

ECOSYSTEM SERVICES AND HEALTH ASSESSMENT REPORT FOR EAST RENNELL



A report prepared for EREPA Project by:
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June 2024

List of acronyms

CTA	Chief Technical Advisor
ECD	Environment Conservation Division
EREPA	Ensuring Resilient Ecosystems and Representative Protected Areas in Solomon Islands
ESRAM	Ecosystems and Socio-economic Resilience Analysis and Mapping
FGD	Focus Group Discussion
IUCN	International Union for Conservation of Nature
MAL	Ministry of Agriculture and Livestock
MECDM	Ministry of Environment Climate Change Disaster Management and Meteorology
MFMR	Ministry of Fisheries Marine Resources
MOFR	Ministry of Forestry and Research
MPA	Member of the Provincial Assembly
NGO	Non-Governmental Organisation
NPC	National Project Coordinator
PAO	Project Administration officer
PEBACC	Pacific Ecosystem-based Adaptation to Climate Change
PMU	Project Management Unit
PPC	Provincial Project Coordinator
SDA	Seventh Day Adventist Church
SPREP	The Secretariat of Pacific Regional Environmental Programme
SSEC	South Seas Evangelical Church
UNESCO	United Nations Educational, Scientific and Cultural Organisation
WHS	World Heritage Site

Acknowledgement

I could not have completed this report without the support and contribution of key individuals and stakeholders, whom I sincerely acknowledge and thank, namely:

- Ms Cathy Unga – EREPA NPC
- Mr Vaera Pulekera – EREPA PAO
- Mr Paul Hatamana – Director, Reforestation Unit, MOFR
- Mr Patrick Fiasi – Chief Extension officer, MAL
- Ms Nelly Kere – Chief Programme Coordination Officer, MECDM
- Mr George Tauika – Provincial Project Coordinator, East Rennell
- Youths of Tegano, East Rennell
- Community leaders, women leaders and participants of East Rennell

I am deeply grateful for the community participants of Hutuna, Tegano, Niupani, and Tevaitahe for their time, their willing participation through the sharing of their knowledge, personal experiences, concerns and hopes with the ecosystems services assessment team.

I also extend my appreciation to the MECDM as implementing agent for facilitating the implementation of this project activity by way of endorsement and approval for the release of funds for the field assessment.

Executive summary

Under the EREPA Project, the Ecosystem Assessment Report is an important report that fills a data deficit area in understanding ecosystem service health in protected areas. Whilst UNESCO and other researchers have done some key studies on the biodiversity of East Rennell, data on the ecosystem services health has been limited or absent. By undertaking this assessment, the data and insights generated will add to the database needed for comparative project assessment and monitoring when relevant. The purpose of this report is threefold: (i) it serves as a baseline dataset; (ii) it serves the purpose of informing the livelihood interventions under component 3; and (iii) it triggers a planning process for technical officers from PMU, ECD, MAL AND MOFR to devise the discussion paper for East Rennell communities livelihood intervention plans.

The assessment identified seven types of ecosystems, namely; terrestrial forest, lake, garden land, plantation land, mangrove forest and coral reefs. These ecosystems provided important ecosystem services from provisioning, cultural, regulating, and supporting services. Table 1 provided the summary of the participants' perception of the ecosystem health for each of the seven ecosystems identified. The terrestrial forest and garden land ecosystems were ranked as 'Not Good'. Plantation land ecosystem and swamp land ecosystems were ranked as 'Not quite Good'. The lake and coral reef ecosystem were ranked as 'Fairly Good', whilst the mangrove ecosystem was ranked as 'Mostly Good'. None of the seven ecosystems were ranked as 'Highly Good'. Based on this assessment, terrestrial forest ecosystems and garden land ecosystems are in an undesirable ecosystem health status and needed management intervention. Most participants depended on terrestrial and garden land ecosystems for food, shelter, medicine, making crafts, firewood and building materials amongst others. People utilised these ecosystem services almost on a daily basis. This suggested that people have a high level of dependence on multiple ecosystem services. The tendency to exploit multiple types of ecosystems on a daily basis implies that the management of ecosystem health requires a multi-ecosystem based approach.

TABLE 1: SUMMARY OF PERCEIVED HEALTH STATUS OF KEY ECOSYSTEMS IN EAST RENNELL

Type of ecosystem	Health status indicators	Perceived health status
Terrestrial forest	<ul style="list-style-type: none"> • High number of complex sets of threats identified to affect the ecosystem conditions; • Tree species lost in the last 10 years was identified by more user groups; • Men, women and youths cross-referenced same "major threats" in their presentations; • Threats on terrestrial ecosystem also affecting garden land ecosystem and plantation ecosystems • Limited capacity at local scale to address complex threats 	<i>Not Good</i>
Garden land	<ul style="list-style-type: none"> • High number of complex threats including soil fertility; reduce fallow period; poor agriculture practice; pest and disease prevalent; high population;; • Loss of soil fertility in the last 10 years 	<i>Not Good</i>

	<ul style="list-style-type: none"> • Men, women and youths cross-referenced same complex threats in their presentations • Threats on garden land ecosystems also affected plantation land and terrestrial forest ecosystems • Limited capacity at local, provincial and national level to address complex threats 	
Lake	<ul style="list-style-type: none"> • Only two main threats identified (climate change, reduction in tilapia size) compared to other ecosystems; • Only species of fish lost in the lake (vagiata); • Lake ecosystem is connected to the coral reefs ecosystem as sources of protein for the communities. Currently both ecosystems are fairly good. • Strong capacity at local and global scale but weak at national and provincial scale 	Fairly Good
Plantation land	<ul style="list-style-type: none"> • Serious fungal attack on plantation trees; invasive black rat damage of coconut fruits; • Loss of coconut tree fruits due to invasive species; • Threats from terrestrial forest and garden land ecosystem on plantation land • Capacity is limited to local scale 	Not quite Good
Swamp land	<ul style="list-style-type: none"> • Some complex issues such as waterlogged areas during heavy rainfalls, • Loss of taro species due to prolonged waterlogged areas; • Threats from the lake (climate change) may likely affect swamp lands • Capacity is limited to local scale 	Not quite Good
Mangrove forest	<ul style="list-style-type: none"> • Only one form of major threat identified compared to other ecosystems (i.e. coastal erosion) • No loss of species identified for the ecosystem • Limited impact from other ecosystems • Strong capacity at local scale for management of mangroves 	Mostly Good
Coral reef	<ul style="list-style-type: none"> • Only two main threats identified (climate change, population increase) compared to other ecosystems; • No species loss identified for the coral reefs; • Population increase was identified as a major threat in the long-term • Limited capacity at local, provincial, national scale for managing the coral reefs 	Fairly Good

Garden land ecosystems and terrestrial forest ecosystems health status suffered due to multiple threats and required remedial intervention. For garden land ecosystems, this included reduced fallow period, poor agricultural practices, clearing of large forest areas for crop cultivation, poor soil fertility, pressure on land use due to resident population increase, invasive species, spread of fungal disease on other ecosystems such as terrestrial forest and plantation land. Building resilience by encouraging families to have multiple gardens, as in the past, was impractical due to the myriad of threats. Consequently, families reduced the number of gardens they own and putting their wellbeing at risk. Interventions in this area must strategically address the myriad of threats by considering multi-scalar capacity and multi-ecosystem approaches.

The lake ecosystem was unique and deeply valued as participants easily identified all four categories of ecosystem services – provisioning, regulating, supporting and cultural services, and ranked as ‘Fairly Good’ in terms of its health status. The lake ecosystem connects to other ecosystems, such as coral reefs with a ‘Fairly Good’ health status and mangrove forests with a ‘Mostly Good’ health status. Using multi-ecosystem approach, interventions that alleviate the pressure on the lake ecosystem and maintain its overall health is imperative.

The assessment found high gendered ecosystems utilisation. Women predominantly used the swamp-land, garden land and lake ecosystem whilst men and youths (mostly male) used terrestrial forests, coral reefs, mangrove, and plantation land. As established in this assessment, women occupied and utilised the most affected ecosystems - garden land ecosystem and terrestrial forest ecosystems. The distinct gendered nature of ecosystem utility suggest that ecosystem management intervention must consider gender sensitive management approaches.

To put this synthesis in the wider context of the province, the analysis revealed that the capacity for the province to support community-based farming livelihoods is weak and needs major reform and development of necessary infrastructure if it desires to improve service delivery to communities. A transformative whole of province development intervention is imperative. This requires genuine collaboration between multiple stakeholders. The strengthening of management of terrestrial forest and garden land ecosystems to avoid descending further into undesirable state of health for these ecosystems is a priority. For this purpose, a household level intervention, using the notion of a second garden plot, collectively managed, run by youths in the community for a small fee, may hold potential to navigate the multiple threats confronting garden land ecosystems and terrestrial forest ecosystems.

The next step is to convene an internal planning meeting to conduct a prioritisation workshop with MAL, MOFR, MECDM and PMU. A livelihood intervention plan for East Rennell will be developed under Component 3 of the project. The interventions for the plan will focus on the household and community level.

