



**Promoting Pacific Islands
Nature-based Solutions**



Pacific
Community
Communauté
du Pacifique



SPREP
Secretariat of the Pacific Regional
Environment Programme



Global
Green Growth
Institute



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FOREIGN AFFAIRS & TRADE
Manatū Aotearoa



Regional NbS Investment Strategy for the Pacific

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Executive summary

Pacific Island countries (PICs) are particularly vulnerable to the impacts of climate change. Increased frequency and intensity of extreme weather events, sea-level rise, ocean acidification, and changing rainfall patterns are placing immense pressure on ecosystems and communities.

For many communities in the Pacific, ecosystems form the frontline defences against the impacts of climate change and disasters. Nature-based solutions (NbS) are defined as

“Actions aimed at protecting, conserving, restoring, and sustainably managing natural or modified terrestrial, freshwater, coastal, and marine ecosystems, which address social, economic and environmental challenges effectively and adaptively, while simultaneously providing human well-being, ecosystem services, resilience and biodiversity benefits”¹

NbS can serve as a powerful tool in mitigating climate impacts by strengthening ecosystem resilience and providing sustainable livelihoods. They can serve as alternatives or complementary measures to traditional ‘grey’ infrastructure by using natural systems to deliver services like flood protection, water purification, and climate resilience.

Funded by the New Zealand Ministry of Foreign Affairs and Trade (MFAT), Promoting Pacific Island Nature-based Solutions (PPIN) supports the development of NbS policies and legislation, builds awareness and capacity, and strengthens regional cooperation among PICs. As part of PPIN, this Regional NbS Investment Strategy aims to scale up the climate impact of, and the investment in, NbS in the Pacific.

The Pacific Islands face a unique set of challenges shaped by their geography, climate vulnerability, and economic dependencies

While each nation has distinct needs shaped by geography, culture, and development priorities, PICs share common challenges that are increasingly exacerbated by climate change. Coastal erosion and flooding threaten lives, infrastructure, and livelihoods, particularly in low-lying areas and atolls. Deforestation and land degradation reduce the capacity of ecosystems to provide essential services such as soil stabilisation, carbon storage, and clean water. Food and water security are at risk due to changing weather patterns, saltwater intrusion, and declining agricultural productivity. Biodiversity loss, driven by habitat destruction, invasive species, and climate-related pressures, undermines the natural resilience of ecosystems.

Climate change is likely to affect everyone in the Pacific in some way. However, some groups, such as women, children, and marginalized communities, may experience greater impacts. This is due to factors like limited access to resources, and socioeconomic inequalities, and gender-specific vulnerabilities, making them more exposed to the effects of climate change.

¹ UNEP. (n.d.). Overview of Nature-based Solutions. United Nations Environment Programme. Retrieved from <https://www.unep.org/topics/nature-action/nature-based-solutions/overview-nature-based-solutions#:~:text=As%20defined%20at%20the%205,social%2C%20economic%20and%20environmental%20challenges>

NbS offers a wide range of opportunities across various sectors

Socially, many communities have strong traditional ties to land and marine ecosystems, making NbS a culturally aligned approach to addressing climate and environmental challenges.

In the Pacific, the most relevant types of NbS are those that address climate resilience, coastal protection, and sustainable livelihoods. These include ecosystem-based adaptation approaches such as mangrove restoration, which provides natural coastal buffers against storm surges and erosion; watershed and forest management to protect freshwater resources and reduce landslide risks; and the restoration of coral reefs and seagrasses to support fisheries and marine biodiversity. Agroforestry and climate-resilient agriculture are also critical in maintaining food security and supporting livelihoods in the face of changing climatic conditions. These solutions not only enhance ecosystem services but also align with traditional knowledge systems and community-based management practices widely used across the region.

This Investment Strategy draws from the findings from case studies conducted

During the PPIN kick-off meeting in September 2023, three priority sectors for NbS were identified, based on alignment with national policies and data availability. These sectors are:

- **Coastal management** – Mangrove and coral reef restoration
- **Forestry** – Reforestation and sustainable forest management
- **Agriculture** – Agroforestry and climate-resilient farming.

Nine CBAs were carried out across Fiji, Tonga, and Vanuatu, focusing on the identified priority sectors. The selected project types are likely to be relevant across other Pacific contexts facing similar challenges.

The table below outlines the nine NbS initiatives assessed. Eight of the nine NbS initiatives assessed showed a positive net present value (NPV), indicating that they would deliver net benefits to society through ecosystem services and reduced climate-related damages.

Table 0.1: Summary of CBA results for NbS in Fiji, Tonga, and Vanuatu

Country	NbS initiative assessed	NPV (USD)
Fiji	Revegetation of floodplain and upland forest, Ba Catchment	53,000,000
	Nature based coastal seawall in Nabuna, Lomaiviti	780,406
	Agroforestry in Taveuni Island.	6500000
Tonga	Nature-based seawall at Ha'avakatolo	-43,007
	Mangrove restoration at Popua Heritage, Tongatapu	632,354
	Agroforestry Assessment in the 'Ohonua Catchment, 'Eua Island	50,000,000
Vanuatu	Water resources and riparian zone restoration in the Tagabe and La Colle River system	1,794,395
	Mangrove restoration in Maskelyne Island	136,618
	Climate smart agriculture in the Mele catchment, Port Vila.	239,000,000

To determine the NPV, a 6 percent discount rate was used over a 30-year project lifecycle. For these NbS initiatives, using a 6 percent discount rate strikes a balance between long-

term environmental benefits and the immediate economic realities faced by Pacific Island nations.²

Access to funding is critical for scaling up NbS across the Pacific

Traditionally in the Pacific, NbS has relied on grants, which do not require repayment. While NbS delivers broad environmental and social benefits, it often lacks direct revenue streams, limiting access to other forms of finance.

While grants are likely to remain a primary funding source, alternative mechanisms should be explored. Debt financing, such as bonds or loans, and private investment can help cover initial project costs, but these options require repayment. To attract debt or private investment, NbS projects must generate revenue through mechanisms such as carbon credits, payment for ecosystem services (PES), and user-pay business models.

Given resource constraints and competing priorities, Pacific governments are unlikely to provide long-term financial support. Additionally, the lack of awareness around the potential value of NbS and its integration into planning and development projects has limited prioritisation thus far. To shift this mindset, it is crucial to raise awareness and demonstrate the benefits of NbS.

Development finance institutions, multilateral development banks, and bilateral donors remain the most viable funders for NbS in the Pacific. International climate funds, such as the Green Climate Fund (GCF) and the Global Environment Facility (GEF), offer potential funding but require large-scale projects and extensive application processes. Bundling smaller projects into larger programmes can help justify the effort needed to access these funds.

A structured implementation pathway is essential for scaling up NbS

The steps to scale up NbS are outlined in the diagram below. While the general approach to scaling up NbS is similar across the region, country-specific variations depend on policy environments, institutional structures, and local needs. Some steps, such as Step 1, are primarily focused on national-level actions, while others, like Steps 2 to 5, apply both nationally and regionally, requiring coordination across countries.

Many of the steps will be ongoing, but additional resources and effort may be needed in the coming years to embed NbS effectively. This includes building capacity across institutions and stakeholder groups to support long-term integration.

² The World Bank states that a 3% per capita growth rate translates into a 6% discount rate. Three percent aligns with Fiji's expected economic growth.

World Bank. (2023). Operational guidance for climate-resilient infrastructure: Applying nature-based solutions for climate resilience.

<https://documents1.worldbank.org/curated/en/099610503022315638/pdf/IDU02e978a2a023f704c140bb1b082595e67e593.pdf>

Asian Development Bank. (n.d.). Fiji: Economy. <https://www.adb.org/where-we-work/fiji/economy>

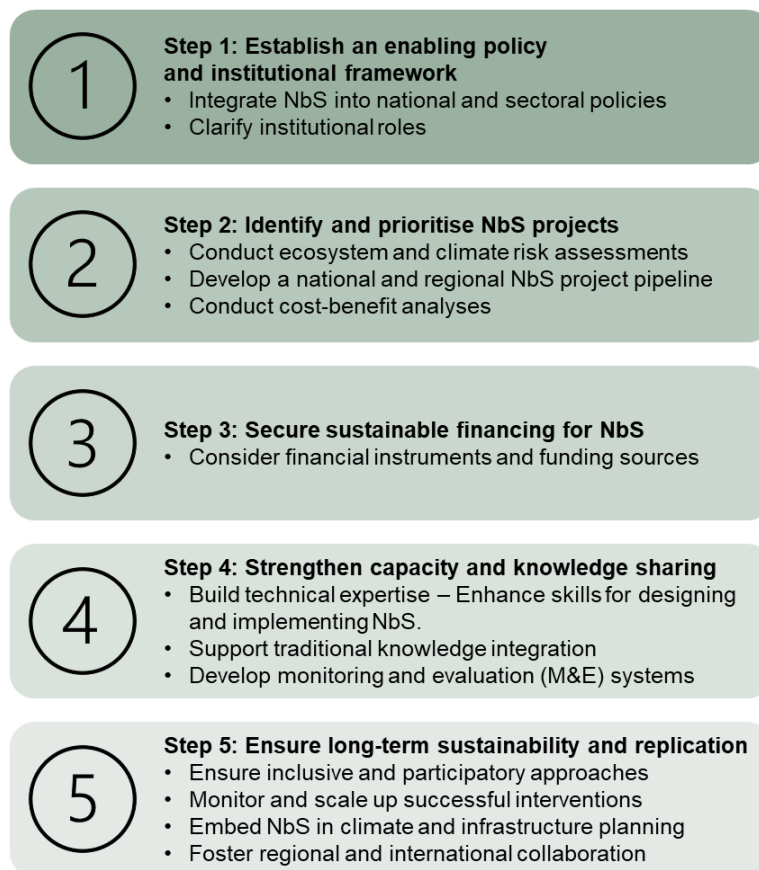


Figure 0.1: Implementation pathway to scale up NbS in the Pacific

A useful resource for scaling up NbS in the Pacific is IUCN's Global Standard for NbS. Its criteria, particularly those focused on identification, design, and assessment of NbS, offer guidance to inform and strengthen efforts to scale up implementation in the Pacific.³

Recommendations and next steps

The steps outlined in the implementation pathway are designed to help mainstream NbS by embedding them into existing policies, planning, and decision-making processes. Once these approaches are integrated, the identification and implementation of NbS will become a routine part of how problems are addressed. This shift will support the consistent delivery of social and environmental benefits, without requiring separate or parallel processes.

While mainstreaming will take time, progress can begin immediately at both national and regional levels. At the national level, governments can integrate NbS into policy updates and development plans, review current infrastructure pipelines to identify opportunities for NbS integration, and catalogue lessons from past NbS initiatives.

At the regional level, countries can share these lessons, identify common challenges, and prioritise collaborative programmes where a regional approach offers greater value than working in isolation. Scaling up NbS through regional cooperation can increase project size, attract investment, and improve outcomes through shared experience.

³ IUCN Global Standard for Nature-based Solutions (2020). Available at: <https://www.iucn.org/resources/publications/iucn-global-standard-nature-based-solutions>

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List of Acronyms

BAU	Business as usual
CBA	Cost Benefit Analysis
FRDP	Framework for Resilient Development in the Pacific
GCF	Global Climate Fund
GEF	Global Environment Fund
GGGI	Global Green Growth Institute
MCT	Micronesia Conservation Trust
MDBs	Multilateral development banks
NAP	National Adaptation Plan
NbS	Nature Based Solutions
NDC	Nationally Determined Contribution
NPV	Net Present value
PCRIC	Pacific Catastrophe Risk Insurance Company
PES	Payment for Ecosystem Services
PICs	Pacific Island Countries
PIF	Pacific Islands Forum
PPIN	Promoting Pacific Island Nature-based Solutions
PPP	Public Private Partnership
PRP	Pacific Resilience Partnership
PV	Present Value
SPC	Pacific Community
SPREP	Secretariat of the Pacific Regional Environment Programme

1. Introduction

Pacific Island Countries (PICs) are particularly vulnerable to the impacts of climate change. Increased frequency and intensity of extreme weather events, sea-level rise, ocean acidification, and changing rainfall patterns are placing immense pressure on ecosystems and the communities that depend on them.

For many communities in the Pacific, ecosystems form the frontline defences against the impacts of climate change and disasters. Nature-based Solutions (NbS) are actions that protect, sustainably manage, or restore natural ecosystems to address societal challenges while providing benefits for both people and the environment. These solutions leverage natural processes to enhance resilience, mitigate climate change, and support biodiversity. NbS differs from conventional 'grey' infrastructure solutions by working with nature to create more sustainable outcomes.

NbS can serve as a powerful tool in mitigating climate impacts by strengthening ecosystem resilience and providing sustainable livelihoods. Although NbS has been used in the Pacific region, these efforts have largely been small-scale pilots led by NGOs and environmental ministries.

For NbS to be effective, it must be integrated into national and regional policy frameworks, embedded into infrastructure planning, and applied across key sectors such as agriculture, forestry, water management, and coastal protection.

The Promoting Pacific Island Nature-based Solutions (PPIN) project seeks to support the development of policy and legislation for NbS, build awareness and capacity, and strengthen regional cooperation amongst PICTS on NbS. As part of PPIN, this Regional NbS Investment Strategy aims to help scale up NbS in the Pacific.

This Investment Strategy builds on the findings of cost-benefit analyses (CBAs) conducted for coastal management, forestry, and agriculture projects in Fiji, Tonga, and Vanuatu. While the analysis focused on these three sectors and countries, the identified project types are likely to be relevant across other Pacific Island contexts facing similar environmental and development challenges. In addition, the Investment Strategy applies to a broader range of NbS initiatives suitable in the Pacific.

The Investment Strategy is structured as follows:

- Section 1: Introduction
- Section 2: Regional context and investment priorities
- Section 3: Funding mechanisms for regional investment
- Section 4: NbS implementation pathway
- Section 5: Fiji national case studies
- Section 6: Tonga national case studies
- Section 7: Vanuatu national case studies
- Section 7: Recommendations and next steps.

This Investment Strategy incorporates insights from government agencies, civil society, and development partners including the Pacific Community (SPC) and the Secretariat of the Pacific Regional Environment Programme (SPREP). Stakeholder workshops were held in Fiji and Tonga to gather feedback and ensure the strategy reflects regional priorities.

2. Regional context and investment priorities

This section outlines the regional context for scaling up NbS in the Pacific. It highlights the climate, environmental, and socio-economic challenges facing Pacific Island Countries, identifies regional NbS investment priorities, and examines how these align with existing regional frameworks.

2.1 Climate, environmental, and socio-economic challenges in the Pacific

The Pacific Islands face a unique set of challenges shaped by their geography, climate vulnerability, and economic dependencies. Climate change poses a severe threat, with rising sea levels, increased frequency of extreme weather events, and coastal erosion endangering communities, infrastructure, and ecosystems. Sea levels in the Pacific have risen approximately 10–15 cm (4–6 inches) since 1993, nearly twice the global average, exacerbating coastal flooding and erosion.⁴

While each Pacific Island nation has distinct needs, common challenges include:

- **Coastal erosion and flooding:** Low-lying atolls and coastal communities are increasingly affected by rising sea levels and storm surges, threatening infrastructure and livelihoods. For example, Pacific Island nations such as Tuvalu, Kiribati, and Fiji are projected to experience at least 15 cm (6 inches) of sea level rise by 2050, regardless of emission scenarios.⁵
- **Deforestation and land degradation:** Unsustainable logging and land-use changes contribute to soil erosion, biodiversity loss, and reduced carbon sequestration. Deforestation and inappropriate agricultural practices, especially on sloping lands, often lead to soil erosion, a key process leading to land degradation in many Pacific Island Countries.⁶
- **Food and water security:** Climate change-induced droughts and extreme weather events disrupt local agriculture and freshwater availability. For example, with no lakes or rivers, Tuvalu relies heavily on rainfall to meet its freshwater needs. However, climate change has made rainfall patterns more unpredictable, leading to periods of drought and freshwater scarcity. At the same time, sea-level rise is increasing the risk of saltwater intrusion into the freshwater lens, further compromising the availability and quality of drinking water.
- **Economic vulnerability:** The reliance on climate-sensitive sectors like agriculture, fisheries, and tourism makes Pacific economies highly exposed to environmental

⁴ World Meteorological Organization (2023). Climate change transforms Pacific Islands. Available at: <https://wmo.int/news/media-centre/climate-change-transforms-pacific-islands> (accessed April 2025).

⁵ NASA Jet Propulsion Laboratory (2024). NASA analysis shows irreversible sea-level rise for Pacific Islands. Available at: <https://www.jpl.nasa.gov/news/nasa-analysis-shows-irreversible-sea-level-rise-for-pacific-islands> (accessed April 2025).

⁶ Wairiu, M. (2016). Land degradation and sustainable land management practices in Pacific Island Countries. *Regional Environmental Change*, 17(4), 1041–1053. Available at: https://www.researchgate.net/publication/307612876_Land_degradation_and_sustainable_land_management_practices_in_Pacific_Island_Countries (accessed April 2025).

changes. For example, coral reefs in the Asia-Pacific region directly contributed \$25 billion annually from 2008 to 2012 through fishing and tourism.⁷

- Biodiversity loss: Coral bleaching, habitat destruction, and unsustainable resource extraction are diminishing the region's rich biodiversity. Approximately 33% of reef-forming corals and over 40% of amphibian species in the Pacific Islands are currently under threat.⁸

Climate change is likely to affect everyone in the Pacific in some way. However, some groups, such as women, children, and marginalized communities, may experience greater impacts due to factors like limited access to resources, social and economic inequalities, and gender-specific vulnerabilities, making them more exposed to the effects of climate change.

2.2 Regional NbS opportunities and investment priorities

NbS offers a wide range of opportunities across various sectors to address climate change, enhance biodiversity, and improve community resilience in the Pacific.

Socially, many communities in the Pacific have strong traditional ties to land and marine ecosystems, making NbS a culturally aligned approach to addressing climate and environmental challenges.

By embedding gender equality, disability, and social inclusion principles into NbS design and implementation, these solutions can promote community ownership, support intergenerational knowledge sharing, and deliver broader benefits that improve social cohesion and resilience.

Different types of NbS projects are shown in the table below. There is often overlap between these project types, as similar activities—such as reforestation, wetland restoration, or sustainable land management—can contribute to a range of outcomes.

⁷ Brander, L. M., Baulcomb, C., van Beek, I. and Hussain, S. S. (2023). The economic value of coral reefs in the Asia-Pacific region. *Ocean & Coastal Management*, 240, 106583. Available at: <https://www.sciencedirect.com/science/article/pii/S0308597X23004724> (accessed April 2025).

⁸ Secretariat of the Pacific Regional Environment Programme (SPREP). (2020). Threats to Pacific Islands' Rich Biodiversity a Key Focus of the Conference. SPREP News. Available at: <https://www.sprep.org/news/threats-to-pacific-islands-rich-biodiversity-a-key-focus-of-the-conference> (accessed April 2025).

Table 2.1: Types of NbS projects

Types of projects	Description
Coastal and marine management	Mangrove restoration, coral reef rehabilitation, protection of seagrass meadows, and the creation of natural flood barriers using wetlands to mitigate coastal erosion, protect against storm surges, and enhance marine biodiversity.
Agriculture and food security	Agroforestry systems, sustainable land management practices, soil conservation, biodiversity friendly practices, and climate-smart agriculture projects that increase food security, improve soil fertility, and enhance resilience to extreme weather events.
Water management	Wetland restoration, watershed management, and the creation of riparian buffers to improve water quality, regulate water flow, prevent flooding, and conserve freshwater resources.
Forestry	Sustainable forest management and reforestation projects present significant opportunities to sequester carbon, restore biodiversity, and provide sustainable livelihoods through timber, non-timber forest products, and ecotourism. Forests are also vital in protecting watersheds and mitigating the impacts of floods and landslides.
Biodiversity conservation	Habitat restoration projects that focus on protecting and rehabilitating critical ecosystems such as forests, wetlands, and grasslands, enhancing biodiversity and ecosystem services.
Disaster risk reduction and resilience	Restoration of natural ecosystems to serve as buffers against disasters such as floods, droughts, and cyclones, including floodplain restoration and forest-based protection against landslides.
Urban planning	Green infrastructure initiatives such as urban parks, green roofs, and permeable pavements that help manage stormwater, mitigate heat, and improve quality of life in urban areas.
Health and wellbeing	Creation of accessible green spaces and urban forests that contribute to the physical and mental wellbeing of communities, as well as improved air quality and reduced heat stress.
Tourism	Sustainable ecotourism initiatives that integrate biodiversity conservation and community engagement, helping to protect natural habitats while generating economic benefits for local communities.
Sustainable infrastructure planning	Integrating nature-based solutions into the design, construction, and operation of infrastructure such as roads, bridges, and energy systems to increase climate resilience, reduce environmental impact, and deliver co-benefits such as flood control and ecosystem restoration. For example, designing green corridors or vegetated buffers along transport or energy corridors.

The Investment Strategy is designed to be applicable to the wide range of NbS project types relevant to PICs.

In particular, it draws from case studies across three priority sectors. These priorities were selected during the PPIN kick-off meeting in September 2023 based on alignment with national policies, data availability, and the suitability of CBA as a tool for identifying investment opportunities. The selected sectors were coastal management, forestry, and agriculture.

2.3 Alignment with regional frameworks

NbS aligns with regional initiatives and frameworks designed to enhance resilience and sustainability in the Pacific. Key frameworks include:

- Pacific Resilience Partnership (PRP): Supports climate adaptation efforts through collaboration among governments, development partners, and local communities.

- Framework for Resilient Development in the Pacific (FRDP): Promotes climate adaptation and disaster risk reduction through ecosystem-based approaches.
- 2050 Strategy for the Blue Pacific Continent: Prioritises ocean and coastal ecosystem protection as central to regional sustainability.
- Pacific Islands Framework for Nature Conservation: promoting the protection and sustainable management of ecosystems, which are central to enhancing resilience to climate change and supporting sustainable development in the Pacific.⁹

By aligning investments with regional frameworks and priorities, NbS can deliver long-term economic, social, and environmental benefits. The CBAs conducted help ensure investments are targeted towards the most impactful solutions, while the implementation pathway provides clear steps for project execution, financing, and monitoring.

