Ecosystem and Socioeconomic Vulnerability and Opportunity Assessment for the Navua catchment and Beqa lagoon 2024

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This report is part of a series of studies and discussions and consultations with the people of Fiji who live within the Navua catchment and Beqa lagoon. The work culminated in the development of an Integrated Ecosystem Management Plan for the Navua catchment and Beqa lagoon and is testament to the commitment of these communities to prosper sustainably and in harmony with their natural ecosystems. We thank and acknowledge all the communities within the catchment and lagoon who supported the development of the plan. The Government of Fiji supported the development of this plan through input and review from several government agencies including the three provincial governments and various line ministries.

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Acronyms

EbA	Ecosystem-based Adaptation
ESV	Ecosystem and Socioeconomic Vulnerability
ESVOA	Ecosystem and Socioeconomic Vulnerability and Opportunity Assessment
GEDSI	Gender, Equity, Disability and Social Inclusion
GSI	Gender and Social Inclusion
IEMP	Integrated Ecosystem Management Plan
MPA	Marine Protected Area
PEUMP	Pacific-European Union Marine Partnership
SOGIESC	Sexual orientation, gender identity and gender expression, and sex characteristics
SPREP	Secretariat of the Pacific Regional Environment Programme

1 Introduction

1.1 The project

The Pacific-European Union Marine Partnership (PEUMP) Programme promotes sustainable management and sound ocean governance for food security and economic growth, while addressing climate change resilience and conservation of marine biodiversity. It follows a comprehensive approach, integrating issues related to oceanic fisheries, coastal fisheries, community development, marine conservation and capacity building under one single regional action. The PEUMP is built around six Key Result Areas (KRA).

Designed to meet KRA 5 of the PEUMP, the By-catch and Integrated Ecosystem Management (BIEM) Initiative is led by the Secretariat of the Pacific Regional Environment Programme (SPREP) to support Pacific countries deliver their priorities to halt the decline of protected marine species, strengthen the sustainable management of their coastal and marine ecosystems and support poverty reduction. The objective of the BIEM Initiative is "*to reduce the by-catch of threatened species in Pacific islands' fisheries and to improve the health of coastal ecosystems through an integrated approach to coastal management and ecosystem-based adaptation to climate change".*

The current project underpins KRA 5.2 and 5.3 of the BIEM, which focus on supporting adoption of integrated ridge to reef ecosystem management and climate change adaptation. To support these KRAs the project seeks to address the economic, social and environmental challenges of the Navua catchment and Beqa lagoon by halting the decline of biodiversity and strengthening the sustainable management of the coastal and marine ecosystems through an integrated ridge-to-reef management approach.

Specifically, this project aims to:

"Address these challenges by developing and implementing a gender, social inclusion and human rights sensitive integrated ecosystem management (IEM) plan for Navua catchment and Beqa lagoon area, Central Division that identifies realistic activities to increase the natural adaptive capacity of coastal habitats to promote human health and poverty reduction, support sustainable livelihoods and contribute to the delivery of Fiji's conservation priorities."

Drawing from the project brief, the objectives of the project include:

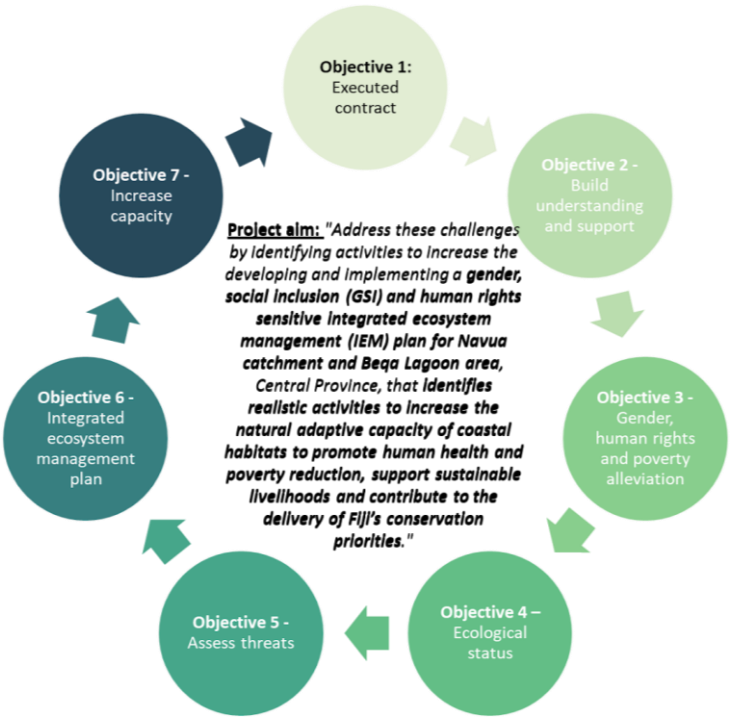
Objective 1 – Fully executed contract that delivers objectives and associated outputs to time and quality.

Objective 2 – Build understanding and support for the Navua catchment and Beqa lagoon area ridge to reef initiative amongst communities and stakeholders.

Objective 3 – Put gender, human rights and poverty alleviation considerations at the heart of the planning and implementation of activities.

Objective 4 – Map and assess the ecological status of the selected coastal area and associated catchments that coastal communities depend upon for their livelihoods.

Objective 5 – Assess the threats to ecosystems, livelihoods and human health as a result of current/planned resource use and the expected impacts of climate change and identify opportunities to address them. In doing so, identify key users of selected



coastal areas and associated catchments by gender, age, disability, ethnicity and socioeconomic status. Apply a GSI lens when identifying threats and risks as well as opportunities for best adaptation.

Objective 6 – Develop and secure endorsement of a widely supported integrated ecosystem management plan for the Navua catchment and Beqa lagoon area that identifies realistic activities to increase the natural adaptive capacity of coastal habitats to promote human health and poverty reduction, support sustainable livelihoods and contribute to the delivery of Fiji's conservation priorities.

Objective 7 – Work with and increase the capacity of women, men and the youth in coastal communities, Government authorities and partners to actively manage natural resources. Identify appropriate capacity building activities carefully with regards to existing power dynamics and gender roles as to meet the 'do no harm' minimum standard. Capacity building opportunities should allow, however, for empowerment and agency enhancement such as building confidence through knowledge and training or support inclusive decision making.

1.2 The study area

The Navua River and Beqa lagoon in Fiji are vital resources for the 15,000 people living in the catchment. The river provides water for agriculture, transportation, and tourism activities like rafting. The Beqa lagoon, a large, enclosed bay protected by a reef, is a rich ecosystem with cultural significance and supports fishing and tourism. However, these resources are threatened by activities such as land degradation from logging and overfishing in the lagoon. Climate change is expected to worsen flooding and erosion, harming the environment and people's livelihoods. Women and people with disabilities are especially vulnerable due to limited access to resources and decision making.

1.3 Purpose of this report

The purpose of this report is to outline the Environmental and Socioeconomic Vulnerability and Opportunity Assessment (ESVOA). Building on the rapid biological assessment (BIORAP), Ecosystem and Socioeconomic Resilience Analysis and Mapping (ESRAM) and Ecosystem based Adaptation (EbA) options analysis, the ESVOA demonstrates the full logic of each of the priority EbA options. This includes providing an understanding of how the key environmental and socioeconomic risks and vulnerabilities provide opportunities, the key benefits of those opportunities, and the beneficiaries to which they accrue. The ESVOA builds on the previous work providing the basis for investment in further developing these projects in the future and for their consideration in the Integrated Ecosystem Management Plan.