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1. INTRODUCTION

1.1 Project background

The GEF6 project titled, ‘Ensuring Resilient Ecosystems and Representative Protected Areas in Solomon Islands’ (EREPA) Project sets out to establish a network of protected areas that are healthy, resilient and serves the needs of communities in a sustainable manner whilst ensuring ecosystems they depend on thrives. For this project, the Ministry of Environment Climate Change Disaster Management and Meteorology (MECDM), the lead implementing agency, with supporting implementation agencies such as Ministry of Agriculture and Livestock (MAL) and Ministry of Forestry and Research (MOFR), form the multi-sector implementation agency at the national level, in leading and supporting the IUCN, respectively, in the overall execution of the project. EREPA project is categorised into three main components:

- 1) Enabling environment for integrated terrestrial ecosystem management and restoration
- 2) Formal declaration of terrestrial protected areas, and their effective management
- 3) Improved land management, agriculture practices and restoration interventions in rural production landscapes

This report on ‘Ecosystem services assessment’ falls under component two. The specific purpose of the report in the broader context of this component is stated below.

1.2 Purpose and scope of the report

This report serves several purposes but the primary purpose of the report is to fill unavailable baseline data in proposed protected areas sites. The EREPA Project Document identified the problem of limited data availability on biodiversity at the landscape and ecosystem level, in the project sites in the four provinces of Guadalcanal, Malaita, Rennell and Bellona and Temotu. Where reports were available with NGOs and other projects, such reports were not accessible in a centralised portal. This means that critical baseline data for the project was unavailable and therefore, it needs to be generated. Without this baseline information, ‘it is not possible to plan, monitor and control extraction activities’ within proposed protected areas. For East Rennell, apart from studies that described the flora and fauna and biodiversity of East Rennell (e.g. Wingham, 1997; Wolff, 1956; Wolff, 1956 (ed)), the literature on ecosystem services for communities near lake Tegano has been missing in the literature. To fill this gap, Output 1.2 of component 2 seeks to undertake ecosystem characterisation assessments to identify baseline data on ecosystem services, amongst other baseline information needs. Second, the assessment serves the purpose of informing aspects of component 3 that requires a systematic way of identifying livelihood interventions to reduce pressure likely put on hosting communities as a result of the conservation intervention brought about by the project itself. Third, the assessment will trigger the devising of strategic goals or visions for livelihood intervention and implementation plans under component 3. This assessment focuses on the

status of the ecosystem services and ecosystem health. It does not cover land use planning, which was covered in a separate activity.

1.2 Complementarity in project baseline assessment reports

Noting the distinct components in the project, a number of baselines reports have been generated. Hence, this particular report is not a standalone baseline report.

1.2.1 ESRAM report for East Rennell

This report contributes to the suite of baseline reports such as the Ecosystems and Socio-economic Resilience Analysis and Mapping (ESRAMR Report conducted for East Rennell by the Secretariate of Pacific Regional Environmental Programme (SPREP) through University of Queensland. The ESRAM report focuses on national level interventions whilst this report focuses on community level baseline and potential interventions.

1.2.2 Socio-economic survey for East Rennell

Similarly, this report also adds to the socio-economic household survey conducted by EREPA Project in June 2024 which focused on deriving baseline data on the socio-economic wellbeing of households for the host communities. These reports, combined, covers the core areas of ecosystems and socio-economic parameters that should serve as critical baseline information for strategic interventions and effective management of proposed protected areas sites.

To set the assessment and analysis into context, the next two subsections of this report intend to briefly establish the context in which the analysis will be considered by looking at the provincial and community level context for the Rennell and Bellona Province, for which this report is made. These subsections provide a succinct summary of the important biophysical, developmental, socio-economic and cultural context in which this report is discussed. Section 1.3 covers background information on the provincial level and section 1.4 covers the community level.

1.3. Provincial Context

1.3.1 Geography and Politics

Rennell and Bellona Province consists of two main islands of Mugava (Rennell) and Mungiki (Bellona) islands. The province is located in the southern end of the chain of islands in the Solomon Islands. The provincial center of Rennell and Bellona Province is Tigoa with a land area of 671 square kilometers.

Historically, in 1897, Rennell and Bellona islands became part of the history of Solomon Islands when the British Protectorate formally recognised Rennell and Bellona and started visiting the islands. Rennell and Bellona was part of Central Islands Province, but in 1992, the Province was officially recognised as a separate Political administration from central Islands Province. The Rennell and Bellona celebrates its Second Appointed Day, marking the establishment of local Government for Rennell and Bellona on 20 July. The provincial capital and administrative headquarter is located on Tigoa on Rennell Island. The provincial government consists of 10 wards, represented by 10 members who join the provincial assembly as Members of the Provincial Assembly (MPA). Rennell, the bigger island has six wards and Bellona, the smaller of the two islands, has four wards. In the last 32 years, has come through times of political instability (especially 2nd and 5th Assemblies) but looks to the future to strengthening and building its political, developmental and financial leadership for improved governing at the provincial level.

1.3.2 Population and climate

Rennell and Bellona Province is Solomon Islands' smallest province in terms of the number of people. The 2019 population and housing census accounted for 4,100 people, the least populated province in Solomon Islands with a density of 4.1 people per square kilometres below the national average of 14.5 people per square kilometres.

Weather information from the provincial capital, Tigoa, indicate annual temperature of 25 degree Celsius, annual high temperature of 28 degree Celsius, the warmest month is in January, the coldest month is in August, the wettest month is in December and the driest month is in June. The average number of rainfall days is 320 and the average no rainfall days is 44 days. The province is subject to tropical storms and cyclones, from November to June. Since 1992 to 2012, seven major cyclones struck the islands of Rennell and Bellona.

1.3.3 Customary landownership

The people of Rennell and Bellona used oral history backed by archaeological evidence when tracing their ancestor to Kaitu'u, a man of Polynesian heritage, who migrated with a group of eight families on canoe from Ellis and Futuna (Uvea) to the islands. Landownership in Rennell and Bellona follows a patrilineal system. Here, land right is passed from father to the first-born son in a family. A grandson, daughter, or nephew, however, could earn the right in the event that the father is without a son. Families with landownership rights could grant consent for mining or logging on their land.

1.3.4 Socio-economic and natural resources development

Farming, fishing, hunting and collecting resources from land and the environment is the way of life for many communities in Solomon Islands, including communities in Rennell and

Bellona. Nowadays, families complemented their livelihoods with produced food from shops. Rennell and Bellona people are Christians but they also claimed to be deeply rooted in their traditions and cultures. Christianity as an institution had tremendous influence on reshaping people's cultural beliefs, norms or practices. In present day communities, most beliefs and practices that underpinned community living are Christian beliefs and practices.

Rennell and Bellona Province, given its size (land mass and population) its economic development capacity is significantly limited in terms of supporting institutions and much needed infrastructure. Minerals, forests, fisheries and agriculture are main natural resources with potential for development for Rennell and Bellona. The Indispensable Reef is an important marine ecosystem, and the lake holds potential for aqua-marine farming. The islands have minerals such as bauxite and phosphate. Forestry attracts logging interests with virgin hardwood forest. Agriculture has potential for strengthening household livelihoods. There is potential for culture and tourism development but the necessary infrastructure is still not in place to facilitate this. Logging and mining companies have operated on the island. Although the industry boosted the local economy but it inadvertently introduced adverse social changes in the communities such as with diet and teenage pregnancy. Logging and mining in parts of West Rennell, boosted economic development infrastructure on the island but remained very rudimentary. Road and health clinic conditions are in a bad state and need repair. In 2024, the provincial administration gained new leadership at the provincial election. Political leaders sought new development partnerships to boost local economy and infrastructure for sustainable development.

1.4 East Rennell Context

1.4.1 Geography, climate and population

Rennell island, divided into East and West Rennell based on provincial administration jurisdictions, is located in the eastern end of Rennell Island. Rennell Island, is 86 km long and 15 km wide, and is the second largest raised coral atoll in the world (<https://whc.unesco.org/en/list/854/>) to Lifou Island¹ in New Caledonia. East Rennell is small and rugged but is unique with outstanding universal value. Rennell Island has a tropical climate (high temperatures and humidity), rainfall that ranges between 3000-4000mm and dry season from May to August. Cyclones are frequent in the area. East Rennell has a population of about 1,200 people of Polynesian origin. The population has never been large due to limited fresh water and soil suitable for cultivation. It is also declining through emigration to Honiara on Guadalcanal and plantations on the Russell Islands nearby. About third of the population of East Rennell live in four villages surrounding Lake Tegano - Hutuna, Tegano, Niupani and Tevaitahe communities.

¹ Lifou Island is a low-lying island, part of French New Caledonia in the south west Pacific Ocean. Measuring some 1,207 square km in area, with its highest points at around 60 m above sea level with around 9,275 inhabitants as of 2014.

