FATUMARU BAY
Coastal Resilience Roadmap and Action Plan

GREATER PORT VILA URBAN RESILIENCE PROJECT
Department of Urban Affairs and Planning

DEPARTMENT OF URBAN AFFAIRS AND PLANNING

Prepared by: Daniel Rodger of JB Pacific, Australia, (2025), for the Vanuatu Government Department of Urban Affairs and Planning. This work was financed by the Asian Development Bank

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scientists
and engineers

Contents

Introduction

Fatumaru Bay is located north of Port Vila, on the island of Efate, Vanuatu. It is widely used by the local Malapoa and Port Vila communities and is surrounded by public land, infrastructure, and community assets. The natural embayment supports a diverse range of marine and intertidal ecosystems, including an extensive coral reef system, seagrass beds, mangroves, intertidal and subtidal rock reefs, and microalgae mats.

However, the bay is under increasing pressure due to limited water circulation, coastal erosion, and coastal inundation. These challenges are being exacerbated by climate change, with coastal storms, tropical cyclones, extreme rainfall, ongoing erosion, and polluted runoff further threatening local ecosystems and nearby communities. In Fatumaru Bay, these impacts will place additional stress on the health of coral reefs and reduce the resilience of surrounding infrastructure.

Local and national authorities are leading efforts to build climate resilience and protect coastal communities across the country, including Fatumaru Bay. This requires a comprehensive strategy that combines nature-based solutions with practical adaptation measures.

This roadmap outlines a coordinated approach for Fatumaru Bay, including :

- **Nature-Based Solutions (NbS)**, which use ecosystems to reduce the impacts of coastal hazards while supporting biodiversity and sustainable livelihoods.
- **Climate adaptation**, which involves implementing site-specific actions to address immediate and long-term risks such as erosion, flooding, and habitat degradation.
- Building **coastal resilience,** which means maintaining the ecological and social integrity of places like Fatumaru Bay, ensuring that ecosystems, infrastructure, and communities can continue to function and thrive despite future uncertainties

Figure 1: Department of Forestry Nursery, which can provide plants for coastal restoration projects


Vanuatu
Pentecost
Malekula
Coral Sea
Port Vila
Fatumaru Bay
0
25
50 km
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Vision of this roadmap

This coastal resilience roadmap has been prepared for Fatumaru Bay, Port Vila. It promotes the use of Nature-Based Solutions (NBS) to strengthen the resilience of the coastal area, including measures to sustainably manage Fatumaru coastal ecosystems to promote nature-based coastal livelihoods and economic development opportunities. It builds on the findings and work previously done during the preparation and implementation of the ADB-financed Greater Port Vila Urban Resilience Project (GPVURP)[1]. It includes support for the Government of Vanuatu in preparing for a NbS coastal protection pilot project to demonstrate how various coastal protection measures may then be considered in other parts of the Greater Port Vila foreshore and throughout Vanuatu.

This roadmap is supported by several Vanuatu policies, including the Foreshore Development Act (1976), Ifira Marine Management Plan (2017) and Port Vila Urban Greening Master Plan (2022)

This roadmap is supported by several policies that contribute to the coastal management framework in Vanuatu. This includes the Foreshore Development Act (1976) which controls coastal foreshore development, the Ifira Marine Management Plan (2017) which nominates Fatumaru Bay for ecosystem restoration, and the Port Vila Urban Greening Master Plan (2022) which identifies the northern mangrove system in Fatumaru Bay as an area to preserve.

Figure 2: Mangrove tree growing in Fatumaru Bay

[1] ADB (2025) Vanuatu : Greater Port Vila Urban Resilience Project. https://www.adb.org/projects/52031-001/main

Existing coastal management framework

Coastal management in Vanuatu is coordinated through a number of departments who have been included within the Roadmap development. Coastal management stakeholders include the Department of Urban Affairs and Planning (DUAP), Department of Forestry, Department of Fisheries, and both the Port Vila City Council (PVCC) and Shefa Provincial Government Council. Workshops were held in April 2025 to understand the current legislative framework, key challenges experienced when managing the area, and to discuss new management priorities.

Legislative frameworks

Vanuatu has a progressive coastal management policy. Its base is the Foreshore Development Act, which regulates development activities below the mean high water mark to ensure sustainable use and prevent damage. The Act requires a Minister's written consent for any foreshore development, mandating that development aligns with other laws and local standards to protect the sensitive coastal environment and benefit all citizens. This Act has been central to the management of Vanuatu's coastline and is now part of a long list of legislation and policy that provides a framework for integrated coastal zone management. This includes