⁹ Secretariat of the Pacific Regional Environment Programme (SPREP). (2021). Pacific Islands framework for nature conservation and protected areas 2021–2025. <https://www.sprep.org/attachments/Publications/BEM/pacific-islands-framework-nature-conservation-2021-2025.pdf>

3. Funding mechanisms for regional investment

Access to funding is critical for scaling up NbS across the Pacific. This chapter outlines key funding mechanisms available for NbS, the providers of funding, and explores opportunities to leverage regional cooperation to improve access to funding.

3.1 Types of funding

The table below presents different funding instruments for financing NbS initiatives. Traditionally in the Pacific, NbS has relied on grants, which do not require repayment. While NbS provides broad environmental and social benefits, it often lacks direct revenue streams, which can limit access to debt instruments like loans or bonds.

Although debt can cover initial project costs, additional funding sources are needed for repayment. Suitable funding instruments for repaying debt include grants, carbon finance, and payment for ecosystem services (PES). Government budget allocations can also be used, but Pacific governments face resource constraints and competing priorities.

Debt can also be forgiven in exchange for the country committing to invest in environmental or climate conservation efforts. This is called a debt-for-nature (or debt-for-climate) swap and would typically be carried out by a multilateral development bank or conservation groups.

NbS initiatives often struggle to attract private investment

Public-private partnerships (PPPs) are often cited as a way to finance government projects. For a PPP, the private sector can fund the initial investment and is repaid over time. Repayments typically come from government budgets or revenue generated by the project, such as entry fees from an eco-park. However, in developing countries, governments typically face resource constraints, increasing the risk of non-repayment. Private investors generally prefer projects with clear revenue streams to mitigate financial risk.

Additionally, PPPs require private entities to take responsibility for delivering agreed outcomes, with payments tied to meeting specific milestones. If these are not met, payments may be withheld or reduced. In the Pacific, private entities may be reluctant to take on this responsibility, preferring traditional service contracts where they are paid for specific activities rather than bearing financial risk. This preference is largely due to the widespread use of service contracts, which are familiar and well-understood by organisations, as well as the limited resources of many small Pacific entities, making it difficult for them to absorb financial risk.

Table 3.1: Financing instruments for NbS

Financial instrument	Sources	Use case	Example
Grants (non-repayable funding)	<ul style="list-style-type: none"> • Governments • Multilateral organisations • Philanthropic foundations • International climate and environmental funds. 	<ul style="list-style-type: none"> • Early-stage NbS projects • Pilot initiatives • Capacity building, • Research • Feasibility studies. 	Ridge to Reef (R2R) project, included a grant of USD 5.8 million from GEF and implemented across several Pacific Island countries starting in 2016, focusing on integrating NbS to protect water resources and coastal areas. ¹⁰
Carbon finance (revenue from carbon credits and offsets)	<ul style="list-style-type: none"> • Carbon markets • Corporate sustainability programmes • REDD+ mechanisms. 	<ul style="list-style-type: none"> • Projects with measurable carbon sequestration benefits, such as afforestation, wetland restoration, and soil conservation. 	Papua New Guinea's V Carbon ESG Group forest preservation project, which spans 1.1 million hectares, is expected to generate 150 million carbon credits over 30 years, and began in 2020. ¹¹
Payment for Ecosystem Services (PES)	<ul style="list-style-type: none"> • Government agencies • Private companies • Water utilities • Carbon markets. 	<ul style="list-style-type: none"> • Incentivising landowners and communities to maintain and restore ecosystems. 	Fiji Sugar Corporation previously funded ecosystem initiatives in Fiji. ¹²
Concessional loans (low interest loans)	<ul style="list-style-type: none"> • Multilateral development banks • Government-backed financial institutions • Bilateral donors. 	<ul style="list-style-type: none"> • Large-scale NbS projects with clear revenue streams (e.g., eco-tourism, • Sustainable forestry • Carbon credit projects). 	Examples have not been identified
Commercial loans	<ul style="list-style-type: none"> • Commercial banks, impact investors, private lenders. 	<ul style="list-style-type: none"> • NbS projects that generate sufficient returns to cover debt repayment, such as sustainable agriculture and eco-tourism 	Examples have not been identified
Blended finance (public-private co-financing)	<ul style="list-style-type: none"> • Combination of grants • Concessional finance • Private investment. 	<ul style="list-style-type: none"> • De-risking NbS investments to attract private sector participation. 	Examples have not been identified
Bonds (Green Bonds & Sustainable Development Bonds)	<ul style="list-style-type: none"> • Development banks • Sovereign governments • International climate and environmental funds. 	<ul style="list-style-type: none"> • Large-scale NbS projects with a clear long-term financial return. 	The Government of Fiji issued its first sovereign green bond in 2017, raising USD 50 million for climate-related projects. ¹³
Guarantees	<ul style="list-style-type: none"> • Government-backed entities • Development banks • Multilateral institutions 	<ul style="list-style-type: none"> • Used to de-risk investments by providing security to investors, reducing perceived financial risks. 	The Galápagos' Debt-for-nature Swap included a guarantee of US\$ 85 million from IDB ¹⁴
Insurance	<ul style="list-style-type: none"> • Climate risk insurance providers • Government-backed insurance schemes. 	<ul style="list-style-type: none"> • Enhancing resilience of NbS projects by providing payouts in case of extreme weather events. 	Pacific Catastrophe Risk Insurance Company (PCRIC) – Provides risk insurance for climate-related disasters. ¹⁵

3.2 Funding providers

For initiatives involving NbS, funding could come from a diverse range of providers as shown in the figure below. Multilateral development banks (MDBs) and bilateral donors are currently the most likely to fund NbS projects due to their established relationships with Pacific Island countries and their long-standing involvement in regional development initiatives.

International climate funds are also a potential funding source, though they typically require large-scale projects to justify the extensive time and effort needed to apply and comply with their often-complex requirements. While these funds are valuable, the process can be resource intensive.

Commercial banks and the private sector may be less likely to directly invest NbS projects due to the low financial returns. However, projects linked to voluntary carbon offset schemes or PES, which offer a market-based incentive for environmental conservation, may attract private sector investment.

National Development Banks could play a key role in supporting NbS through targeted financial mechanisms. During stakeholder consultations in Fiji, participants suggested that development banks could offer more favourable loan terms for projects incorporating NbS. Since the bank already provides loans to farmers, this could be an extension of its existing support. However, loan conditions are designed to offset risk, meaning that easing these terms would increase financial exposure for the bank. To make such an initiative viable, additional support, such as grants or other financial incentives, may be needed to mitigate the increased risk.

¹⁰ Global Environment Facility (GEF), "Ridge to Reef (R2R) Project," 2016, <https://www.thegef.org/projects-operations/projects/5395?utm>

¹¹ V Carbon ESG Group, "Papua New Guinea Forest Preservation Project," 2020, vcarbonpng.com

¹² Stakeholder feedback at "Stakeholder Consultations of NbS Investment Strategy" workshop, Suva, 11 Mar. 2025.

¹³ World Bank. "Fiji Issues First Developing Country Green Bond, Raising \$50 Million for Climate Resilience." World Bank, 17 Oct. 2017, <https://www.worldbank.org/en/news/press-release/2017/10/17/fiji-issues-first-developing-country-green-bond-raising-50-million-for-climate-resilience>.

¹⁴ Climate Policy Initiative. (2024). Toolbox on Financing Nature-Based Solutions. Climate Policy Initiative.

¹⁵ Pacific Catastrophe Risk Insurance Company (PCRIC). "Welcome to PCRIC." PCRIC, <https://pcric.org/>.

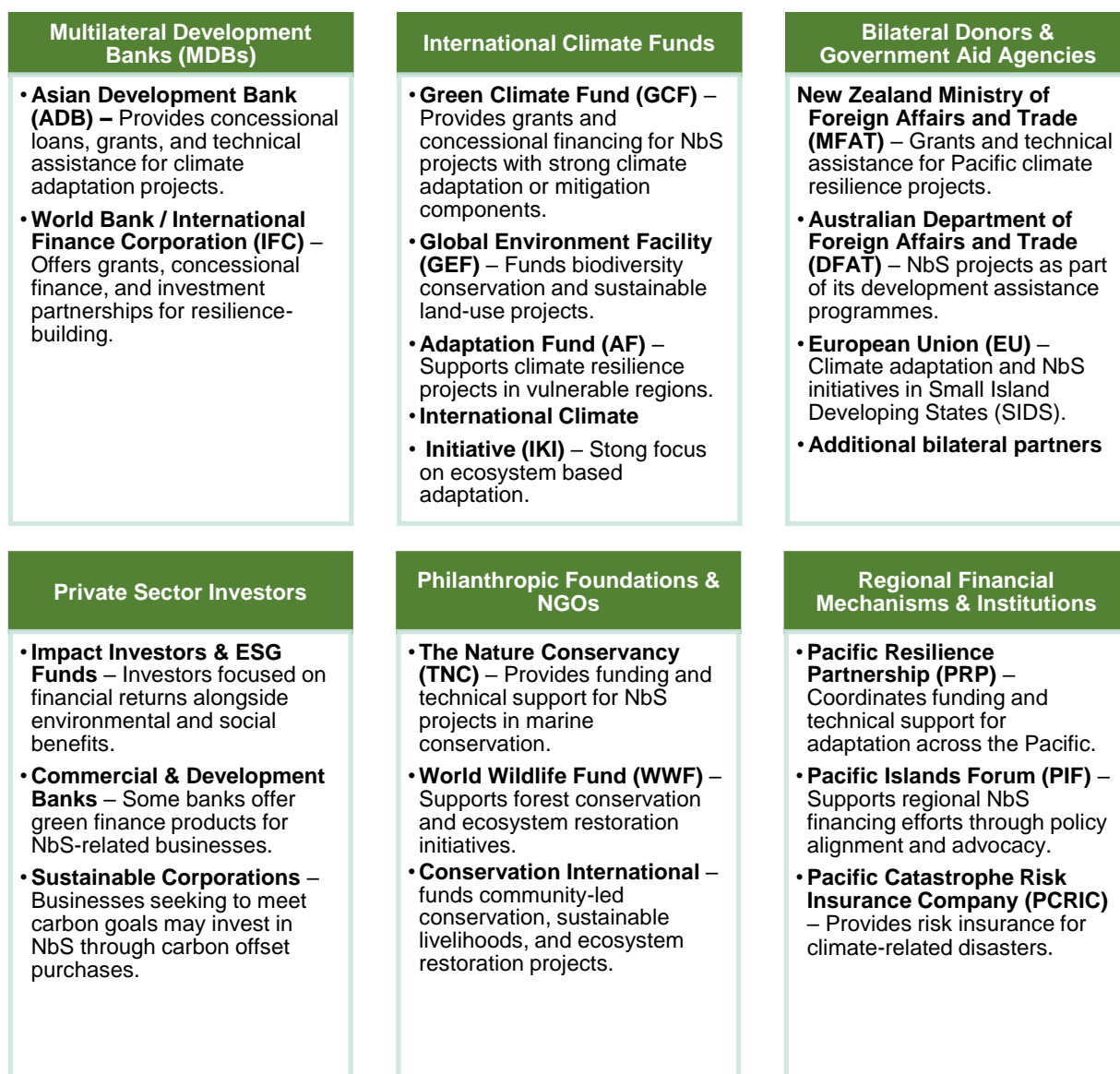


Figure 3.1: Potential funding providers for NbS initiatives

CBA results can help determine the most appropriate funding mechanism or provider for a given NbS project. For example:

- Projects with financial returns - Suitable for loans, impact investing, and green bonds (e.g., sustainable forestry, eco-tourism).
- Projects with strong public benefits but low direct revenue - Suitable for grants, climate finance, and PES schemes (e.g., wetland restoration, disaster risk reduction, or infrastructure projects).
- Projects with long-term carbon sequestration benefits - Suitable for carbon credit finance, PES, and blended finance models.

3.3 Leveraging Regional Cooperation for Funding

Regional cooperation can enhance funding opportunities for NbS projects by enabling PICs to access larger and more diverse funding sources. By working together, countries can

strengthen their bargaining power, streamline resources, and develop joint proposals that are more attractive to international donors and climate funds.

Some ways to leverage regional cooperation for funding NbS projects are:

- **Joint proposals and pooled funding:** PICs can collaborate on multi-country funding applications, increasing their chances of securing large-scale finance from global climate funds (e.g., GCF, GEF).
- **Regional funding platforms:** Institutions like the Pacific Islands Forum (PIF), Pacific Resilience Partnership (PRP), and the Kiwa Initiative facilitate access to regional funding and technical support.
- **Cross-border projects:** Coordinated approaches to shared challenges (e.g., coastal protection, forestry management) can attract investment by demonstrating regional impact.
- **Strengthening negotiation power:** A unified regional voice enhances advocacy efforts for increased funding from international donors and financial institutions.

Regional funds have been established or are in development to support NbS initiatives in the Pacific (Table 3.2). While some of these funds are still in the planning stages, their emergence highlights increasing efforts for collaboration and to mobilise resources for NbS across the region.

Table 3.2: Regional funds for NbS investment in the Pacific

Fund	Overview	Mechanisms	Projects
Asian Development Bank's (ADB) Nature Solutions Finance Hub	<ul style="list-style-type: none"> • Launched in December 2023 • Aims to mobilize at least \$2 billion for NbS across Asia and the Pacific. • Focuses on innovative financing approaches to attract private capital 	<ul style="list-style-type: none"> • Guarantees • Impact linked payments • Blended finance 	<ul style="list-style-type: none"> • Specific projects funded by the hub are in development, focusing on scalable NbS initiatives that address climate change and biodiversity conservation.
Kiwa Initiative	<ul style="list-style-type: none"> • Launched in 2020. • Supports climate resilience through NbS in the Pacific. • Supported by multiple donors, including the European Union, France, Canada, Australia, and New Zealand. • Managed by the Agence Française de Développement (AFD) 	<ul style="list-style-type: none"> • Grants for local projects (€25,000–€400,000). • Grants for regional projects (€1.5M–€5M). 	<p>24 projects in total (17 country projects and 7 regional). Examples include:</p> <ul style="list-style-type: none"> • RESTORE : Restoring Ecosystems for Sustainable, TransfOrmative, and REsilient Communities, Fiji, Samoa, and Timor-Leste. • Restoring mangroves for livelihoods in Fiji
Pacific Resilience Facility (PRF)	<ul style="list-style-type: none"> • Pacific-led initiative for community-level resilience projects. • Aims to build a capital base of \$1.5 billion to support climate adaptation, disaster preparedness, and early response effort. 	<ul style="list-style-type: none"> • Guarantees • Impact linked payments • Blended finance 	<ul style="list-style-type: none"> • Specific projects have not been identified
Pacific Catastrophe Risk Insurance Company (PCRIC)	<ul style="list-style-type: none"> • Offers parametric insurance solutions to PICs • Enables countries to access immediate funds based on predefined triggers, such as cyclone intensity or earthquake magnitude. 	<ul style="list-style-type: none"> • Guarantees • Impact linked payments • Blended finance 	<p>Payouts have been utilized for:</p> <ul style="list-style-type: none"> • Restoration of essential services post-disaster. • Rehabilitation of damaged public infrastructure. • Community support programs to aid recovery.
Micronesia Conservation Trust (MCT)	<ul style="list-style-type: none"> • Regional financing mechanism • Supports biodiversity conservation and climate adaptation. • Accredited entity for GCF and executing entity for AF and GEF. 	<ul style="list-style-type: none"> • Endowment Funds • Small grants programmes • Capacity-Building Initiatives 	<ul style="list-style-type: none"> • Executing Entity for the Adaptation Fund “Practical Solutions for Reducing Community Vulnerability to Climate Change in FSM” • Executing Partner & Regional Coordinator for the GEF funded “Micronesia Challenge 2030 (MC2030) Goals Support Project”

4. NbS implementation pathway

Scaling up NbS in Pacific Island countries involves a structured approach that incorporates policy alignment, stakeholder engagement, financing, and long-term sustainability. While the general pathway for NbS implementation remains largely similar across the region, there are context-specific variations based on each country's policy environment, institutional structures, and local needs.

Below is a step-by-step approach for scaling up NbS, with examples used to highlight the possible differences between countries. The steps are:

- Step 1: Establish an enabling policy and institutional framework
- Step 2: Identify and prioritise NbS projects
- Step 3: Secure sustainable financing for NbS
- Step 4: Strengthen capacity and knowledge sharing
- Step 5: Ensure long-term sustainability and replication.

While step 1 focuses on national level actions, steps 2 to 5 are relevant at both a national and regional level.

An additional resource for scaling up NbS in the Pacific is IUCN's Global Standard for NbS. Its criteria, particularly those focused on the identification, design, and assessment of NbS, offer useful guidance that can inform and strengthen national and regional efforts to scale up implementation in the Pacific context.¹⁶

4.1 Step 1: Establish an enabling policy and institutional framework

This is a national-level action to be implemented over the next 3–5 years. Governments will lead the process, with input from technical advisors and practitioners.

Integrate NbS into national and sectoral policies

Countries should prioritise integrating NbS principles into key national policies and frameworks, such as National Adaptation Plans (NAPS) and nationally determined contributions (NDCs). Integration into policies and frameworks helps provide a structured process for integrating climate adaptation, including NbS, into national development planning and budgeting.

For example, Vanuatu's national policies and strategies align with NbS in practice, even though they do not necessarily reference the term explicitly (see Section 7.2). When these policies are next updated, it would be valuable to explore how NbS relates to each sector and consider embedding NbS-specific targets where appropriate. This would help to strengthen policy coherence, attract climate finance, and ensure that NbS is fully integrated into sectoral planning and implementation.

Clarify institutional roles

It is essential that governments define the roles and responsibilities of key institutions responsible for NbS implementation. In larger countries like Fiji, institutions may already

¹⁶ IUCN Global Standard for Nature-based Solutions (2020). Available at: <https://www.iucn.org/resources/publications/iucn-global-standard-nature-based-solutions>

have formalised structures for climate change adaptation where NbS fit naturally within the current structure. For smaller nations, greater emphasis may be placed on community-level governance and traditional leadership in decision-making processes.

4.2 Step 2: Identify and prioritise NbS projects

This step will take place at a national and regional level. These actions should be undertaken over the next three years and then monitored and updated periodically. Governments, practitioners, technical advisors, and community groups will all play a key role in this process.

Conduct ecosystem and climate risk assessments

It is important for PICs to assess ecosystem vulnerabilities to climate change and identify areas where NbS can address these risks. This can involve using climate models and vulnerability mapping to identify areas most at risk from sea-level rise, storm surges, or drought. There are also some helpful tools to support this, such as Digital Earth Pacific.¹⁷

Conducting community consultations and integrating traditional knowledge can help ensure that the risk assessments are comprehensive and reflect local realities, improving the accuracy and relevance of the findings.

For example, the Solomon Islands has implemented a large-scale Integrated Vulnerability Assessment (IVA) process, guided by a framework tailored for atoll islands. This framework adopts a sustainable livelihoods-based approach that combines assessments of vulnerability to both climate change and disasters. It emphasizes participatory learning, the integration of traditional knowledge, and inclusive decision-making to empower communities and enhance resilience.¹⁸

Develop national and regional NbS project pipelines

Countries should develop a project pipeline to address the specific ecosystems and vulnerabilities identified in their risk assessments. Countries can work together to create a regional NbS project pipeline, identifying common priorities and areas for collaboration across countries, such as shared coastal ecosystems or regional flood risk zones.

The NbS initiatives highlighted in the case studies, nature-based seawalls (see Figure 5.3), mangrove restoration, and climate-smart agriculture, are likely to be relevant across Pacific Island countries. They should be considered in different contexts depending on each country's unique environmental, social, and economic context.

For example, nature-based seawalls may be particularly important for low-lying atolls like those in the Marshall Islands, while mangrove restoration could be a priority for countries with significant coastal ecosystems, such as Fiji or Vanuatu. Meanwhile, climate-smart agriculture is likely to have widespread relevance across the region, especially in countries where agriculture is a key sector for livelihoods and food security, like Tonga and Solomon Islands.

¹⁷ Digital Earth Pacific. (n.d.). Home. Retrieved from <https://digitalearthpacific.org/>

¹⁸ Secretariat of the Pacific Regional Environment Programme (SPREP). (2021). Integrated Vulnerability Assessment Framework for Atoll Islands: A Collaborative Approach. Available at: <https://www.sprep.org/publications/integrated-vulnerability-assessment-framework-for-atoll-islands-a-collaborative-approach>

Another example is that seawalls and land reclamation may be feasible for urban atoll islands, but for rural islands the smaller populations and lower access to materials (including aggregates) mean that NbS and building raising are more feasible.¹⁹

Conduct cost-benefit analyses

NbS solutions should be evaluated against the effectiveness of business-as-usual approaches and traditional grey infrastructure options. This comparison helps determine whether NbS is the most appropriate solution and aids in prioritising projects. Even a basic CBA is more useful than no assessment at all.

Criterion 4 of the IUCN Global Standard highlights the importance of ensuring that NbS are economically viable, making it directly relevant to cost-benefit analyses (CBAs). By assessing long-term costs and benefits, CBAs help determine the economic justification for NbS initiatives and support informed investment decisions.²⁰

For NbS projects, benefits typically include ecosystem services, though values for these can vary across different sources. A useful resource is the SPREP ERSAM project, which provides per-hectare values for different ecosystem types in Fiji, Solomon Islands, and Vanuatu. In the absence of country-specific data, an average of these values could be applied to other Pacific islands.

Another benefit often cited is a reduction in property and infrastructure damage. Estimating this benefit can be challenging, but examples like the Ba flooding project (Section 5.1) demonstrate how surveys with landowners can quantify annual expenditures on flood damage.

Ministries of finance (or equivalent) often possess CBA expertise and can provide useful Excel templates. The department responsible for NbS (e.g., the climate change department or ministry) should collaborate closely with the ministry of finance when CBAs are required, leveraging expertise across government. Embedding CBAs into the planning process is essential for effective project evaluation.

4.3 Step 3: Secure sustainable financing for NbS

Step 3 will occur at both national and regional levels, depending on the project or programme. This will be an ongoing task led by government and practitioners.