1.4.2 Communities and faith affiliations

People in East Rennell organised themselves in the four main communities of Hutuna, Tegano, Niupani and Tevaitahe based on religious affiliation than social or cultural relationships. The four communities, located at the western side of the Lake Tegano, are home to multiple tribal groupings. Despite this tribal mix, the communities are organised separately based on religious affiliations. For instance, the Tevaitahe and Niupani communities belong to the South Seas Evangelical Church (SSEC) faith. The Hutuna and Tegano communities, on the other hand, are members of the Seventh Day Adventist (SDA) faith are new communities that emerged out of the Niupani and Tevaitahe communities due to their faith affiliation. Hutuna and Tegano when some community members become members of the SDA faith. All four communities have church buildings and church leaders who have strong influence on church members' engagement in community activities.

1.4.3 People, land and culture

As people, East Rennellese view themselves as inextricably linked to the environment or nature through their culture. In this interrelationship; people, the land and the resources therein cannot be separated as different elements but part of a complex system. The people of East Rennelle perceive their landscape as an extension of their being as people and therefore their survival intertwined in the inseparable people-land relationship through their tribes. All East Rennellese belong to a tribe or clan. Each tribe or clan identify with the land and resources therein. As tribes continued to evolve and new clans' emerged, new connection to land also emerge. In 2024, the EREPA Project socio-economic household survey identified the increasing number of tribes (19 tribes) in the four communities in East Rennell. they included:

1. Kungahenua
2. Nohoanga
3. Teava
4. Baigau
5. Kapeiatu
6. Teatugau
7. Vaigau
8. Nepegi
9. Teagima
10. Tehakatu'u
11. Tuhunui
12. Kavigi
13. Avavilage
14. Tekungahanua
15. Tigoa
16. Tepisinga
17. Tea'agima,
18. Hangagoa,
19. Giumata

East Rennell's inscription in 1998 as a world heritage site (WHS) under customary ownership and management speaks to this notion. People's customary ties to the island and land reinforced the 'Avaiki way' – where people helping each other to survive is a bedrock of the Polynesian culture.

1.4.5 Socio-economic profile

The 2009 census data estimated the population of East Rennell to be 1,200 people. Whilst the census data showed the average household size for Rennell Bellona Province reflected the national average at 5.5 people per household, according to the EREPA Project socio-economic survey in 2024, this was different for East Rennell communities. The average number of people per household was higher at seven and eight persons per household for Niupani and Tevaitahe communities respectively. In the same survey, Hutuna community reflected a declining population of more adults and fewer young people, as the population continues to grow older with a median age range of 21-32 years and modal age group of 51-80 years. Tegano community depicted a stable population with roughly equal distribution of young and old in the population. Niupani and Tevaitahe communities showed a growing population of more young people and fewer adults in the sample population. The median age group for both male and female, in Niupani and Tevaitahe communities is in the adolescent age group (13-20 years). In all sample populations, the life expectancy for both male and female was below 81 years, for all communities.

In the same survey, secondary level educational attainment was the most popular for both male and females living in the community. Postgraduate level educational attainment was very low for both male and female. Females' highest level of educational attainment is the secondary level. Males' have a higher educational attainment than females at the postgraduate level. The survey identified five main types of social groups in the communities: (i) church or religious groups; (ii) tribal affiliations; (iii) savings groups, (iv) weavers groups; and (v) sports groups. Social groups are popular for both men and women from adolescents up to late adulthood. Occupations mainly fall in five categories: (i) fishing; (ii) gardening or farming; (iii) weaving; (iv) contract services; and (v) formal employment. Most young adults living in the community have no occupation. The survey showed that the communities of Niupani and Tevaitahe used three types of sanitation systems: (i) own flush toilets, (ii) deep pit latrines, and (iii) stone pit latrines. Most households have own flush toilets. A few households (20% Niupani, 33% Tevaitahe) still use deep pit and stone-pit latrine (20% Niupani).

The survey also categorised the household's income structure into six main sources: (i) agriculture-based, (ii) aquatic-based, (iii) forestry-based, (iv) swamp-based, and (v) service-based sources. Land-based incomes sources come from forestry, agriculture and swampland resources. Aquatic-based income sources come from resources from the lake. Service-based incomes come from labour contracts and employment. Percentage of households with land-based incomes accounted for 53%, service-based income 40% and aquatic-based income, 7%.

The three main forms of livelihoods activities that household heads consistently identified as their three main forms of livelihood activities were (i) farming, (ii) fishing and (iii) weaving. Farming accounted for 44%, fishing and weaving accounted for 28% respectively. Weaving is popular for women in the 51-80 years age range. Similarly, fishing is popular for men in the same age group. Both men and women involved in farming or food gardens. About 95% of household respondents identified that the three forms of livelihood activities were the same in the last 10 years.

1.4.6 Natural resources use

The 2024 EREPA socio-economic survey for East Rennell identified five forms of natural resources identified in the sample population in East Rennell communities. They are; (i) trees for timber, (ii) tilapia, (iii) coconut trees, (iv) pandanus trees, and (v) garden crops. Five of the common natural resources identified are land-based resources and only one is aquatic-based resource. This insight suggest that land-based resources will require careful land use planning with communities around its sustainable utility. Other land-based resources identified included garden land, swampy land for taro and fruit trees. Based on frequency of reporting by household head's, land use for garden crops, coconut trees, pandanus and fruit trees have been subject to daily and weekly use compared to land used for trees for timber and swamp taros, which have a longer rest period between subsequent uses. Gender wise, women mostly accessed land-based resources and men aquatic-based resources, indicating a gendered utility for these resources.

1.4.7 Vegetation

Tropical rainforest is the dominant vegetation on Rennell Island. There are three major vegetation types: low mature forest on the karst ridge of the island's perimeter; tall forest of the island interior; and beach flora on the Lake Tegano margins. The beach flora included small patches of mangrove vegetation along the margins of the lake. The karst ridge and island interior are where deeper soils occur.

1.4.8 Fauna

UNESCO reported East Rennell site as the highest endemism per hectare in the Pacific owing to the remoteness of the island and its low population. However, the black rat pest (*Rattus exulans*) snails posed a real threat to this high endemism and biodiversity on Rennell. UNESCO reported that at least 43 species of breeding land and water birds have been identified, 21 being endemic to Rennell: five species and nine subspecies plus seven subspecies endemic to both Rennell and Bellona. Silver-capped fruit dove *Ptilinopus richardsii cyanopterus* is endemic to both islands. Other endemic species include Rennell shrike-bill *Clytorhynchus hamlini*, Rennell fantail *Rhipidura rennelliana*, Rennell white-eye, *Zosterops rennellianus*, bare-eyed white-eye *Woodfordia superciliosa* and Rennell starling *Aplonis insularis*. Little pied

cormorant *Phalacrocorax melanoleucos* and Australasian grebe *Tachybaptus novaehollandiae* are common on Lake Tegano. The site has 11 species of bats including:

- the locally endemic Rennell flying-fox *Pteropus rennelli*
- Other bats are the Pacific flying-fox *P. tonganus*,
- Solomons bare-backed fruit-bat *Dobsonia inermis*,
- spurred leaf-nosed bat *Hipposideros calcaratus* and
- Schreiber's long-fingered bat *Miniopterus schreibersii*.

Wingham's (1997) biodiversity record for Lake Tegano fauna included snakes, geckos, skinks, lizards, coconut crabs, hermit crabs, snails, and moths. Lake Tegano is the only known location for the endemic Rennell Island sea krait *Laticauda crockery*. The lake's other snake, the yellow-lipped sea krait is *Laticauda colubrine*. This species hides in rock crevices and holes. There are five species of geckos, four skinks, one monitor lizard *Varanus juxtindicus* and three snakes in East Rennell. No amphibians have yet been recorded for the Island. Coconut crab *Birgus latro* and two other species of land hermit crabs *Coenobita* species were recorded on the island. The island has 27 species of land snails (endemic), 731 insects and 246 moths in all, with 35 species and 25 subspecies exclusive to Rennell and Bellona islands (Wingham, 1997).

East Rennell is unique for its diverse fauna and high endemism within this fauna. It is the only WHS in Solomon Islands and the only one under customary ownership and management for WHS listings globally. This is a significant achievement for tribal leaders and communities in East Rennell. Despite this rich knowledge on the biodiversity on East Rennell, the region's ecosystem services status remained poorly understood. This assessment will contribute to fill this gap in order to populate the baseline dataset for the project. The next section covered how this was done.

2. Methodology

2.1 Assessment approach

I put together the conceptual framework² for this assessment based mainly on a brief review of the PEBACC Ecosystems and Socio-economic Resilience Analysis and Mapping (ESRAM) assessment approach and other climate change vulnerability assessment approaches conducted in Solomon Islands. Whilst the PEBACC ESRAM assessment approach delved deep into identifying the vulnerabilities and key threats, the framework was weak in integrating the strength of communities of interest and the gendered nature of ecosystem services. This framework added these dimensions into its framework, emphasising the agency of communities and the differential connections to the ecosystems based on the gendered nature of use of ecosystems. This section presents the assessment framework below:

² In the conceptual framework, S1 denotes Step 1, Step 2 denotes Step 2, and there are nine steps in the assessment approach.