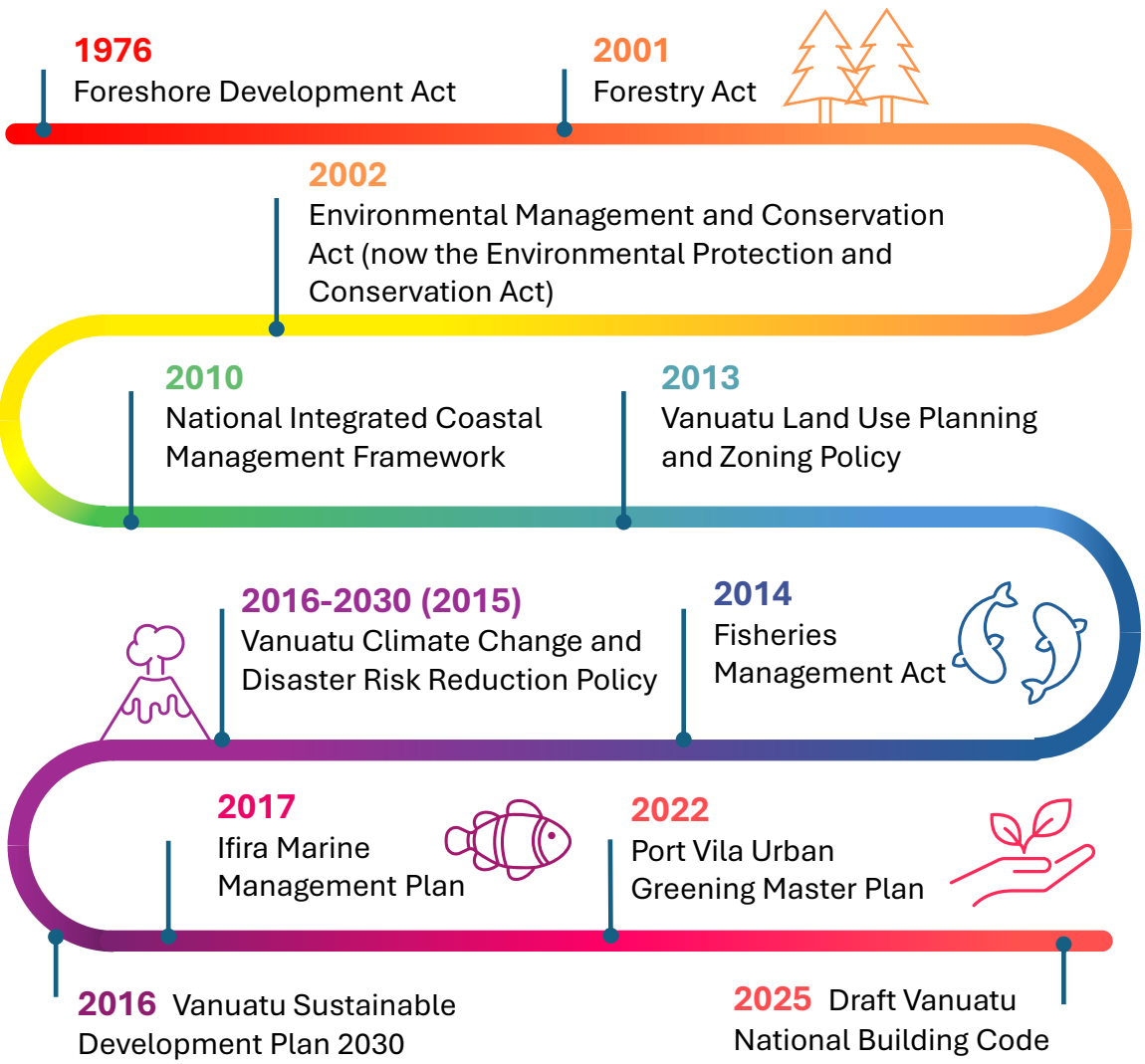

Figure 3: Legislation and Policy relevant to the Fatumaru Bay Roadmap

Coastal hazards and climate change in Fatumaru Bay

Top hazards

Vanuatu is at risk from urban flooding, coastal flooding, earthquakes, landslides, tsunami, volcanoes and cyclones. Vanuatu is a cyclone-prone country, with an average of 31 TCs per decade (~ 3 cyclones per year) passing within 500 km of the country. Cyclones can cause coastal inundation, which is considered a significant risk in terms of its impact on people, infrastructure and economy, particularly in low-lying areas of Port Vila. However, different areas will have a varying risk profile in terms of their local site characteristics.

In order to assess the main risks for Fatumaru Bay, a coastal hazard assessment was undertaken in preparation of this roadmap. The assessment identified the top threats to Fatumaru Bay, which are degrading water quality, coastal erosion and coastal inundation. Degrading water quality will cause tangible and intangible damages; from environmental degradation to loss of passive recreational activities. Erosion and coastal inundation can lead to direct damages to infrastructure. These hazards are further described in the following pages.