2 ESVOA framework

The broad ESVOA framework is presented in Figure 1. It outlines the high-level logic for investment in EbA options, where EbA options should address key risks and vulnerabilities to provide benefits to the desired stakeholders.

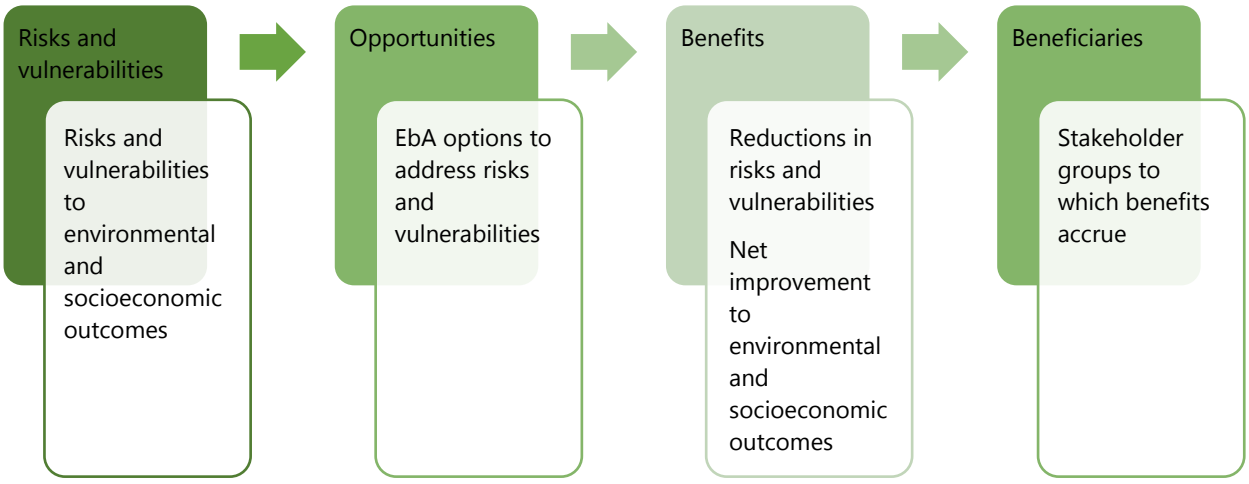


Figure 1. ESVOA framework

3 Priority EbA options

3.1 Reforestation/revegetation

3.1.1 Description

The EbA options assessment (presented in the EbA options report) revealed three options related to reforestation or revegetation activities as high priorities for the study area. Table 1 presents a description of each including indicative locations for implementation.

Table 1. Reforestation/revegetation options

Option	Description	Indicative location/s
Native reforestation of harvested forestry areas	Multi-species (native) reforestation of cleared land to promote biodiversity, reduce soil erosion and enhance ecosystem resilience. Project could link to the 30 million trees programme and initiate native species nurseries or enhance existing nursery operations (e.g. focussed on traditional plant species – gasau, dawa, ivi, Moli), providing opportunities for community development and capacity building. Historical practices of maintaining reserves for regeneration of land and food security as part of forestry leases could be reinstated.	Highland communities and other harvested areas (e.g. upstream of Latianara and Korovisilou communities)
Revegetation of long-term fallow areas	Revegetation of cleared areas to support biodiversity and enhance ecosystem resilience. Natural recovery of these areas usually has a weedy stage before secondary forest, so this represents an opportunity to establish forests and reduce weed spread. this could also be integrated with ecotourism and community groups for economic diversification and the support of livelihoods.	Long-term fallow agricultural land and suitable buffer zones.
Riverbank stabilisation using vegetation and bioengineering	Targeted works to address riverbank erosion using vegetation and bioengineering measures. This could be linked with the establishment of buffer zones to maximise chances of success. With increasing risks of extreme events, it becomes crucial to undertake these works, particularly drawing on traditional practices and long-lived species.	Intersection between lowland areas and floodplain transition areas, particularly around gravel extraction.

3.1.2 Option logic

Figure 2 presents the logic for investment in reforestation/revegetation activities.

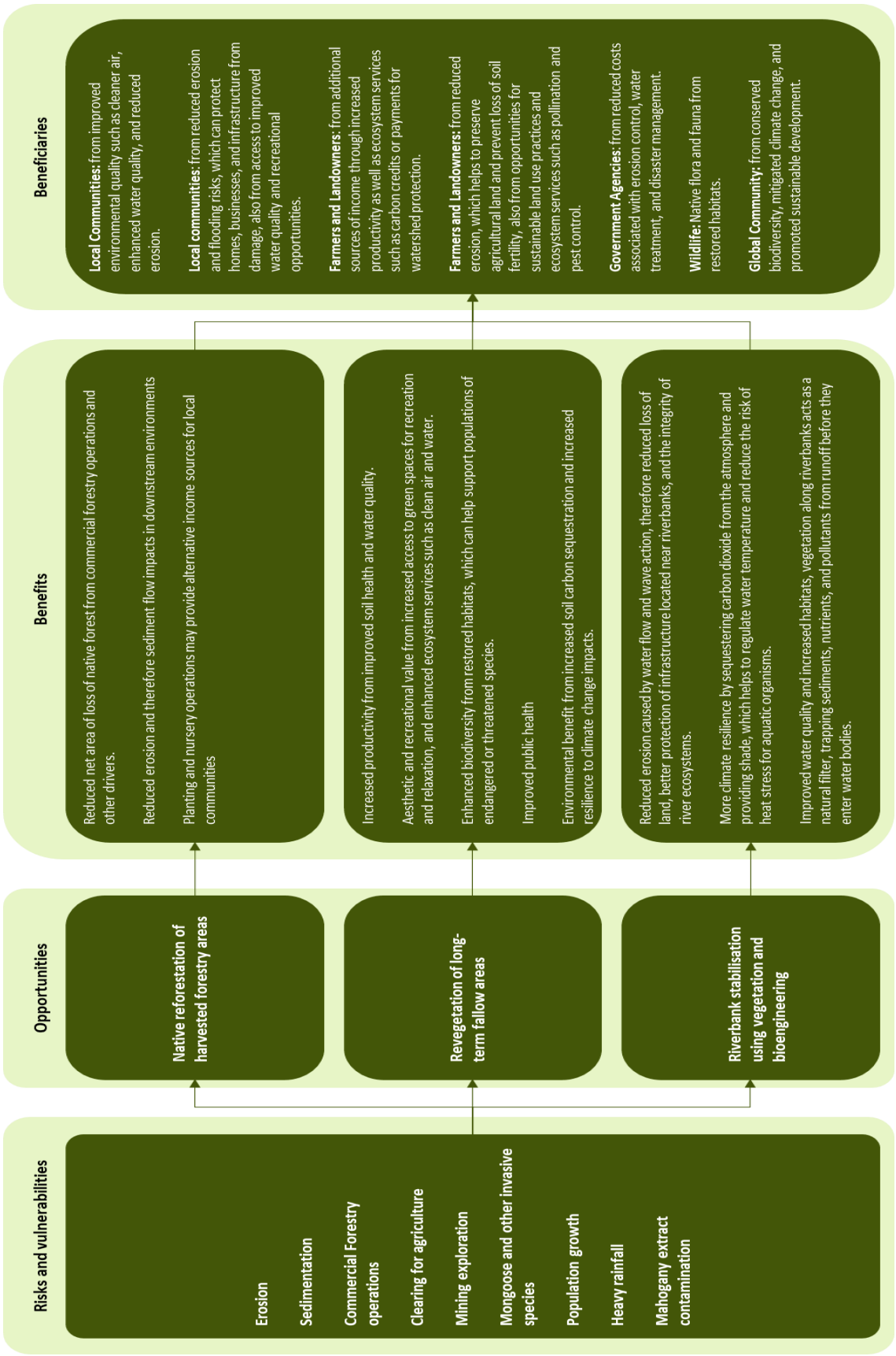


Figure 2. Logic for investment in reforestation/revegetation activities

3.1.3 Economic implications

The economic implications refer to the costs and benefits associated with EbA options. Table 2 presents a summary of the key costs and benefits associated with the reforestation/revegetation activities, with indicative unit rates included where possible based on publicly available information (De Groot et al. 2012, Gonzalez et al. 2015) or previous estimates in Integrated Village Development plans. Ecosystem services valuation (ESV) such as this gives an indication of the cost of replacing services if they are lost.