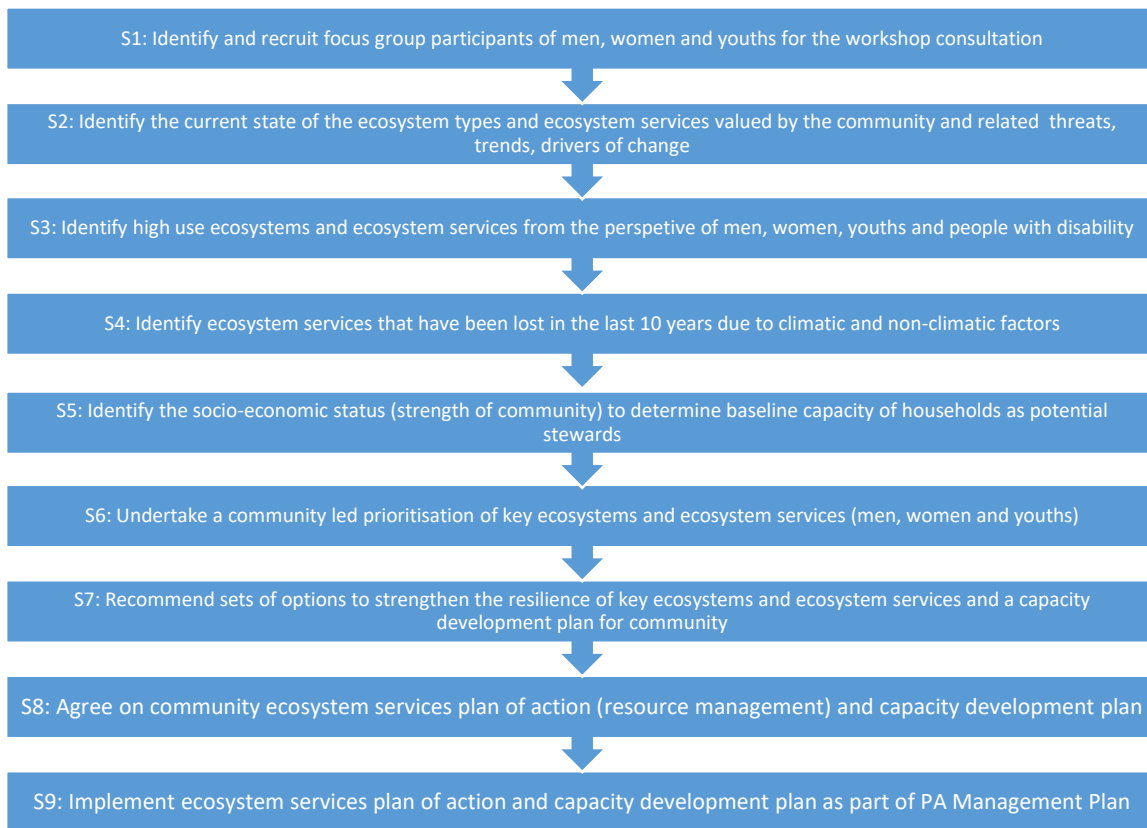


FIGURE 1: ASSESSMENT APPROACH

Steps 1, 2, 3, and 4 adopted a focus group discussion method, whilst step 5 adopted a household survey interview. Steps 6, 7, 8 and 9 adopted a planning workshop with decision makers and support groups in the community. The next section described details of the FGD sessions.

2.2 Workshop methodology

The dataset for this report was generated mainly through focus group discussion (FGD), observations and expert knowledge of key informants. Focus group discussion (FGD) participants (Steps 1, 2, 3 and 4) attended the consultation workshop on the 24 June 2024, with members of the four communities in East Rennell. The specific objectives of the consultation workshop were:

- to introduce components 1 and 2 of the project to communities and seek communities' reaffirmation of their engagement in the project;
- to raise awareness on ecosystem and ecosystem services and its importance to overall wellbeing of community and biodiversity health;
- to document the knowledge, experiences, values, practices, concerns, hopes and perceptions with a particular focus on: (i) identifying key ecosystems and ecosystem services as perceived by men, women and youths; (ii) documenting trends, threats, and losses in relation to key ecosystem services; (iii) documenting the socio-economic status of households as community stewards to determine baseline capacity as stewards;

(iv) undertake interactive mapping of threats by way of transect walks through key ecosystem areas as identified by community participants.

Approximately 40 participants attended the consultation workshop. The Provincial Project Coordinator (PPC) selected participants based on inclusive participation of men, women, youths and people with disability, leadership, and expert knowledge in community setting and resource use. In the workshop, facilitators' ensured women and youths have the safe space to discuss and voice their perspectives, concerns and views in the presence of men using creative facilitation approaches.



(A) interactive exercises to explain and define ecosystem and ecosystem services; (B) Female facilitator assisting Hutuna men's FGD; (C) Hutuna women's FGD; (D) Tegano youths doing their group presentation

The FGDs focused on five main questions:

1. What are the main ecosystems in your community?
2. Who are the people who relied most on these ecosystems (e.g. men, women, youths)?
3. What type of ecosystem services do you obtain from these ecosystems?
4. What type of ecosystem service benefits have been lost in the last 10 years?
5. What are the main threats facing these ecosystems?

The FGD session concluded with group presentations of their discussions and general reflection on the threats, and benefits lost in the last 10 years and strategies to protect and manage, where relevant, the key ecosystems that sustain the wellbeing and livelihood of communities.

2.3 Analysis of ecosystem health

Ecosystem health is analysed based on the participants' perception of what is a normal range of activities in an ecosystem. Van Andel and Aronson (2006) defined ecosystem health as “the state or condition of an ecosystem in which its dynamic attributes are expressed within the normal ranges of activity relative to its ecological state of development”. According to IPBES, there is no universally accepted benchmark for a healthy ecosystem. Rather, the apparent health status of an ecosystem can vary, depending upon which metrics one employed in judging it, and the purpose of the assessment. Based on the participants views and the purpose of this assessment (trigger livelihood interventions), the metrics in Table 1 was derived and applied in the analysis of the FGD data.

TABLE 1: RANKING METRICS FOR ECOSYSTEM HEALTH IN EAST RENNELL

Rank	Description	Indicators
1	Not Good	<ul style="list-style-type: none"> • More complex sets of threats and disease identified in the ecosystem; • Species lost in the ecosystem identified by more user groups; • Number of ecosystem users that agree on “major threats” are more than one group; • Threats on one ecosystem inflicting another ecosystem;
2	Not quite Good	<ul style="list-style-type: none"> • Number of threats identified are localised to the ecosystem • No species loss identified • Clear potential threats identified
3	Fairly Good	<ul style="list-style-type: none"> • Number of threats identified low for more user groups

		<ul style="list-style-type: none"> • More users of ecosystem claimed no species loss for the ecosystem; • No clear potential threats identified
4	Mostly Good	<ul style="list-style-type: none"> • Number of major threats are low; • Number of user groups agree that there are no major threats to the ecosystem high; • Potential threats identified are low
5	Highly Good	<ul style="list-style-type: none"> • Number of major threats very low; • Number of users that agree on 'no major threats' is high (men, women, youths) • No potential threats in the future • No major disease or fungal attacks

2.4 Analysis of ecosystem services

The analysis of ecosystem services integrated the views of Groot et al. (2012) and Costanza et al. (2012). Costanza et al. (2012) stated that a healthy ecosystem is one that provides a range of ecosystem services (see Figure 2). Table 1 shows general attributes of the ecosystem services by Groot et al. (2012) but the framework failed to see the capacity for maintaining healthy ecosystems as critical to maintaining ecosystem health. To account for this, this analysis framework included maintenance services as described by Costanza et al. (2012), based on the philosophy that ecosystems need human and institutional agency for its maintenance. These categories guide the assessment of ecosystem services.

TABLE 2: ECOSYSTEM SERVICES AND CATEGORIES

Category	Service
Provisioning services	Cultivated food, Water Medicinal resources Energy Wood and fibre
Regulating and supporting services	Pest regulation Flood regulation Micro climate Air quality regulation Water flow regulation Erosion prevention Nutrient cycling Pollination, biodiversity, nursery services Habitat connectivity
Cultural services	Identity Leisure Aesthetics, education Recreation Inspiration, spiritual experience
Maintenance services	Local scale Regional scale Global scale

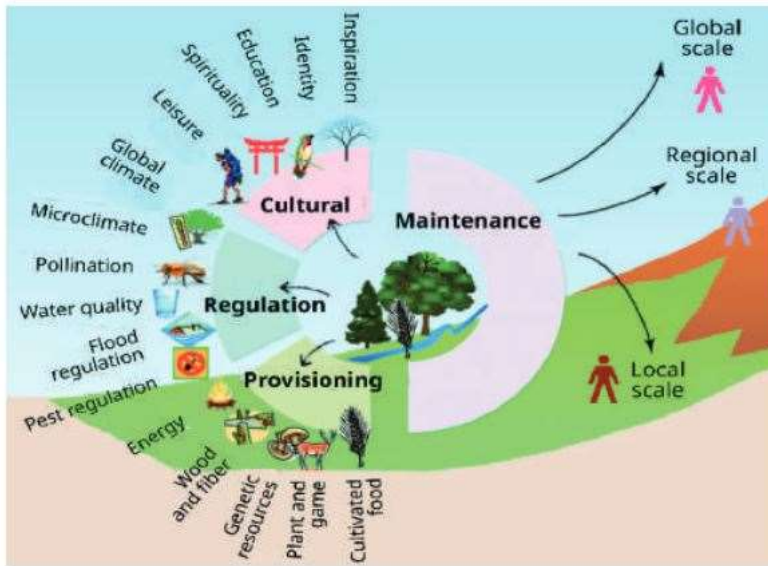


FIGURE 2: ECOSYSTEM SERVICES (ADAPTED FROM COSTANZA ET AL. (2012))

The next section of the report presents the findings from the assessment. Importantly, the assessment focused on ecosystems that the communities perceived to be of importance to them. This means, the assessment focuses on the types of ecosystems and ecosystem services that community households actively utilise, connect with or acknowledge as culturally significant to them. This means there are other types of ecosystems in the community that may not be included in this dataset if in the case they fall outside of what the community people perceive as important in their daily living.

