutrients and sediments. 2011 survey on dugongs showed high population in East Guadalcanal. This is due to high seagrass cover.		including coastal communities.
Malaita	Patches of mangroves evident starting at Suava Bay, down to Lau and Takoa area. LangaLanga Lagoon reported as the high mangrove cover, right down to West Are are. Maramasike Passage identified as a high mangrove forest cover area. Southern part of Malaita-small patches of mangroves including leeward side of the island, Walande Bay. The TNC (Nature Conservancy) study in 2004 showed that the largest seagrass bed in Solomon Islands is located in the Northern region in Lau Lagoon.	Supporting all for instance soil formation and major habitat. Supporting, Provisioning (food), Regulating and Cultural services are evident in most parts of Malaita. Food in which most people sell their mangrove in the main market for income and food. Mangrove species harvested are part of our culture thus they	Logging is coming into these areas. Huge mangroves are logged for log ponds. Threats to conservation sites.	Local conservation initiatives or tabu practices are still practiced. Community Based Resource Management (CBRM) sites are at Maramasike Conservation areas work with World Fish (Eliot community) which they conserve part of the mangroves. conservation sites.

		offer cultural services. Livelihood- such as honey production		

IV. Policy Framework for ICZM Mangrove Plan in Solomon Islands

The framework includes an understanding of the coastal zone's nature and ecosystems based on multi-stakeholders' assessment in the Solomon Islands.[12] Below are four strategic objectives for achieving this vision for a sustainable coast.

VISION

To define and strengthen integrated ecosystem-based adaptation at national and regional levels and across sectors, to achieve adapting to climate change.

MISSION

To protect and conserve the Solomon Islands ecosystem through sustainable and integrated management, specifically safeguarding the mangrove area along the coastal zone to build ecosystem resiliency in the face of climate change.

POLICY OBJECTIVES

The policy specifically seeks to,

1. Adapt to Climate Change
2. Protect Mangroves Area as Important Cultural Area (Customary own conservation) Solomon Islands
3. Support Sustainable community of Solomon Islands
4. Build Alliances to Benefit of Mangrove Area, Solomon Islands

GUIDING PRINCIPLES

The following principles will guide the development and implementation of this policy;

[12] The Rapid Ecosystem Services Assessment, with multi-stakeholders in the Solomon Islands, was applied to support the understanding of ecosystems in the Solomon Islands. In addition, we analyzed satellite imagery to identify mangrove habitat. The results are in Annex II and III.

1. ADAPTING TO CLIMATE CHANGE

1.1. MANGROVE AREAS ALONG COASTAL AREAS MONITORING

- Enhancing of forestry management
- Control the coastal development
- Enhancing policy regulations, including enforcement regulations

Actions

- Develop a centralized data repository for Solomon Islands on ecosystem health and human use activities within the coastal zone
- Facilitate data accessibility among government agencies and non-governmental organizations for monitoring ecosystem services and human use impacts on the coastal area
- Enhancing forestry management, including enforcement regulations
- Monitoring of logging activities
- Develop a long-term national strategy for the scientific monitoring of the health of critical habitats, including but not limited to reef, seagrass, mangroves, and coastline dynamics
- Prepare annual report to analyze trends and changes in the mangroves area along the coastal zone

1.2. SOCIO-ECONOMIC ADAPTATION CAPACITY

- Resolving marine resource use conflicts and benefit sharing
- Promoting multi-sectoral approaches to the management of coastal resources

Actions

- Applying ecosystem-based adaptation approach that recognizes the relationships and inter-linkages between all components of the wider ecosystem in addressing coastal zone management issues
- Ensuring equity in access and use of resources

2. PROTECTING MANGROVES AREA AS IMPORTANT CULTURAL AREA (CUSTOMARY OWN CONSERVATION) SOLOMON ISLANDS

2.1. PROTECTED MANGROVES AREAS SYSTEM

- Improving sustainable community
- Enhancing policy regulation
- Managing Commercial Fishing

Actions

- Increase the technical and management capacity of both management and co-management agencies in order to ensure sound management practices
- Support local and national initiatives to achieve the Target 3, Convention on Biological Diversity of the marine territory of Solomon Islands
- Advocate for adoption of Mangrove related Regulations
- Implement mangrove restoration projects as a means to mitigate the effects of climate change, and to ensure the delivery of coastal protection services especially in areas, such as the Malaita of Solomon Islands, which are highly prone to erosion and inundation
- Supporting an inventory on Solomon Islands' mangrove cover and distribution, which should be updated on a bi-annual basis
- Identify areas for mangrove conservation