Table 2. Costs and benefits of reforestation/revegetation activities (2023 FJD)

Option	Costs*	Benefits

Native reforestation of harvested forestry areas	• Planting costs ($550/ha)
	• Ongoing monitoring and maintenance costs
	• Optional community based training for native forest expansion techniques ($11,000 per community)
	• Optional community run seed stock collection of native species ($7,000 per community)
	• Land/opportunity cost
		• ESV of native forest areas ($18,000/ha), including:
		  ○ Food ($680/ha)
		  ○ Medicinal resources ($5,130/ha)
		  ○ Regulating services ($8,600/ha)
		  ○ Cultural services ($3,000/ha)
		• Marginal ESV change of downstream habitats due to reduced sediment loads (e.g. coral reefs)

Revegetation of long-term fallow areas	• Planting costs ($550/ha)
	• Ongoing monitoring and maintenance costs
	• Land/opportunity cost
		• ESV of native forest areas ($18,000/ha), including:
		  ○ Food ($680/ha)
		  ○ Medicinal resources ($5,130/ha)
		  ○ Regulating services ($8,600/ha)
		  ○ Cultural services ($3,000/ha)
		• Marginal ESV change of downstream habitats due to reduced sediment loads (e.g. coral reefs)

Riverbank stabilisation using vegetation and bioengineering	• Stabilisation using vetiver grass ($12,000/km)
	• Ongoing monitoring and maintenance costs
	• Land/opportunity cost
		• ESV of native forest areas ($18,000/ha), including:
		  ○ Food ($680/ha)
		  ○ Medicinal resources ($5,130/ha)
		  ○ Regulating services ($8,600/ha)
		  ○ Cultural services ($3,000/ha)
		• Marginal ESV change of downstream habitats due to reduced sediment loads (e.g. coral reefs)

*Note: The Pacific EbA Tool provides an indication of key cost components for a variety of EbA options. (https://ebatool.pacificclimatechange.net/)

3.1.4 Key social issues

Social considerations in implementing each of the above EbA options are discussed here. While these may represent historical and current challenges, they also represent opportunities to do things better with future projects.

NATIVE REFORESTATION OF HARVESTED FORESTRY AREAS

Decisions about land use, conservation and reforestation of harvested forests can perpetuate inequalities and reinforce gender biases, hindering sustainability of efforts. Decision making and land tenure ownership have traditionally been male dominated, reinforced by governance structures that favour men. Efforts to address these issues should prioritise inclusivity and equity, ensuring that all community members have a voice in decision making processes related to land management and reforestation initiatives. Empowering marginalised groups, specifically, women, persons with disability, people with diverse sexual orientation, gender identity, gender expression and sex characteristics (SOGIESC) and youth, to participate in these processes can lead to more holistic and effective solutions that benefit both people and the environment.

Shifting clan dynamics and favouritism can undermine the goals of reforestation and conservation efforts, leading to inefficiencies and inequitable distribution of resources. Addressing these challenges requires a multi-faceted approach, which can be achieved by promoting transparency, accountability in nursery management, mitigating favouritism and ensuring resources and their benefits are allocated fairly. Establishing clear guidelines and procedures for nursery operations (at communal level) by the Department of Forestry, as well as mechanisms for monitoring and oversight, mitigates misuse of power and promotes more equitable outcomes. Additionally, efforts to empower women, people with disability, women and men in all their diversities and youth (marginalised groups) within clans, ensure their voices are heard in decision making processes in relation to nursery management. Strengthened capacity-building opportunities can enable these groups to actively participate in and contribute to reforestation initiatives, fostering more inclusive and sustainable outcomes. Collaborative efforts involving various stakeholders, including community members, local authorities, and conservation organisations, human rights-based organisations and disabled people's organisations are essential for addressing these issues effectively. By working together to promote fairness, transparency and inclusivity in nursery management, communities can enhance their capacity to restore and sustainably manage native forests for the benefit of all.

REVEGETATION OF LONG-TERM FALLOW AREAS

By integrating reforestation efforts with ecotourism and community development initiatives, communities can create diversified and resilient economies while also promoting environmental conservation and cultural heritage preservation. Integrating ecotourism and community groups can offer numerous benefits and barriers, in terms of economic diversification and support for local livelihoods. Ecotourism initiatives focus on the importance of native forests and highlight reforestation efforts. Initiatives could include guided tours of restoration sites, birdwatching tours, or cultural experiences that incorporate traditional ecological knowledge that solely benefit land owning units (power and authority dynamic) and clan land/boundaries owners. Such opportunities can intensify gender bias, gender-based violence and inequalities within the space of economic diversification.

Skills development and awareness, capacity building programmes on ecotourism-related skills such as hospitality, guiding, and sustainable resource management offered to community members may be biased towards individuals that have basic literacy and numeracy skills leaving out marginalised groups within the community. Therefore, any capacity building activities should consider these needs and potentially be supported by training in literacy and numeracy skills. Inclusive capacity building programmes empower marginalised members to participate and benefit from ecotourism initiatives and foster a sense of ownership and stewardship of the natural resources. Integrating the use of ecotourism platforms for environmental education (Duavata Initiative, Provincial and District Council Natural Resource Committee) and awareness initiatives for visitors and local community members highlight importance of native species, restoration efforts and role of traditional ecological knowledge in sustainable natural resource management. For educational platforms/mediums aiming to share knowledge in the local language/dialect, information needs to be available in an accessible format especially where network connectivity is a constraint.

Integrating traditional ecological knowledge into ecotourism can highlight indigenous practices for natural resource management, medicinal plant use, and sustainable agriculture. Traditional ecological knowledge is gendered, with both women and men holding knowledge based on their gendered roles related to the access and use of natural resources and environmental spaces. Hence, preserving traditional knowledge systems fosters intergenerational learning by transferring these skills to the younger generation as well as women (from the community or married into a local community) as they are often the greatest knowledge bearers in a community. While promoting traditional practices caution must be taken to ensure that traditional gender biases are not reinstated.

RIVERBANK STABILISATION USING VEGETATION AND BIOENGINEERING

The onset of riverbank stabilisation (vegetation and bioengineering) presents the following challenges and/or barriers.

Women's roles as water managers and caregivers are central to many communities, and alterations to river ecosystems can significantly impact their daily lives and livelihoods. For women, disruptions to activities like fishing, gleaning for freshwater resources, or farming can have profound effects on their ability to provide for their families and manage household responsibilities. Additionally, increased workload may result from the need to adapt to new conditions or find alternative sources of income or water. Similarly, youth engage in various activities along riverbanks that contribute to their economic well-being and community development. Any changes to these activities due to bioengineering projects can affect their opportunities for income generation, recreation and personal growth. Additionally, youth face challenges if their traditional activities are disrupted or if new opportunities do not arise from the bioengineering projects. Loss of income, decreased access to recreational spaces, and limited educational opportunities could all hinder their overall well-being and development. Therefore, restoration activities should be implemented in a way that does not detract from these activities but could enhance them.