3. East Rennell Ecosystems and Ecosystem Services

This section presents the findings in two parts: (i) the overview of the main ecosystems identified by men, women and youths; and (ii) the description of the key ecosystems and ecosystem services, key threats, current management practices, types of ecosystem services lost in the last 10 years, the most affected group of people (men, women or youths), and management opportunities to address ongoing threats. This section attempts to describe the links between components (structure, threats, human agency, management opportunities) of the ecosystems that link to each other through people’s utility and agency for management of ecosystems.

3.1 Overview of ecosystems and ecosystem services identified by communities

The FGDs identified seven key ecosystems (see Table 3) that play a critical role in the daily lives of people on East Rennell. They included: (1) lake; (ii) terrestrial forest; (iii) garden land; (iv) mangrove; (v) coral reefs; (vi) plantation land; and (swampy land).

Segregated into specific user groups, the key ecosystems popular with Women’s FGDs included:

- 1) Garden land
- 2) Swampy land
- 3) **Lake**

Similarly, for men, the ecosystems popular with them are:

- 1) Terrestrial forest
- 2) Coral reefs
- 3) **Lake**
- 4) Mangrove
- 5) Plantation land

And for youths, the ecosystems popular with youths are:

- 1) **Lake**
- 2) Terrestrial forest
- 3) Coconut land
- 4) Coral reefs

Between the three main groups (women, men and youths), the most common type of ecosystem is the lake ecosystem. The ecosystems that are highly gendered are the swamp land, coral reefs terrestrial forest and plantation land. Women predominantly used swamp land and garden land ecosystems whilst men and youths (mostly male) utilised coral reefs, terrestrial forest and plantation land and mangroves in more ways than women did.

TABLE 3: SUMMARY OF THE ECOSYSTEM TYPES AND FREQUENCY OF IDENTIFICATION BY COMMUNITIES

Ecosystems	Key ecosystem services identified by East Rennell Communities	Preference by group (M=Men; W=Women; Y=Youths)	Frequency of identification by the communities			
Lake			Hutuna	Tegano	Niupani	Tevaitahe
	Fishing ground for tilapia	M, Y	xx	xx	x	x
	Water supply (cooking, swimming, drinking)	W, M, Y	xx	xx	x	x
	Leisure (canoeing, swimming, water games)	Y, M	x	x	x	x
	Aesthetics (scenic, unique seascape, historic)	M, W, Y	x	xx	x	x
Terrestrial forest						
	Timber source for building material	M, Y	xx	xx	x	x
	Wood source for making canoe, carvings	M, Y	xx	x	x	x

	Source of clean fresh air	Y, M		x		
	Forest land for medicinal plants	W, M, Y	xx	x	x	x
	Forest land for fruit trees	M, W, Y	x	x	x	x
	Wood source for firewood	W, M	x	x	x	x
	Forest area habitat for galigi trees (fruit tree)	W, M	x	x	x	x
	Forest area habitat for akui	M	x	x	x	x
Garden land						
	Land for gardening	W, M	xx	xx	x	x
	Planting of food crops for families (taro, tago hahine, tago sua)	W, M	xx	xx	x	x
Mangrove forest						
	Planting cash crops	W, M	x	x	x	x
	Mangrove propagules for food	M, W	x	x	x	x
	Mangrove trees for house post	M, Y	x	x	x	x
	Mangrove trees for firewood	W, M	x	x	x	x
Coral reefs						
	Mangrove forest from wind protection	M, W	x	x	x	x
Coconut plantation land						
	Food source – fish and trochus shell	M, Y	x	xx	x	
			xx	x	x	
	Planting coconut for drinking	M, W, Y	xx	x	x	
Swampy land						
	Planting coconut for source of cook milk for cooking	M, W	xx	xx	x	x
	Planting coconut trees used for making fans, houses	W	x	x	x	x
Swampy land						
	Swampy land for planting swamp taro or kakake	W, M	x	xx	x	x
	Swampy land for planting pandanus	W	x	x	x	x
	Swampy land for fern and kangkung	W	xx	xx	x	x

The most frequently identified ecosystem services (see Table 4) fall under the provisioning services category. This category of services included food from forest and aquatic food sources, fuel wood, medicine. The other categories of ecosystem service benefits identified included

regulating (forest as source of oxygen), supporting (species habitats) and cultural services (cultural use of resources and aesthetics).

TABLE 4: SUMMARY OF ECOSYSTEM SOURCES AND RELATED ECOSYSTEM SERVICES

Key ecosystems	Dry land food	Aquatic Land food	Water drinking	Water cooking	Water bathing	Water leisure	Fuelwood	Timber	Transport	Medicine	Recreation	Culture	Provide oxygen	Habitats	Aesthetics
Terrestrial forest															
Lake															
Garden land															
Swamp land															
Plantation land															
Coral reefs															
Mangrove forest															

Based on the FGD's with men, women and youths, the views, experiences, concerns, values, and perspectives, the health of the ecosystems is analysed and summarised in Table 5 below. Terrestrial forest and garden land ecosystems are not in good health condition according to the perspective of community participants.

TABLE 5: SUMMARY OF ECOSYSTEM HEALTH ASSESSMENT USING FGDS BY MEN, WOMEN AND YOUTHS

Key ecosystems	Complex threats (High/Low)	Species loss (Yes/No)	Number of user groups affected (High/Low)	Clearly identified potential threats (Yes/No)	Reference ecosystem threats affecting another ecosystem (Yes/No)	Capacity for managing threats on ecosystem services (High/Medium/Low)	Health Status? (1=Not Good; 2=Not quite Good; 3=fairly Good; 4=Mostly Good; 5=Highly Good)
Terrestrial forest	High	Yes	Yes	Yes	Yes	Low	Not Good
Lake	High	Yes	Low	Yes	No	Medium	Fairly Good
Garden land	High	Yes	High	Yes	Yes	Low	Not Good
Swamp land	High	Yes	Low	No	Yes	Low	Not quite Good
Plantation land	Low	No	High	No	No	Low	Not quite Good
Mangrove forest	Low	No	Low	No	No	Medium	Mostly Good
Coral reef	Low	No	Low	Yes	Yes	Low	Fairly Good

The next section provided a narrative of the key findings. It covers detail description of ecosystems and ecosystem services, and key threats, species loss and management opportunities in the following order: (i) terrestrial forest; (ii) lake; (iii) garden land; (iv) lowland swamps; (v) plantation land; (vi) mangrove; and (vii) coral reefs.

3.2 Terrestrial forest

3.2.1 Description of terrestrial forest ecosystem and ecosystem services

According to studies on East Rennell, the vegetation in East Rennell is classified in three main types: (i) low mature forest on the karst ridge of the island's perimeter; (ii) tall forest in the island's interior; and (iii) and beach flora on the Lake Tegano margins. The most dominant vegetation on the island is the tropical rainforest, largely untouched, with canopy averaging 20 meters according to one study. A study by Wingham (1997) identified that the local people depended on the forest for building materials (ropes, canes, poles, and posts), fuel wood (charcoal), tools (fishing, crafts), productive assets (canoe, axe stick), personal assortments (tapa cloth bark, comb, crafts) and medicines (leaves, barks and fruits).

The communities of East Rennell accounted for the same types of ecosystem services derived from their terrestrial forest, three decades after the study by Wingham in 1997. This included timber for building their houses, trees for making family assets such as canoes and carvings and crafts for sale, firewood for cooking, plants used as traditional medicine, forest as a source of oxygen, and habitat for important trees such as galigi. Whilst most ecosystem services identified by men and youths related to shelter, personal assets, and fuel wood, women particularly identified traditional medicine as an important ecosystem service. However, men, women and youth groups tend to identify provisioning and cultural services with more ease than regulating and supporting services. When it comes to supporting services, communities showed some degree of awareness that forest trees are important producers of oxygen and important habitat for animals living in the forest such as bats and birds.

3.2.2 Key threats

The FGD groups for men, women and youths identified four main threats to the terrestrial forest. These included (i) logging and mining; (ii) clearing of large areas of secondary forest for gardening; (iii) population increase; and (iv) fungus that kill forest trees. The most frequently identified threat is logging and mining followed by forest clearance for gardening. Although the resident population in East Rennell is comparatively small to other rural Solomon Island communities, participants perceived that the threat from population increase could potentially surpass threats from logging and mining with more pressure on the land and forest areas for food gardens. The practice of shifting cultivation in secondary forest areas could lead to a loss in forest areas to grassland, which would hardly support food gardens.