Figure 5: Port Vila seawall

Impacts to infrastructure

Erosion and coastal inundation can lead to direct damages to infrastructure. Adjacent to Fatumaru Bay this includes sections of coastal roadway, powerlines, and a limited number of residential and commercial buildings, which are shown in Figure 6. The number of buildings, roads and powerlines exposed to present-day coastal hazards are shown in Table 1.

Table 1: Number of buildings, roads and powerlines exposed to coastal hazards. See maps in Figure 6.

Receptor	Number of properties, road and power lines	
	Coastal Inundation	Potential coastal erosion
All Buildings	70	10
Roads and adjacent power lines	1.84 km	0.71 km

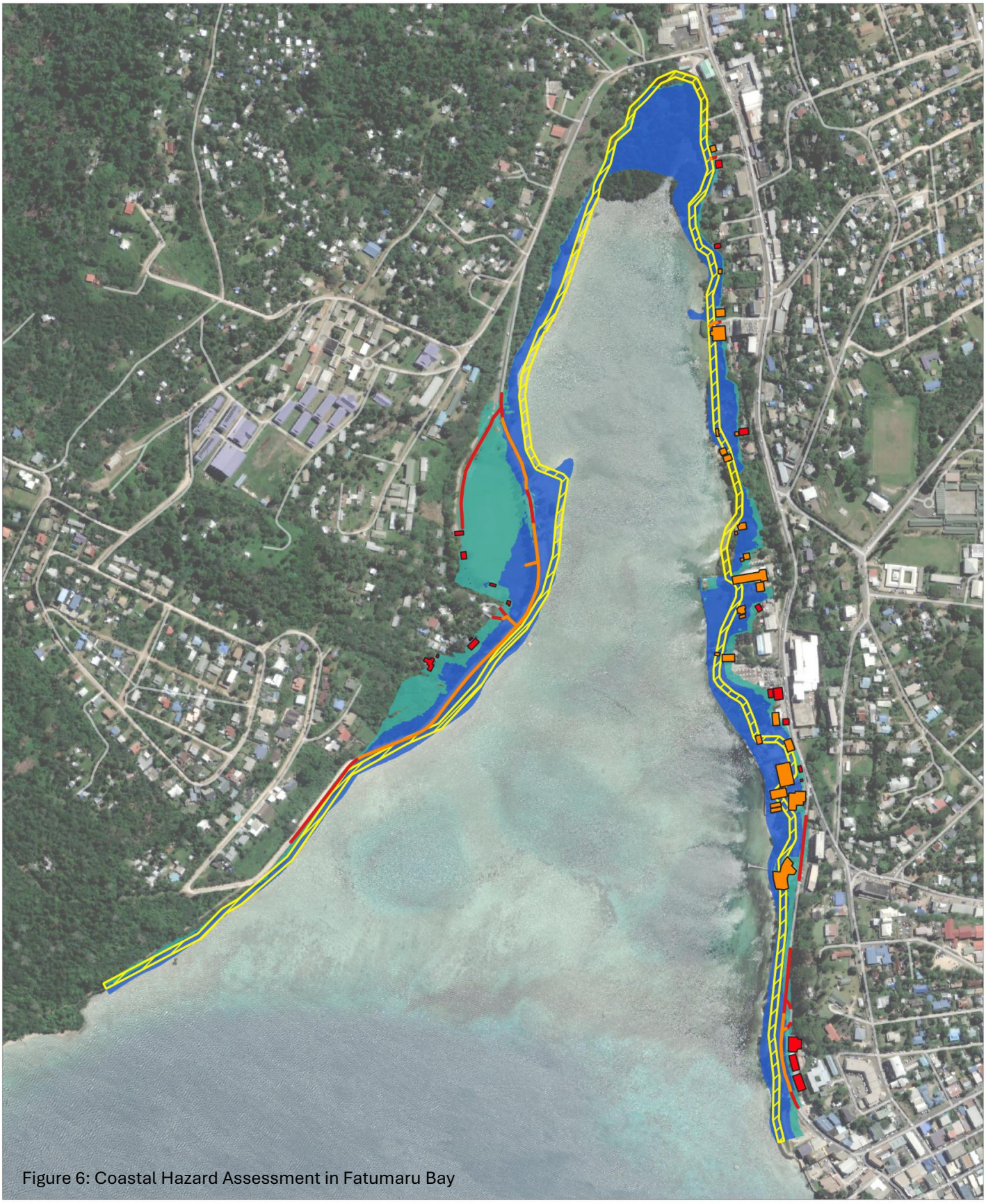

Figure 6: Coastal Hazard Assessment in Fatumaru Bay

0 100 200 m

Date: 07/05/2025
Version: 1
Page Size: A4
EPSG: 4326
Credit(s): Microsoft Bing (2023)

Hazard Assessment: Fatumaru Bay, Vanuatu

Legend

Road Exposure
- Present Day
- Future (2100)

Building Exposure
- Present Day
- Future (2100)

Coastal Erosion

Coastal Inundation
- Present Day
- Future (2100)

JB Pacific (JBP)
jbpacific.com.au
1300 764 332
150 Charlotte Street
Brisbane City
QLD 4000

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Figure 7: Lack of kerb and guttering or stormwater controls along roads adjacent to Fatumaru Bay.