- Conduct research to better capture the biomass, coverage, spatial distribution and rates of change for mangroves in Solomon Islands, and make this information available to support decisions on the issuing of mangrove alteration permits

2.2. DISASTER RISK MANAGEMENT

- Addressing coastal line change
- Addressing emerging issues affecting the coastal regions

Actions

- Develop a comprehensive inventory of people and property located within vulnerable coastline
- Applying best available science-based assessment to reduce disaster risk to climate change
- Strengthening the regulations guiding development along the coastal line
- conducting mapping and integrated spatial planning

3. SUPPORTING SUSTAINABLE COMMUNITY OF SOLOMON ISLANDS

3.1. COASTAL AND MANGROVE AREAS

- Enhancing governance
- Co-management of coastal and mangoes areas
- Awareness and information programs focusing on ICZM

Actions

- Implement existing policies for the supporting sustainable community of Solomon Islands for the benefit of current and future generations
- Sustain aggressive public awareness campaigns in order to understand the importance of mangrove areas with key stakeholder groups
- Promoting the participation of the community and multi-stakeholders in planning and implementation policies related to ICZM
- Supporting the scaling-up best practices in coastal and mangrove areas management
- Promoting research and monitoring programs in coastal and mangrove areas

3.2. COASTAL AREA PLANNING AND DEVELOPMENT

- Promoting off-shore fishing to reduce pressure on overfishing
- Preserving, protecting and restoring the integrity of coastal and mangrove areas

Actions

- Developing and implementing site-specific ICZM action plans related to fishery issues
- Promoting alternative livelihoods
- Promoting using of traditional knowledge in research and management of coastal and mangrove areas
- Promoting public and private sector partnerships for the management of marine resources and conservation
- Promoting market-based instruments for ecosystem services payments

4. BUILDING ALLIANCES TO BENEFIT OF MANGROVE AREA, SOLOMON ISLANDS

4.1. ECO-TOURISM AND RECREATION

- Developing nature-based tourism industry
- Establishing mechanisms for the sustainable use of mangrove area
- Management of cultural and natural areas

Actions

- Promoting the sustainable use of mangrove areas by generating income, jobs and business opportunities in ecotourism
- Developing and implementing eco-tourism and recreation awareness strategy
- Establishing eco-tourism and recreation mechanisms for information dissemination to the community and stakeholders
- Ensuring proper planning and visitor management to minimize negative impacts on the community
- Promoting community participation in the mangrove area through the use of indigenous knowledge an observing cultural services and value

4.2. ECO-FRIENDLY AQUACULTURE

- Exploring sustainable aquaculture
- Identifying major risk with respect to aquaculture

Actions

- Implementing sustainable management
- Training the knowledge and skills of sustainable aquaculture
- Suggesting the priorities
- Emphasizing and practicing minimizing environmental impacts, both physical (air, water and soil) and biological (fauna and flora)

4.3. ECO-FRIENDLY BEE-KEEPING

- Exploring gender issue and children-engaged income
- Payment Ecosystem Service

Actions

- Implementing female and children labor for poverty-reduction
- Training the knowledge and skills of sustainable beekeeping
- Supporting for production, distribution, and promotion of mangrove honey

V. Specific Policy Statement

1. INTEGRATED PLANNING AND COORDINATION

Integrated planning and coordination are key aspects of ICZM Mangrove Plan, which needs to be relevant and fully cognizant of the current and potential implementer. This means efficiently and effectively using updated multi-stakeholder-based approaches, including Ministries such as Ministry of Environment, Climate Change, Disaster Management and Meteorology (MECDM), with partnerships in the future.

MECDM oversees environmental conservation, climate change mitigation and adaptation, disaster management, and meteorological services. MECEM promotes and safeguards the sustainable use of natural resources for the people of the Solomon Islands; provides leadership in development and supports communities in reducing climate risks and other natural hazards; and provides response measures to disasters. In addition, the Environment and Conservation Division, MECDM supports the protection and conservation of the environment; protection, conservation and management of wildlife; and declaration and management of protected areas. MECDM can cooperate with MFR, Ministry of Fisheries and Marine Resources (MFMR) and Ministry of Agriculture and Livestock (MAL) to implement management plan of land use change. Ministry of Forestry and Research (MFR) is responsible for the management, conservation, sustainable use of forest resources. MFMR deals with the management and conservation of marine resources, which often intersect with mangrove ecosystems, especially in terms of fishing and fisheries (refer to Annex I).