FIGURE 3: DEFORESTATION DUE TO LOGGING ACTIVITIES NEAR THE BORDER IN EAST RENNELL



FIGURE 4: A/B ARE AREAS OF SECONDARY FOREST CLEARANCE FOR CROP CULTIVATION

3.2.3 Ecosystem service benefits lost in the las 10 years

The FGD groups identified that in the last 10 years the tree species called the ‘giligi’ tree has been lost. The giligi tree bear edible fruits, that is food for people particularly children. These trees are also habitats for other living animals in the forest area. Participants’ in the FGD’s claimed that the ‘giligi’ tree was lost due to fungal attack. The loss in tree species means loss in provisioning, regulating and supporting and cultural services have been lost subsequently. Also, the participants identified that trees used for making canoes have been lost. The loss in these type of trees directly affected community culinary and the practice of making canoe and potentially the art of transferring knowledge and skills from elders to the younger generation in the practice of making canoes. These losses suggests that older men and young men indirectly loss a medium of connecting to the environment and ecosystem through the cultural lens. It is possible that the loss in ecosystem services ultimately is a loss in cultural practice in the long term. This suggests a potential deterioration in cultural connection within the terrestrial forest ecosystem. This is a concern that requires attention of community leaders. Recognising that the relationship between people, land and culture closely intertwined, the loss of a

cornerstone tree species could potentially trigger significant ramifications for the forest landscape, cultural rituals and practices of people in East Rennell in the long term.

3.2.4 Management opportunities to address ongoing threats

The threats identified for terrestrial forest ecosystem are both direct and indirect. It requires specific species management and broader ecosystem management for vegetation type. Current level of capacity is low. The PA management committee presents an opportunity to increase capacity to respond to the threats with the support of the EREPA Project.

3.3 Lake

3.3.1 Description of the lake ecosystem and ecosystem services

Lake Tegano is a unique water body ecosystem, serving a significant sanctuary for large number of endemic species biodiversity. In 1998, the inscription of the Lake Tegano by UNESCO as a world heritage site recognised its conservation importance at a global level. Lake Tegano is the second largest raised atoll in the insular Pacific, covering 15,500 hectares. The surface of the lake is at sea level and the water body is brackish. Cliffs surrounded the lake and a number of small limestone islands in the water body with small patches of mangrove forest on the lake margin. The site is unspoilt but it prone to natural hazards such as cyclones.

Adding to the ecological significance of the ecosystem, it is also a source of protein for the communities of Hutuna, Tegano, Niupani and Tevaitahe. In the FGD, the participants identified that fish is a regular part of their diet, mostly *Tilapia mozambica* from the lake introduced by the government around 1957 as an additional source of protein. Other species that are part of the lake ecosystem include 'ura', hokai (iguana), vagiata (tilpia species), eel fish, and poghava (small blue fish), and coconut crab (akui). Most of these are food source for the people. Importantly, the participants recognised the intricate interaction between the living things in the lake, in maintaining the ecological community in the lake ecosystem. Women's FGD also identified other uses of the lake including bathing, washing, water for cooking and drinking. Other uses identified by youths included leisure activities such as canoeing, water games, swimming competitions. The community participants also recognised the aesthetic attributes of the natural ecosystem, its scenic, unique and historic attributes.



FIGURE 5: PARTICIPANTS INTERACTIVE SESSION ON DEFINING THE TERM ECOSYSTEMS



FIGURE 6: FEMALE PARTICIPANT FROM TEVAITAE COMMUNITY EXPLAINING THE TERM ECOSYSTEM

The beauty of the lake also attracts eco-tourism facilities that support entrepreneurship for local Renellese in the community. Although tourists arrival is sparse, there are three eco-tourism facilities operating on the lake (Teha Moana, Ever Green and Motumahi). These facilities create employment and services for visiotrs to the area.



FIGURE 7: VIEW FROM MOTUMAHI LODGE ON TO THE LAKE



FIGURE 8: (A) EVER GREEN LODGE; (B) TEHA MOANA LODGE

3.3.2 Key threats

Despite the environmental and ecological significance of the lake ecosystem, the lake and its surrounding ecosystem face key threats from encroaching logging and mining from Western Rennell, including threats from invasive species, climate change and sustainable land use practices to protect the unique biodiversity hotspot and cultural heritage in the Solomon Islands. However, it is observed that the people have taken pride in protecting and caring for the lake by ensuring that household waste including sanitation problems are considered around the protection of the lake for its use as possible drinking water. When using the lake via boats or canoe, one of the threats observed was the coastal erosion around the margins of the lake. This is due mainly to the strong wind actions that battered the surrounding lake environment on a daily basis and is affecting the communities along the lake.

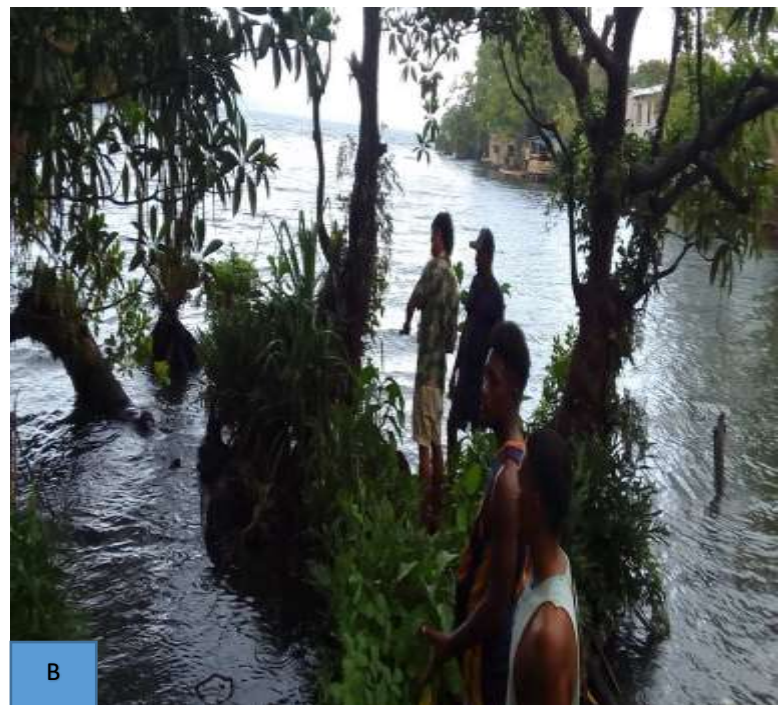


FIGURE 9: A/B COASTAL EROSION ON THE MARGINS OF LAKE TEGANO

Other indirect impacts on the lake ecosystem, particularly on the tilapia harvesting is related to the increased capacity of most households to harvest tilapia. The EREPA project socio-economic survey identified that most households have increased their access to productive assets in the last 10 years. Some of the key assets identified included access to boats and engine, deep freezers, and new nets. These assets increased the productivity of a household to earn income. However, they also increase the pressure on resource exploitation. These drivers

makes it imperative to manage the ecosystem in order to ensure the resource base is healthy, sustainable and does not succumb to any surprise shock, whether natural or anthropogenic.

3.3.4 Ecosystem service benefits lost in the last 10 years

The FGD groups identified the ‘vagiata’ fish known to locals’ as the original fish species in the lake was already lost due to the introduction of the Tilapia (Mozambique species) by the government. Men’s FGD have reported a decrease in the size of tilapia fish caught from the lake in recent years. Hence, some of the ecosystem services related to provisioning services from the lake ecosystem has been lost in the last 10 years. Loss in ecosystem services from the lake directly affected fishermen’s livelihood and wellbeing of the household in terms of household’s protein supply. Since the lake is the main source of stable protein for the communities, this analysis recommends avoiding further decline or loss in critical provisioning services from the lake using a multi-ecosystem based approach.

3.3.5 Opportunities to address ongoing threats

In 2014, the East Rennell World Heritage Site Management Committee developed a Management Plan but was never implemented. This plan carries an important vision and mission to ensure effective protection and conservation of the lake ecosystem. Under the EREPA Project this plan has been reviewed and revised by the community chiefs and elders and the Protected Areas Management Committee members to meet the requirements of the PA Act 2010. Whilst communities have so far been exemplary in their efforts in customary governance and management of the unique ecosystem, a broader more encompassing plan that involves the support of more stakeholders to tackle the complex socio-economic and ecological challenges in the lake is imperative. With support from the EREPA Project, the management plan will be finalised and implemented by the PA Management Committee arrangement.

3.4. Garden land

3.4.1 Description of cultivated land ecosystem and ecosystem services

Whilst East Rennell has land clad with rainforest, the island has only pockets of deep soil due to its coralline limestone nature, which is difficult to cultivate for food gardens. The FGD groups, especially women FGD’s identified garden areas and soil as important ecosystems. Garden land is important for crop cultivation for food, cash and sharing with extended family members. Traditional garden land provided most of the villagers’ subsistence food and cash crops. Often garden areas are cultivated for around nine months before being left to fallow for four years in most cases. Garden crops identified in the FGDs include cassava, sweet potato, yams, taro and pana, slippery cabbage, banana, paw-paw and coconuts, melon and fruit trees.