Degrading Water Quality, Low Circulation, and Long Residence Times

Fatumaru Bay, along with Mele Bay and Port Vila Harbour, supports diverse marine ecosystems, but is increasingly threatened by poor water quality. Limited tidal flushing causes pollutants—such as nitrogen, suspended solids and chlorophyll from runoff—to accumulate, leading to oxygen depletion and sediment buildup. This degrades coral reefs, which are being replaced by algae, threatening biodiversity, food security, and tourism potential. The reef also plays a vital role in protecting the shoreline from wave energy; its degradation could increase vulnerability to storm surges and erosion.

Coastal Erosion

Fatumaru Bay experiences varying levels of erosion, particularly in sandy, unprotected areas exposed to wind-driven waves at high tide. While some shoreline protection exists, such as rock armouring, other areas rely on less effective, ad-hoc measures. Erosion leads to permanent land loss, damages infrastructure like roads and powerlines, and incurs high restoration costs.

The exposure to coastal erosion varies around the bay. The greatest risk is along the western shoreline where erosion poses safety risks and threatens public infrastructure (Malapoa College buildings, local nakamal, local houses), the road network and utility services. Erosion is also experienced along the eastern shoreline. In the north-east, this includes land that is leased to residential and commercial owners, with private assets most at risk. Several waterfront buildings withing the city centre within the mapped coastal risk area were damaged in the 2024 earthquake and are being removed or rebuilt.

Figure 9: Ad-hoc erosion protection

Coastal Inundation

Vanuatu is highly vulnerable to tropical cyclones, which occur frequently and can generate storm surges. Low-lying areas of Fatumaru Bay are particularly at risk, with saltwater inundation damaging property, infrastructure and ecosystems. The most south-east shoreline of the bay are exposed to storm surges and wave effects; where coastal studies recommend planning for water levels approaching 3 meters above mean sea level to account for extreme events[2, 3]. In these areas there is a need for adaptive planning and resilient infrastructure. The western coastline is protected from large waves, however is lower in elevation. Mapped coastal inundation zones extend over the foreshore and public roads.

Given the current urban planning following the 2024 earthquake, designs to improve the resilience of the city centre to coastal inundation resilience should be prioritised.

Figure 9: Summary of hazards

[2] CSIRO, SPREP and VMGD (2023). Vanuatu Central: subnational historical and projected climate overview. A report to the Van-KIRAP project. CSIRO Technical Report, Melbourne, Australia
[3] Tonkin & Taylor (2018) "Disaster Risk Assessment - Climate Risk and Vulnerability Assessment". Job Number 1007629.1000

Coastal management options

Coastal management in Vanuatu can consider a range of management approaches. Existing policies and strategic plans already provide a regulatory foundation for guiding development and safeguarding coastal zones. The controls within the Foreshore Development Act are considered 'international best practice' in coastal zone management, with all development on the foreshore requiring written consent of the Minister. This has been enforced since 1976 aiming to control development along the shoreline, however many assets remain at risk of flooding and erosion, such as those of Fatumaru Bay.

The scientific community and the local officers of Fatumaru Bay have developed a growing emphasis on the use of 'soft' or 'green' engineering approaches to enhance coastal resilience while preserving biodiversity. These include mangrove restoration, beach nourishment and community-based ecosystem management amongst other forms of NbS. Where erosion or coastal inundation is threatening high value infrastructure or assets and intervention is required urgently, the decision may be made to move towards traditional 'hard' engineering options, including seawalls and rock revetments to provide immediate protection. Together, these approaches can be integrated into a holistic coastal protection strategy that balances environmental sustainability with social and economic needs.

A Coastal Protection Feasibility Study (Fraser Thomas Partners 2021)[4] has been prepared for a section of Fatumaru Bay which presents a range of approaches to enhance resilience against climate-related risks, particularly coastal erosion and sea-level rise. This includes coastal re-vegetation, mangrove planting, toe protection and planting with wave protection, rock revetments, and the integration of hard structures with NbS, discussed in the following sections.

Figure 10: Western Fatumaru Bay

[4] Fraser Thomas Partners (2021) "Fatumaru Bay Foreshore Protection Draft Report v2", submitted to the Asian Development Bank and Ministry of Internal Affairs.