The partnership arrangements include collaboration among governmental implementer and community, private sector, academics, and NGOs, which will prove critical and required in successful linkages to implement the ICZM Mangrove Plan in the Solomon Islands.

2. SUSTAINABLE ECONOMIC DEVELOPMENT

To establish sustainable economic development related to ICZM mangrove forests in the Solomon Islands, you can consider integrating aquaculture, fisheries, and beekeeping activities. These activities support livelihoods and promote the conservation and sustainable use of mangrove ecosystems. Mangrove-friendly aquaculture is one suggestion that focuses on cultivating species that thrive in mangrove environments without harming the ecosystem, such as mud crabs (Scylla spp.), milkfish (*Chanos chanos*), and mangrove red snapper *(Lutjanus argentimaculatus*). It also needs to consider the education of communities on resource management to ensure the long-term sustainability of aquaculture activities. It also needs to consider educating communities on Community-Based Fisheries Management, which can involve local communities in managing fisheries resources and ensure that traditional knowledge and practices are incorporated. However, it needs to consider implementing and enforcing

regulations on fishing practices, including closed seasons, gear restrictions, and prohibiting overharvesting in the protected areas. The other opportunity is establishing mangrove beekeeping in the Solomon Islands. Stingless bees (*Trigona* spp.) are well-suited for mangrove environments.[13] It can encourage the establishment of beekeeping activities in or near mangrove areas to take advantage of the mangrove forest resources with beekeeping training and capacity building.

3. CONSERVATION OF MANGROVES AND THE COASTAL AND MARINE ENVIRONMENT

Mangroves connect terrestrial and marine ecosystems. They perform diverse ecosystem functions and provide various socio-economic ecosystem services, the refer human-benefit from nature, consideration of multiple stakeholders. Currently, mangroves in the Solomon Islands are declining, leading to serious discussions about deforestation and degradation mf mangrove ecosystems and their services. Therefore, mangrove management in ICZM should be categorized into conservation, restoration, and sustainable use, based on spatiotemporal information. In the current stage, mangrove areas are reported vary across statistics and estimation methodologies. Thus, integrating internationally developed satellite-derived land cover products that include mangroves, along with locally developed data on mangrove area and distribution, is crucial to check the mangrove areas. Collaboration efforts are required among MFR, MECDM, and MAL for appropriate governance, and academic involvement is required to develop and to assess exact mangrove areas. With this spatio-temporal assessment results utilizing various remote sensing and on-field research, pinpoint areas with high mangrove density can be designated as conservation areas. In this selection, support for local communities and NGOs for protection should be required. Core conservation areas for strict protection zones like green belts should be established around mining and logging areas. Restoration areas should focus on areas where mangroves historically existed but are now degraded due to coastal development and interventions. For sustainable use, identifying OECMs (Other Effective Area-Based Conservation Measures) in collaboration with local communities is essential and their sustainable management plans should be established. In this management, monitoring the activities OECMs and impact of small-scale logging, non-timber forest product acquisition, and fisheries that critical for maintaining key ecosystem services within the Solomon Islands, are evaluated. Especially, the supporting services, such as soil nutrient cycling and biodiversity, should be focused on the monitoring and management.

[13] https://www.kanopi-indonesia.org/project-2/cultivation-of-stingless-bee-trigona-sp-in-the-mangrove-ecosystem-kutawaru-village-cilacap-dsitrict-central-java-province-indonesia/