For people with disability, changes to riverbanks and ecosystems can present unique challenges related to accessibility and adaptation. Infrastructure modifications and alterations to vegetation may mean that people can no longer rely on traditional ecological knowledge. For people with disability this could make it more difficult to navigate and utilise their surroundings effectively for livelihood and food security needs. Mobility limitations could be exacerbated and increase barriers for people with disability in accessing resources and opportunities where communities need to travel further inland due to changes in soil fertility or other environmental factors brought on by bioengineering projects. Similarly, women and men in all their diversities in communities may experience heightened social and economic vulnerabilities because of changes to their environment. Food security and livelihood activities are heavily impacted by alterations to riverbanks, escalating economic hardships and struggle to maintain their way of life. Furthermore, any displacement or disruption caused by these projects could amplify existing social stigma and discrimination faced in these communities, making it even more challenging for them to access support and resources.

3.1.5 Other challenges or barriers

While these opportunities offer promising solutions for the study area, implementing these strategies faces several other challenges:

- One consideration is land tenure. In the study area, customary land ownership is widespread. Obtaining community consensus and navigating traditional leadership structures can be complex and time-consuming for reforestation or revegetation projects; however, this can also be a strength. When the decisions are made by the mataqali, they are locally owned and there is serious commitment to implementation (unlike when decisions are made externally, quickly, and then imposed on an unwilling or unconvinced community).
- Another challenge is resource availability. Local access to native plant materials for planting may be limited, requiring transportation from further afield. Similarly, bioengineering techniques for riverbank stabilisation might necessitate specific materials not readily available, increasing costs.
- Ongoing maintenance is crucial for EbA success. Reforestation projects require weeding, pest control, and fire management, especially in the early stages; riverbank vegetation needs monitoring and

potential reinforcement after floods. A lack of a dedicated workforce or funding for such maintenance can hinder long-term effectiveness.

- Limited equipment can also be a barrier. Large-scale planting efforts may benefit from mechanical assistance, but access to machinery in rural areas can be restricted. Revegetation and riverbank bioengineering might also require specialised tools that may not be readily available.
- The time to full establishment of EbA projects presents another challenge. Benefits like erosion control or flood mitigation from reforestation or revegetation take years to materialise. Communities may be reluctant to invest in projects with delayed returns, especially when faced with pressing needs.
- Establishment risk from storms or cyclones is a concern. Newly planted trees or riverbank vegetation are vulnerable to damage from extreme weather events. Careful planning and selection of species suited to local climate conditions can help mitigate this risk, but setbacks due to storms can be disheartening and require replanting efforts.
- Finally, there is the potential for harvesting of planted native vegetation. While community involvement is crucial, clear agreements and education around the long-term goals of EbA projects are necessary. Uncontrolled harvesting of trees for firewood or timber can undermine the ecological benefits of reforestation efforts.
- Finding appropriate avenues to foster inclusion and managing sensitivities such as perceived cultural clashes with GEDSI ideas. Every community can have different understandings and practices and therefore, establishing a common understanding of GEDSI ideals and putting them into practice can be a considerable challenge.

3.2 Coral/mangrove restoration

3.2.1 Description

The EbA options assessment revealed several options related to restoration or conservation of mangrove or coral ecosystems as high priorities for the study area. Table 3 presents a description of each including indicative locations for implementation.

Table 3. Coral/mangrove restoration options

Option	Description	Indicative location/s
Mangrove restoration and conservation – coastal protection of roads	Implement mangrove restoration and protection programmes to restore degraded mangrove habitats in strategic locations to provide coastal protection for road access and enhance their resilience to environmental stressors. Mangroves act as nursery grounds for fish, improve water quality, and provide coastal protection against erosion and storms.	Queens Road where mangroves may be suitable to address current erosion or prevent future erosion, noting that some locations may be beyond the point at which mangrove establishment will be sufficient.
Mangrove restoration and conservation – coastal protection of communities	Implement mangrove restoration and protection programmes to restore degraded mangrove habitats in strategic locations to provide coastal protection for communities and enhance their resilience to environmental stressors. Mangroves act as nursery grounds for fish, improve water quality, and provide coastal protection against erosion and storms.	Beqa Island, coastal mainland communities
Mangrove restoration and conservation –	Implement mangrove restoration and protection programmes to restore degraded mangrove habitats in strategic locations to improve biodiversity and enhance their resilience to environmental	Small islands with surrounding coral habitat to restore fish

biodiversity focus	stressors. Mangroves act as nursery grounds for fish, improve water quality, and provide coastal protection against erosion and storms.	nursery habitat (e.g., Naqara island and near-by mainland coastal areas, between Veivatuloa and former Ocean Pacific Resort and Yanuca Island).
Coral reef restoration – storm tide mitigation	Use placement of coral rubble and coral restoration programmes to restore degraded mangrove habitats in strategic locations to provide coastal protection for communities and enhance their resilience to environmental stressors. Coral rubble in shallow areas can act as habitat for live coral and other fauna and provide coastal protection against erosion and storms. They can also protect nearshore environments creating low energy "backwaters" that allow other species to recruit successfully (e.g. mangroves). This effectively represents a nature-based seawall.	Beqa Island, coastal mainland communities
Coral reef restoration and conservation	Coral reef restoration utilises various methods like coral nurseries, relocation and seeding to revive degraded reefs and enhance their resilience to future threats.	Inshore reefs inside the Navua flood plume would support degraded biodiversity.

3.2.2 Option logic

Figure 3 presents the logic for investment in coral/mangrove restoration activities.