Consider financial instruments and funding sources

The most suitable funding source will depend on the specific initiative, as different financial instruments and providers may be more appropriate depending on the project's characteristics.

In addition to the financial instruments set out in Section 3, the questions in the figure below offer a starting point for identifying suitable funding sources for NbS initiatives. For accessing global climate funds, the size of the project is considered to ensure that the benefits justify

¹⁹ World Bank Group. (2024). The Pacific Atoll Countries Country Climate and Development Report. CCDR Series. Washington, DC: World Bank. Retrieved from <https://hdl.handle.net/10986/42262>

²⁰ IUCN Global Standard for Nature-based Solutions (2020). Available at: <https://www.iucn.org/resources/publications/iucn-global-standard-nature-based-solutions>

the intensive application process. An indicative project value of \$2 million is used but this number will vary based on the fund and the country.

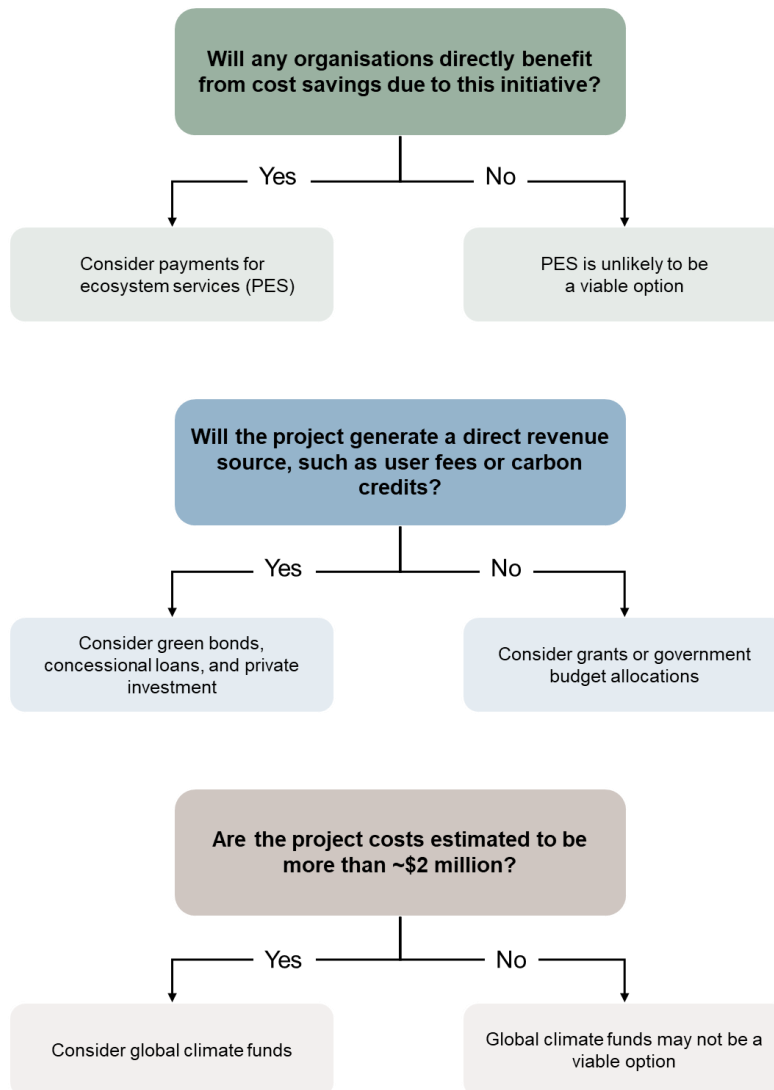


Figure 4.1: Prompts for identifying suitable funding sources

Other factors will also influence the final decision, such as the availability of funding at the right time. MDBs and bilateral partners have country budgets and priorities that will also play a role in determining funding opportunities.

4.4 Step 4: Strengthen capacity and knowledge sharing

This step will be carried out at both national and regional levels and will remain an ongoing priority. Capacity building is likely to be a particular focus in the coming years, as NbS is still a relatively new concept for many stakeholders. Government, technical advisors, practitioners, and community groups will all play an important role.

Build technical expertise

Countries should enhance technical capacity for designing and implementing NbS to ensure projects are well-adapted to local conditions. Both SPC and SPREP do a lot of work in this space and capacity building is a key focus for SPC as part of PPIN.

Stakeholder consultations in Fiji and Tonga highlighted technical capacity as a key gap. Each NbS project is unique due to variations in landscape and location, requiring tailored designs and specialised expertise.

Capacity-building initiatives should include:

- Training programmes for government officials, NGOs, and local practitioners on NbS design, implementation, and maintenance.
- Establishing regional centres of excellence or partnerships with universities to provide technical training.
- Knowledge exchanges with countries that have successfully implemented NbS projects.
- Leveraging digital tools such as GIS mapping and climate modelling to improve project design

Support traditional knowledge integration

Pacific Island countries have a strong tradition of integrating indigenous knowledge into environmental management, and in turn, traditional knowledge contributes significantly to their overall resilience. Combining traditional land-use practices with scientific NbS approaches enhances local ownership, sustainability, and long-term effectiveness.

Practical ways to integrate traditional knowledge include:

- Engaging community leaders in NbS project planning and decision-making.
- Documenting and sharing successful traditional practices that align with NbS principles.
- Supporting community-led NbS initiatives that draw on indigenous ecological knowledge.

Develop monitoring and evaluation systems

Pacific Islands can develop effective M&E systems for NbS by:

- **Defining objectives and indicators:** Set measurable goals aligned with climate, biodiversity, and socio-economic outcomes, and track progress through clear performance indicators.
- **Establishing baselines and monitoring plans:** Conduct baseline assessments before implementation and use standardised methods to ensure consistent, long-term monitoring.
- **Using digital tools:** Leverage GIS, remote sensing, drones, and platforms like Digital Earth Pacific to support baselining and climate risk assessments. Use mobile apps and cloud systems for real-time data collection and sharing.

- Reporting and evaluation: Implement regular reporting cycles, apply adaptive management, and encourage independent evaluations to build credibility and attract investment.

4.5 Step 5: Ensure long-term sustainability and replication

Lastly, step 5 will be implemented at both national and regional levels and will be an ongoing process. It will involve all key entities, including government, technical advisors, practitioners, and community groups.

Ensure inclusive and participatory approaches

NbS projects involve a diverse range of stakeholders and must ensure inclusive engagement. Inclusivity means actively involving marginalised groups (e.g., women, youth, and indigenous communities), ensuring equitable decision-making, and recognising diverse knowledge systems.

Different stakeholders will have different roles depending on the project. Understanding these differences ensures that NbS interventions are well-designed, socially inclusive, and aligned with national and community priorities. For example:

- Water resources restoration – Stronger engagement with water utilities and municipal authorities due to its urban setting.
- Mangrove restoration – Greater focus on marine-based stakeholders, including fishers and seafood businesses.
- Climate-smart agriculture – Requires active participation from farmers, agribusinesses, and financial institutions to drive adoption.

Effective engagement approaches include multi-stakeholder forums that bring together government agencies, landowners, and the private sector. These forums help coordinate restoration efforts and clarify roles in maintaining NbS. Community-based planning also plays a key role. It incorporates local needs and knowledge through participatory mapping and decision-making, supporting long-term stewardship.

The Stakeholder engagement sections in each country chapter sets out the different categories of stakeholders. This can be used as a framework for identifying stakeholders in other Pacific countries.

Monitor and scale up successful interventions

NbS interventions that demonstrate positive impacts should be replicated across similar contexts. A regional knowledge-sharing document highlighting successful NbS projects in the Pacific and key lessons learned could help accelerate replication across different countries.

Pilot projects serve as valuable models for scaling up NbS. These pilots should focus on demonstrating measurable benefits such as:

- Ecosystem restoration and biodiversity conservation.
- Climate resilience and disaster risk reduction.
- Socio-economic benefits, including improved livelihoods.

In Fiji, hybrid seawalls combining natural elements like mangroves with engineered structures were piloted under the Kiwa Initiative. This approach is now being scaled up

through an Adaptation Fund project, highlighting the potential for nature-based solutions to be integrated into broader climate resilience efforts.²¹

Embed NbS in climate and infrastructure planning

NbS should be formally integrated into national development plans and sectoral policies, as outlined in Step 1. Assessing NbS alongside other adaptation and infrastructure investment options should be embedded in climate change planning and project feasibility assessments. This ensures NbS solutions are considered viable alternatives or complementary measures to traditional infrastructure and adaptation measures.

Foster regional and international collaboration

Strengthening regional cooperation will enhance the effectiveness and sustainability of NbS across the Pacific. Countries can collaborate through existing platforms such as:

- PIFS, SPREP and SPC – Facilitating technical assistance, funding opportunities, and regional policy alignment.
- Pacific Resilience Partnership (PRP), Pacific Regional Infrastructure facility (PRIF) and Pacific Island Roundtable NbS working group – Sharing best practices and coordinating regional NbS efforts.
- Multilateral climate finance mechanisms – Accessing funding through initiatives like the Green Climate Fund and Global Environment Facility.

Key opportunities for collaboration include:

- Joint research initiatives to improve NbS design and implementation.
- Data and knowledge-sharing platforms to track progress and lessons learned.
- Cross-country capacity-building programmes to strengthen technical expertise and implementation skills.

²¹ Adaptation Fund. (n.d.). Strengthening the adaptive capacity of coastal communities of Fiji to climate change through nature-based seawalls. Retrieved April 14, 2025, from <https://www.adaptation-fund.org/project/strengthening-the-adaptive-capacity-of-coastal-communities-of-fiji-to-climate-change-through-nature-based-seawalls/>

5. Fiji national case studies

Fiji faces environmental and climate challenges shaped by its tropical maritime climate and geographic features. The country's weather patterns are influenced by the South Pacific Convergence Zone, which brings heavy rainfall during the wet season from November to April, often accompanied by tropical cyclones. The dry season follows for the remainder of the year, with distinct variations between the wetter windward and drier leeward zones of the main islands.

As in other Pacific Island countries, climate change is intensifying Fiji's vulnerability to extreme weather events, particularly cyclones, which have become more frequent and severe in recent decades. Rising sea levels, coastal erosion, and shifting rainfall patterns further threaten ecosystems and livelihoods.

Three CBAs were conducted for Fiji under the PPIN programme:

- Case study A: Revegetation of floodplain and upland forest, Ba Catchment
- Case Study B: Nature based coastal seawall in Nabuna, Lomaiviti
- Case study C: Agroforestry in Taveuni Island.

A separate CBA report outlines the methodology and results of the CBAs. This chapter presents the business case for each initiative, discusses the integration of NbS into national development plans, and outlines stakeholder engagement for NbS projects in Fiji.

5.1 Business case for revegetation of floodplain and upland forest, Ba Catchment.

Ba Catchment is in the north-western part of Viti Levu. Ba is the second largest province in Fiji by area and the largest by population, with approximately 231,762 residents.²²

The Ba River runs from its headwaters in the central mountainous parts of Viti Levu north through Ba Town, spilling into the Pacific near the village of Nailaga.

The Ba River catchment in Fiji experiences frequent and severe flooding, causing extensive damage to crops, property, and livelihoods. Current land use, dominated by open grasslands and agriculture, exacerbates runoff and reduces the region's natural flood attenuation capacity.

Three scenarios were considered in the CBA:

- Business as usual (BAU) scenario: Flood risks remain high, with reliance on costly and temporary measures such as dredging. Dredging occurs every 10 years at the lower portion of the Ba River (3,845,000 m³). Agricultural land continues to be used for sugarcane farming, providing immediate income streams. Environmental degradation and biodiversity loss persist.
- NbS scenario: Native trees would be planted on 35,626 ha of talasiga (open grassland) in upper catchment. Native vegetation would be planted on 1,631 ha (10%) of the floodplain. Revegetation stabilises soils, reduces runoff, and enhances

²² Fiji 2007 census.

flood protection. Land required may currently be in use for agriculture (such as growing of sugar cane) or other purposes.

- Grey scenario: A grey infrastructure scenario would involve the construction of engineered flood management solutions such as levees, floodwalls, and additional river dredging to control water flow and reduce flood risks in the Ba River catchment. This approach may disrupt natural ecosystems.

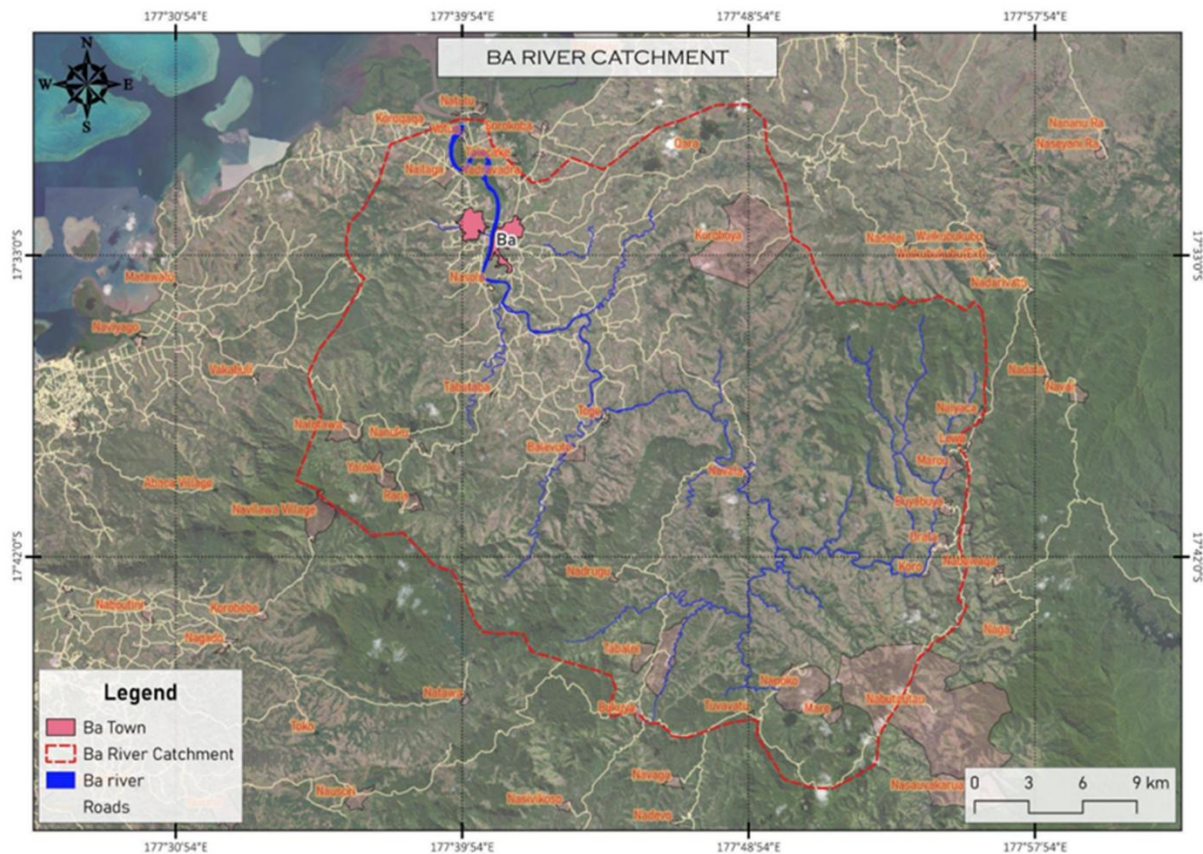


Figure 5.1: Site location, Ba River catchment

Cost-benefit analysis results

The costs and benefits of flood mitigation in Ba over a 30-year period are presented in the graph below. The values are from:

- Costs: Costs include capital expenditure in initial years and operational expenditure over the 30-year period is taken from the Ba Flood Mitigation Scoping Study (2024).²³
- Benefits: The benefits of all the scenarios include, to different extents, avoided damages for crops, livestock, housing, durable assets, and businesses. The NbS option also includes benefits from carbon sequestration and provision of non-timber forest product like food, construction materials and medicines.²⁴

²³ Ba flood mitigation scoping study: Option evaluation and recommendations (2025) Haskoning Australia Pty Ltd Jan 2024

²⁴ Ba flood mitigation scoping study: Option evaluation and recommendations (2025) Haskoning Australia Pty Ltd Jan 2024

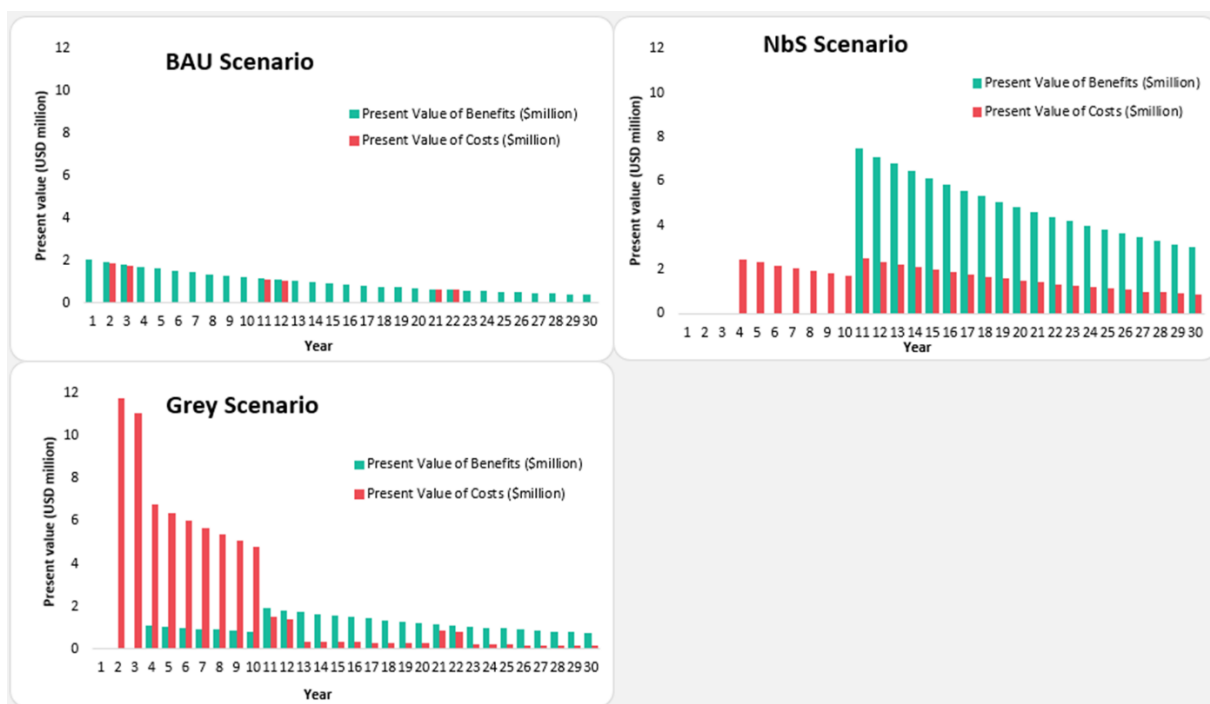


Figure 5.2: Costs and benefits of flood mitigation in Ba over 30 years

The NbS Scenario has the highest net present value. This means that the revegetation project would generate the most net benefits to society. The costs and benefits are taken over a 30-year period and a 6 percent discount rate has been used to determine the present value.

Table 5.1: Net present value of flood mitigation in Ba

	Benefits (PV, USD million)	Costs (PV, USD million)	NPV (USD million)	Benefit cost ratio
BAU scenario	29	7	23	4.24
NbS scenario	98	44	53	2.2
Grey scenario	31	70	-40	0.44

Economic, social, and environmental benefits

A flood mitigation scheme in the Ba Catchment that involves revegetation of floodplains and upland forests would have significant economic, social, and environmental benefits:

- Economic benefits
 - Reduced flood damage costs: Restoring vegetation helps slow water runoff and improve soil absorption, reducing infrastructure damage and agricultural losses.
 - Enhanced agricultural productivity: Stabilised soils and improved water retention reduce erosion and increase soil fertility. This benefit would need to be compared to the reduction in income from land converted from agricultural purposes for revegetation.
 - Tourism and eco-business opportunities: A restored landscape can attract eco-tourism and support sustainable businesses like beekeeping or agroforestry.

- **Social benefits**
 - Improved community resilience: Reduced flood risks protect homes, livelihoods, and critical infrastructure like roads and schools.
 - Increased water security: Healthy forests regulate water flows, reducing drought risks and ensuring a more stable water supply.
 - Livelihood diversification: Restoration projects create jobs in nurseries, planting, and forest management, supporting local employment.
 - Cultural and traditional benefits: Restored ecosystems support indigenous practices and community land stewardship.
- **Environmental benefits**
 - Improved flood regulation: Reforestation absorbs excess rainwater, reducing peak flood levels and downstream impacts.
 - Enhanced biodiversity: Native vegetation restoration creates habitats for wildlife and strengthens ecosystem resilience.
 - Carbon sequestration: Replanted forests absorb CO₂, contributing to climate change mitigation.
 - Reduced sedimentation: Vegetation stabilises soils, preventing sediment runoff that can degrade rivers and coastal ecosystems.

Market potential

The viability of private sector engagement is outlined in the table below. Given the location and scale of the flooding, there are some organisations with enough resources to potentially support this project either through PES or sponsorship. There is also sufficient land area to consider carbon or biodiversity credits.

Table 5.2: Market potential for revegetation of floodplain in Ba

Private engagement	Potential funding source
Public-private partnerships (PPPs)	<p>Low likelihood</p> <p>Private sector is unlikely to invest due to no clear revenue streams. In addition, for implementation under a PPP arrangement, the private party would be responsible for meeting project objectives which has financial risks. Therefore, they may prefer a service contract where payment is guaranteed.</p>
Payment for Ecosystem Services (PES)	<p>Moderate potential</p> <p>Downstream beneficiaries such as hydropower operators, water utilities, and municipalities could pay for initiatives to maintain forests that regulate water flow and reduce sedimentation.</p>
Carbon offsetting and biodiversity credits	<p>Moderate potential</p> <p>There is sufficient land area for practices to create measurable and verifiable carbon credits.</p> <p>However, for carbon or biodiversity credits to be feasible, the project would need to meet specific standards which require clear baselines, monitoring, and verification over time. This process can be intensive and costly.</p>
Sponsorship and corporate social responsibility	<p>Moderate potential</p> <p>There is potential to receive sponsorships from organisations impacted by the flooding. For example, water and hydropower companies, the tourism and hospitality sector, agribusiness and food companies, banks and financial institutions, or telecommunications companies.</p>
Eco-tourism and sustainable business models	<p>Low likelihood</p> <p>There may be support from eco-tourism businesses, but they are unlikely to invest in this project given the scale resource constraints of these businesses.</p>

Risk analysis: Identifying and mitigating potential challenges

Project risks along with mitigating strategies are presented in the table below.