4. ENVIRONMENT RISK MANAGEMENT

Climate change impacts the greatest environmental threat to humanity and current ecosystem. The Solomon Islands, as part of the Southwest Pacific islands, expected to face significant pressure from sea levels rise and ecological habitat shifts due to increasing temperatures. Predicted climate change effects are anticipated to significantly impact on mangrove ecosystems, implying substantial challenges in adapting to future changes since the establishment of Integrated Coastal Zone Management (ICZM). Long-term projections based on the SSP5-8.5 scenario, which predicts the highest greenhouse gas concentrations in the atmosphere with high challenges of mitigation and adaptation, forecast disturbances in mangrove habitat and adjacent ecosystems due to extreme heat and other anomalies, leading to reduced suitable habitats for growth. Given the increasing risks defined by meteorological aspects of climate change and anticipated ecosystem changes, there is a need to reduce vulnerabilities through policies and infrastructures managing mangrove ecosystems. Specifically, by 2070, it is projected that mangrove habitat distribution and suitable habitats will sharply decrease across Malaita, Guadalcanal, and Makira-Ulawa, necessitating comprehensive management of mangrove habitats and surrounding ecosystems. Therefore, MECDM need to develop future assessment framework. Addressing current issues that related climate change adaptation, such as prevent indiscriminate logging and managed urbanization is essentially planned to prepare for predicted future changes. In this step, academia also needs to develop appropriate assessment methodologies and nature-based solutions. In addition, local community and NGO need to aware the importance of climate-related actions. However, limited resource of environmental and future foresting efforts, integrated climate change impact and risk assessment is required with comprehensive land and urban planning to secure potential habitats suitable for mangrove regrowth and succession with collaboration with governance and international cooperations. Additionally, securing genetic resources of key mangrove species and conducting more academic research on species inhabiting coastal and estuarine ecosystems adjacent to mangroves will be crucial.

5. CAPACITY BUILDING, EDUCATION, AWARENESS AND RESEARCH

Capacity building is a critical component that multi-stakeholders ensure is captured in their work. All organizations have work that includes capacity building with communities or their staff. However, most of their work is limited due to challenges beyond their capacity in the Solomon Islands. Limited expertise in the mangrove field is also an eminent issue with many organizations, and there is a lack of interest among students in pursuing mangrove-related studies. Despite these challenges, opportunities exist to enhance capacity building in mangroves. For instance, enhancing ministerial capacity to develop and continue with outreach and awareness activities. Academics such as SINU should develop an appropriate curriculum to boost awareness and interest in mangroves. Community and NGOs need to keep their close

connections with communities, continue to inspire people with carbon finance and strengthen the desire to focus on conservation.

The continuing education of multi-stakeholders, including the community level in the Solomon Islands, will be fundamental to the sustained implementation of the ICZM Mangrove Plan. Fundamental to the sustained generation of ICZM Mangrove Plan knowledge is the continuing education of multi-stakeholders, including community level in the Solomon Islands. The government played a vital role in building capacity in various sectors through its ministries. From discussions, Mangrove had a complicated dynamic when it came to the implementation of projects. It is a cross-cutting process between several ministries, and coordination is a critical issue between these ministries. The key ministries having cross-cutting work with mangroves are the MECDM and MFMR (refer to Annex IV). Apart from the government, many NGOs are implementing projects across the Solomon Islands. The opportunity to focus on mangrove-specialized training needs to be given. Government ministries, community sector, academics and NGOs can continue to pursue strengthening their relationships and communication based on capacity-building activities in the Solomon Islands.

6. INSTITUTIONAL ARRANGEMENTS AND LEGAL FRAMEWORKS

The creation of a multi-stakeholder-based ICZM Mangrove Plan will improve the integration of up-to-date operational institutional arrangements for ICZM-related activities. Its application and use across all sectors, particularly the land use change sectors, to assist in long-term planning are deemed essential.

The recent National Development Strategy (2016-2035), National Environmental Management Strategy (2020-2023), and National Climate Change Policy (2023-2033) will underpin the approach to implementing ICZM and the wider process of developmental planning in the Solomon Islands.

Importantly for ICZM delivery, the National Environmental Management Strategy guides the integration of environmental considerations into national and local planning. National Environmental Management Strategy supports mangrove conservation as a natural defense against climate change impacts like sea-level rise and storm surges. The National Biodiversity Strategy and Action Plan shall be delivered through the conservation of biodiversity, including mangrove ecosystems, through sustainable management practices. In addition, the Forestry Resources and Timber Utilization Act can control logging activities and promote sustainable forestry practices in mangrove areas with Community-Based Resource Management. It will facilitate community participation in mangrove management and align with traditional knowledge and practice. By leveraging these policies, institutional arrangements and Legal Frameworks, the Solomon Islands can effectively deliver an ICZM Mangrove Plan that ensures the sustainable management and conservation of mangrove ecosystems.

References

Albert, J. A., and A. M. Schwarz. 2013. Mangrove management in Solomon Islands: Case studies from Malaita Province. CGIAR Research Program on Aquatic Agricultural Systems. CGIAR Research Program on Aquatic Agricultural Systems. Policy Brief: AAS-2013-14.