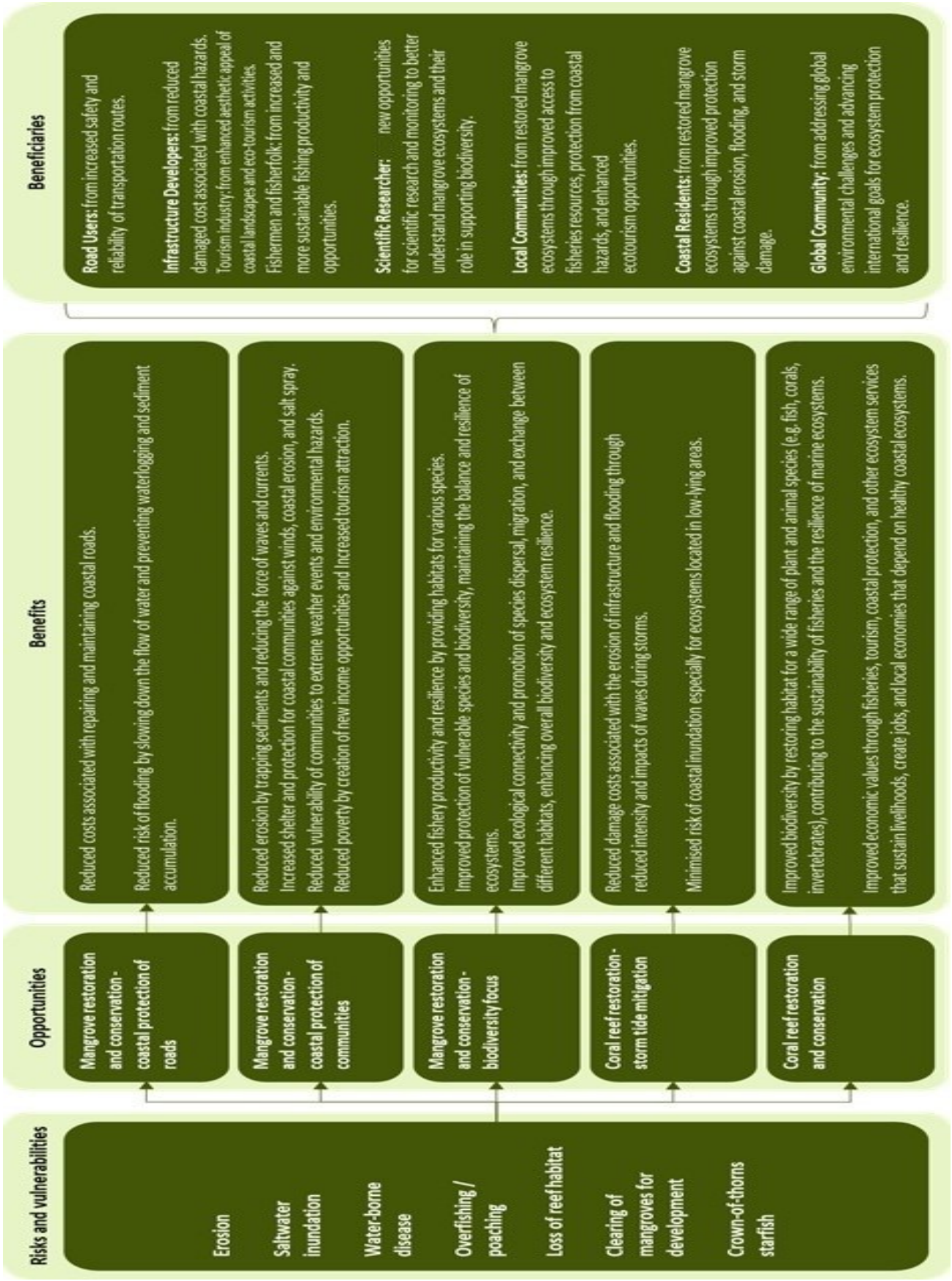


Figure 3. Logic for investment in coral/mangrove restoration activities

3.2.3 Economic implications

The economic implications refer to the costs and benefits associated with EbA options. Table 4 presents a summary of the key costs and benefits associated with the coral/mangrove restoration activities, with indicative unit rates included where possible.

Table 4. Costs and benefits of coral/mangrove restoration activities (2023 FJD)

Table 4. Costs and benefits of coral/mangrove restoration activities (2023 FJD)

Option	Costs*	Benefits

Mangrove restoration and conservation – coastal protection of roads	• Restoration costs ($3,420/ha)
	• Ongoing monitoring and maintenance costs
		• ESV of mangrove areas ($662,000/ha), including:
		  ○ Regulating services ($585,000/ha)
		  ○ Habitat services ($58,000/ha)
		  ○ Provisioning services ($10,000/ha)
		• Reduction in losses due to erosion (e.g. avoided cost of taking a longer route, avoided replacement cost of road infrastructure)
		• Improved fisheries productivity

Mangrove restoration and conservation – coastal protection of communities	• Restoration costs ($3,420/ha)
	• Ongoing monitoring and maintenance costs
	• Optional community wetland planting training and workshops ($11,000 per community)
		• ESV of mangrove areas ($662,000/ha), including:
		  ○ Regulating services ($585,000/ha)
		  ○ Habitat services ($58,000/ha)
		  ○ Provisioning services ($10,000/ha)
		• Reduction in losses due to erosion (e.g. avoided replacement cost of buildings, avoided loss of productive land)
		• Reduction in losses due to inundation (e.g. avoided loss of crops or productive land, avoided health impacts)
		• Improved fisheries productivity

Mangrove restoration and conservation – biodiversity focus	• Restoration costs ($3,420/ha)
	• Ongoing monitoring and maintenance costs
		• ESV of mangrove areas ($662,000/ha), including:
		  ○ Regulating services ($585,000/ha)
		  ○ Habitat services ($58,000/ha)
		  ○ Provisioning services ($10,000/ha)
		• Improved fisheries productivity

Coral reef restoration –	• Movement and placement of coral rubble	• ESV of mangrove areas ($662,000/ha), including:

Option	Costs*	Benefits
storm tide mitigation	• Mangrove restoration costs ($3,420/ha) • Ongoing monitoring and maintenance costs • Optional community wetland planting training and workshops ($11,000 per community)	○ Regulating services ($585,000/ha) ○ Habitat services ($58,000/ha) ○ Provisioning services ($10,000/ha) • ESV of coral reef areas ($1.2m/ha), including: ○ Regulating services ($585,000/ha) ○ Cultural services ($371,000/ha) ○ Provisioning services ($190,000/ha) ○ Habitat services ($55,300/ha) • Reduction in losses due to erosion (e.g. avoided replacement cost of buildings, avoided loss of productive land) • Reduction in losses due to inundation (e.g. avoided loss of crops or productive land, avoided health impacts) • Improved fisheries productivity
Coral reef restoration and conservation	• Restoration costs of coral reef ($278,000/ha) • Ongoing monitoring and maintenance costs • Optional community training for coral cultivation and transplanting ($22,000 per community)	• ESV of coral reef areas ($1.2m/ha), including: ○ Regulating services ($585,000/ha) ○ Cultural services ($371,000/ha) ○ Provisioning services ($190,000/ha) ○ Habitat services ($55,300/ha) • Improved fisheries productivity

*Note: The Pacific EbA Tool provides an indication of key cost components for a variety of EbA options.

3.2.4 Key social issues

Social considerations in implementing the above EbA options are discussed here. While these may represent historical and current challenges, they also represent opportunities to do things better with future projects.

Mangrove and coral reef restoration and conservation efforts can actively promote the participation of women and men in all their diversities. Creating inclusive spaces and policies that respect and value diversity ensures that all community members can contribute to conservation efforts. Acknowledging the contributions and perspectives of women and men in all their diversities, in particular the involvement of marginalised groups such as SOGIESC and people with disability in mangrove and coral reef conservation fosters a sense of belonging and recognition within the community. Promoting representation in decision making processes and leadership roles helps amplify diverse voices and experiences. Creation of a knowledge sharing platform of the social and economic benefits to women and men in all their diversities, such as employment opportunities, community

development, and enhanced well-being can also assist with addressing social issues. Inclusive conservation efforts contribute to social equity and justice, promoting the rights and dignity of all individuals within the community.

Ensuring accessibility and inclusion of persons with disabilities, through (for example) accessible pathways, signage and facilities, promotes their active involvement in conservation efforts and ensures they can benefit from the potential socioeconomic opportunities. Tailoring training programmes to accommodate diverse abilities helps build skills and enhance economic independence for people with disability. For instance, Rewa Disabled People's Organisation representative Ms Litia Naitanui suggested a "trash to cash" initiative. This involves recycling waste material (plastic bottles, wrappers, etc) in the local communities to generate income. Training, employment, accelerator programmes and grants opportunities in activities such as mangrove planting, habitat restoration, and ecotourism can support people with disability. Their inclusion in conservation efforts helps strengthen community resilience to natural disasters and climate change impacts and contribute to environmental resilience and disaster risk reduction, benefiting all members of the community, including people with disability.