Table 5.3: Risks and mitigation measures for revegetation of floodplain in Ba

Risk	Description	Mitigation
Land tenure and community conflicts	Many areas in the Ba Catchment are under customary or freehold ownership, which could lead to disputes over land use for revegetation and flood mitigation.	Engage early with landowners and local communities through participatory planning, ensuring that benefits such as agroforestry or PES incentives align with their interests.
Climate change impacts	Increased rainfall variability and extreme weather events could reduce the effectiveness of revegetation efforts and disrupt project timelines.	Use climate-resilient tree species, design NbS with flexibility for changing conditions, and integrate adaptive management practices.
Limited long-term funding	Initial funding may cover project implementation, but long-term maintenance of reforested areas and flood mitigation infrastructure requires sustained financial support.	Establish PES schemes, corporate sponsorship, or government budget allocations to ensure ongoing financial sustainability.
Land-use pressure and deforestation	Competing land-use demands, such as agriculture, logging, or urban expansion, may lead to continued deforestation in upland areas, reducing the effectiveness of flood mitigation efforts.	Implement land-use zoning, promote sustainable agroforestry, and provide alternative livelihoods to reduce reliance on deforestation. Compensation schemes may also be needed.

Scalability: Opportunities to replicate and expand successful interventions

There are opportunities to replicate and expand flood mitigation through NbS in other areas of Fiji and the Pacific.

- Scaling within Ba Catchment
 - Additional upland and riparian areas within Ba could be targeted for revegetation to further reduce flood risk and improve water retention.
 - Expanding agroforestry practices in flood-prone farming areas can integrate economic benefits with flood mitigation.
- Application in Other Fiji River Catchments
 - Other flood-prone catchments such as Nadi, Rewa, and Sigatoka face similar challenges of deforestation, erosion, and flood risk.
 - Lessons from Ba’s revegetation project can inform catchment-wide restoration strategies in these areas.
- Regional Expansion in the Pacific
 - Many Pacific islands experience similar flood risks and watershed degradation, making nature-based flood mitigation relevant for countries like Vanuatu, Solomon Islands, and Papua New Guinea.
 - Regional collaboration under initiatives like the Pacific Resilience Facility could support knowledge-sharing and funding for expansion.

- Construction and maintenance: US \$512,366 total seawall cost (SPC, 2023), spread over the first 3 years.²⁵ Maintenance costs are \$5,124 each year after year 3 (1% of initial costs)
- Benefits
 - Ecosystem services from mangroves: 10,400 mangroves are expected to be planted over 5.2 hectares (2,000 mangroves/ha). The value of ecosystem services for any new mangrove planting has been progressively increased to reach this full value over ten-years. After 10 years, the value is US \$54,080 each year.²⁶
 - Ecosystem services from vetiver: 13,000 vetiver is expected to be planted over 0.87 hectares (15,000 vetiver/ha). From year 3, ecosystem benefits from vetiver are US \$11,310 per year.²⁷
 - Avoided damages: The seawall provides erosion control as well as protection from storm surges and flooding. This is expected to equal US \$46,827 in avoided damages spread over the 43 households each year.

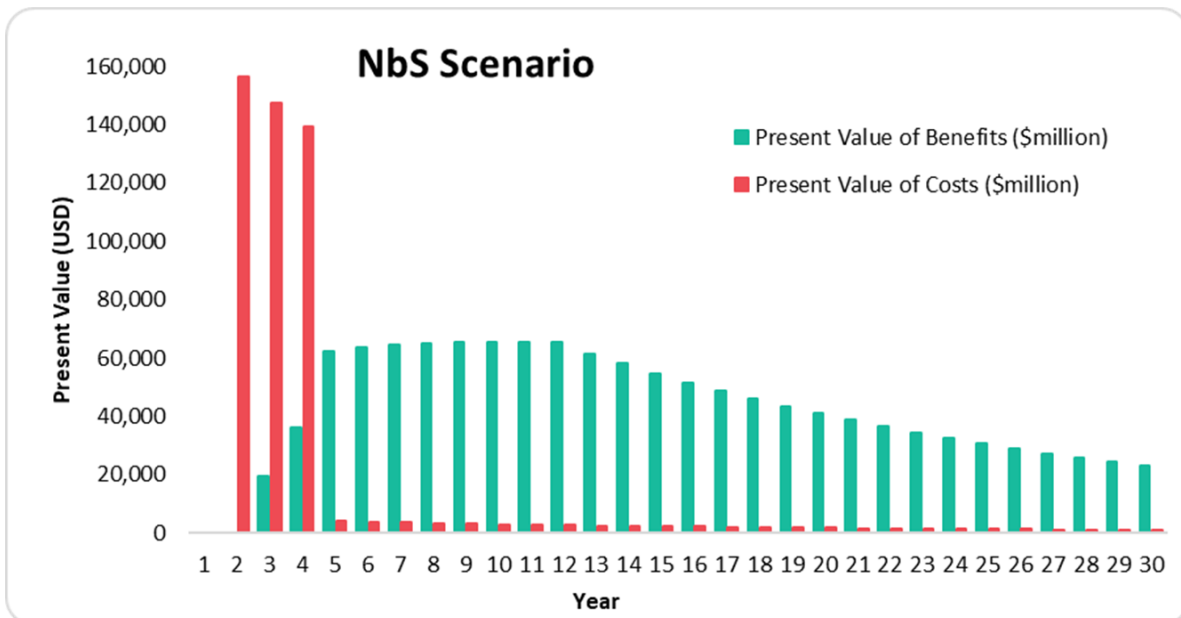


Figure 5.4: Costs and benefits of NbS seawall in Nabuna over 30 years

For the Grey scenario, the values are from:

- Costs:

²⁵ “Strengthening the Adaptive Capacity of Coastal Communities in Fiji to Climate Change through Nature-Based Seawalls” (2023) Adaptation Fund Proposal by SPC.

²⁶ Coastal mangroves in Fiji have an ecosystem service value of US \$12,789/ha/year. “National Ecosystem and Socio-Economic Resilience Analysis and Mapping Fiji” (2020) SPREP

²⁷ Coastal wetlands in Fiji have an ecosystem service value of US \$16,147/ha/year. “National Ecosystem and Socio-Economic Resilience Analysis and Mapping Fiji” (2020) SPREP

- Construction and maintenance: Conventional concrete seawall cost US \$6,780 per metre (SPC 2023 AF proposal). This equals a cost of US \$3,525,600 split evenly over the first 3 years.²⁸
- Benefits
 - Avoided damages: The seawall provides erosion control as well as protection from Storm Surges and Flooding. There are 43 households in Nabuna. The NbS seawall will help prevent approximately US \$1,650 in damages to each house each year (10% of the estimated house value). This equals US \$ 70,950 in avoided damages each year.

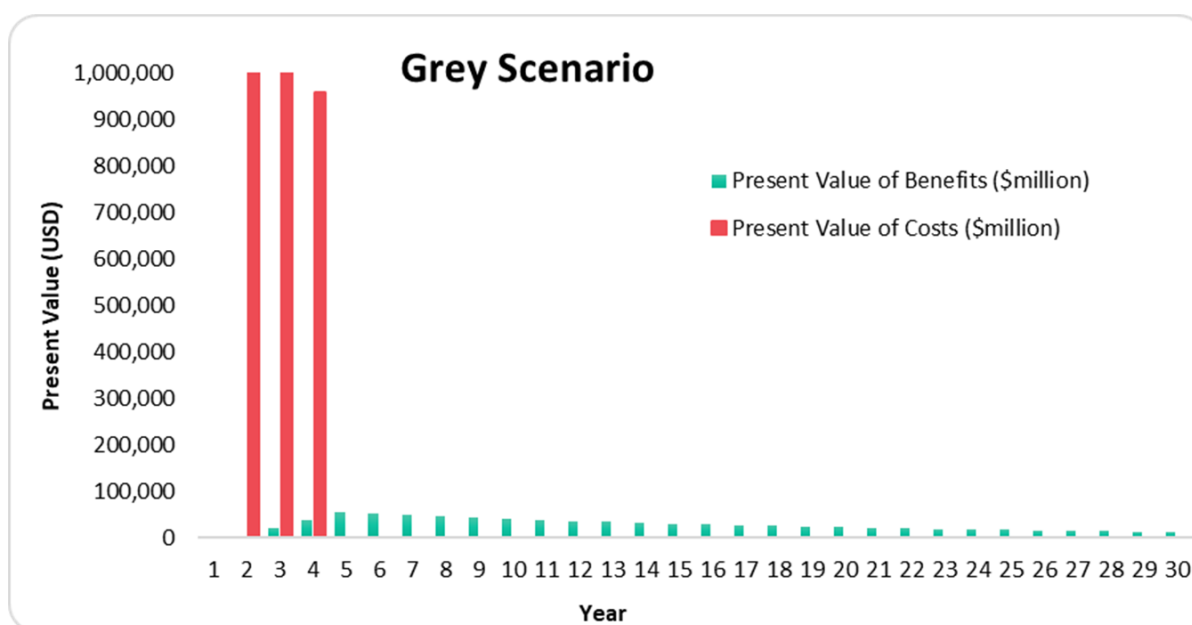


Figure 5.5: Costs and benefits of grey seawall in Nabuna over 30 years

The NbS Scenario has a positive net present value. The positive NPV indicates net benefits to society from the NbS seawall. The costs and benefits are taken over a 30-year period and a 6 percent discount rate has been used to determine the present value.

Table 5.4: Net present value of seawall in Nabuna

	Benefits (PV, USD)	Cost (PV, USD)	NPV (USD)	Benefit cost ratio
NbS scenario	1,278,150	497,744	780,406	2.57
Grey scenario	811,387	3,051,123	-2,239,736	0.27

The grey scenario is expected to protect properties more effectively than a nature-based seawall. However, when environmental benefits are also considered, the NbS scenario provides greater overall value. Communities may prioritise minimising property damage, as these costs are more immediate and easier to quantify. Stakeholder consultation will be important to understand local priorities and to clearly communicate the broader

²⁸ “Strengthening the Adaptive Capacity of Coastal Communities in Fiji to Climate Change through Nature-Based Seawalls” (2023) Adaptation Fund Proposal by SPC.

environmental benefits of NbS. Further research into the performance of nature-based seawalls in other locations is also needed to more accurately assess their effectiveness.

Economic, social, and environmental benefits

A nature-based seawall in Nabuna would have economic, social, and environmental benefits:

- Economic benefits
 - Reduced coastal damage: Protects homes, infrastructure, and businesses from erosion and storm surges, reducing long-term repair and maintenance costs.
 - Cost-effectiveness: Compared to conventional concrete (grey) seawall.
 - Livelihood support: Preserves fisheries, tourism, and agriculture by maintaining coastal ecosystems, benefiting local income sources.
- Social benefits
 - Community resilience: Enhances protection for coastal communities, reducing displacement risks and safeguarding cultural heritage.
 - Aesthetic and recreational benefits: A greener coastline improves community well-being and can enhance tourism appeal.
- Environmental benefits
 - Coastal ecosystem restoration: Strengthens biodiversity by restoring mangroves, seagrass, and coral reefs, improving fish habitats and carbon sequestration.
 - Water quality improvement: Mangroves and other natural barriers can filter pollutants, enhancing nearshore water quality.
 - Climate resilience: Natural barriers can adapt and grow with sea-level rise, unlike hard infrastructure, providing long-term protection.

Market potential

Market potential is limited due to the island's small population and rural nature. The 2017 census recorded 2,937 residents and the ferry time from Suva is 6 to 8 hours.

There is moderate potential for carbon credits if combined into a larger programme of work. The viability of private sector engagement is outlined in the table below.

Table 5.5: Market potential for nature-based seawall in Nabuna

Private engagement	Potential funding source
Public-private partnerships (PPPs)	Low likelihood Due to scale, location, and revenue potential.
Payment for Ecosystem Services (PES)	Low likelihood Unlikely given the size and number of businesses in the area.
Carbon offsetting and biodiversity credits	Moderate potential Potential for carbon credits if combined into a larger programme with other similar projects. Scale is needed to justify the administrative and monitoring costs which can be complex and resource intensive.
Sponsorship and corporate social responsibility	Low likelihood Unlikely given the size and number of businesses in the area.
Eco-tourism and sustainable business models	Low likelihood There is likely to be support from eco-tourism operators. However, investment is unlikely due to limited resources.

Risk analysis: Identifying and mitigating potential challenges

Project risks along with mitigating strategies are presented in the table below.

Table 5.6: Risks and mitigation strategies for nature-based seawall and Nabuna

Risk	Description	Mitigation
Climate and natural hazards risk Description	Extreme weather events, such as cyclones and storm surges, could damage newly established vegetation or erode the seawall before it becomes fully effective.	<ul style="list-style-type: none"> • Use resilient native species like mangroves or salt-tolerant plants. • Implement phased planting to allow gradual ecosystem establishment. • Incorporate hybrid approaches (e.g., combining vegetation with rock barriers for initial stability).
Community acceptance and land tenure issues	Landownership complexities or resistance from local communities may delay implementation, especially if land use changes are required. Given there is an existing seawall the risks for this may be low.	<ul style="list-style-type: none"> • Conduct early and continuous stakeholder engagement. • Ensure community co-design of the project.
Long-term maintenance and sustainability	Without ongoing management, invasive species, coastal erosion, or inadequate community engagement could undermine the seawall's effectiveness.	<ul style="list-style-type: none"> • Establish a local stewardship programme with training for community members. • Integrate monitoring into existing environmental initiatives. • Secure funding for long-term maintenance through government or donor support.
Financial and administrative challenges	The project may face difficulties securing funding, especially if administrative costs for compliance with carbon credits or other financing mechanisms are too high.	<ul style="list-style-type: none"> • Bundle the project with other NbS initiatives to reduce administrative costs. • Seek blended finance options. • Ensure financial sustainability through partnerships with regional organisations.

Scalability: Opportunities to replicate and expand successful interventions

The scalability of the nature-based seawall in Nabuna presents opportunities to replicate and expand successful interventions across similar contexts in the region:

- **Community-led expansion:** If the local community sees economic and environmental benefits, they may take the lead in expanding the approach.
- **Replication across coastal communities:** The success of the seawall in Nabuna could serve as a model for other low-elevation coastal communities in Fiji and the wider Pacific. Given the shared vulnerabilities to sea level rise and extreme weather, the design could be adapted and implemented in areas with similar coastal dynamics and housing exposure.
- **Integration with other NbS:** The seawall could be combined with other NbS, such as mangrove restoration or coral reef rehabilitation, to create a more holistic coastal protection strategy.
- **Leveraging regional platforms:** By collaborating with regional organisations, the project could benefit from shared knowledge and resources to scale up. These platforms could help identify additional sites and secure funding for further NbS projects in other Pacific islands facing similar threats.

5.3 Business case for agroforestry in Taveuni Island

Taveuni faces rapid agricultural expansion, with farmers encroaching on forested areas to establish high-demand crops like yaqona and dalo, leading to soil degradation and loss of biodiversity. The shift from subsistence to semi-commercial agriculture exacerbates the environmental and economic challenges, threatening both agricultural productivity and ecological health.

For the CBA, an NbS scenario has been compared to a business-as-usual scenario:

- **BAU scenario** - Current land-use patterns continue, with a focus on monocropping (vanilla, yam, kava, coconut) and limited land restoration over the 55 hectares of land. This approach results in ongoing soil erosion, reduced biodiversity, and declining agricultural productivity, further exacerbating food security risks and vulnerability to climate change impacts
- **NbS scenario** - Broad-scale adoption of agroforestry practices on 55 hectares of land, converting agricultural and underutilised land, including portions of forest, into diversified agroforestry systems. This approach supports sustainable land management by enhancing soil and water conservation, increasing biodiversity, and providing diversified income streams for farmers. For this scenario a hypothetical 'agroforestry arrangement' (AA) was created that considered crops, and tree species appropriate to the region



Figure 5.6: Map of Taveuni

Cost-benefit analysis results

The costs and benefits of agroforestry in Taveuni over a 30-year period are presented in the graph below. The values for the BAU scenario are from:

- Costs
 - Operational costs: Costs are estimated at 0.3 times revenue for existing land use.
- Benefits
 - Existing land use benefits: Land use in the study area is made up of forest, vanilla/yam/kava, tropical fruits, coconut and open land. Land use have been multiplied by the value of agricultural yields and eco system services (World Bank Commodity data). Total value for the 55 hectares of land is estimated at US \$303,599 per year.

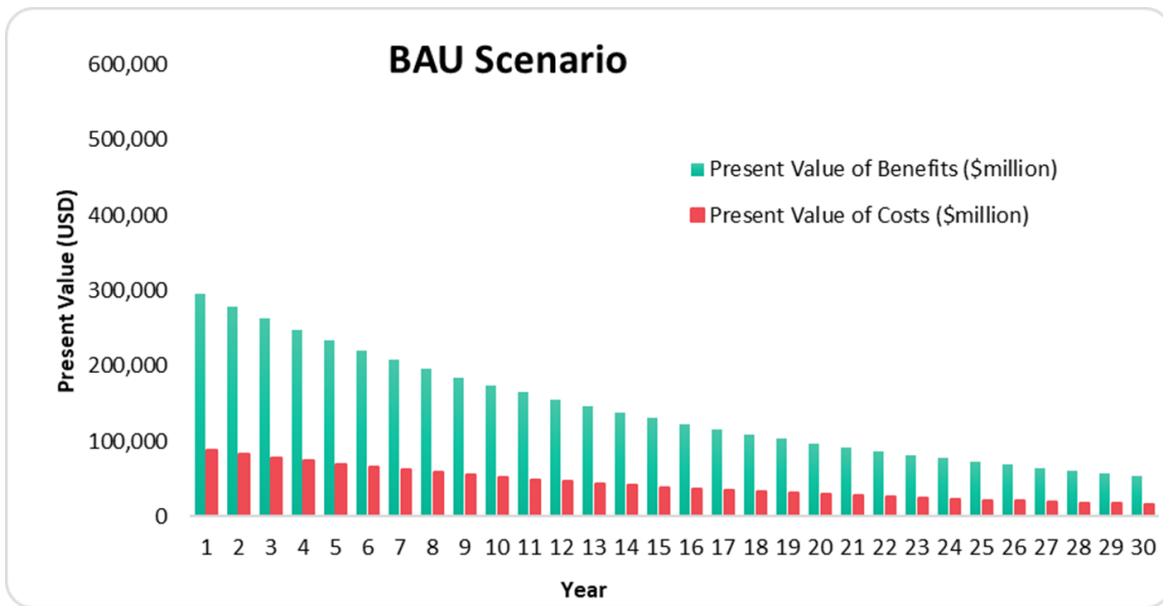


Figure 5.7: Costs and benefits of BAU scenario in Taveuni over 30 years

For the NbS scenario, the values are from:

- Costs
 - Made up of nurseries, self-managed and commercial replanting, agricultural enhancement, ongoing training and support, and labour costs.²⁹
- Benefits
 - Existing land use benefits, as well as additional values for annual, perennial and long-term crops. The existing land use benefits are the value of agricultural yields and eco system services already established (World Bank Commodity data). As land is converted to agroforestry, the existing land use benefits decrease but the agroforestry benefits increase.³⁰

²⁹ Project document for “Ecosystem-Based Adaptation Options for Taveuni”

³⁰ “Categorisation of regional agriculture products into functional roles based on term to maturity, and the average yield in USD per hectare per year” Promoting Pacific Islands Nature-Based Solutions (PPIN) Programme. (2024). Cost-benefit analysis of Nature-based Solutions in Fiji.

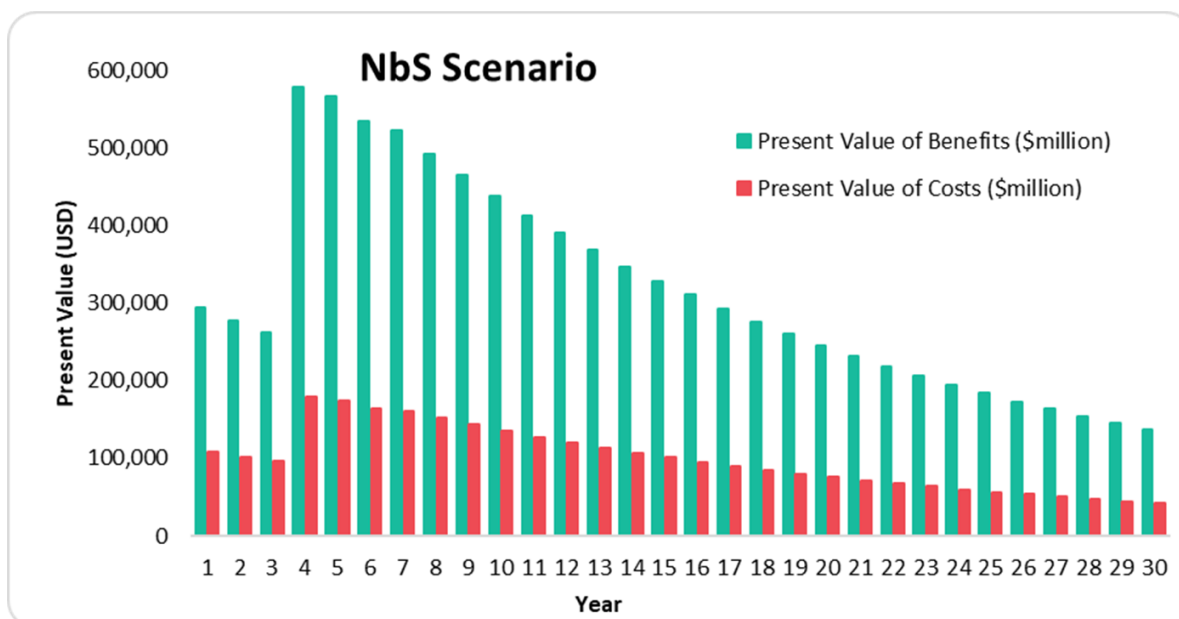


Figure 5.8: Cost and benefits of agroforestry in Taveuni

The NbS Scenario has a higher net present value than the BAU scenario. This represents net benefits to society from the agroforestry project. The costs and benefits are taken over a 30-year period and a 6 percent discount rate has been used to determine the present value.