Bhattarai, B., and C. Giri. 2011. Assessment of mangrove forests in the Pacific region using Landsat imagery. J Journal of Applied Remote Sensing:053509.

FAO. 2004. Profils FAO de la pêche et de l'aquaculture par pays. Solomon Islands, 2017. Fiches d'information Profils de pays. Division des pêches et de l'aquaculture [en ligne]. Rome. Mis à jour Jun 19, 2018.

FAO. 2005. Global Forest Resources Assessment 2005. Thematic Study on Mangroves - Solomon Islands Country Profile.:1-7.

FFA. 2015. he value and volumes of tuna catches in the WCPO. [spreadsheet]. Forum Fisheries Agency. Honiara, Solomon Islands.

Gillett, R. 2016. Fisheries in the economies of Pacific Island countries and territories. Pacific Community, Forum Fisheries Agency, and Australian Aid.

International Finance Corportation. 2021. Solomon Islands Tourism Industry Guides for Investors and Government.

McDonald, J. 2006. Marine resource management and conservation in Solomon Islands: roles, responsibilities and opportunities. Secretariat of the Pacific Regional Environment Programme, Honiara, Solomon Islands.

Pallai, G., and M. Q. Sirikolo. 2001. Mangroves of the Solomon Islands. USP Marine Studies Technical Report. Marine Studies Programme, The University of the South Pacific.

Solomon Islands Government. 2019. olomon Islands National Forest Reference Level. Modified Submission for the UNFCCC Technical Assessment 2019.

Spalding, M., E. Blasco, and C. J. T. I. S. f. M. E. O. Field, Japan. 1997. World Mangrove Alias.

Wairiu, M. 2006. Governance and livelihood realities in Solomon Islands. IN THE PACIFIC ISLANDS, 409. :409.

Warren-Rhodes, K., A.-M. Schwarz, L. N. Boyle, J. Albert, S. S. Agalo, R. Warren, A. Bana, C. Paul, R. Kodosiku, and W. Bosma. 2011. Mangrove ecosystem services and the potential for carbon revenue programmes in Solomon Islands. J Environmental Conservation **38**:485-496.

Annex I

Potential implementers for ICZM Mangrove Plan in Solomon Islands

		Implementer											
		Public sector									Community Sector	Academic	NGOs
		MFR	MECDM	MFMR	MID	MHMS	MEHRD	MWYCA	MAL	Province level			
Land use change	Forestry	+++	+++						++		+	+	+
	Mining		++	+++						++	O	+	O
	Energy		+++									O	-
	Environ-ment	++	+++	+++							++	+	+++
Coastal develop-ment	Seawall, Recla-mation		+++								+	O	+
Agriculture									+++		++	++	++
Infra-structure	Harbor, port				+++							O	O
Fishing/Fisheries				+++							+	++	++

Gender								+++				++	+++
Others	**Aquaculture**			+++								+	+
	Policy regulation											O	O
	Health					+++						+++	+++
	Education						+++					+++	+++

+++: Significant High implementing

++: High implementing

+: Implementing

O: Moderate implanting

Annex II

The results of the Solomon Islands ecosystem services assessment based on Rapid Assessment of Wetland Ecosystem Services (RRC-EA, 2020)

Ecosystem services		**Rank**	**Main benefit**
Provisioning	Fresh water	++	It provides domestic drinking supply, supply for sanitation, hygiene, and export potential for drinking.
	Food	++	Food supplies for local, export regionally, and internationally bring revenue.
	Fuel	++	Firewood from mangroves is common in coastal communities.
	Fiber	++	It provides building materials and export revenue.
	Genetic resources	+	40 species of mangroves; support other species, such as birds and animals.
	Natural medicines	++	Natural benefit to local health: Communities depend on some mangrove plants for cultural remedies, e.g., for the common cold and curing wounds.
	Ornamental resources	+	It is revenue for locals, tourism, cultural significance, and display.
	Clay, mineral, aggregate harvesting	++	Extractor for buildings also damages natural landscapes.
	Waste disposal	0	Proper waste disposal is required in the Solomon Islands.
Regulating	Air quality regulation	++	Improved air quality, providing fresh air.
	Local climate regulation	++	Mangrove forests regulate local climate.
	Global climate regulation	++	Supported by Ensure Mangrove Conservatory.
	Water regulation	++	Regulated surface water recharges groundwater.
	Flood hazard regulation	0	Due to logging and degradation, there is less benefit; Mangroves reduce coastal flooding, and windbreaker protection for villages.