Engaging youth in mangrove and coral reef restoration and conservation activities provides opportunities for environmental education, hands-on learning and skill development. Youth involvement in activities such as tree planting, habitat monitoring, and environmental education programmes fosters environmental awareness and stewardship. In addition, the conservation efforts provide opportunities for environmental education, hands-on learning, and skill development. Youth-led initiatives, such as mangrove clean-up campaigns or environmental clubs, promote active citizenship and community engagement among young people. Youth involvement in conservation efforts helps instil a sense of responsibility and commitment to environmental sustainability among future leaders and decision-makers. This fosters traditional ecological knowledge transfer from the elder generation and ensures preservation of these vital ecosystems for future generations.

Women are critical in ensuring community health and wellbeing. Mangroves play a crucial role in protecting coastal communities from natural disasters and providing ecosystem services such as water filtration and erosion control. Women, as primary caregivers and household managers, benefit from improved community health and wellbeing resulting from mangrove conservation efforts. Active involvement in activities like collecting mangrove seeds, nursery management, and guiding eco-tours, can promote new livelihood opportunities for women. Women often have traditional knowledge and cultural practices associated with mangrove ecosystems, such as herbal medicine preparation and artisanal fishing techniques. Mangrove conservation projects that recognise and incorporate this knowledge can enhance women's roles as custodians of cultural heritage and environmental stewardship.

3.2.5 Other challenges or barriers

While these opportunities offer promising solutions for the study area, implementing these strategies faces several other challenges.

MANGROVE RESTORATION AND CONSERVATION

- Land tenure and community engagement: as with reforestation, customary land ownership can complicate mangrove restoration projects, particularly regarding coastal areas. Negotiation with traditional leaders and ensuring community understanding of the project's benefits are crucial.
- Funding and ongoing maintenance: Planting, protecting young saplings from grazing and long-term monitoring require consistent funding. Communities may struggle to secure resources for ongoing maintenance, impacting the project's effectiveness.
- Differing goals: Balancing coastal protection needs with a biodiversity focus can be complex. Species chosen for rapid growth for shoreline stabilisation might not be the most suitable for fostering diverse ecosystems.

CORAL REEF RESTORATION

- Technical expertise and resources: Coral reef restoration often involves specialised techniques and materials, such as coral nurseries or transplantation methods. Limited local expertise and access to these resources can be significant barriers.

- Water quality: Polluted water runoff from the catchment can impede coral growth and survival. Addressing upstream land use practices and improving water quality is crucial for successful restoration.
- Climate change impacts: Rising water temperatures and ocean acidification due to climate change threaten the survival of restored reefs. The long-term success of coral restoration hinges on effectively mitigating climate change.

BOTH MANGROVE AND CORAL REEF RESTORATION

- Timeframes and delayed benefits: Both ecosystems take years to recover and provide full benefits. Communities facing immediate threats from coastal erosion or storms might struggle to see the value in long-term restoration projects.
- Monitoring and enforcement: Effective monitoring of restoration efforts and enforcing regulations to prevent destructive practices (e.g. overfishing) require dedicated resources and labour/workforce, which may be limited.

Despite these challenges, mangrove and coral reef restoration offer significant ecological and economic benefits for the Navua catchment. Careful planning, community engagement and addressing these potential hurdles can increase the success and sustainability of these EbA initiatives.

3.3 Training for alternative livelihoods

3.3.1 Description

The EbA options assessment revealed diversification of livelihoods supported by training programmes as a key priority for the study area. Table 5 presents a description of this opportunity, which could be implemented across all communities.

Table 5. Training for alternative livelihoods option

Option	Description	Indicative location/s
Providing training and support for alternative livelihoods	Providing training and support for alternative livelihoods, such as ecotourism, aquaculture and community based enterprises, to reduce pressure on natural resources. This may include training for livelihoods targeted towards women and youth, and training on traditional practices (e.g. traditional farming methods, weaving, etc.).	All communities

3.3.2 Option logic

Figure 4 presents the logic for investment in training for alternative livelihoods activities.

Figure 4. Logic for investment in training for alternative livelihoods activities

3.3.3 Economic implications

The economic implications refer to the costs and benefits associated with EbA options. Table 6 presents a summary of the key costs and benefits associated with training activities, with indicative unit rates included where possible.

Table 6. Costs and benefits training activities (2023 FJD)

Option	Costs*	Benefits
Providing training and support for alternative livelihoods	• Planning and facilitating training, with following examples provided by various previous IVDPs including: ○ Financial and literacy training ($2,000-$3,000 per workshop) ○ Cultural/traditional training ($5,000 per community) ○ Participation of women in community workshops ($1,000 per workshop) ○ Impact of cutting trees workshops ($1,000 per workshop)	• Contributes to avoiding all impacts driven by expanding or intensifying use of resources • Avoided clearing of native forest (ESV at $18,000/ha and reduced WQ impact), including: ○ Food ($680/ha) ○ Medicinal resources ($5,130/ha) ○ Regulating services ($8,600/ha) ○ Cultural services ($3,000/ha) • Avoided overfishing (improved fisheries productivity) • Avoided intensification of agriculture

*Note: The Pacific EbA Tool provides an indication of key cost components for a variety of EbA options.

3.3.4 Key social issues

Social considerations in implementing the above EbA options are discussed here. While these may represent historical and current challenges, they also represent opportunities to do things better with future projects.

Shifting behaviours and fostering acceptance within local communities are essential steps in ensuring that people with disability and women and men in all their diversities are able to benefit equitably from training and support for alternative livelihoods, regardless of the ecosystem type. According to the 2017 census by the Fiji Bureau of Statistics, 36,583 persons aged over five years have at least one "functioning challenge" or disability. In the Central-Eastern division, Navua (28.2%) and Deuba (17.8%) recorded the highest numbers of people with one functioning challenge (Fiji Bureau of Statistics 2017). The Department of Social Welfare Navua Disability Statistics highlight diverse needs, which include: 178 people with physical impairments, 87 with multiple disabilities, 30 with mental illnesses, 19 with visual impairments, 16 with intellectual impairments, etc. In total, 155 females and 190 males were identified, amounting to 345 individuals. This illustrates the significance of addressing diverse needs within the community.

Targeting training approaches to the specific needs and abilities of people with disability and women and men in all their diversities will ensure they have the skills and knowledge to participate fully in alternative livelihood activities. Empowering participants to take ownership of their learning process and pursue opportunities that align with their interests and goals is essential for fostering independence and self-determination, through mentorship, coaching and ongoing support helps build confidence and resilience. Moreover, addressing barriers to entry through the capacity building programme aids in identifying and addressing these barriers that may disproportionately affect people with disability and women and men in all their diversities is crucial for ensuring equal access and opportunities.

Ensuring infrastructure for ecotourism, aquaculture and other community-based enterprises is accessible to people with disability is essential for facilitating their participation such as ramps, accessible paths and sensory-

friendly facilities. Collaboration efforts with the Ministry of Health and Medical Services and Ministry of Infrastructure on cost and design of such facilities should be sought.

Recognising that learning is an ongoing process, it is important to provide opportunities for continuous skill development and adaptation to changing circumstances. This may include offering refresher courses, updating training materials, and incorporating feedback from participants to improve programme effectiveness. Additionally, designing and providing mental health consultations can further support participants with their mental health.

Creating employment and accelerator programme opportunities within these alternative livelihood sectors that are inclusive of people with disability and women and men in all their diversities will help promote economic empowerment, social inclusion and economic sustainability. Employers can facilitate network collaboration opportunities amongst participants, as well as with relevant stakeholders and industry partners, enhance their social capital and expand their professional networks. Establishing an avenue for employment opportunities, partnerships, and mentorship. This approach recognises the value of diversity and ensures that all individuals can thrive and contribute to their fullest potential.