Ecosystem-based Approaches: Mangrove planting

Mangroves are salt-water tolerant forests which grow in coastal and riverine areas regularly saturated by water. They are characterised by extreme salt tolerance, and root adaptations allowing them to grow in soft and unstable substrates. Mangrove can reduce erosion by stabilising the shorelines and supporting accretion. They can have a long-term influence on the local topography by capturing riverine or coastal sediments deposited by tides and flood events, which will add to their own organic matter in the form of roots, leaves and woody material. Mangrove root growth can also push the soil upward, resulting in a raised soil levels which may reduce peak flood levels. Species such as Avicennia marina grow within Fatumaru Bay and surrounding areas, with seeds able to be collected and planted directly on site or grown in a nursery

Mangroves in Fatumaru Bay

Mangrove mapping was undertaken in April 2025. Whilst mangrove trees have reduced from their historic extent, two species remain growing in the bay:

- *Sonneratia caseolaris*
- *Rhizophora stylosa*

Figure 11: Roots of existing Mangrove Trees in Fatumaru Bay stabilizing soil

Beach building and nourishment

In areas where beach conditions are degraded, several activities can be undertaken to rehabilitate the foreshore. Controlling and limiting pedestrian access to be coastline can minimise local erosion from occurring, with formal access points preferred. Ongoing management of dune vegetation should be undertaken, with replanting where needed (see action 'coastal re-vegetation'). The addition of brush matting can assist in protecting remaining sand from wave and tidal action; where dead branches and coconut fronts can be incorporated into the foredune. If a suitable sand source is available, small-scale nourishment can then be added onto the beach.

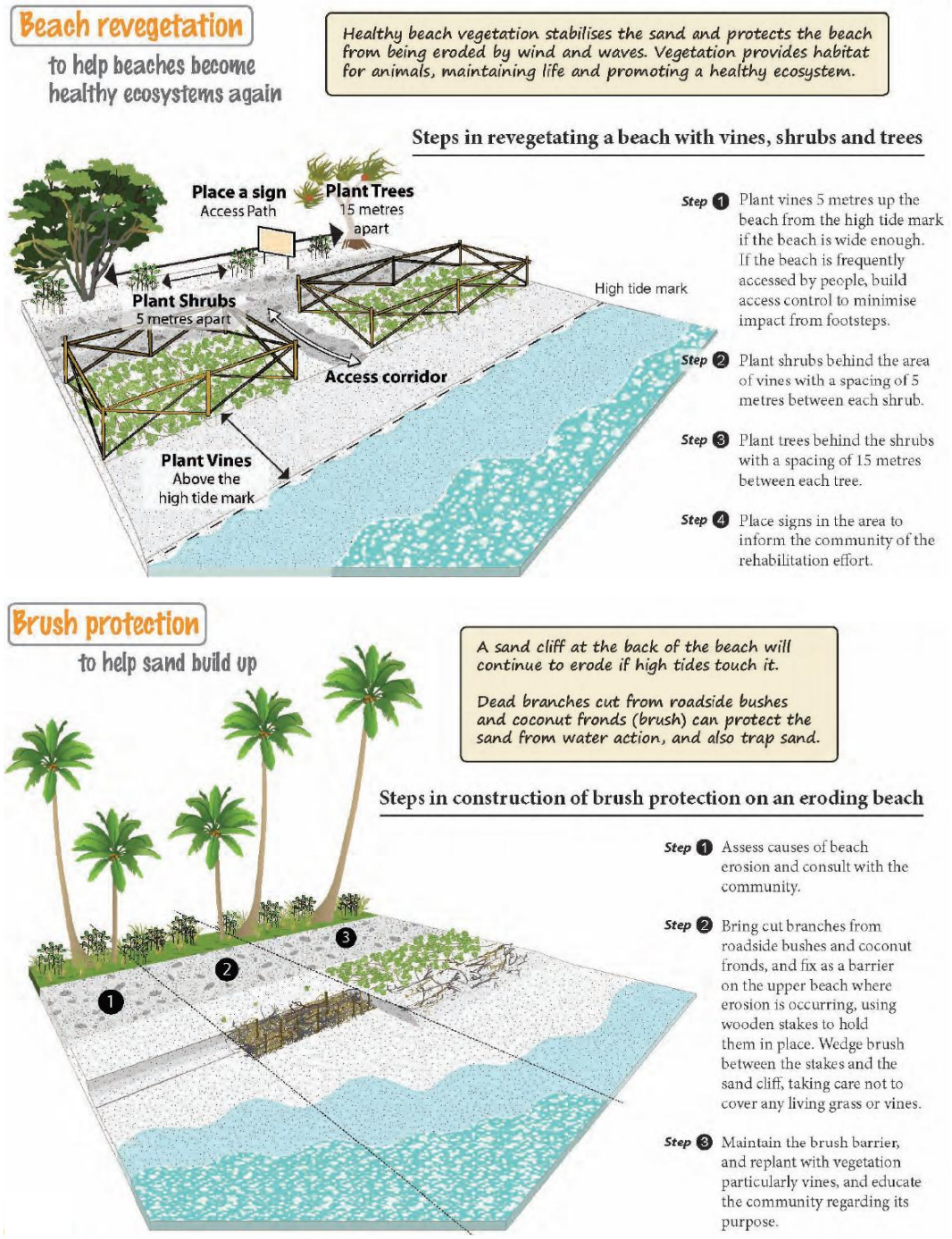

Figure 12: Revegetation and brush protection concepts from the Coastal Ecosystem-based Rehabilitation Guide (SPREP 2015)