	Pest regulation	0	Introduces species of flora or fauna that become invasive over native species.
	Disease regulation - human	0	Natural trust air and aquatic life provide fresh air, water, and trees provide healthy, nutritious diets.
	Erosion regulation	+	Natural systems ensure less erosion.
	Water purification	++	Filter and provide clean water.
	Pollination	++	It has flowering plants and orchids for pollination.
	Salinity regulation	+	Mangroves protect inland saltwater intrusion.
	Fire regulation	0	Fire control barriers.
	Noise/visual buffering	+	The mangrove forest ecosystem reduces the noise as a buffer.
Cultural	Cultural heritage	++	It has connectivity between mangroves and people and other regions/people.
	Aesthetic value	++	It is attracting tourism and homestay.
	Social relations	++	The community works together via conversation, which binds tribunal groups together; livelihoods for communities and villages.
	Educational and research	++	Environment for a research opportunity.
	Recreation and tourism	++	It brings revenue to the country and promotes ecotourism.
	Spiritual and religious value	++	It has significant spiritual and religious value for the people.
Supporting	Soil formation	++	Regulate produce soil/mud; healthy ecosystem maintains soil aggregation.
	Primary production	++	Houses nutrient supply for the food chain.
	Nutrient cycling	++	Mangroves increase nutrient supply for marine organisms and humans as well.
	Water recycling	++	They are providing an increased clean water supply.

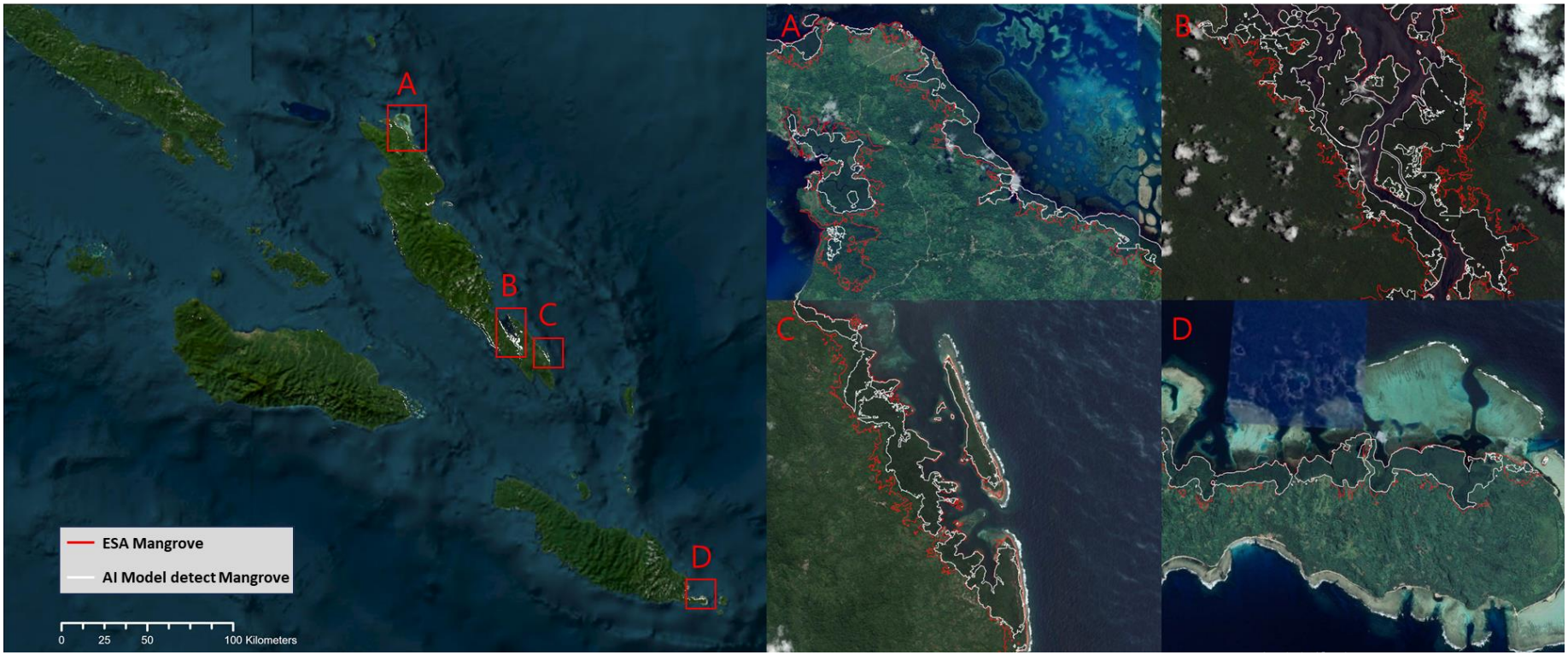
	Provision of habitat	++	Provision of habitat for the majority of marine biodiversity; conditions and stains of Habitat are maintaining 40 species of mangrove.