Encouraging communities to diversify their livelihood options, such as engaging in eco-tourism, aquaculture, or community-based enterprises, can reduce their reliance on vulnerable sectors that may be heavily impacted by natural disasters. In creating multiple income streams, communities are better able to withstand economic shocks and recover more quickly following disasters. Integrating disaster preparedness (risk reduction) and emphasising the importance of environmental conservation and sustainable resource management into alternative livelihood training programmes ensures that communities are better prepared to respond to and mitigate the impact of natural disasters. This may involve training on early warning systems, evacuation procedures, first aid, disaster-resistant construction techniques, eco-friendly tourism and responsible aquaculture. Community-based natural resource management can help preserve ecosystems, which in turn provide additional protection against natural disasters. Alternative livelihood initiatives can also foster social cohesion and community empowerment, which are critical components of disaster resilience. By empowering community members in decision making processes and promoting inclusive participation, these programmes strengthen social networks and enhance collective action in times of crisis. Lastly, facilitating accessible financial resources, such as microfinance loans or grants, enables community members to invest in alternative livelihood ventures and build resilience against natural disasters. Financial literacy training and support for establishing savings and credit groups can further enhance financial preparedness.

Further leadership training may support appropriate and effective decision making in environmental management, rather than merely filling traditional roles. This training should sensitise leaders to social, developmental and environmental issues, emphasising their diplomatic role in benefiting both current and future communities. In addition, training should be provided to encourage marginalised community members to take on roles in regulation enforcement and monitoring.

3.3.5 Other challenges or barriers

Shifting towards alternative livelihoods like ecotourism, aquaculture, and community-based enterprises in the Navua catchment holds promise for reducing pressure on natural resources, but navigating this transition presents several hurdles.

One key challenge is ensuring the availability of sufficient and suitable alternatives. Not all communities possess the necessary resources or market access to thrive in ecotourism or they may require training in entirely new sectors like aquaculture. A careful assessment of local strengths, such as cultural heritage or existing agricultural practices, is crucial to identify viable options that align with existing skills set and market demands.

Furthermore, the existing skill base in the community may not directly translate to these new opportunities. For instance, traditional fishing skills might not translate directly to aquaculture, requiring additional training to bridge the gap. This is particularly relevant for women and youth who may have limited experience in resource management or business ventures. Furthermore, implementation of these activities should be cognisant of other roles and responsibilities that participants have in communities (e.g. women as caregivers). Investing in targeted training programmes and mentorship opportunities becomes essential to empower these groups to participate effectively in the new economic activities without adding time and work burdens.

3.4 Marine Protected Areas

3.4.1 Description

The EbA options assessment revealed the establishment or re-establishment of Marine Protected Areas (MPAs) as a key priority for the study area. Table 7 presents a description of this opportunity which could be implemented across all communities.

Table 7. MPA establishment option

Option	Description	Indicative location/s
Marine Protected Areas (MPAs)	Establishing or re-establishing MPAs to protect critical fish habitats, spawning grounds and biodiversity hotspots. This could be supported by equipping local communities with the knowledge and resources to manage the MPAs.	Areas with expired or near-to-expiry MPAs. The previous local community led MPAs potentially as a starting point. Community consultation required to finalise.

3.4.2 Option logic

Figure 5 presents the logic for investment in MPA establishment.

3.4.3 Economic implications

The economic implications refer to the costs and benefits associated with EbA options. Table 8 presents a summary of the key costs and benefits associated with the establishment of MPAs, with indicative unit rates included where possible.

Table 8. Costs and benefits of MPA establishment (2023 FJD)

Option	Costs*	Benefits
Marine Protected Areas (MPAs)	• Establishment costs (likely fixed, i.e. may be some economies of scale) • Introduction of trained fish warden with 2*boats ($45,000 per community) • Notification of community to fishing grounds and additional surveying ($15,000 per community) • Ongoing monitoring and maintenance costs, e.g. patrol, enforcement, renewal, equipment	• Improved fisheries productivity • Improved ecotourism opportunities

*Note: The Pacific EbA Tool provides an indication of key cost components for a variety of EbA options.

Figure 5. Logic for investment in MPA establishment

3.4.4 Key social issues

Based on the EbA options articulated above, a few social issues related to each EbA are highlighted below. While these may represent historical and current challenges, they also represent opportunities to do things better with future projects.

The establishment of MPAs disrupt livelihoods for women, youth, PWDs and women and men in all their diversities, as it restricts access to traditional fishing grounds and resources, potentially impacting the livelihoods of fishers. Women, youth and women and men in all their diversities are actively fishing, gleaning and diving the marine area from the coastal flats to the edge of the reef to support livelihood and subsistence use. The loss of access to fishing grounds could lead to economic loss and food insecurity, particularly for vulnerable households. There may be opportunities to involve these groups in the management of MPAs to reduce the disruption to their livelihood. Local communities within the Beqa lagoon have continued efforts from Fiji Locally Managed Marine to manage their MPA's by the natural resource management committee. Although poachers continue to take fish from the non-take zones, local committees have raised concerns within the District Level meetings led by the respective provincial council.

MPAs impede on traditional cultural practices and social dynamics within communities, affecting customary fishing rights, cultural ceremonies, and community cohesion. This can have social and psychological impacts, especially for marginalised groups in society, as well as other socioeconomic impacts (e.g. due to loss of income or food sources). Persons with disabilities may face physical barriers in accessing and enjoying the benefits of MPAs, such as inaccessible infrastructure and limited accommodation for specific needs. Additionally, women and marginalised groups may face challenges in participating in decision making processes related to MPA management and governance. The lack of awareness of MPA boundaries and duration of banning of the protected area may result in gender-based violence amongst marginalised groups and may alternate community cohesion.

Well-managed MPAs can create economic opportunities through ecotourism, sustainable fishing practices, and enhanced fisheries productivity. Women, youth, and other community members may benefit from these opportunities by engaging in activities such as guided tours, sustainable fishing, and small-scale enterprises. Clans that hold power and authority within a local community may perpetuate existing inequalities and further marginalise already vulnerable communities. For example, in some cases, powerful clans or individuals may monopolise access to economic benefits generated by MPAs, excluding or exploiting marginalised groups. Establishing transparent governance structures and mechanisms for resource allocation and revenue-sharing from MPA-related activities, which ensures that decision making processes are accountable, inclusive, and representative of the diverse interests within the community. Encourage the establishment of community-based social enterprises and cooperatives that prioritise inclusive economic development and benefit-sharing. Support initiatives that provide training, mentorship, and access to finance for women, youth, and marginalised individuals to start and manage their own businesses. Legal and Policy Frameworks: Enact and enforce legal and policy frameworks that protect the rights of marginalised groups and promote equitable access to resources and economic opportunities. Ensure that laws and regulations governing MPAs explicitly address issues of social equity and justice. Establishing social impact assessments to identify and address potential inequities and power imbalances resulting from MPA establishment and management. Use the findings to inform decision making and design targeted interventions to mitigate negative impacts and promote social inclusion. Advocating and empowering marginalised groups about their rights and entitlements regarding MPA-related economic activities and their interests and hold decision-makers accountable for equitable resource distribution and benefit-sharing.

3.4.5 Other challenges or barriers

While establishing or re-establishing Marine Protected Areas (MPAs) offers a powerful tool for ecosystem conservation and potential benefits for the Navua catchment, implementing these projects faces several hurdles.