Figure 13: Log fillet offering toe support and mangrove recolonisation, Moreton Bay, Aus.(Daniel Rodger 2025)

Toe protection, fillets and living shorelines

Low-crested rock or log fillets can be established create a 'sill' and living shoreline that provides wave protection to help establish coastal vegetation. The crest of the fillets should be designed to offer protection during typical tides and wave conditions, creating a calm area where sediment will settle and plant species can colonise. Several materials are being trialled to create fillets, including rock, oyster bags, rock bags, logs (see image) and reefballs[5, 6]. The fillets are designed with an expectation that they willed to eventually be covered by vegetation, which will form the primary bank stabilisation.

The benefits of this approach are the immediate protection offered by the rock fillets, the reduced construction costs and improved associated ecological and social benefits.

Bank armouring

Traditional coastal engineering can involve the placement of rock armourstone further up the bank. This approach can have drawbacks due to high costs and loss of ecosystem services and is consequently only recommended when erosion is threatening high value infrastructure.

Instead, in preparation for a future revetment, initial works could be undertaken to integrate smaller-scale toe protection works with ecological-based approaches to stabilise an eroding shoreline.

Figure 14: Port Vila northern rock revetment

[5] For examples in Australia see Living Shorelines Australia (2025): https://livingshorelines.com.au/about-living-shorelines/the-database/

[6] For examples in Asia see Nature-Based Solutions (2025) database: https://www.nature-basedsolutions.com/

Coastal resilience roadmap

Objectives

Available studies, the updated coastal hazard assessment and information provided in stakeholder workshops have been used to assess the resilience of the Fatumaru Bay coastal area. The top hazards of degrading water quality, coastal erosion and coastal inundation were identified due to their impact on the community livelihood, health/safety, infrastructure and the environment. Actions have been developed considering the discussions from the stakeholder workshop (i.e. the 'roadmap workshop') completed in April 2025, existing priorities in available policy and management plans, and through new actions developed to integrate NBS into planning, strengthen governance and policies, and offer new investments to enhance coastal resilience.

This roadmap presents actions within six pillars, which will strengthen the management of the Fatumaru Bay area and build additional experience and capacity within departments to allow further implementation over a wider coastline. The updated coastal hazard assessment study of Fatumaru Bay has informed the selections of these pillars and actions to target the identified coastal hazards

A **Promote the use of nature-based solutions**

B **Implement a coastal protection pilot project**

C **Strengthen coastal management governance**

D **Improve coastal policy**

E **Capacity building**

F **Continue to invest in additional resilience works**

Figure 15: Eastern Fatumaru Bay, facing south

A. Promote the use of nature-based solutions

NbS offer cost-effective, locally appropriate ways to reduce climate and disaster risks while preserving biodiversity. Their implementation can improve water quality by filtering sediment and providing natural buffers, to help stabilise soil to limit erosion, and help increase foreshore levels to limit wave overtopping. Fatumaru Bay was historically a mangrove-dominated coastal environment, and whilst remnant stands still remain throughout the bay, more widespread coverage would have traditionally offered greater protection against erosion and coastal inundation. With the imminent mangrove restoration efforts to take place in the coastal protection Pilot Project (See Action B1) and examples and lessons learned from pilot projects throughout Vanuatu's islands, there is enough scope to promote mangrove restoration and its co-benefits. Ecosystem, mangroves and nature-based mitigation strategies can be designed to incorporate local resources and labour, whilst offering creating habitat for fish and birds and enhancing flood mitigation and climate change adaptation.

To scale up the use of this NbS there is a need for mangrove seedlings. The Department of Forests maintains a plant nursery that sells native tree and shrub species for restoration and government projects. This would be ideal to expand to include the propagation and sale of local mangrove species and coastal dune or riparian plants

Action A1: Development of a Coastal NbS guideline for Vanuatu, or inclusion of specific coastal-guidance in a wider NbS guideline. This should include a guide for mangrove restoration, with lessons learned from the Fatumaru Bay Pilot Project (Action B1) and other examples undertaken in Efate and Vanuatu islands. This should recommend NbS as the initial approach for foreshore protection.

Timeframe: Short term (1-2 years)

Target Hazard: Degrading water quality, coastal erosion and coastal inundation

Action A2: Expansion of the Department of Forests plant nursery to include targeted NbS plants including local mangrove and coastal dune and riparian plants. These should be made available for community coastal restoration projects.