Table 5.7: Net present value of agroforestry in Taveuni

	Benefits (PV, USD million)	Cost (PV, USD million)	NPV (USD million)	Benefit cost ratio
NbS scenario	4.3	1.3	3.0	3.33
Grey scenario	9.5	3.0	6.5	3.19

Economic, social, and environmental benefits

An agroforestry project in Taveuni could have a range of economic, social, and environmental benefits:

- Economic benefits
 - Diversified income sources: Agroforestry systems can provide farmers with multiple streams of income from both crops and trees (e.g., vanilla, kava, fruits, timber, and non-timber forest products). This diversification can help stabilise income, especially in the face of climate risks.
 - Increased productivity: The integration of trees with crops can enhance overall productivity, such as through better soil fertility, reduced erosion, and improved water retention.
- Social benefits
 - Improved food security: Agroforestry can contribute to enhanced food security by increasing the diversity of food crops grown alongside cash crops, helping local communities become more resilient to supply chain disruptions.

- Community engagement and empowerment: Involving local communities in agroforestry projects can build knowledge, improve collaboration, and empower farmers by providing them with more sustainable livelihood options.
- Cultural preservation: Agroforestry can support the cultivation of culturally important crops, like kava and yam, fostering a sense of identity and preserving traditional farming practices.
- Environmental benefits
 - Biodiversity enhancement: By integrating trees with crops, agroforestry systems can improve habitat quality, support biodiversity, and provide shelter and food for wildlife.
 - Soil conservation: Agroforestry can reduce soil erosion, improve soil fertility, and enhance water retention by maintaining tree cover and root systems.
 - Carbon sequestration: Trees in agroforestry systems capture carbon from the atmosphere, contributing to climate change mitigation through carbon sequestration.
 - Water management: The presence of trees can improve water cycle management, including better absorption and filtration of rainwater, reducing the risk of flooding and soil degradation.

Market potential

The viability of private sector engagement is outlined in the table below. There is moderate potential for a partnership between the government and smallholder farmers and some co-investment.

Table 5.8: Market potential for agroforestry in Taveuni

Private engagement	Potential funding source
Public-private partnerships (PPPs)	Moderate potential The Government would need to collaborate with local communities to implement this project, which primarily involves subsistence and small-scale farmers. These farmers would require training, as well as initial access to seeds and materials. While this is not a traditional public-private partnership (PPP), it would still involve a partnership between the government and local communities, with shared functions and responsibilities.
Payment for Ecosystem Services (PES)	Low likelihood Unlikely given that the benefits are predominantly the local communities.
Carbon offsetting and biodiversity credits	Low likelihood There is unlikely to be sufficient land area for practices to create measurable and verifiable carbon credits.
Sponsorship and corporate social responsibility	Low likelihood Unlikely given the size and number of businesses in the area.
Eco-tourism and sustainable business models	Low likelihood Unlikely given the size and number of businesses in the area.

Risk analysis: Identifying and mitigating potential challenges

Project risks along with mitigating strategies are presented in the table below.

Table 5.9: Risks of agroforestry in Taveuni

Risk	Description	Mitigation
Climate variability and extreme weather events	Fiji is vulnerable to extreme weather events, such as cyclones and droughts, which can affect crop yields and project sustainability.	<ul style="list-style-type: none"> • Incorporate climate-resilient practices (e.g., drought-tolerant crops, improved irrigation systems) and develop contingency plans for extreme weather events to protect the livelihoods of farmers.
Limited access to technology and expertise	Farmers may lack access to the necessary tools, technologies, or expertise to implement climate-smart practices effectively.	<ul style="list-style-type: none"> • Provide capacity-building programs, training workshops, and access to affordable technologies (e.g., weather forecasting tools, improved seed varieties) to empower farmers.
Land tenure and ownership disputes	The customary land ownership system in Tonga may lead to disputes or confusion about land rights, hindering project implementation.	<ul style="list-style-type: none"> • Engage with local landowners and communities early in the project design process, ensuring clarity in land agreements and promoting inclusive decision-making.
Financial Sustainability	Farmers may struggle to sustain long-term financing for these climate smart methods.	<ul style="list-style-type: none"> • Explore alternative funding sources, such as carbon offsetting and biodiversity credits, and establish partnerships with development organizations to support long-term project financing.

Scalability: Opportunities to replicate and expand successful interventions

There are opportunities to replicate and expand the agroforestry project in Taveuni and the wider region:

- Scaling within Taveuni
 - Expanding to other agricultural lands: Taveuni is approximately 43,500 hectares in size with a substantial portion of the island's land is used for agriculture. Agroforestry can be introduced in areas affected by soil erosion or deforestation to restore land productivity.
 - Partnerships with local farmers: Training more farmers on agroforestry techniques and sustainable land management can encourage broader adoption.
- 2. Replication across Fiji
 - Other islands with similar challenges: Regions facing deforestation, declining soil fertility, or water scarcity could benefit from similar projects.
 - Coastal agroforestry for climate resilience: Expanding the project to coastal areas could help protect shorelines from erosion while providing livelihood opportunities.
- 3. Regional and International Scaling
 - Knowledge-sharing with other Pacific Islands: Countries like Tonga and Vanuatu, which have similar land-use challenges, could replicate the model through regional cooperation (see step 5 of the Implementation Pathway).

- Agroforestry value chains: Developing processing facilities for agroforestry products could support commercial scaling and attract investment.

5.4 Integrating NbS into national development plans

Fiji has several key national policies and strategies that align with NbS, particularly in areas such as ecosystem conservation, disaster risk reduction, and climate adaptation.

Fiji's National Climate Change Policy and revised NDC both specifically mention NbS objectives. Drafting of the revised National Adaptation Plan (NAP) will begin in April 2025. According to the stakeholder consultation, the revised NAP will include NbS elements.

There are opportunities to strengthen NbS by establishing measurable targets, embedding NbS into infrastructure and environmental planning processes, and clarifying its connection to national policies that reference its components or related approaches.

Table 5.10: Integration of NbS in key Fiji policy documents

National document	Alignment with NbS	Opportunities for Strengthening NbS
Fiji's National Climate Change Policy (2018-2030)	This policy specifically mentions NbS as part of its strategy for reducing climate risks and enhancing resilience. It includes the objective to increase ecosystem protection, natural resource redundancy, and environmental resilience through NbS.	NbS is already integrated into the document. Strengthening NbS further could involve setting specific, measurable targets and ensuring its integration into sector-specific climate strategies and action plans developed in alignment with the Climate Change Policy.
Fiji's National Adaptation Plan (NAP)	The NAP will be developed in 2025 and is expected to include NbS.	Explicitly integrate NbS into adaptation actions, particularly for climate-resilient infrastructure, agriculture, and urban planning.
Fiji's National Biodiversity Strategy and Action Plan (NBSAP) (2017)	The NBSAP does not specifically use the term NbS, but it aligns with NbS principles by focusing on ecosystem management, biodiversity conservation, and restoration to address climate change impacts and enhance resilience.	Explicitly link NbS to biodiversity conservation and ecologically sustainable development
Fiji's Revised NDC (2020)	The 2020 NDC specifically mentions NbS as part of its climate mitigation and adaptation strategies. It includes a target to prioritise NbS to mitigate the impact of flooding and cyclones. It also aligns with NbS by including actions like mangrove restoration, forest conservation, reforestation, and carbon sequestration as key to addressing climate change.	Expand NbS commitments by setting targets and detailing sector-specific applications. Improve monitoring and reporting on NbS outcomes.

5.5 Stakeholder engagement

The table below outlines the key stakeholders involved in the three NbS projects. While all projects involve national government agencies, customary landowners, local authorities, private sector actors, NGOs, and research institutions, their specific roles and involvement vary. The Ba floodplain project primarily engages the Ministry of Waterways and

Environment due to its focus on flood management, alongside agricultural cooperatives using the land. The Nabuna seawall project requires close collaboration with coastal communities, the Ministry of iTaukei Affairs, and construction-related private sector stakeholders. The Taveuni agroforestry project is more focused on smallholder farmers and research institutions supporting crop diversification and sustainable land use.

Table 5.11: Stakeholder engagement for NbS projects in Fiji

Stakeholder group	Revegetation of floodplain, Ba	Nature based coastal seawall, Nabuna	Agroforestry in Taveuni
National government agencies	• Ministry Environment and Climate Change, Ministry of Agriculture and Waterways	• Ministry of Environment and Climate Change, Ministry of iTaukei Affairs	• Ministry of Agriculture and Waterways, Ministry of Fisheries and Forestry, Ministry of iTaukei Affairs
Local communities and customary landowners	• Customary landowners and farmers in Ba	• Nabuna village and adjacent coastal communities	• Customary landowners and farming communities in Taveuni
Municipal and provincial authorities	• Ba Town Council, Ba Provincial Office	• Tavua Town Council, Ba Provincial Office	• Cakaudrove Provincial Office
Private sector	• Agricultural cooperatives, agribusinesses involved in floodplain use	• Contractors for seawall construction, tourism operators	• Vanilla, cocoa, and kava exporters, agribusiness investors
NGOs and development partners	• WWF-Pacific, GGGI, UNDP, SPC	• Conservation International, GGGI, UNDP	• NatureFiji-MareqetiViti, SPC, FAO
Scientific and research institutions	• University of the South Pacific (USP), Fiji Meteorological Service	• USP, Pacific Community (SPC)	• USP, Ministry of Agriculture's Research Division

Step 5 in the Implementation Pathway (Section 4.5) highlights the importance of inclusive stakeholder consultation and types of engagement approaches.

6. Tonga national case studies

The Kingdom of Tonga consists of over 175 named islands in the South Pacific Ocean. The population of approximately 106,000 inhabits 43 of the islands, with Tongatapu the most populous with around 75,000 people.

The Tongan islands are highly vulnerable to a range of natural disasters due to their geographic location in the South Pacific. Tropical cyclones affect Tonga mainly between November and April, with an average of 20 cyclones per decade and approximately 1 in 3 considered a 'severe event'.

Tonga also has a long history of volcanic eruptions, earthquakes, and tsunamis due to its location along the Pacific Ring of Fire, an area known for intense tectonic activity.

Three CBAs were conducted for Tonga under the PPIN programme:

- Case study A: Nature-based seawall at Ha'avakatolo
- Case Study B: Mangrove restoration at Popua Heritage, Tongatapu
- Case study C: Agroforestry Assessment in the 'Ohonua Catchment, 'Eua Island.

A separate CBA report outlines the methodology and results of the CBAs. This chapter presents the business case for each initiative, discusses the integration of NbS into national development plans, and outlines stakeholder engagement for NbS projects in Tonga.

6.1 Business case for a nature-based seawall at Ha'avakatolo

Ha'avakatolo, a village on the western side of Tongatapu, is approximately 20 kilometres west of the capital, Nuku'alofa

Ha'avakatolo village faces significant vulnerability to cyclones, wave impacts, and inundation, threatening homes and livelihoods. Coastal erosion and the failure of existing protective measures in neighbouring Kolovai highlight the need for more effective and sustainable coastal defences.

An NbS scenario has been compared to a business-as-usual scenario to determine the incremental value of NbS. The NbS scenario involves a 380-metre nature-based seawall incorporating local boulders, mangrove forest establishment, and vetiver grasses would stabilise the coastline and dissipate wave energy.



Figure 6.1: Nature-based seawall area; Ha'avakatolo

Cost-benefit analysis results

The costs and benefits of a nature-based seawall at Ha'avakatolo over a 30-year period are presented in the graph below. The values are from:

- **Costs:** The construction costs for this design are estimated at \$340 per meter.³¹ For the seawall of 380 meters, this is a total of US \$129,200.
- **Benefits:** With a nature-based seawall, damage to houses is expected to reduce by US \$2,061 per year across the 9 properties located at a low elevation level. There are also expected to be ecosystem service values of from planting mangroves on approximately 3,800 metres squared.³²

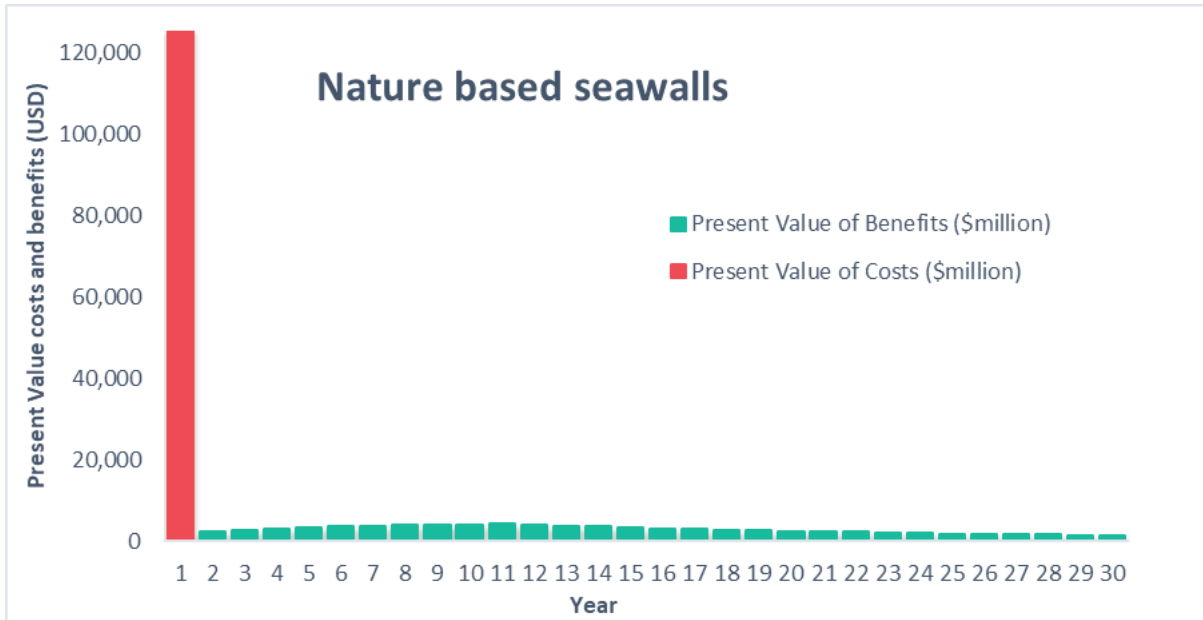


Figure 6.2: Costs and benefits of a nature-based seawall at Ha'avakatolo over a 30-year period

The NbS Scenario has a negative net present value. This indicates additional net costs compared to the BAU scenario. This negative result is due to the high upfront costs and the fact that only 9 households are expected to directly benefit from the seawall.

However, more research is needed to ensure all benefits are captured. For example, avoided erosion and permanent loss of land has not been quantified which would result in additional benefits. In addition, 259 residents live in Ha'avakatolo and may rely on the infrastructure and environment along the coast.

The results are presented in Table 6.1 using a 6 percent discount rate to determine the present value.

Table 6.1: Net present value of nature-based seawall at Ha'avakatolo

	Benefits (PV, USD)	Costs (PV, USD)	NPV (USD)	Benefit cost ratio
NbS seawall	82,483	125,200	-43,007	0.66

³¹ Based on ADB 2021 data on NbS seawalls in Fiji

³² The Ecosystem-based Shoreline Resilience Assessment and Monitoring (ESRAM) project, led by SPREP, is the source of the ecosystem service values used in this analysis.

Economic, social, and environmental benefits

A nature-based seawall in Ha'avakatolo, Tonga, would have economic, social, and environmental benefits including:

- Economic benefits
 - Lower disaster recovery costs – A seawall mitigates storm and wave damage, reducing the financial burden on households and the government for post-disaster recovery.
- Social benefits
 - Health and safety benefits – Reduced flooding and erosion decrease exposure to waterborne diseases and physical hazards.
 - Cultural preservation – Coastal erosion threatens traditional land use and cultural heritage sites; a nature-based seawall helps maintain the integrity of the coastline.
- Environmental benefits
 - Enhanced biodiversity – A nature-based seawall using mangroves, coral reefs, or dune restoration provides habitat for marine and coastal species.
 - Coastal erosion control – Vegetation and natural barriers stabilise the shoreline, reducing the impact of wave action.
 - Carbon sequestration – Mangroves and other coastal vegetation integrated into the seawall absorb carbon, contributing to climate change mitigation.

Market potential

There is limited market potential due to there being no direct revenue streams and no organisations that directly benefit from this project. The viability of private sector engagement is outlined in the table below.

Table 6.2: Market potential for nature-based seawall in Ha'avakatolo

Private engagement	Potential funding source
Public-private partnerships (PPPs)	Low likelihood No direct revenue stream to attract private sector investment.
Payment for Ecosystem Services (PES)	Low likelihood No organisations would be direct beneficiaries of this seawall, so PES is unlikely to be an option.
Carbon offsetting and biodiversity credits	Moderate potential Possible option due to the mangroves and other vegetation that sequesters carbon and enhances biodiversity. May need to be combined into a larger programme with other similar projects. Scale is needed to justify the administrative and monitoring costs which can be complex and resource intensive.
Sponsorship and corporate social responsibility	Low likelihood Unlikely given the size and number of businesses in the area.
Eco-tourism and sustainable business models	Low likelihood There is likely to be support from eco-tourism operators. However, investment is unlikely due to limited resources.

Risk analysis: Identifying and mitigating potential challenges

Project risks along with mitigating strategies are presented in the table below.

Table 6.3: Risks and mitigation measures for nature-based seawall in Ha'avakatolo

Risk	Description	Mitigation
Climate and natural hazards risk Description	Extreme weather events, such as cyclones and storm surges, could damage newly established vegetation or erode the seawall before it becomes fully effective.	<ul style="list-style-type: none"> • Use resilient native species like mangroves or salt-tolerant plants. • Implement phased planting to allow gradual ecosystem establishment. • Incorporate hybrid approaches (e.g., combining vegetation with rock barriers for initial stability).
Community acceptance and land tenure issues	Landownership complexities or resistance from local communities may delay implementation, especially if land use changes are required. Given there is an existing seawall the risks for this may be low.	<ul style="list-style-type: none"> • Conduct early and continuous stakeholder engagement. • Ensure community co-design of the project.
Long-term maintenance and sustainability	Without ongoing management, invasive species, coastal erosion, or inadequate community engagement could undermine the seawall's effectiveness.	<ul style="list-style-type: none"> • Establish a local stewardship programme with training for community members. • Integrate monitoring into existing environmental initiatives. • Secure funding for long-term maintenance through government or donor support.
Financial and administrative challenges	The project may face difficulties securing funding, especially if administrative costs for compliance with carbon credits or other financing mechanisms are too high.	<ul style="list-style-type: none"> • Bundle the project with other NbS initiatives to reduce administrative costs. • Seek blended finance options. • Ensure financial sustainability through partnerships with regional organisations.

Scalability: Opportunities to replicate and expand successful interventions

The scalability of the nature-based seawall in Ha'avakatolo, Tonga, presents opportunities to replicate and expand successful interventions across similar contexts in the region:

- **Replication across coastal communities:** The success of the seawall in Ha'avakatolo could serve as a model for other low-elevation coastal communities in Tonga and the wider Pacific. Given the shared vulnerabilities to sea level rise and extreme weather, the design could be adapted and implemented in areas with similar coastal dynamics and housing exposure.
- **Integration with other NbS:** The seawall could be combined with other NbS, such as mangrove restoration or coral reef rehabilitation, to create a more holistic coastal protection strategy. The lessons learned from Ha'avakatolo could inform the development of integrated projects that offer both protection and ecosystem restoration across the region.

- Leveraging regional platforms: By collaborating with regional organisations, the project could benefit from shared knowledge and resources to scale up. These platforms could help identify additional sites and secure funding for further NbS projects in other Pacific islands facing similar threats.

6.2 Business case for mangrove restoration at Popua Heritage, Tongatapu

Popua is located at the north-eastern part of Tonga's main island; Tongatapu. This region is recognised for its cultural and ecological significance, particularly due to the presence of ring ditches and mangrove forests

Extensive mangrove clearing around the Tongatapu Fanga'uta Lagoon was undertaken in 2017 to accommodate a proposed development. The loss of mangroves has reduced biodiversity, impacted water quality, and diminished ecosystem services crucial for livelihoods and carbon sequestration.

An NbS scenario has been compared to a business-as-usual scenario to determine the incremental value of NbS. The NbS scenario involves a large-scale mangrove restoration programme creating a 10-hectare mangrove fringe along the south-eastern shoreline would restore critical ecosystem services. The intervention would enhance biodiversity, improve water quality, support livelihoods, and contribute to carbon sequestration.



Figure 6.3: Site location, Popua

Cost-benefit analysis results

The costs and benefits of mangrove restoration in Popua over a 30-year period are presented in the graph below. The values are from:

- Costs: Three mangrove nurseries are required which will cost an estimated US \$15,000.³³ The multi-year restoration programme is expected to cost US \$3,333 per year for the first 15 years followed by US \$333 each year in subsequent years for maintenance.³⁴
- Benefits: a rate of US \$7,500/ha/year of ecosystem service benefits has been applied to the newly restored mangroves after their initial 10-years of establishment.