- **Community Engagement and Livelihoods**: Restricting access to fishing grounds within MPAs can have a significant impact on local communities who rely on these resources for subsistence or income. These impacts have GEDSI dimensions as described above. Securing community buy-in and potentially identifying alternative livelihoods or co-management strategies are crucial for long-term success. Re-establishment or expansion of former or current MPAs may help to navigate this.

- **Enforcement and Monitoring**: Effectively enforcing regulations within MPAs, especially in large or remote areas, can be challenging. Limited resources for patrolling and monitoring can hinder efforts to prevent illegal fishing or resource extraction.
- **Data Gaps and Scientific Understanding**: Designing effective MPAs necessitates a strong scientific understanding of the local marine ecosystem, including key species, migration patterns, and habitat types. Data gaps in these areas can hinder the selection of optimal locations and management strategies for the MPA.
- **Financing and Sustainability**: Establishing and maintaining MPAs requires long-term funding for management, enforcement, and potentially compensating communities for lost fishing grounds. Finding sustainable funding sources can be challenging, especially for communities already facing resource constraints.
- **Compliance and Equity**: Ensuring equitable enforcement of regulations within MPAs is crucial. Communities may be wary of restrictions that disproportionately impact their livelihoods compared to commercial fishing operations outside the MPA.

Despite these challenges, collaborative efforts with local communities, combined with securing sustainable funding and strengthening scientific understanding, can pave the way for successful establishment and management of MPAs in the Navua catchment.

3.5 Environmental setbacks and buffers

3.5.1 Description

The EbA options assessment revealed the establishment of environmental setbacks and buffers as a key priority for the study area. Table 9 presents a description of this opportunity including indicative locations.

Table 9. Environmental setbacks option

Option	Description	Indicative location/s
Environmental setbacks/buffers - sensitive environmental assets	Establishing and maintaining buffers between intensive agriculture and sensitive environmental areas (e.g. mangroves, waterways) may serve to promote biodiversity and enhance ecosystem resilience.	Grace Farms and other intensive agricultural areas, particularly in the coastal zone.

3.5.2 Option logic

Figure 6 presents the logic for investment in environmental setbacks.

3.5.3 Economic implications

The economic implications refer to the costs and benefits associated with EbA options. Table 10 presents a summary of the key costs and benefits associated with the establishment of environmental setbacks, with indicative unit rates included where possible.

Table 10. Costs and benefits of environmental setback (2023 FJD)

Option	Costs*	Benefits
Environmental setbacks/buffers - sensitive environmental assets	• Establishment costs • Land/opportunity cost (e.g. foregone agriculture) • Ongoing monitoring and maintenance costs	• ESV of native forest ($18,000/ha) or mangrove areas ($662,000/ha) • Water quality improvement due to increased buffer – marginal ESV change of downstream habitats (e.g. coral reefs)

*Note: The Pacific EbA Tool provides an indication of key cost components for a variety of EbA options.

Figure 6. Logic for investment in environmental setbacks

3.5.4 Key social issues

Based on the EbA options articulated above, a few social issues related to each EbA are highlighted below. While these may represent historical and current challenges, they also represent opportunities to do things better with future projects.

It is essential to recognise the importance of inclusivity and actively working to address the diverse needs and perspectives of all community members including women, youth, persons with disabilities (PWD), and women and men in all their diversities, in environmental conservation efforts can be more effective, sustainable, and socially just. Historically, marginalised groups often face barriers in accessing resources such as land, water, and financial support. Additionally, they may encounter challenges in participating in decision making processes related to land-use planning and environmental management. Lack of inclusion in these processes can lead to policies and practices that do not adequately consider their needs and interests. Women, youth, and other marginalised groups may rely heavily on natural resources such as agriculture and mangroves for their livelihoods and food security. Buffer zones can potentially impact their access to these resources, affecting their income and food security. Additionally, displacement or changes in land use may disrupt existing livelihood activities, leading to economic hardships.

Cultural norms and gender roles may restrict the participation of women, youth, PWD and women and men in all their diversities in environmental conservation efforts. Discrimination and stigma may further marginalise PWD and women and men in all their diversities, limiting their opportunities for engagement and leadership in conservation initiatives. Persons with disabilities may encounter physical barriers that impede their access to buffer zones or participation in conservation activities. Lack of accessible infrastructure, such as paths, ramps, and sensory-friendly facilities, can restrict their mobility and limit their ability to engage fully in environmental stewardship efforts and upholding livelihood and food security. The lack of awareness and understanding among communities, including women, youth, PWD, and women and men in all their diversities, about the importance of buffer zones and ecosystem conservation. Efforts to build awareness and capacity through targeted education and outreach initiatives are essential to overcome these barriers.

In addressing these challenges, meaningful inclusion of all community members in buffer zone initiatives as well as promoting social equity and empowering marginalised communities contribute to sustainable development and are crucial in; i). Adopting participatory approaches that actively involve women, youth, PWD, and women and men in all their diversities in decision making processes and project planning; ii) Providing targeted support and capacity-building programmes to empower marginalised groups to participate effectively in conservation efforts; iii) Promoting gender-responsive and inclusive policies and practices that address the specific needs and priorities of diverse community members; iv) Ensure that buffer zone initiatives prioritise accessibility and consider the unique requirements of PWD, such as accessible infrastructure and accommodations; v) Foster partnerships and collaborations with local organisations and community leaders to advocate for the rights and inclusion of marginalised groups in environmental conservation efforts.

3.5.5 Other challenges or barriers

While establishing buffers between intensive agriculture and sensitive environmental areas like mangroves offers a promising EbA approach for the Navua catchment, several challenges need to be considered.

- Land Availability and Tenure: Allocating land for buffers can be difficult, especially in areas with high-value agricultural land or complex land ownership structures. Negotiations with landowners and potentially exploring compensation mechanisms may be necessary.
- Balancing Productivity and Conservation: Farmers may be reluctant to give up productive land for buffers, especially if the short-term economic benefits are unclear. Demonstrating the long-term advantages of buffer zones, such as improved soil health, reduced fertilizer runoff, and potential for carbon credits, can be crucial for gaining farmer buy-in.
- Management and Maintenance: Effective buffer zones require ongoing management, such as controlling invasive species or periodic planting of native vegetation. Ensuring dedicated resources for long-term maintenance is essential for the success of these buffer zones.

- Enforcement: In some cases, enforcing regulations around buffer zones might be necessary. However, navigating customary land ownership and securing community cooperation are critical for sustainable implementation.
- Determining Buffer Width and Design: The optimal width and design of buffer zones depends on specific factors like slope, soil type, and the adjacent environmental area. Scientific expertise may be needed to determine the most effective buffer design for the local context.

Overcoming these challenges requires collaboration between farmers, land managers, and government agencies. By demonstrating the ecological and economic benefits of buffer zones, along with providing technical and financial support, environmental buffers can become a successful EbA strategy in the Navua catchment.

4 Conclusions and implications for the Integrated Ecosystem Management Plan

The ESVOA further details the logic for investment in the high priority EbA options identified through the EbA options analysis. There are clearly opportunities to include these interventions in the Navua and Beqa IEMP to provide benefits for a wide range of stakeholders; however, a number of social issues and other challenges should be considered during design and implementation of these projects, particularly GEDSI activities that requires reliance on strategic partnerships and allocation of resources to cover all the cost. Moreover, in order to effectively cater to the marginalised groups, additional consultations, targeted training and initiatives focusing on empowerment need to be implemented. Furthermore, scale of implementation should be a key consideration, as each of these options could be applied in a number of locations across the study area, there are opportunities to package them up into broader programmes both for efficiency purposes and for maximising investment attractiveness for external donors.

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