Timeframe: Short term (1-2 years)

Target Hazard: Degrading water quality, coastal erosion and coastal inundation

Figure 16: Dept of Forestry Nursery, which can provide plants for coastal restoration projects

B. Implement a coastal protection pilot project

A coastal protection Pilot Project in western Fatumaru Bay will address current erosion threats to public assets and infrastructure, including the Malapoa coastal roadway, powerlines, nakamal and water front land. It will have an emphasis on NbS and will allow the design, community engagement and government approval process to be tested.

Its planning and construction will feature a greater emphasis on community support, and the use of a Non-Governmental Organisation (NGO) to support community-based implementation. It will be able to share lessons learned throughout project stakeholders, and the final system can easily be visited from Port Vila.

These lessons and the internal capacity built throughout its implementation and monitoring will directly support Actions A1, A2, C1, E1 and F2.

Action B1: Completion of a pilot project in western Fatumaru Bay, sharing of lessons learned and results for wider application. The pilot project will undertake various coastal protection and nature-based restoration works along a 400m section of the western embayment.

This will include mangrove planting and restoration, foreshore restoration, a living shoreline created using rock bags, a new artificial reef to improve biodiversity, and construction of a small groyne to provide protection from waves and boat wash.

Timeframe: Implementation - Short term (1-2 years). Monitoring, evaluation and full sharing of lessons learned – medium term (3-5 years).

Target Hazard: Coastal erosion

Figure 17: Eastern Fatumaru Bay shoreline

C. Strengthen coastal management governance

Vanuatu has a strong governance structure with experienced staff delivering a range of projects involving NbS activities, often in isolation. The multiple benefits gained from NbS are applicable to several departments where additional coordination could be undertaken.

Action C1: Improved coordination between departments involved in coastal management and protection, i.e. the attendees of the roadmap workshop. An coordinating group should be established at a multi-department level to allow for coordination of cross-cutting themes such as a sea level rise planning, assessment of coastal developments, mangrove restoration plans and coastal NbS projects. The group would share opportunities and information from external projects between departments, for example Vanuatu's role in the MACBLUE project includes mangrove restoration works that will be of interest to multiple departments.

Governance should enforce the existing policies and plans developed for the area, including:

- ***The preservation zones identified in northern Fatumaru Bay and calls for water quality improvements within the Port Vila Urban Greening Master Plan (2022)***
- ***The establishment of the Limited Use Zone within Fatumaru Bay identified in the Ifira Marine Management Plan (2017)***

Timeframe: Short term (1-2 years) for establishment of multi-department coordinating group.

Target Hazard: Degrading water quality, coastal erosion and coastal inundation.

Figure 18: Reefs within Fatumaru Bay

D. Improve coastal policy framework

Vanuatu has an extensive number of policies and plans that provide a framework for integrated coastal zone management and protect the foreshore land. These could be strengthened through new policy statements or minor amendments.

The Foreshore Development Act (1976) provides protection for intertidal coastal land under the present day high water mark, with any physical development requiring an assessment and permit. However, infrastructure remains at risk of erosion and inundation. In order to further protect existing infrastructure and future development, this Act could be strengthened by considering future sea level rise, rather than relying solely on the present-day tidal conditions. Sea level rise will lead to an increased tidal range, higher extreme sea levels and greater coastal inundation. Incorporating the future high water mark supports adaptive management and the transition from reactive to proactive risk governance.

The Ifira Marine Management Plan (2017) is a strategic plan that covers the marine areas of Mele Bay, Fatumaru Bay and Port Vila Harbour. Fatumaru Bay is classified as a Limited Use Zone which is nominated for ecosystem restoration. Soon approaching ten-years only, an update to the plan would capture changes in ecological conditions, coastal pressures, and community needs since it was initially developed.

Action D1: Adopt a policy statement on sea level rise that can be integrated into coastal management planning, in particular the assessment of foreshore land under the Foreshore Development Act (1976). This provides a statement on sea level rise that identifies a common planning horizon, shared socio-economic pathway, and sea level rise projection that can be used when planning coastal management works. This sea level statement may fall within the upcoming Vanuatu National Building Code or other amendments to recent policy (e.g. Vanuatu National Loss and Damage Policy, 2025).

Timeframe: Short term (1-2 years).

Target Hazard: Coastal inundation

Figure 19: Fatumaru Lodge during a high tide

Action D2: Update the Ifira Marine Management Plan. This should review ecological conditions, coastal pressures, and community needs, and provide updated information on its planning area, boundaries, conservation areas, development controls, and ongoing management framework including the management team, roles, and actions. This should include recommendations for NbS as the initial approach for foreshore protection, including allowances for climate change (see Action A1 and D1).

Timeframe: Short to medium term (2-3 years)

Target Hazard: Degrading water quality, coastal erosion

E. Capacity building

There is a high interest in NbS and mangrove restoration within government technical and management teams that should be supported through a programme of capacity building.