++: significant positive contribution, +: positive contribution, 0: negligible contribution, -: negative contribution, --: significant negative contribution

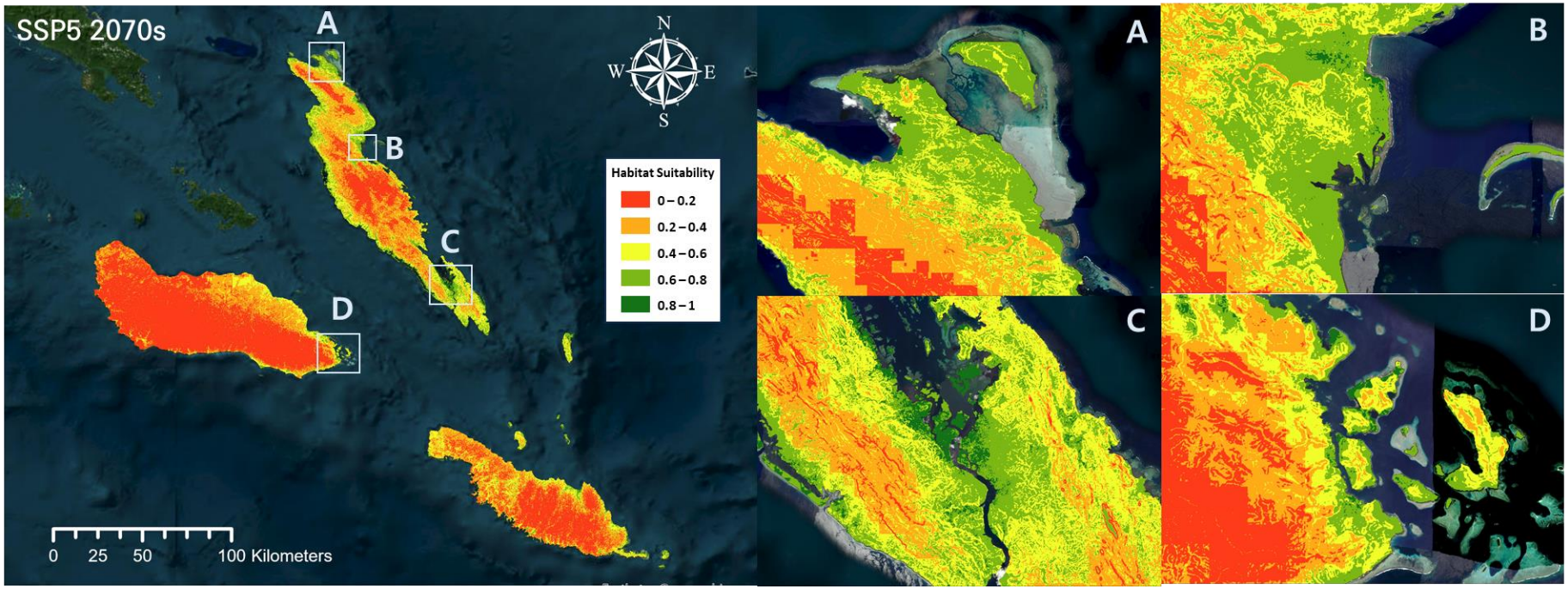
Rapid Wetland Ecosystem Services Assessment with stakeholders in the Solomon Islands (Photo by Donguk Han)