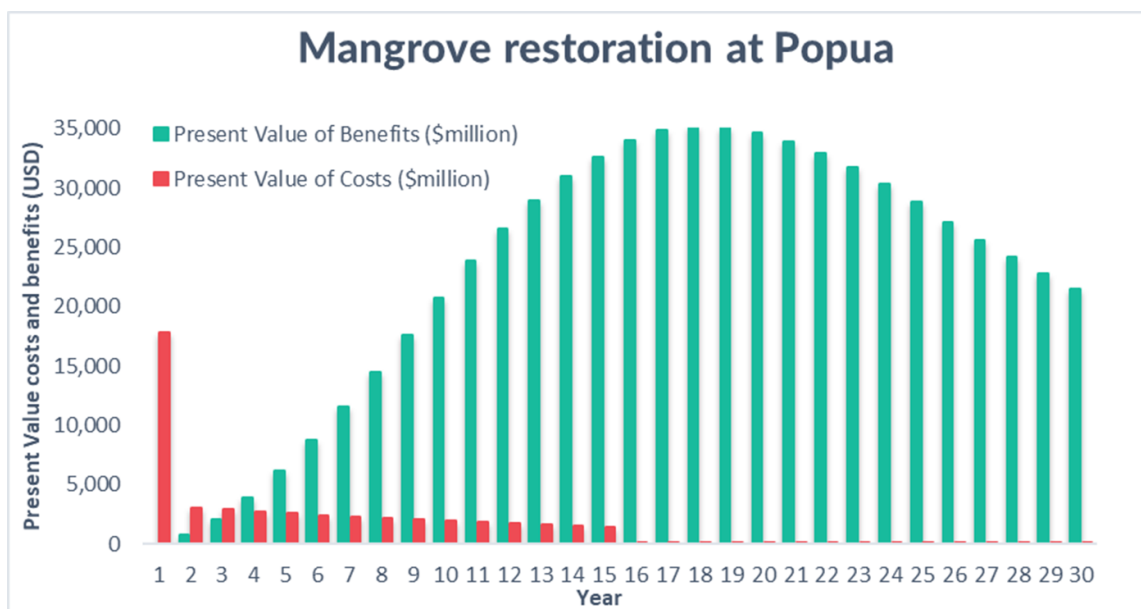


Figure 6.4: Costs and benefits of mangrove restoration at Popua over a 30-year period

The NbS Scenario has a positive net present value. The NPV represents the incremental costs and benefits relative to the BAU baseline. Therefore, a positive NPV indicates additional benefits compared to the BAU scenario.

The costs and benefits are taken over a 30-year period and a 6 percent discount rate has been used to determine the present value.

Table 6.4: Net present value of mangrove restoration at Popua

	Benefits (PV, USD)	Costs (PV, USD)	NPV (USD)	Benefit cost ratio
Mangrove restoration, Popua	681,354	125,490	632,354	13.83

Economic, social, and environmental benefits

A 10-hectare mangrove planting project in Popua, Tonga, would provide several economic, social, and environmental benefits:

- Economic benefits

³³ US \$5,000 per nursery based on the Community based mangrove planting handbook for PNG

³⁴ Restoration rate estimated at US \$0.5/m² (within the \$0.15 to \$0.65 range reported by Glover and Jones, 2016)

- Coastal protection: Reduces damage to infrastructure, homes, and businesses from storm surges and coastal erosion, lowering maintenance and repair costs.
- Fisheries enhancement: Supports local fisheries by providing nursery habitats for commercially valuable fish and shellfish species, increasing catch potential.
- Social benefits
 - Disaster risk reduction: Enhances community resilience by acting as a natural buffer against extreme weather events, reducing risks to people and property.
 - Food security: Improves access to fish and other marine resources, supporting subsistence fishing for local households.
 - Cultural and educational value: Supports traditional knowledge and practices related to coastal management, and provides an opportunity for environmental education in schools and communities.
- Environmental benefits
 - Biodiversity conservation: Provides habitat for marine and bird species, enhancing ecosystem health.
 - Water quality improvement: Acts as a natural filter by trapping sediments and pollutants, improving coastal water quality.
 - Erosion control: Stabilises shorelines and reduces land loss due to rising sea levels and wave action.
 - Climate change mitigation: Absorbs and stores carbon dioxide, helping reduce Tonga's net emissions.

Market potential

The viability of private sector engagement is outlined in the table below. There is moderate potential for eco-tourism if the location is appealing as an eco-reserve.

Table 6.5: Market potential for mangrove restoration in Popua

Private engagement	Potential funding source
Public-private partnerships (PPPs)	Low likelihood Although there is potential for eco-tourism, the financial prospects may not be sufficient to attract private investment. In addition, the private party would be responsible for meeting project objectives which can have financial risks. Therefore, private entities may prefer a service contract where payment is guaranteed.
Payment for Ecosystem Services (PES)	Low likelihood Unclear if organisations would directly benefit from this mangrove project.
Carbon offsetting and biodiversity credits	Moderate potential Possible option due to the mangroves and other vegetation that sequesters carbon and enhances biodiversity. May need to be combined into a larger programme with other similar projects. Scale is needed to justify the administrative and monitoring costs which can be complex and resource intensive.
Sponsorship and corporate social responsibility	Low likelihood Unlikely given the size and number of businesses in the area.
Eco-tourism and sustainable business models	Moderate potential There is likely to be support from eco-tourism providers and there may be potential for a revenue stream if made into an eco-park and visitors are charged an entrance fee. For this, additional investment would be needed for boardwalks etc which needs to be factored into the costs.

Risk analysis: Identifying and mitigating potential challenges

Project risks along with mitigating strategies are presented in the table below.

Table 6.6: Risks and mitigation measures for mangrove restoration at Popua

Risk	Description	Mitigation
Climate and environmental risks	Extreme weather events like cyclones and changes in sea levels or salinity could reduce mangrove survival rates.	Select resilient mangrove species, plant in naturally sheltered areas, and implement staggered planting with ongoing monitoring to replace lost seedlings.
Social and community risks	Community engagement may be low if past mangrove clearance for development has altered local perceptions of their value.	Conduct awareness campaigns on the benefits of mangroves, involve the community in planning and planting, and create alternative livelihood opportunities (e.g., eco-tourism or sustainable fishing).
Financial and economic risks	Long-term funding challenges could arise if financial support from donors, the government, or private sector partners is not sustained.	Develop a financial sustainability plan that includes blended finance (e.g., grants, carbon credits, and private investment) and establish a local stewardship programme to ensure long-term maintenance.
Ecological risks	Poor site selection or soil degradation from past development could lead to low mangrove survival and slow ecosystem recovery. Mitigation:	Conduct detailed site assessments to determine suitable planting locations, improve soil conditions where necessary, and use adaptive management to refine planting strategies based on monitoring results. One of the primary criteria, when planting, is that they are in the intertidal area e.g. where water is already flush against the coast.

Scalability: Opportunities to replicate and expand successful interventions

There are opportunities to replicate and expand the mangrove project in Tonga and across the Pacific, building on the lessons from Popua:

- Scaling within Tonga
 - Other cleared or degraded coastal areas: Similar restoration could be done in other locations where mangroves were historically removed for development, such as in Tongatapu and outer islands.
 - Integration with coastal protection projects: Mangrove planting could be incorporated into national disaster risk reduction and climate adaptation initiatives, particularly in vulnerable coastal communities.
 - Partnerships with local businesses: Expanding the project with the tourism, fisheries, and insurance sectors could provide financial sustainability for larger-scale restoration efforts.
- Replication across the Pacific
 - NbS for coastal resilience: Other Pacific islands facing similar erosion and storm risks (e.g., Fiji, Vanuatu, and Kiribati) could use the Popua project as a model for their own restoration efforts.
 - Knowledge-sharing and best practices: Establishing a regional mangrove restoration knowledge hub could help other Pacific countries implement similar

projects with guidance on species selection, community engagement, and financial sustainability.

6.3 Business case for agroforestry in the 'Ohonua Catchment, 'Eua Island

Agroforestry provides an opportunity to support livelihoods and improve land management through the sustainable integration of trees into agricultural systems. In Tonga, this approach is particularly relevant given the increasing challenges of climate change, land degradation, and food security.

The 'Ohonua catchment covers an area of 821 ha, and is comprised primarily of Forest (62%), with Crop Land (Vanilla/Yam/Kava/Coconut) (21%), Plantation (6.6%) and Open Land (6%) being the next largest land uses.

Land degradation, climate change, and food security concerns pose significant challenges to agricultural systems in Tonga. The current land-use practices in the Ohonua River catchment, characterised by fragmented cropping and unused lands, provide limited economic and environmental resilience. A sustainable land management approach is required to enhance productivity, conserve biodiversity, and build climate resilience.

An NbS scenario has been compared to a business-as-usual scenario to determine the incremental value of NbS. The NbS scenario involves the broad-scale adoption of agroforestry practices, converting agricultural and underutilised land, including portions of forest, into diversified agroforestry systems. This approach supports sustainable land management by enhancing soil and water conservation, increasing biodiversity, and providing diversified income streams for farmers. For this scenario a hypothetical 'agroforestry arrangement' (AA) was created that considered crops, and tree species appropriate to the region.

The land around the 'Ohonua River has been classified into land and soil capability classes. Based on this classification, three scenarios have been assessed:

- Scenario 1: Conversion of low capability land to agroforestry (92 ha, 11%)
- Scenario 2: Conversion of low, and moderate-low capability land to agroforestry (316 ha, 38%)
- Scenario 3: Conversion of all unused low, moderate-low, and moderate land to agroforestry (810ha, 98%).



Figure 6.5: Location NbS Site; 'Ohonua River Catchment, 'Eua Island.

Cost-benefit analysis results

The costs and benefits of the agroforestry project over a 30-year period are presented in the graph below. The values are from:

- **Costs:** There are capital requirements for the initial setup of agroforestry followed by ongoing operational costs.³⁵
- **Benefits:** Existing land use benefits, as well as additional values for annual, perennial and long-term crops. The existing land use benefits are the value of agricultural yields and eco system services already established (World Bank Commodity data). As land is converted to agroforestry, the existing land use benefits decrease but the agroforestry benefits increase. The inputs for the agroforestry benefits calculations are the same for each scenario and are multiplied by the hectares that are converted to agroforestry.³⁶

³⁵ Capital costs are estimates for NbS 1: US \$200,000 in year 0; NbS 2: US \$2.5 million in year 0 and US \$500,000 in year 1; NbS 3: US \$2.5 million in year 0, US \$500,000 in year 1 and an additional US \$500,000 every 5 years.

Ongoing costs were assumed to be a function of revenue. Martinelli, G. do C., Schindwein, M. M., Padovan, M. P., & Gimenes, R. M. T. (2019).

³⁶ "Categorisation of regional agriculture products into functional roles based on term to maturity, and the average yield in USD per hectare per year" Promoting Pacific Islands Nature-Based Solutions (PPIN) Programme. (2024). Cost-benefit analysis of Nature-based Solutions in Tonga.

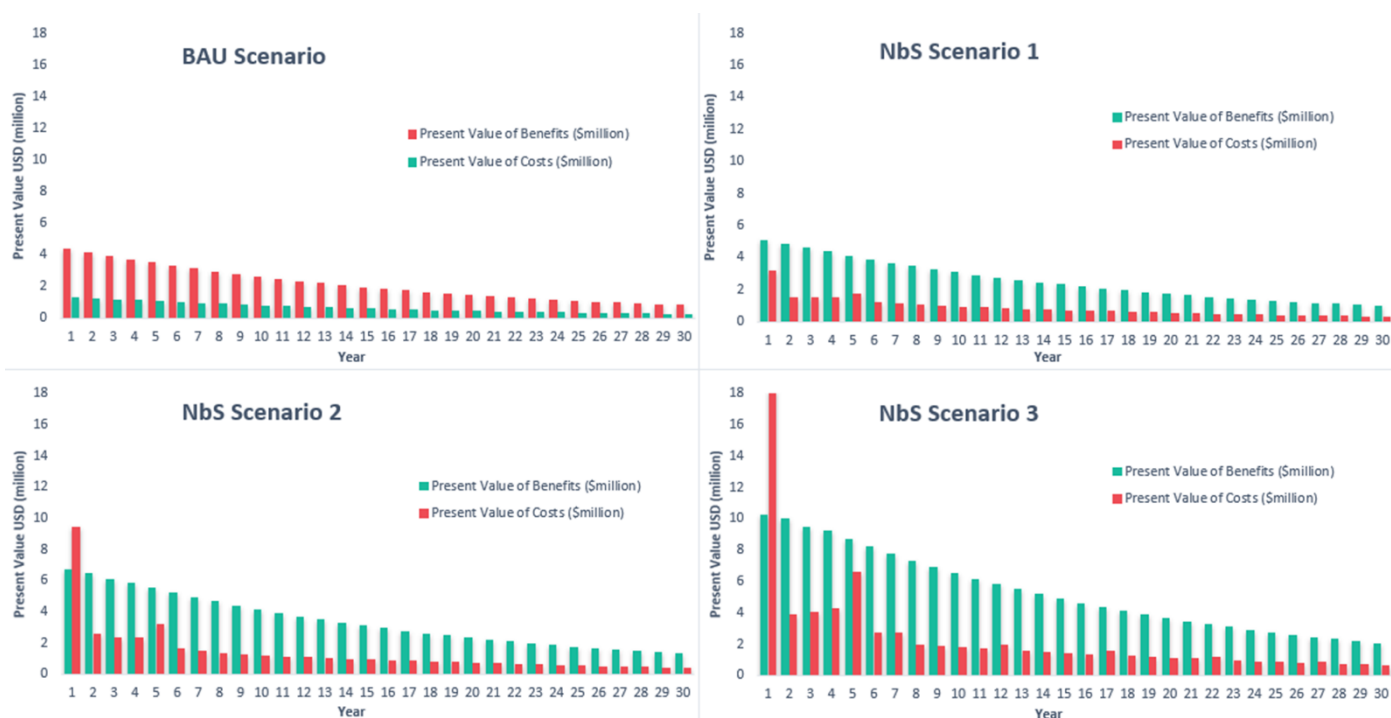


Figure 6.6: Costs and benefits of Agroforestry in the 'Ohonua Catchment over 30 years

The NPV of all the NbS scenarios are higher than the BAU Scenario. The NPV represents the incremental costs and benefits relative to the BAU baseline. Therefore, a higher NPV indicates additional benefits from agroforestry compared to the BAU scenario.

The costs and benefits are taken over a 30-year period and a 6 percent discount rate has been used to determine the present value.

Table 6.7: Net present value of agroforestry in 'Ohonua Catchment

	Benefits (PV, USD million)	Costs (PV, USD million)	NPV (USD million)	Benefit cost ratio
BAU Scenario	64	19	45	3.33
NbS Scenario 1	75	25	50	3.02
NbS Scenario 2	101	41	60	2.49
NbS Scenario 3	159	71	88	2.25

Economic, social, and environmental benefits

An agroforestry project in the 'Ohonua Catchment would have significant economic, social, and environmental benefits:

- Economic benefits
 - Diversified income streams: Farmers can generate income from multiple products, such as fruits, timber, and livestock, reducing financial risk.
 - Increased agricultural productivity: Improved soil fertility from tree cover can enhance crop yields and reduce dependence on synthetic fertilisers.
- Social benefits

- Food security: Enhances access to a variety of food sources, reducing dependence on imports.
- Community resilience: Strengthens local capacity to adapt to climate change by promoting sustainable land use.
- Cultural preservation: Supports traditional land management practices and knowledge-sharing between generations.
- Environmental benefits
 - Soil and water conservation: Reduces soil erosion, improves water retention, and enhances groundwater recharge.
 - Carbon sequestration: Trees absorb and store carbon, contributing to Tonga's climate mitigation efforts.
 - Biodiversity enhancement: Creates habitats for native species, supporting ecosystem health.

Market potential

The viability of private sector engagement is outlined in the table below. There is moderate potential for a partnership between the government and smallholder farmers and some co-investment.

Table 6.8: Market potential for agroforestry in the 'Ohonua Catchment

Private engagement	Potential funding source
Public-private partnerships (PPPs)	<p>Moderate potential</p> <p>The Government would need to collaborate with local communities to implement this project, which primarily involves subsistence and small-scale farmers. These farmers would require training, as well as initial access to seeds and materials. While this is not a traditional public-private partnership (PPP), it would still involve a partnership between the government and local communities, with shared functions and responsibilities.</p>
Payment for Ecosystem Services (PES)	<p>Low likelihood</p> <p>Unlikely given that the benefits are predominantly the local communities.</p>
Carbon offsetting and biodiversity credits	<p>Low likelihood</p> <p>There is unlikely to be sufficient land area for practices to create measurable and verifiable carbon credits.</p>
Sponsorship and corporate social responsibility	<p>Low likelihood</p> <p>Unlikely given the size and number of businesses in the area.</p>
Eco-tourism and sustainable business models	<p>Low likelihood</p> <p>Unlikely given the size and number of businesses in the area.</p>

Risk analysis: Identifying and mitigating potential challenges

Project risks along with mitigating strategies are presented in the table below.

Table 6.9: Risks and mitigation measures for agroforestry in the 'Ohonua Catchment

Risk	Description	Mitigation
Climate variability and extreme weather events	Tonga is vulnerable to extreme weather events, such as cyclones and droughts, which can affect crop yields and project sustainability.	<ul style="list-style-type: none"> • Incorporate climate-resilient practices (e.g., drought-tolerant crops, improved irrigation systems) and develop contingency plans for extreme weather events to protect the livelihoods of farmers.
Limited access to technology and expertise	Farmers may lack access to the necessary tools, technologies, or expertise to implement climate-smart practices effectively.	<ul style="list-style-type: none"> • Provide capacity-building programs, training workshops, and access to affordable technologies (e.g., weather forecasting tools, improved seed varieties) to empower farmers.
Land tenure and ownership disputes	The customary land ownership system in Tonga may lead to disputes or confusion about land rights, hindering project implementation.	<ul style="list-style-type: none"> • Engage with local landowners and communities early in the project design process, ensuring clarity in land agreements and promoting inclusive decision-making.
Financial Sustainability	Farmers may struggle to sustain long-term financing for these climate smart methods.	<ul style="list-style-type: none"> • Explore alternative funding sources, such as carbon offsetting and biodiversity credits, and establish partnerships with development organizations to support long-term project financing.

Scalability: Opportunities to replicate and expand successful interventions

There are opportunities to replicate and expand the agroforestry project in the 'Ohonua Catchment 'Ohonua Catchment and other areas in Tonga:

- Scaling within 'Ohonua Catchment
 - Expanding to degraded lands: Agroforestry can be introduced in areas affected by soil erosion or deforestation to restore land productivity.
 - Integrating with watershed management: Expanding agroforestry practices can improve water retention, reducing runoff and enhancing local water security.
 - Partnerships with local farmers: Training more farmers on agroforestry techniques and sustainable land management can encourage broader adoption.
- 2. Replication across Tonga
 - Other catchments with similar challenges: Regions facing deforestation, declining soil fertility, or water scarcity (e.g., Tongatapu and Ha'apai) could benefit from similar projects.
 - Coastal agroforestry for climate resilience: Expanding the project to coastal areas could help protect shorelines from erosion while providing livelihood opportunities.
- 3. Regional and International Scaling

- Knowledge-sharing with other Pacific Islands: Countries like Fiji and Vanuatu, which have similar land-use challenges, could replicate the model through regional cooperation (see step 5 of the Implementation Pathway).
- Agroforestry value chains: Developing processing facilities for agroforestry products (e.g., fruit, nuts, or timber) could support commercial scaling and attract investment.

6.4 Integrating NbS into national development plans

Tonga has several key national policies and strategies that align with NbS. Feedback from the stakeholder consultation in Tonga highlighted that integrating NbS into existing national documents was a priority.

Tonga's national documents do not explicitly mention NbS currently. However, other terms are used that strongly align with NbS, like ecosystem-based adaptation (EBA). EBA is a subset of NbS. EBA is specifically focused on addressing climate change adaptation, while NbS can address broader societal and environmental goals.

There are opportunities to strengthen NbS by establishing measurable targets, embedding NbS into infrastructure and environmental planning processes, and clarifying its connection to national policies that reference its components or related approaches.

Table 6.10: Integration of NbS in key Tonga policy documents

National document	Alignment with NbS	Opportunities for Strengthening NbS
Tonga Climate Change Policy (2016-2035)	Recognises the role of ecosystem-based adaptation, including coastal protection through mangroves and reforestation.	Incorporate NbS principles alongside EBA. While EBA remains a key strategy for climate adaptation, strengthening the language on NbS could ensure that other ecosystem-based strategies are also included, such as urban green spaces, agroforestry, and coastal habitat restoration. Expand the focus to include mitigation. Emphasising carbon sequestration and other mitigation aspects of NbS would enhance the policy's scope and impact.
Second Nationally Determined Contribution (NDC) (2020)	Includes commitments to ecosystem restoration and afforestation for carbon sequestration.	Expand NbS targets with specific implementation plans and link them to adaptation funding.
JNAP 2 – Joint National Action Plan on Climate Change and Disaster Risk Management (2018-2028)	Promotes NbS for disaster risk reduction, such as reforestation and coastal protection.	Develop clear NbS indicators for monitoring progress and enhance community participation in NbS projects.
Tonga Agriculture Sector Plan (TASP) (2016-2025)	Supports agroforestry and climate-smart agriculture as strategies for resilience.	Increase investment in agroforestry pilot projects and integrate NbS into land-use planning policies.
Tonga National Biodiversity Strategy and Action Plan (NBSAP) (2018-2025)	Focuses on conservation and restoration of ecosystems to protect biodiversity.	Link biodiversity conservation efforts with climate adaptation strategies through NbS approaches.
Tonga Strategic Development Framework (TSDF) II (2015-2025)	Recognises environmental sustainability and resilience as key national priorities.	Incorporate NbS into economic development planning and infrastructure projects.

6.5 Stakeholder engagement

The key differences between stakeholders for each NbS project in Tonga reflect the specific focus and location of the projects. The nature-based seawall in Ha'avakatolo involves coastal communities, construction businesses, and provincial authorities from Ha'apai, with a focus on coastal protection. The mangrove restoration in Popua engages fishermen, conservation NGOs, and local developers, aiming to restore coastal ecosystems. The agroforestry project in the 'Ohonua catchment works with farmers, agribusinesses, and the Ministry of Agriculture, focusing on sustainable land management. While scientific institutions and NGOs like GGGI and Oxfam are involved in all three, their roles vary according to each project's goals.

The table below outlines how engagement differs across three NbS projects.