Figure 20: Mangroves growing in rock armour

Action E1: Develop internal capacity building opportunities where government staff involved in coastal management can be provided with training in coastal processes, coastal protection, NbS and mangrove restoration.

Action E2: Ongoing training and investigation tools for DUAP Foreshore Management teams to allow improved monitoring of the shoreline and poor water quality sources. This should include purchase and use of unmanned aerial vehicle (UAV) / drones and training to allow inspection of difficult to reach coastal locations. Additional training could target Geographic Information System (GIS) to allow captured data to be mapped and linked with remote sensing.

Action E3: A wider research programme should be considered where masters and PhD level study opportunities are given to local academics to investigate the upcoming NbS and mangrove works (including the pilot project).

Action E4: Ongoing support for government departments undertaking water quality testing in Fatumaru Bay and wider areas such as Mele Bay and Port Vila harbour. This may require investment in new water quality instruments, resources to allow expansion from the current sites, and methods to share data throughout different departments (e.g. online portals). This data will serve as an ongoing 'health check' for the bay.

Action E5: Opportunities and information from external projects should be shared between departments, for example Vanuatu's role in the MACBLUE project includes mangrove restoration works that will be of interest to multiple departments.

Timeframe for all: Short to medium term (1-3 years).

Target Hazard: Degrading water quality, coastal erosion and coastal inundation

F. Continue to invest in additional resilience works

The ongoing management of the coastal area would benefit from continued investigations and targeted engineering works (encompassing soft, green and grey approaches) to address the key hazards of degrading water quality, coastal erosion, and coastal inundation.

Water quality investigations and Water Sensitive Urban Design works would target the degrading water quality within the bay. Investment in erosion mitigation approaches would target public land spanning west of the nakamal, near the boundary of the proposed pilot area (See Action B1). Erosion to the northern bay should be managed through protection of the existing mangroves (as identified in the Greening Master Plan) and NbS the recommended approach for any coastal protection of leased foreshore land along the east of the bay (See Action A1, D1, D2). Formal coastal protection works along the northern city centre should include allowances for climate change and sea level rise (to be included in Waterfront Planning following the Port Vila CBD Vision And Concept Plan). Protection from future coastal inundation can be managed through the establishment of suitable building floor levels above the coastal planning level (refer to the Vanuatu National Building Code), which will be supported by the incorporation of NbS along the foreshore. Investing in these proactive resilience measures will help reduce long-term risks to infrastructure, ecosystems, and community wellbeing.

Action F1: Investment in water quality management. Complete a stormwater management investigation and implementation of stormwater quality improvement devices (SQIDs) or Water Sensitive Urban Design features within the drainage network in the northern areas of Fatumaru Bay. This would support the Urban Greening Master Plan which advocates for the integration of more Water Sensitive Urban Design principles in the upgrading and expansion of Port Vila's catchment management system using green infrastructure elements such as constructed wetlands, detention basins, swales and contouring to enhance groundwater recharge.

Timeframe: Medium to long term (3-5 years)

Target Hazard: Degrading water quality

Figure 21: Dirty stormwater runoff being discharged directly into Fatumaru Bay

Action F2: Expansion of coastal protection works, incorporating NbS, to the west of the proposed pilot area to build resilience to the coastal road located in the mapped erosion zone.

The implementation of the pilot project may offer opportunities for synergies for the selection of the most appropriate option which should be informed by a dedicated feasibility study.

Timeframe: Medium to long term (3-5 years)

Target Hazard: Coastal erosion

Figure 22: Coastal road south of the nakamal

Figure 23: Western Fatumaru Bay / Mele Bay shoreline

Implementation

Timeframes have been included for each action, summarised below. These are indicative only as implementation will depend on several factors, including the availability of funding, institutional capacity, prioritisation within government and community agendas, and coordination across stakeholders. Flexibility in timing will also be necessary to account for changes in environmental conditions, community needs, and the results of ongoing monitoring and evaluation of the pilot project

Action	*Approx. Timeframe (Years)*
A. Promote the use of NbS Timeframe	
A1. Coastal NbS guideline	*1-2*
A2. Mangrove nursery	*1-2*
B. Implement a coastal protection pilot project	
B1. Implementation	*1-2*
Monitoring and knowledge sharing	*3-5*
C. Strengthen coastal management governance	
C1. Continued stakeholder coordination	*1-2*
D. Improve coastal policy framework	
D1. Sea level rise guidance	*1-2*
D2. Update Ifira Marine Management Plan	*2-3*
E. Capacity building	
E1. Capacity building opportunities	*1-3*
E2. Shoreline investigation tools	*1-3*
E3. NBS research programme	*1-3*
E4. Water quality investigation tools	*1-3*
E5. Links with external NBS programmes	*1-3*
F. Continue to invest in additional resilience works	
F1. Water quality improvements	*3-5*
F2. Coastal protection works expansion	*3-5*