FIGURE 10: TARO PATCH AND MIX CROPS IN A GARDEN IN TEGANO COMMUNITY

3.4.2 Key threats

Several key threats were identified on garden land ecosystem, which are both direct and indirect in nature. Direct threats included the increasing trend in reduced fallow periods which inadvertently reduces the fertility of the soil and its long term ability to develop into deep soil pockets to support food gardens. Poor soil quality is a major threat that could be underestimated by community participants. Poor soil indirectly exacerbated the already reduced fallow periods, reinforcing these undesirable conditions on garden land ecosystems. With the type of soil system in Rennell which only has pockets of arable land, families tend to clear big areas of forest to cultivate and plant enough food variety for their families survival. Furthermore, the FGD identified that these issues are also further complicated by the presence of invasive pests and disease such as rat, beetles, African snails and fungal disease. In addition to these obvious threats, more subtle threats that are difficult to control, such as increase population, also adds to the already complex maze of threats that confront garden land ecosystems. Although not an immediate threat, in the long term, as the resident population gradually increases, the need for clearing more forest area for food gardens will subsequently increase. Ultimately, for families, their garden land that support food source for families are severely under pressure from compounding threats that needs well placed strategies to navigate the complex array of threats.



FIGURE 11: CASSAVA TUBER, BANANA AND CUT NUT FRUIT EATEN BY THE BLACK RAT



FIGURE 12: SOUR SOAP FRUIT, PAWPAW FRUIT AND COCONUT FRUIT EATEN BY THE BLACK RAT PEST

Another threat related to farmers limited competence and knowledge on soil management or crop management practices to manage gardens from pest and disease threats. From the picture below, farmers are not using any agriculture techniques to help with the growth of crop management, in this case the melon plant. In the picture below the melon plant which has started fruiting could improve productivity with basic agriculture techniques and pest and disease management skills.



FIGURE 13: WATER MELON FRUIT STRUGGLING TO GROW IN THE GARDEN

3.4.4 Benefits lost in the last 10 years

In the last 10 years communities have noticed loss in soil fertility. Coupled with persistent plant disease and pest attacks, some food crops such as tago hahine, tago sua and taro have been lost by farmers. Loss in garden land productivity and soil fertility is a serious ecosystem problem for households food security and socio-economic wellbeing. The EREPA socio-economic study in 2024 showed that most households have reduced the number of gardens they owned over time. Only few households have multiple food gardens. Women identify garden land as a key ecosystem and ecosystem service. Although all groups identified that all people (men, women, youths, elders) will be affected as a result of a poor state of the ecosystem, women will have felt the effect more than the rest due to the shift in their relationship to the land, the garden and connection to the ecosystem. Women spent more time in the garden than in any of the other forms of ecosystem.

3.4.5 Opportunities to address key threats

BirdLife International with the support from Kiwa has devoted resources to control the black rats using bait stations. Preliminary results are very promising with signs that black rats are being pushed back and crop yields are improving. Multi-stakeholder actors are collaborating with local rangers who are eager to learn and make a difference. A monitoring plan will enable rangers to monitor threats to the fauna and values using indicatr endemic bird species, snails and seabirds. The project team is working with local implementing partners such as the MECDM, the UNESCO National Commission and Live & Learn Solomon Islands to manage logistics in order to effectively deliver on project outcomes.

3.5 Lowland swamps

3.5.1 Description of swamp-land ecosystem and ecosystem services

Lowland swamps are located around groundwater lens and the soil is saturated with water and dominated by water tolerant plants, vegetation, bushes and trees. Swamps are distinctly valued

by women in the FGD's as an important ecosystem to ferns, swamp taros, bushes, swamp trees. Most of the FGD groups considered taro as a staple crop and the tago or taro leaf is an important cultural culinary. Swamp taro which is one of the most important staple food crops for the communities has not been growing well due to brackish water intrusion from the lake. Taro tuber and the leaves are sources of food. Taro leaf culinary is traditional and reflects the connection between people, land and culture. Taro leaves are eaten in special occasions including events such as workshops where local food is prepared. Also, the swamp land ecosystem also acts like a reservoir to absorb excess water and reduce flooding into the lake and effects of flooding into the lake. In this way, swamps protect the lake ecosystem from storm surges that can wash away soil run-offs.

3.5.2 Key threats

The available land for growing crops was decreasing, and villagers were losing some traditional ways of farming that used to work well. The rise in the brackish water level of the lake also raised the level of waterlogged swamps and in some cases the swamp taros are immersed in water for longer period of time that it smoothers the taro plants. In such situation, participants identified that they lost their taro patches. Climate change also affected the swamp land especially during disaster times when waterlogged areas are prolonged and food sources are damaged or disease stricken after a prolonged wet weather periods and cyclone events.



FIGURE 14: SWAMP TAROS AFFECTED BY INUNDATION OF BRACKISH WATER IN SWAMP AREAS

3.5.3 Ecosystem service benefits lost in the las 10 years

Some of the participants identified that taro species are less resilient to difficult waterlogged areas and some species have been lost over the years. The loss of a staple crop such as taro

indirectly affected aspects of culture in terms of culinary, food security and traditional food systems.

3.5.4 Opportunities to address ongoing threats

Opportunities to manage the key threats that impacted the swamp land ecosystem can be sought through the livelihood component of the EREPA Project. Also, the work of BirdLife International has introduced vegetable gardens to address the challenges related to climate change. These project interventions should be further supported at the household level. Kastom Gaden Association (KGA) and Ministry of Agriculture and Livestock (MAL) should be consulted to provide advice to support livelihood intervention for agriculture-based or land-based livelihoods.

3.6 Plantation land

3.6.1 Description of plantation land ecosystem and ecosystem services

Cultivated plantation land comprised of coconuts, pandanus and sago palms. Cultivated plantation land is an important ecosystem. Plantations can cover large areas of land and sometimes used for planting single species of plants such as coconuts. Plantation land also identified by women as important for growing pandanus trees, which are important for women weavers who weave fans, purses and other crafts to sale for income. The plantations such as coconut plantations are habitats for coconut crabs. Coconut crabs fetch income for households and also food for non-SDA families. Coconut trees are very important trees for drinking, eating, cooking milk, making crafts and also household brooms, mats and make thatch roofs of houses in community.

3.6.2 Key threats

Coconuts growing in garden areas are prone to being cut down for land clearance for gardens. During storms and cyclones, tall coconut trees are vulnerable to strong winds. As human population increases, the demand for coconut fruits for drinking also increased due to lack of freshwater streams that can be used for drinking. Pandanus trees also have medicinal properties. Many of the female participants did not see any threats from the current rate of use of pandanus trees for weaving mats, baskets, fans, purses for sale. The participants also identified that coconut crabs are severely overharvested due to high demand from workers from the logging camps who pay high prices for coconut crabs.



FIGURE 15: A FUNGUS INFECTED PALM TREE

3.6.3 Ecosystem benefits lost in the last 10 years

For cultivated plantation land, the participants did not identify any ecosystem service benefit loss in the last 10 years. It suggests that although the black rat had a devastating impact on most crops, fruits, and nuts, the actual plants are not damaged, only the edible fruits.

3.6.4 Opportunities to address ongoing threats

The BirdLife International's work to control the black rats is an important opportunity to address the invasive species and inform biosecurity laws on pest and disease control for rural communities. The involvement of local rangers for educating, informing and monitoring of the research work is critical for addressing the threats.

3.7 Mangrove forest

3.7.1 Description of mangrove ecosystem and ecosystem services

Mangroves provided food and building material and natural protection to strong wind for communities along the lake. Mangroves forest is small compared to other parts of Solomon Islands. However, it is identified as an important ecosystem by communities due to its natural protection against strong winds that is experienced by lake dwellers. Although mangrove fruits provided for delicious meal, it is not a staple for families and is only eaten during gatherings or events. White and Red mangrove species were found in East Rennell.. Mangrove species has strong root system and important nursery areas with roots able to breath underwater and can tolerate high salinity.

3.7.2 Key threats

The development of eco-tourism facilities may lead to reclamation of mangrove forests. However, the current level of development in eco-tourism showed eco-tourism efforts integrated the development of facilities in much less destruction of the natural environment. For example, the Motumahi and Evergreen lodges are built with nature, embracing the greenery and the mangrove ecosystems giving a close to nature appeal to the facilities. Mngroves also used for firewood and building materials.



FIGURE 16: MANGROVE PATCH NEAR EVER GREEN LODGE IN LAKE TEGANO

3.7.3 Ecosystem benefits lost in the las 10 years

The FGD has not identified any major loss related to the mangrove forest ecosystem in East Rennell. Participants perceived mangroves forest to be in a good and healthy state.