Table 6.11: Stakeholder engagement for NbS projects in Tonga

Stakeholder group	Nature-based seawall at Ha'avakatolo	Mangrove restoration at Popua Heritage, Tongatapu	Agroforestry Assessment in the 'Ohonua Catchment, 'Eua Island
National government agencies	<ul style="list-style-type: none"> • Ministry of Environment and Climate Change (MECC) • Ministry of Agriculture, Forestry, and Fisheries (MAFF) • Ministry of Lands, Survey, and Natural Resources (MLSN) 	<ul style="list-style-type: none"> • Ministry of Environment and Climate Change (MECC) • Ministry of Agriculture, Forestry, and Fisheries (MAFF) • Ministry of Lands, Survey, and Natural Resources (MLSN) 	<ul style="list-style-type: none"> • Ministry of Agriculture, Forestry, and Fisheries (MAFF) • Ministry of Environment and Climate Change (MECC)
Local communities and customary landowners	<ul style="list-style-type: none"> • Ha'avakatolo community • Customary landowners in Ha'avakatolo 	<ul style="list-style-type: none"> • Popua community • Customary landowners in Popua 	<ul style="list-style-type: none"> • 'Ohonua community • Customary landowners in the 'Ohonua catchment
Municipal and provincial authorities	<ul style="list-style-type: none"> • Niuatoputapu District Council • Ha'apai Provincial Government 	<ul style="list-style-type: none"> • - Nuku'alofa City Council • - Tongatapu Provincial Government 	<ul style="list-style-type: none"> • 'Eua Provincial Government • Tongatapu Provincial Government
Private sector	<ul style="list-style-type: none"> • Local construction companies • Coastal development businesses 	<ul style="list-style-type: none"> • Coastal developers • Mangrove restoration businesses 	<ul style="list-style-type: none"> • Agribusinesses • Private landowners with agroforestry potential
NGOs and development partners	<ul style="list-style-type: none"> • The Pacific Community (SPC) • GGGI (Global Green Growth Institute) • Tonga Red Cross Society 	<ul style="list-style-type: none"> • Conservation International • World Wildlife Fund (WWF) • GGGI (Global Green Growth Institute) 	<ul style="list-style-type: none"> • The Pacific Community (SPC) • GGGI (Global Green Growth Institute) • Oxfam
Scientific and research institutions	<ul style="list-style-type: none"> • University of the South Pacific (USP) • Tongan Scientific Research Institute • National University of Tonga (NUT) 	<ul style="list-style-type: none"> • University of the South Pacific (USP) • Tongan Scientific Research Institute • Pacific Islands Applied Geoscience Commission (SOPAC) 	<ul style="list-style-type: none"> • University of the South Pacific (USP) • National Agricultural Research Centre (NARC)

Step 5 in the Implementation Pathway (Section 4.5) addresses the importance of inclusive stakeholder consultation and types of engagement approaches.

7. Vanuatu national case studies

Located in the South Pacific, Vanuatu is an archipelago of volcanic origin, comprised of approximately 83 islands, of which 65 are inhabited. These islands are mostly rocky, the catchments steep with unstable soils, with narrow coastal plains, fringing reefs and no continental shelf.

Vanuatu is vulnerable to cyclones, floods, earthquakes, and tsunamis. Natural disasters impact water and food security by destroying crops, contaminating water sources, and cutting off supply chains. Disasters resulting from natural hazards are estimated to cost 6% of GDP on average per year.

Three CBAs were conducted for Vanuatu under the PPIN programme:

- Case study A: Water resources and riparian zone restoration in the Tagabe and La Colle River system
- Case study B: Mangrove restoration in Maskelyne Island
- Case study C: Climate smart agriculture in the Mele catchment, Port Vila.

A separate CBA report outlines the methodology and results of the CBAs. This chapter presents the business case for each initiative, discusses the integration of NbS into national development plans, and outlines stakeholder engagement for NbS projects in Vanuatu.

7.1 Business case for water resources and riparian zone restoration in the Tagabe and La Colle River system

Both the Tagabe and La Colle River watersheds suffer from degradation of the riverbank due to erosion and landslides. This is caused by the removal of trees and an increase in heavy rainfall and flooding.

Degradation of the riverbank leads to increased sediment (silt, clay, and sand) in the river system. Increased sediment can cause negative impacts to aquatic plants and animals, water contamination, increased flooding risks, and infrastructure damage.

An NbS scenario has been compared to a business-as-usual scenario to determine the incremental value of NbS. The NbS scenario includes converting unused land within a 20-metre buffer to vegetated riparian zones. This would enhance flood retention and slow water flow during heavy rains, creating more resilient ecosystems and protecting coastal marine areas.



Figure 7.1: Site location, Tagabe and La Colle River

Cost-benefit analysis results

The costs and benefits of NbS at the Tagabe river over a 30-year period are presented in the graph below. The costs in the initial 5 years represent the initial restoration costs, this is followed by lower maintenance costs for the rest of the project.³⁷

The benefits increase due to ecosystem service values to society and a reduction in flood damage for the estimated 4,803 buildings in the Tagabe riparian zone.³⁸

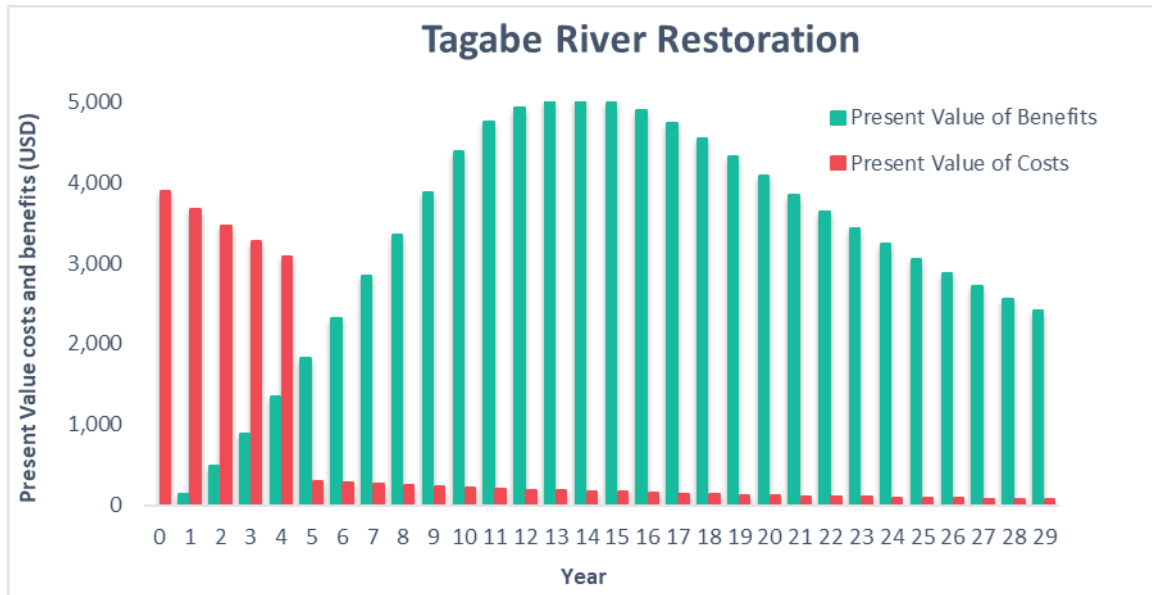


Figure 7.2: Costs and benefits of Tagabe River restoration over 30 years

The costs and benefits of NbS at La Colle river over a 30 year period is presented in the graph below. Unlike Tagabe, La Colle does not have any buildings in the riparian zone, so all the benefits are from ecosystem services. However, the value of ecosystem benefits is much higher than Tagabe due to a much larger area of forest, coral and marine ecosystems to be restored (22.08 ha at La Colle vs. 6.9 ha at Tagabe).

³⁷ The costs to restore degraded riparian land and allow filtering of pollutants and reduction in downstream sediment loads is estimated to be \$5/m².

³⁸ Eco-system services are the various ways in which humans may benefit from the environment. The values are from the UN Statistical Commission's Experimental Ecosystem Accounting system and SPREP (2017) Vanuatu Ecosystem and Socio-economic Resilience Analysis and Mapping (ESRAM).

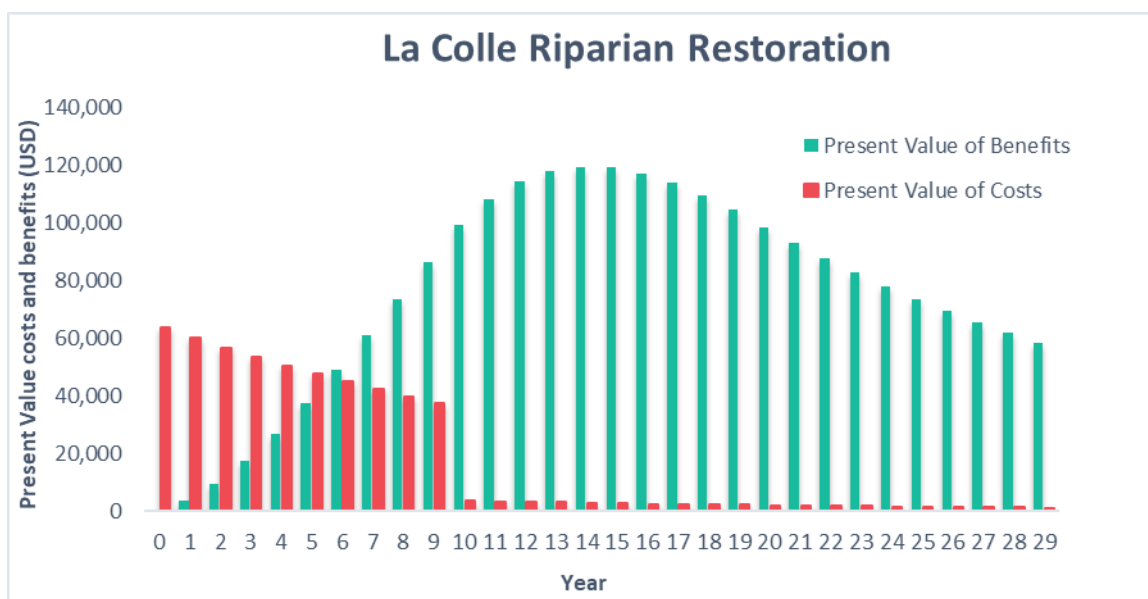


Figure 7.3: Costs and benefits of La Colle riparian restoration over 30 years

Both the Tagabe and La Colle NbS scenario have a positive net present value. The NPV represents the incremental costs and benefits relative to the BAU baseline. Therefore, a positive NPV indicates additional benefits compared to the BAU scenario.

The costs and benefits are taken over a 30-year period and a 6 percent discount rate has been used to determine the present value.

Table 7.1: Net present value of Tagabe and La Colle river restoration

	Benefits (PV, USD)	Costs (PV, USD)	NPV (USD)	Benefit cost ratio
Tagabe river	96,460	21,303	75,157	4.53
La Colle river	2,258,623	539,385	1,719,238	4.19

The net benefits of NbS may be understated in this analysis due to the following impacts not being quantified:

- Reduced risk of water contamination – The Tagabe river is the only source of potable water for Port Vila. Improving water quality can lead to health benefits or a reduction in bottled water consumed.
- Further degradation in the BAU Scenario – The ecosystem benefits in the NbS scenario are compared to the degradation level today. However, it is likely that without intervention, the catchment areas will degrade further, making the difference between the scenarios larger.

Economic, social, and environmental benefits

Regenerating the Tagabe and La Colle riverbanks will have the following benefits:

- Contribution to climate resilience – Replanting mangroves and native vegetation will strengthen natural flood defences and support biodiversity. In addition, reducing runoff and erosion protects freshwater supplies and marine ecosystems, making them more resilient to climate change-related stressors.

- Job creation – The NbS project could create jobs through activities such as replanting mangroves and native vegetation, riverbank restoration, and ongoing ecosystem monitoring and maintenance. It may also support long-term employment in sustainable land management, eco-tourism, and community-based conservation initiatives.
- Biodiversity conservation - The project will support biodiversity conservation by restoring natural habitats along the riverbanks, which provide critical breeding and feeding grounds for fish, birds, and other wildlife. Replanting mangroves and native vegetation will enhance ecosystem connectivity, protect marine biodiversity by reducing sedimentation and pollution, and help maintain healthy coral reefs and coastal fisheries.

Market potential

The CBA highlights significant benefits that are primarily derived from ecosystem services rather than direct revenue streams. While this limits the potential for private investment, some viable options for engagement are outlined in the table below.

Table 7.2: Market potential for Tagabe and La Colle river restoration

Private engagement	Potential funding source
Public-private partnerships (PPPs)	Low likelihood No direct revenue stream so private sector may not be willing to finance the investment without a guarantee. Hiring the private sector under a service contract is an option.
Payment for Ecosystem Services (PES)	Moderate potential If the project leads to measurable improvements in water quality, then there may be potential for PES from organisations that benefit directly (e.g. Vanuatu Water Utility Corporation or Vanuatu Brewing Company). Further research would be needed on the potential benefits.
Carbon offsetting and biodiversity credits	Moderate potential The project would lead to improvements for approximately 14 hectares of forest and 14 hectares of coral reef. These projects may not be big enough in scale to access some credit schemes but there is potential if they are combined into a wider programme of work.
Sponsorship and corporate social responsibility	Low likelihood The small scale and limited CSR budgets in the domestic private sector would make it challenging to secure significant funding. International firms with a regional presence may be a potential source but there are many competing projects.
Eco-tourism and sustainable business models	Moderate potential There may be support from eco-tourism businesses who benefit from the enhanced natural landscapes, but they are unlikely to invest in this project given the scale and resource constraints of these businesses.

Although there is market potential, the government is likely to need to fund some of the costs. This could be done with designated government budget or a grant from a development partner.

Risk analysis

Project risks along with mitigating strategies are presented in the table below.

Table 7.3: Risks and mitigation measures for Tagabe and La Colle river restoration

Risk	Description	Mitigation
Stakeholder conflicts	Stakeholders may have conflicting interests. For example, people who live in the area remove trees for firewood and establish gardens along the riverbank that disturb topsoil.	<ul style="list-style-type: none"> • Ensure early and ongoing consultation • Involve stakeholders in the decision-making process • Establish clear communication channels and conflict resolution mechanisms.
Limited technical capacity	There may be limited local knowledge about restoration techniques and long-term ecosystem management. This could lead to the ecosystem values not being realised.	<ul style="list-style-type: none"> • Build local capacity by training community members • Partner with technical experts, NGOs, and academic institutions to provide expertise and ensure high-quality implementation.
Climate variability and extreme weather events	Extreme weather events undermine rehabilitation progress.	<ul style="list-style-type: none"> • Select appropriate plant species, implement erosion control measures, and consider flood and drought risks in the project design. • Use adaptive management practices to respond to changing climate conditions.
Financial sustainability	The project has reliable, long-term funding sources to support its implementation and maintenance.	<ul style="list-style-type: none"> • Explore diverse funding sources including insurance and guarantee mechanisms • Ensure due diligence is conducted thoroughly for private sector participants.

Scalability

Successful riverbank restoration interventions at the Tagabe and La Colle river could be replicated and expanded in other parts of Vanuatu and the Pacific region. Opportunities include scaling up efforts to other watersheds facing similar erosion and water quality challenges, integrating NbS into national climate adaptation plans, and leveraging regional cooperation for funding and technical support.

Different locations may have unique ecological, social, and economic conditions, requiring tailored approaches. Site-specific assessments will be essential to understand local challenges, such as variations in land tenure, community priorities, hydrological conditions, and biodiversity.

Lessons learned from this project could also inform policies and best practices for ecosystem restoration in coastal and freshwater environments across the Pacific.

7.2 Business case for mangrove restoration in Maskelyne Island

The Maskelyne Islands consist of at least 10 small islands. The largest and most populated being Uluveo (also known as Maskelyne Island). This region is recognised for its ecological significance, particularly due to coral reefs and mangrove forests.

On Maskelyne Island there has been degradation and retreat of mangrove forests, which undermines biodiversity, carbon sequestration, water quality, and local livelihoods. Without

intervention, the ecological and economic benefits provided by mangroves will continue to decline, impacting both the environment and community resilience.

An NbS scenario has been compared to a business-as-usual scenario to determine the incremental value of NbS. The NbS scenario involves a community-led mangrove restoration project, supported by a locally constructed nursery to revive degraded areas, enhance biodiversity, improve food security and increase carbon sequestration.



Figure 7.4: Site location, Maskelyne Island

Cost-benefit analysis results

The costs and benefits of Mangrove restoration in Maskelyne Island over a 30-year period are presented in the graph below. The values are from:

- **Costs:** The costs in year 1 represent the initial costs of setting up the nursery. This is followed by costs of the restoration programme for 10 years.
- **Benefits:** Restoring mangroves would result in an increase in value of ecosystem services. Approximately 18,000m² has been lost/degraded between 1996 and 2020. The program will target 1,800m² per year for the initial ten years to restore the mangroves. Eco system benefits are expected to reach their full value in year 19, resulting in US \$43,200/year of benefits.

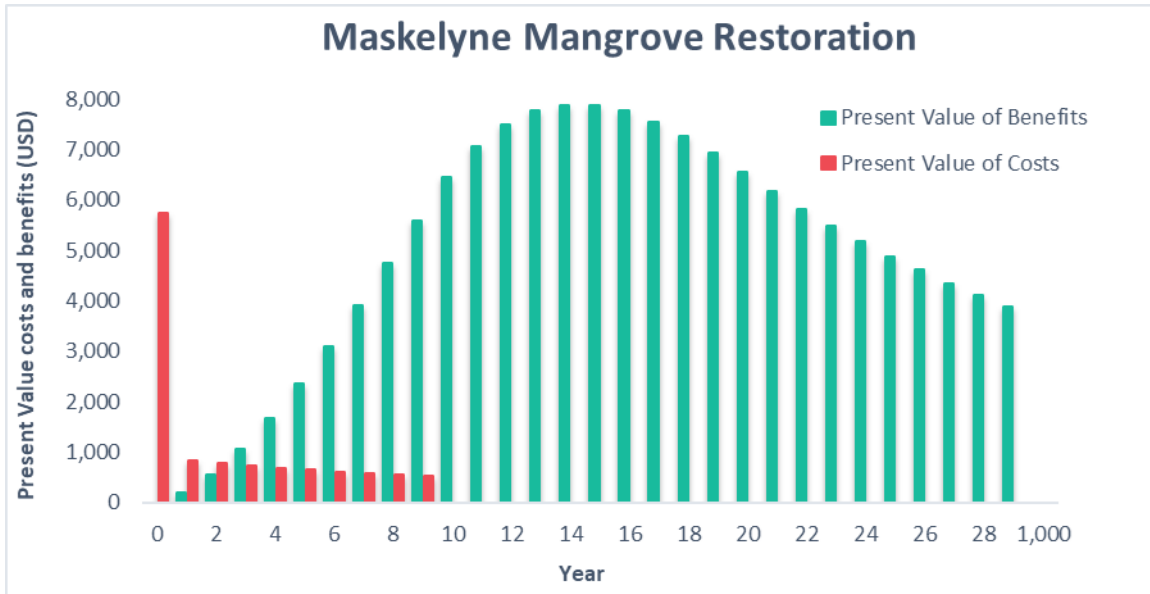


Figure 7.5: Costs and benefits for mangrove restoration in Maskelyne Island over 30 years

The NbS Scenario has a positive net present value. The NPV represents the incremental costs and benefits relative to the BAU baseline. Therefore, a positive NPV indicates additional benefits compared to the BAU scenario.

The costs and benefits are taken over a 30-year period and a 6 percent discount rate has been used to determine the present value.

Table 7.4: Net present value of mangrove restoration in Maskelyne Island

	benefits (PV, USD)	costs (PV, USD)	NPV (USD)	Benefit cost ratio
Mangrove restoration	148,295	11,676	136,618	12.7

There may be additional disaster risk management and shoreline stabilisation benefits that have not been quantified in this assessment.

Economic, social, and environmental benefits

A mangrove restoration project in Maskelyne Island would have the following benefits:

- Contribution to climate resilience – Restoring mangroves and native vegetation will strengthen natural flood defences and protect marine ecosystems. While the area for restoration is not large (1.8 ha), it can have a big impact on a small island.
- Job creation – There could be 1-2 management and coordination jobs and the project would support the existing eco-tourism operators. Restoring mangroves is likely to be mostly voluntary workers from the community.
- Biodiversity conservation – The project will support biodiversity conservation by restoring natural, which provide critical breeding and feeding grounds for fish, birds, and other wildlife. Replanting mangroves and native vegetation will enhance ecosystem connectivity, protect marine biodiversity by reducing sedimentation and pollution, and help maintain healthy coral reefs and coastal fisheries.

Market potential

There are limited opportunities for private sector engagement due to the population size and location of Maskelyne Island. The island group has approximately 1,022 residents and is a 10-to-15-hour boat ride from Port Vila or a half an hour plane ride followed by an hour by boat.^{39,40} There is an estimated 100 to 500 visitors per year.⁴¹

The Maskelyne Islands host some locally operated businesses, primarily focusing on eco-tourism and cultural experiences. Accommodation is available in family-run bungalows.⁴²

The viability of private sector engagement is outlined in the table below.

Table 7.5: Mangrove restoration viability of private sector engagement

Private engagement	Potential funding source
Public-private partnerships (PPPs)	Low likelihood Due to scale, location, and revenue potential.
Payment for Ecosystem Services (PES)	Low likelihood Unlikely given the size and number of businesses in the area.
Carbon offsetting and biodiversity credits	Moderate potential Potential for carbon credits if combined into a larger programme with other similar projects. This project may need to be grouped with similar initiatives to justify the administrative and monitoring costs which can be complex and resource intensive.
Sponsorship and corporate social responsibility	Low likelihood Unlikely given the size and number of businesses in the area.
Eco-tourism and sustainable business models	Low likelihood There is likely to be support from eco-tourism operators. However, investment is unlikely due to limited resources.

This project could be funded by designated government budget or a grant from a development partner. Given the size, combining this project with other mangrove regeneration projects to create a larger programme would be beneficial.

Risk analysis: Identifying and mitigating potential challenges

Project risks along with mitigating strategies are presented in the table below.

³⁹ Vanuatu National Population and Housing Census (20)

⁴⁰ "Getting to Malekula and the Maskelyne Islands." Available at: <https://www.vanuatu.travel> (Accessed 20 February 2025).