Annex III

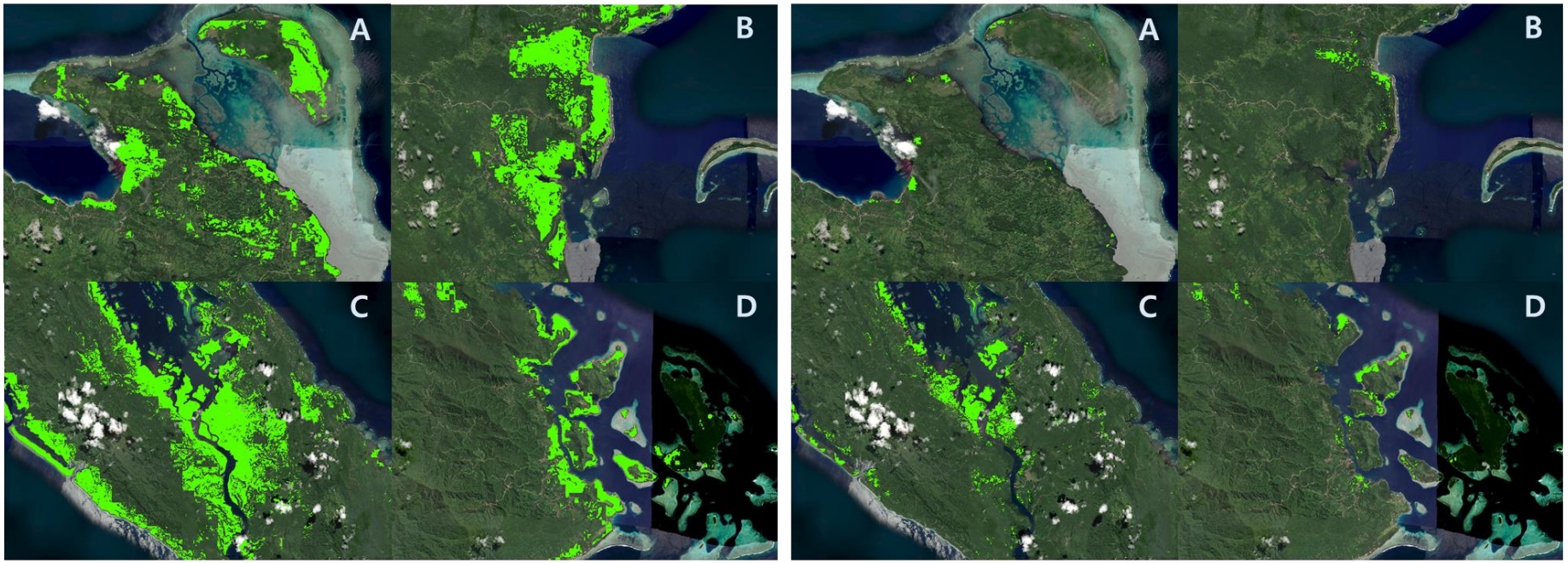
Satellites maps of the mangroves of Solomon Islands & Climate scenarios modeled



Satellite-based identifying mangroves of Solomon Islands (Focused on Malaita, Guadalcanal, Makira-Ulawa)



Habitat suitability of mangroves according to climate change scenario (SSP5-8.5, 2070s) Focused on Malaita, Guadalcanal, Makira-Ulawa



Current and future comparison of mangrove habitat suitability (Focused on Malaita, Guadalcanal, Makira-Ulawa)

Annex IV

Suggestion for the capacity building to delivery of ICZM Mangrove plan

Government Ministries		
Status	Challenges	Way forward
• community awareness (minimal activities) • Existing partnership/collaboration between Govt ministries, NGOs and communities e.g., SIRA, SIELA provides training & capacity building; Technical training (biodiversity surveys); Management committee training	• Limited technical human resources with expertise in mangrove • Minimal training for Govt staffs.	• Provide training opportunities in mangroves management and governance at all Level. • SINU university to offer courses relating to mangrove
Non-Government Organization (NGOs)		
Status	Challenges	way forward
• Provide trainings e.g. Training of trainers (TOT). • Networking with relevant/key stakeholders • Active participations within the organization (projects sharing)	• There is no proper distribution of training opportunities to the project staff/office staff. • No specialize training on mangrove ecosystem	• Provide specialized training on mangrove (TOT) • Strengthened relationship with key stakeholders (Govt, NGO, Donors)
Academics		
Status	Challenges	Way forward

• No specialized are/sphere for mangrove as stands alone. e.g., it is always part of a course or units (minor part)	• Interests in indigenous knowledge on mangrove is slowly redirected to other areas. • Funding to support research/ fieldwork on mangroves.	• Policy framework should accommodate these areas/gaps. • Provision of funding/resources to support training. • Short course training. e.g., rangers training (certificate to be offered by SINU)