FIGURE 17: HOUSE OVER STILTS BUILT FROM MANGROVE WOOD

3.7.4 Opportunities to address key threats

Opportunities to continue to raise the importance of mangroves as natural barriers to strong wind and eco-tourism attraction has been in the way the local people value and understand the importance of mangroves. The role of mangrove ecosystems can be further enhanced by ensuring future generations continue to learn traditional knowledge, values and practices related to mangrove use, management and protection to uphold these values into the future.

3.8 Coral reefs

3.8.1 Description of coral reefs ecosystem and ecosystem services

East Rennell communities have accessed the coral reef ecosystems to harvest clams, turtles and sharks. A few take crayfish, dolphin, octopus, coconut crabs and a species of seaweed. Coral reef ecosystems are accessible but they are not frequented due to the distance that people have to walk to reach the coast. The men's FGD identified coral reef ecosystems as important but not the women who are restricted due to the distance. The male participants identified mainly fish and trochus shells as the main resources that they harvested on reefs.



FIGURE 18: FISHERMEN ON THE REEF

3.8.2 Key threats

The main threats identified by men in the FGDs were over-harvesting and climate change impacts. Overharvesting is an issue because of the open access to the reefs and no management rules in place. The coral reef ecosystems are located away from the community and faces a different challenge of remoteness but it is still subjected to over-harvesting due to improved gears and increase in number of people in households and demand for more protein. In the context that coral reef ecosystems are over-exploited, it will increase the pressure on the lake ecosystem for protein harvest and subsequently increase the pressure to increase harvest time and quantity in the lake in the future. This trend over time may further impact on the sustainable harvest of tilapia in the lake. The need to sustainably manage these ecosystems appears important in the next 10 years. Ensuring that multiple sources of protein supply are healthy is a resilient practice that serves the communities well into the future.

3.8.3 Ecosystem benefits lost in the last 10 years

Although participants have identified over-harvesting as an issue, they have not named or identified any specific loss to the resources they frequently collected, gathered or harvested on the reefs in the last 10 years. It can be inferred that the pressure on resources have increased in the last decade. This pressure should be managed to alleviate resource depletion in the coral reef ecosystem, particularly given the natural increase in population in the future coupled with the increasing threats from a warming ocean.

3.8.4 Opportunities to address key threats

Coral reef ecosystems are important sources of protein supply for households and cash income. However, coral reefs do not appear to be a priority ecosystem service based on the perspectives of communities. The opportunities to address threats associated with climate change and resource management may require partnership with Ministry of Fisheries and Marine Resources (MFMR).

4. Summary synthesis

The FGDs identified seven types of ecosystems, namely; terrestrial forest, lake, garden land, plantation land, mangrove forest and coral reefs. These ecosystems provided important ecosystem services from provisioning, cultural, regulating, and supporting services. Table 6 provided the summary of the participants' perception of the ecosystem health for each of the seven ecosystems identified. The terrestrial forest and garden land ecosystems were ranked as 'Not Good'. Plantation land ecosystem and swamp land ecosystems were ranked as 'Not quite Good'. The lake and coral reef ecosystem were ranked as 'Fairly Good', whilst the mangrove ecosystem was ranked as 'Mostly Good'. None of the seven ecosystems were ranked as 'Highly Good'. Based on this assessment, terrestrial forest ecosystems and garden land ecosystems are in an undesirable ecosystem health status and needed management intervention. Most participants depended on terrestrial and garden land ecosystems for food, shelter, medicine, making crafts, firewood and building materials amongst others. People utilised these ecosystem services almost on a daily basis. This suggested that people have a high level of dependence on multiple ecosystem services. The tendency to exploit multiple types of ecosystems on a daily basis implies that the management of ecosystem health requires a multi-ecosystem based approach.

TABLE 6: SUMMARY OF PERCEIVED HEALTH STATUS OF KEY ECOSYSTEMS IN EAST RENNELL

Type of ecosystem	Health status indicators	Perceived health status
Terrestrial forest	<ul style="list-style-type: none"> • High number of complex sets of threats identified to affect the ecosystem conditions; • Tree species lost in the last 10 years was identified by more user groups; • Men, women and youths cross-referenced same “major threats” in their presentations; • Threats on terrestrial ecosystem also affecting garden land ecosystem and plantation ecosystems • Limited capacity at local scale to address complex threats 	<i>Not Good</i>
Garden land	<ul style="list-style-type: none"> • High number of complex threats including soil fertility; reduce fallow period; poor agriculture practice; pest and disease prevalent; high population;; • Loss of soil fertility in the last 10 years • Men, women and youths cross-referenced same complex threats in their presentations • Threats on garden land ecosystems also affected plantation land and terrestrial forest ecosystems • Limited capacity at local, provincial and national level to address complex threats 	<i>Not Good</i>
Lake	<ul style="list-style-type: none"> • Only two main threats identified (climate change, reduction in tilapia size) compared to other ecosystems; • Only species of fish lost in the lake (vagiata); • Lake ecosystem is connected to the coral reefs ecosystem as sources of protein for the communities. Currently both ecosystems are fairly good. • Strong capacity at local and global scale but weak at national and provincial scale 	Fairly Good
Plantation land	<ul style="list-style-type: none"> • Serious fungal attack on plantation trees; invasive black rat damage of coconut fruits; • Loss of coconut tree fruits due to invasive species; • Threats from terrestrial forest and garden land ecosystem on plantation land • Capacity is limited to local scale 	Not quite Good
Swamp land	<ul style="list-style-type: none"> • Some complex issues such as waterlogged areas during heavy rainfalls, • Loss of taro species due to prolonged waterlogged areas; • Threats from the lake (climate change) may likely affect swamp lands • Capacity is limited to local scale 	Not quite Good
Mangrove forest	<ul style="list-style-type: none"> • Only one form of major threat identified compared to other ecosystems (i.e. coastal erosion) • No loss of species identified for the ecosystem • Limited impact from other ecosystems • Strong capacity at local scale for management of mangroves 	Mostly Good
Coral reef	<ul style="list-style-type: none"> • Only two main threats identified (climate change, population increase) compared to other ecosystems; • No species loss identified for the coral reefs; • Population increase was identified as a major threat in the long-term • Limited capacity at local, provincial, national scale for managing the coral reefs 	Fairly Good

Garden land ecosystems and terrestrial forest ecosystems health status suffered due to multiple threats and required remedial intervention. For garden land ecosystems, this included reduced fallow period, poor agricultural practices, clearing of large forest areas for crop cultivation, poor soil fertility, pressure on land use due to resident population increase, invasive species, spread of fungal disease on other ecosystems such as terrestrial forest and plantation land. The compounding effect of threats further exacerbated due to physical ecosystem connectivity. Building resilience by encouraging families to have multiple garden, as in the past, may not be possible due to the myriad of threats. Consequently, families reduced the number of gardens they own, therefore implicating their household wellbeing, due to this complex web of threats. To address this, intervention strategies must encourage multi-scalar capacity development, and consider multi-ecosystem approach and these approaches be adaptive.

The lake ecosystem was unique and deeply valued as participants easily identified all four categories of ecosystem services – provisioning, regulating, supporting and cultural services, and ranked as ‘Fairly Good’ in terms of its health status. The lake ecosystem connects to other ecosystems, such as coral reefs with ‘Fairly Good’ health status and mangrove forests with ‘Mostly Good’ health status. Using multi-ecosystem approach, interventions that alleviate the pressure on the lake ecosystem and maintain its overall health is imperative.

The assessment found high gendered ecosystems utilisation. Women predominantly used the swamp-land, garden land and lake ecosystem whilst men and youths (mostly male) used terrestrial forests, coral reefs, mangrove, and plantation land. As established in this assessment, the most affected ecosystems are highly gendered – the garden land ecosystem and terrestrial forest ecosystems. The distinct gendered nature of ecosystem utility suggest that ecosystem management intervention must consider gender sensitive management approaches.

To put this synthesis in the wider context of the province, the analysis revealed that the capacity for the province to support community-based farming livelihoods is weak and needs major reform and development of necessary infrastructure if it desires to improve service delivery to communities. A transformative whole of province development intervention is imperative. This requires genuine collaboration between multiple stakeholders. The strengthening of management of terrestrial forest and garden land ecosystems to avoid descending further into undesirable state of health for these ecosystems, is a priority. For this purpose, household level of intervention, using the notion of a second garden plot, collectively managed, run by youths in the community for a small fee, may hold potential to navigate the multiple threats confronting garden land ecosystems and terrestrial forest ecosystems.

5. Next steps

Based on these insights, a panel of technical officers from the ECD, MAL, and MOFR and PMU will convene an internal meeting to devise an intervention plan for the community based on ecosystem service-based approach to livelihood strengthening. The draft intervention plan will form the baseline document for prioritisation of community livelihood intervention. The prioritisation process will focus on strength-based scenarios, whereby communities play essential agency role in the approach to ensure high level of maintenance of ecosystem services. Focusing on community agency means mainstreaming of community capacity and strengths as essential to the planning process. The intervention aims to centralise the support system for households and communities to avoid falling into an undesirable state of ecosystem services. Once a community falls below the desirable level into an undesirable state, it is more costly to recover, than to avoid the fall in the first place. Invest in an avoidance strategy and not a recovery or revitalisation strategy. A capacity development plan to support an avoidance strategy ought to be in place.

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