⁴¹ Estimate based on the limited accommodation options and the reliance on boat transfers from Malekula.

⁴² Book Me Vanuatu. "Batis Seaside Bungalows." Available at: https://bookmevanuatu.com/?page_id=945 (Accessed 20 February 2025).

Vanuatu Tourism. "Senelich Bungalows – Maskelyne." Available at: <https://vanuatu.com.au/malekula-island/senelich-bungalows-maskelyne/> (Accessed 20 February 2025).

Table 7.6: Risks and mitigation measures for mangrove restoration in Maskelyne Island

Risk	Description	Mitigation
Coastal erosion and rising sea levels	Erosion may wash away newly planted mangroves before they establish.	<ul style="list-style-type: none"> • Select sheltered planting sites with lower wave energy and use natural barriers (e.g., coconut fronds, biodegradable mesh) to protect seedlings. • Plant in staggered phases over multiple years to ensure some plants mature before the next cyclone season.
Stakeholder conflicts	Stakeholders may have conflicting interests. For example, competing land uses (e.g., for firewood, fishing access).	<ul style="list-style-type: none"> • Conduct community consultations and ensure customary landowners support the project. Involve local schools and village groups in mangrove planting and monitoring. • Use participatory mapping with local fishers to identify areas where mangrove regeneration enhances fish habitat without disrupting access.
Logistical and capacity risks	Limited technical expertise and difficulty accessing seedlings and material	<ul style="list-style-type: none"> • Partner with technical experts, NGOs, and academic institutions to provide expertise and ensure high-quality implementation. • Build local capacity by training community members • Establish local nurseries managed by villages to provide a continuous supply of seedlings.

Scalability: Opportunities to replicate and expand successful interventions

There is an opportunity to expand the project within and outside of Vanuatu:

- Within the Maskelyne Islands:
 - Similar projects can be implemented on Avok, Vao, Sakao, and Vetes, which have similar coastal conditions and face erosion challenges.
 - Creating a network of community-led mangrove nurseries. Local nurseries could supply seedlings for continuous planting across different sites.
 - Combining mangrove regeneration with seagrass conservation and coral reef restoration can enhance coastal protection and fisheries.
- Replicating across Vanuatu:
 - Applying lessons to other islands with coastal erosion issues, such as Malekula, Espiritu Santo, and Epi.
 - Sharing knowledge through community exchange programmes, where Maskelyne residents train other coastal communities in mangrove restoration.
- Regional and international:

- Draw on proven approaches from similar Pacific contexts and provide additional lessons learnt to the existing models.
- Engaging in knowledge-sharing (see step 5 of the Implementation Pathway).

7.3 Business case for climate smart agriculture in the Mele catchment

The Mele catchment area is just over 8,000 hectares and is comprised primarily of forested area (81%), with Grassland (13%), Coconut (3%), and urban areas (1%) being the next largest land uses.

The Mele Catchment faces increasing challenges from climate change, land degradation, and food security concerns. By enhancing biodiversity, conserving soil and water, and diversifying income sources, agroforestry can play a critical role in building resilience within rural communities.

Climate smart agriculture has been considered as NbS options and compared to a business-as-usual scenario to determine the incremental value of NbS.

With NbS, a climate-smart agroforestry system is implemented, integrating appropriate crops and tree species to enhance biodiversity, conserve soil and water, and improve productivity. This approach is expected to increase agricultural yields and strengthen the resilience of rural communities in the catchment. Three scenarios have been considered:

- NbS Scenario 1: Conversion of low capability land to agroforestry (1,202 ha)
- NbS Scenario 2: Conversion of low, and moderate-low capability land to agroforestry (3,018 ha)
- NbS Scenario 3: Conversion of all unused low, moderate-low, and moderate land to agroforestry (6,265 ha).

Cost-benefit analysis results

The costs and benefits of climate smart agroforestry in La Colle/Mele catchment are presented in the graph below over a 30-year period. The values are made up of:

- Costs: There are capital requirements for the initial setup of agroforestry followed by ongoing operational costs.⁴³
- Benefits: Existing land use benefits, as well as additional values for annual, perennial and long-term crops. The existing land use benefits are the value of agricultural yields and eco system services already established. As land is converted to agroforestry, the existing land use benefits decrease but the agroforestry benefits increase. The inputs for the agroforestry benefits calculations are the same for each scenario and are multiplied by the hectares that are converted to agroforestry.

⁴³ Capital costs are estimates for NbS 1: US \$2 million in year 0; NbS 2: US \$25 million in year 0 and US \$5 million in year 1; NbS 3: US \$25 million in year 0, US \$5 million in year 1 and an additional US \$5 million every 5 years.

Ongoing costs were assumed to be a function of revenue. Martinelli, G. do C., Schlindwein, M. M., Padovan, M. P., & Gimenes, R. M. T. (2019).

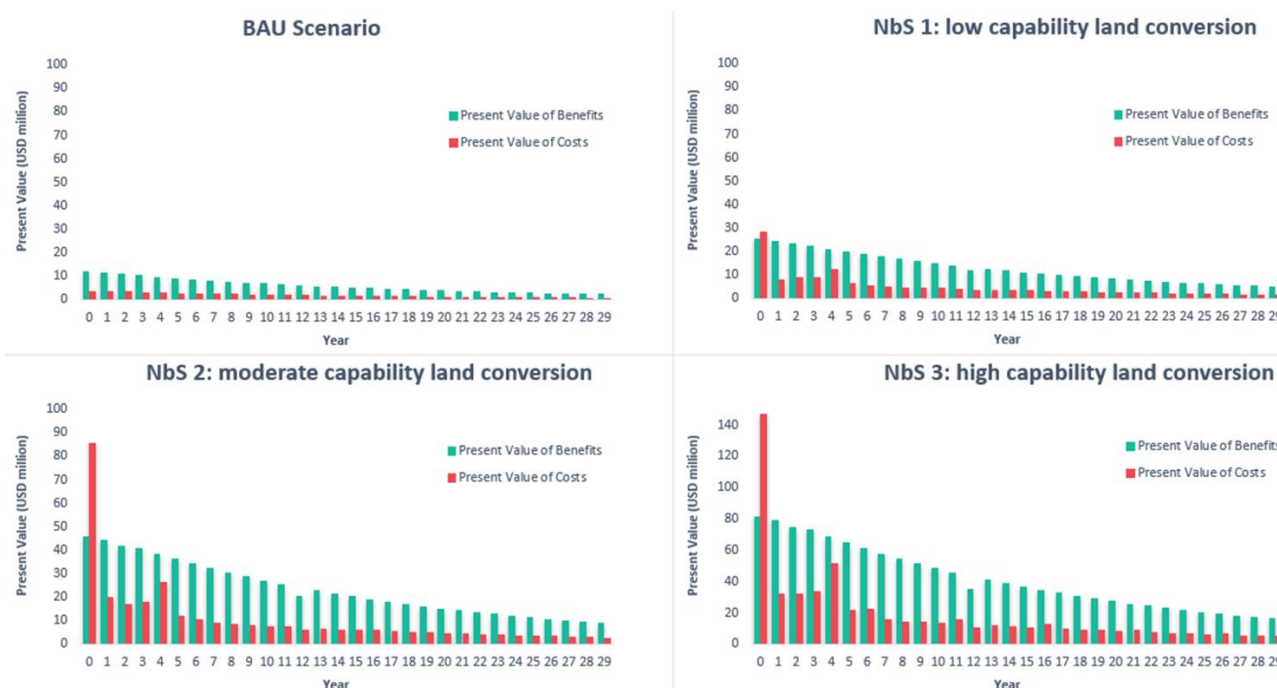


Figure 7.6: Costs and benefits of climate smart agriculture in the mele catchment over 30 years

The NbS Scenarios have a positive net present value. The NPV represents the incremental costs and benefits relative to the BAU baseline. Therefore, a positive NPV indicates additional benefits compared to the BAU scenario.

The costs and benefits are taken over a 30-year period and a 6 percent discount rate has been used to determine the present value.

Table 7.7: Net present value of climate smart agriculture in the mele catchment

	Benefits (PV, USD million)	Costs (PV, USD million)	NPV (USD million)	Benefit cost ratio
BAU Scenario	177	53	124	3.33
NbS Scenario 1	384	145	239	2.64
NbS Scenario 2	696	309	387	2.25
NbS Scenario 3	1,250	562	687	2.22

Economic, social, and environmental benefits

A climate smart agriculture project in the Mele catchment would have the following benefits:

- **Diversified Income Streams:** By integrating sustainable agricultural techniques, farmers may diversify their products, enabling them to tap into new markets (e.g., organic produce, value-added goods, eco-tourism tied to farming practices).
- **Improved Food Security:** Climate-smart practices can increase food availability and reduce vulnerability to climate shocks (e.g., floods, droughts), improving the health and nutrition of local communities.
- **Sustainable Land Use:** CSA practices like agroforestry, crop rotation, and reduced chemical use can improve soil health and prevent land degradation, promoting long-term environmental sustainability.

- Biodiversity Conservation: Integrating native plants and more diverse agricultural systems could support biodiversity, improve habitats for wildlife, and prevent monoculture farming practices that harm ecosystems.

Market potential

Small-scale farmers will play a crucial role in the agricultural landscape of the Mele Catchment and will be the primary beneficiaries of the climate smart agriculture initiatives. These farmers may face financial constraints and lack the initial capital to invest in necessary technologies and training. As agriculture is primarily subsistence-based, there is a need for capacity building to introduce sustainable farming methods and equip farmers with the skills to improve productivity while adapting to climate change.

The viability of private sector engagement is outlined in the table below.

Table 7.8: Climate smart agriculture viability of private sector engagement

Private engagement	Potential funding source
Public-private partnerships (PPPs)	<p>Moderate potential</p> <p>The Government would need to collaborate with local communities to implement this project, which primarily involves subsistence and small-scale farmers. These farmers would require training, as well as initial access to seeds and materials. While this is not a traditional public-private partnership (PPP), it would still involve a partnership between the government and local communities, with shared functions and responsibilities.</p>
Payment for Ecosystem Services (PES)	<p>Low likelihood</p> <p>Unlikely given that the benefits are predominantly the local communities.</p>
Carbon offsetting and biodiversity credits	<p>Moderate potential</p> <p>There is sufficient land area for practices to create measurable and verifiable carbon credits.</p> <p>However, for carbon or biodiversity credits to be feasible, the project would need to meet specific standards which require clear baselines, monitoring, and verification over time. This process can be intensive and costly.</p>
Sponsorship and corporate social responsibility	<p>Low likelihood</p> <p>Unlikely given the size and number of businesses in the area.</p>
Eco-tourism and sustainable business models	<p>Low likelihood</p> <p>Unlikely given the size and number of businesses in the area.</p>

Risk analysis: Identifying and mitigating potential challenges

Project risks along with mitigating strategies are presented in the table below.

Table 7.9: Risks and mitigation measures for climate smart agriculture in the Mele Catchment

Risk	Description	Mitigation
Climate variability and extreme weather events	Vanuatu is vulnerable to extreme weather events, such as cyclones and droughts, which can affect crop yields and project sustainability.	Incorporate climate-resilient practices (e.g., drought-tolerant crops, improved irrigation systems) and develop contingency plans for extreme weather events to protect the livelihoods of farmers.
Limited access to technology and expertise	Farmers may lack access to the necessary tools, technologies, or expertise to implement climate-smart practices effectively.	Provide capacity-building programs, training workshops, and access to affordable technologies (e.g., weather forecasting tools, improved seed varieties) to empower farmers.
Land tenure and ownership disputes	The customary land ownership system in Vanuatu can lead to disputes or confusion about land rights, hindering project implementation.	Engage with local landowners and communities early in the project design process, ensuring clarity in land agreements and promoting inclusive decision-making.
Financial Sustainability	Farmers may struggle to sustain long-term financing for these climate smart methods.	Explore alternative funding sources, such as carbon offsetting and biodiversity credits, and establish partnerships with development organizations to support long-term project financing.

Scalability: Opportunities to replicate and expand successful interventions

There are opportunities to replicate and expand the agroforestry project in the Mele Catchment and other areas in Vanuatu:

- Scaling within Mele Catchment
 - Expanding to degraded lands: Agroforestry can be introduced in areas affected by soil erosion or deforestation to restore land productivity.
 - Integrating with watershed management: Expanding agroforestry practices can improve water retention, reducing runoff and enhancing local water security.
 - Partnerships with local farmers: Training more farmers on agroforestry techniques and sustainable land management can encourage broader adoption.
- Replication across Tonga
 - Other catchments with similar challenges: Regions facing deforestation, declining soil fertility, or water scarcity could benefit from similar projects.
 - Coastal agroforestry for climate resilience: Expanding the project to coastal areas could help protect shorelines from erosion while providing livelihood opportunities.
- Regional and International Scaling
 - Knowledge-sharing with other Pacific Islands: Countries like Fiji and Tonga, which have similar land-use challenges, could replicate the model through regional cooperation.

- Agroforestry value chains: Developing processing facilities for agroforestry products (e.g., fruit, nuts, or timber) could support commercial scaling and attract investment.

7.2 Integrating NbS into national development plans

Vanuatu has several key national policies and strategies that align with NbS, particularly in areas such as ecosystem conservation, disaster risk reduction, and climate adaptation. However, these documents do not explicitly reference NbS.

The updated Nationally Determined Contribution (NDC) and the National Adaptation Plan (NAP), both currently in development, present an opportunity to integrate NbS. The table below provides an overview of how NbS aligns with existing national documents and where its integration could be strengthened.

Table 7.10: Integration of NbS in Key Vanuatu Policy Documents

National document	Alignment with NbS	Opportunities for Strengthening NbS
<p>Vanuatu's revised and enhanced Nationally Determined Contribution (NDC) 2021-2030</p>	<p>Recognises the importance of sustainable resource management, ecosystem protection, and climate resilience. Specifically:</p> <ul style="list-style-type: none"> • Agriculture – Vanuatu commits to upscaling climate-smart management practices, improving genetic varieties for climate resilience, and enhancing food security through agroforestry systems. • Forestry – Vanuatu commits to conserving, protecting, and sustainably managing mangrove forests, wetlands, and shoreline trees, as well as reducing forest degradation. • Oceans – Vanuatu commits to protecting naturally resistant or resilient ecosystems, such as coral reefs with high coral cover, mangroves, and coastal wetlands. • Environment – Vanuatu commits to quantifying the value and benefits of ecosystem services for resilience and incorporating this into planning and budgeting. 	<p>To better integrate NbS, the updated NDC could:</p> <ul style="list-style-type: none"> • Explicitly reference NbS as a key approach to achieving adaptation and resilience goals. • Under infrastructure commitments, highlight the need to evaluate NbS and green-grey infrastructure solutions to determine the most effective approach to climate resilience. • Expand on how quantifying ecosystem benefits can be systematically integrated into planning and budgeting processes. • Ensure NbS is linked to climate finance mechanisms in the NDC implementation plan.
<p>National Climate Change and Disaster Risk Reduction Policy (CCDRRP)</p>	<p>The CCDRRP does not explicitly mention NbS. However, it emphasizes ecosystem-based approaches and the sustainable management of natural resources, which align with NbS principles:</p> <ul style="list-style-type: none"> • Ecosystem-Based Approaches: The policy promotes ecosystem-based approaches to climate change adaptation and disaster risk reduction, recognizing the role of healthy ecosystems in enhancing community resilience. • Sustainable Resource Management: It emphasizes the sustainable management of natural resources, including forests, coastal zones, and 	<ul style="list-style-type: none"> • Explicitly state the link between NbS and ecosystem-based adaptation (EbA)/ ecosystem-based disaster risk reduction (Eco-DRR). • Indicate roles for government agencies, NGOs, and the private sector in NbS implementation and scaling.

	water resources, to mitigate climate risks and support livelihoods.	
National Sustainable Development Plan (NSDP)	While the NSDP does not explicitly mention NbS, it emphasizes the protection and sustainable management of natural resources, including forests, oceans, and freshwater systems, aligning with NbS principles.	<ul style="list-style-type: none"> • Introduce NbS as a key approach for achieving environmental and climate resilience goals. • Link NbS to economic and social benefits for sustainable development.
National Adaptation Plan (NAP)	A NAP for Vanuatu is currently under development.	<ul style="list-style-type: none"> • Mainstream NbS across all adaptation actions (e.g., agriculture, water, coastal resilience). • Identify priority sectors and locations where NbS should be implemented. • Provide a framework for integrating NbS into adaptation planning at national, provincial, and community levels.

7.3 Stakeholder engagement

For NbS initiatives in Vanuatu, key actors and their roles vary depending on the ecosystem, land tenure, and sectoral focus of each initiative. The table below outlines how engagement differs across three NbS projects. Step 5 in the Implementation Pathway (Section 4.5) highlights the importance of inclusive stakeholder consultation and types of engagement approaches.

Table 7.11: Stakeholder Engagement for NbS Projects in Vanuatu

Stakeholder group	Water resources and riparian restoration (Tagabe and La Colle)	Mangrove restoration (Maskelyne Island)	Climate smart agriculture (Mele Catchment)
National government agencies	<ul style="list-style-type: none"> • Department of Water Resources (DoWR) • Department of Environment (DEPC) • Ministry of Lands and Natural Resources • Vanuatu Meteorology & Geo-Hazards Dept (VMGD) 	<ul style="list-style-type: none"> • DEPC • Department of Fisheries • Department of Climate Change • Vanuatu Maritime Safety Authority 	<ul style="list-style-type: none"> • Ministry of Agriculture, Livestock, Forestry, Fisheries & Biosecurity (MALFFB) • Department of Water Resources • Department of Environment (DEPC)
Local communities and customary landowners	<ul style="list-style-type: none"> • Customary landowners and chiefs • Tagabe River Management Committee • Local farmers & households 	<ul style="list-style-type: none"> • Customary landowners and chiefs • Fisher cooperatives & local fishers • Coastal communities 	<ul style="list-style-type: none"> • Local farmers & agricultural cooperatives • Customary landowners & village leaders
Municipal and provincial authorities	<ul style="list-style-type: none"> • Port Vila Municipal Council • Shefa Provincial Government 	<ul style="list-style-type: none"> • Malampa Provincial Government • Local marine governance bodies 	<ul style="list-style-type: none"> • Efate-based provincial authorities • Municipal governments
Private sector	<ul style="list-style-type: none"> • UNELCO (utility) • Local businesses affecting water quality 	<ul style="list-style-type: none"> • Local seafood businesses • Coastal tourism operators 	<ul style="list-style-type: none"> • Agribusinesses & food supply chain actors • Rural finance providers
NGOs and development partners	<ul style="list-style-type: none"> • VESS • GGGI • UNDP • GIZ • ADB • World Bank 	<ul style="list-style-type: none"> • The Nature Conservancy (TNC) • SPC (Fisheries Programme) • GIZ • ADB • World Bank 	<ul style="list-style-type: none"> • FAO • SPC (Land Resources Division) • Agricultural extension services • ADB • World Bank
Scientific and research institutions	<ul style="list-style-type: none"> • Universities conducting hydrological research 	<ul style="list-style-type: none"> • Marine research institutions 	<ul style="list-style-type: none"> • Agricultural research and extension services

9. Recommendations and next steps

The steps outlined in the implementation pathway are designed to help mainstream NbS by embedding them into existing policies, planning, and decision-making processes. Once these approaches are integrated, the identification and implementation of NbS will become a routine part of how problems are addressed. This shift will support the consistent delivery of social and environmental benefits, without requiring separate or parallel processes.

While mainstreaming will take time, progress can begin immediately at both national and regional levels. At the national level, governments can integrate NbS into policy updates and development plans, review current infrastructure pipelines to identify opportunities for NbS integration, and catalogue lessons from past NbS initiatives.

At the regional level, countries can share lessons learnt, identify common challenges, and prioritise joint programmes where regional coordination adds value. Regional collaboration can help standardise approaches, reduce duplication, and build a stronger case for investment by bundling projects.

A near-term priority is to identify and scale up existing NbS projects with strong results, particularly those that have the potential to be replicated in similar contexts across the Pacific. Building an evidence base of what works will further embed NbS into practice and strengthen the case for sustained investment.

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Annex 1: Useful resources for NbS

Document name	Organisation	Year
NbS background and application		
IUCN Global Standard for NbS	IUCN	NA
Pacific NbS Guideline	PPIN	TBD
Framework for Nature Conservation and Protected Areas in the Pacific Islands Region 2021-2025	SPREP	2020
World Bank Pacific Atoll Countries Climate and Development report	World Bank	2024
Nature-Based Solutions for Asia and the Pacific	ADB	2024
Nature-Based Solutions Inventory for Fiji	International Institute for Sustainable Development	2024
Pacific Atoll Countries report	World Bank	2024
Analysis and engagement for NbS		
Integrated Vulnerability Assessment Framework for Atoll Islands	SPC, SPREP, GIZ	2018
Guidelines for the Economic Analysis of Projects	ADB	2017
Cost Benefit Analysis for Natural Resource Management in the Pacific, A guide	SPREP/ SPC/ PIFS/ Landcare Research and GIZ	2013
National Ecosystem and Socio-Economic Resilience Analysis and Mapping, Fiji	SPREP	2020
Stakeholder Engagement Guide for Nature-Based Solutions	Pacific Institute	2022
Kiwa Initiative Capacity Needs Assessment for Implementing Nature-based Solutions for Climate Change Adaptation	KIWA	2023
Benefit Accounting of Nature-Based Solutions for Watersheds	UN, Pacific Institute	2020
Sector specific information		
Pacific Agriculture and Forestry Strategy for 2024-2050	SPC	2024
Ba flood mitigation scoping study: Option evaluation and recommendations	Haskoning Australia Pty Ltd, GGGI	2024
Climate smart agriculture training module: A reference manual for agricultural officers	Asia-Pacific Network for Global Change Research	2022
Tropical Permaculture Guidebook	Permatil Global	2018
Pacific Community Climate Smart Agriculture (CSA) Alliance	SPC	2018
Climate-Smart Agriculture: A Call to Action	United Nations	2015
Guidance for Managing Coastal Protection Works in Pacific Island Countries	PRIF	2024
Nature-based Urban design for Wellbeing and Adaptation in Oceania Guide	NUWAO	2017

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