

ECOSYSTEM-BASED ADAPTATION

OPTIONS ASSESSMENT AND MASTERPLAN

HONIARA



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Our vision: The Pacific environment, sustaining our livelihoods and natural heritage in harmony with our cultures.

This report produced by BMT WBM for the Secretariat of the Pacific Regional Environment Programme (SPREP) presents the Ecosystem-based Adaptation (EbA) Options Assessment and Masterplan for Honiara prepared as part of the Solomon Islands Ecosystems and Socio-economic Resilience Analysis and Mapping (ESRAM) to assess and prioritise climate change-related ecosystem-based adaptation options for selected locations in Solomon Islands. The report outlines EbA options for Honiara.

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All photographs are credited to Beth Toki unless stated otherwise.

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1 Introduction

1.1 Pacific Ecosystem-based Adaptation to Climate Change Project

1.1.1 Background

This project forms part of the Solomon Island component of the broader 'Pacific Ecosystems-based Adaptation to Climate Change' (PEBACC) project. PEBACC is a five-year project funded by the German Government and implemented by the Secretariat of the Pacific Regional Environment Programme (SPREP) in three participating countries (Fiji, Solomon Islands and Vanuatu) to explore and promote ecosystem-based options for adapting to climate change.

Ecosystem-based adaptation (EbA) is an ecosystem-focussed approach to building the resilience of linked social and ecological systems to the adverse effects of climate change. Through sustainable resource management, ecosystem-based adaptation integrates biodiversity and ecosystem services into an adaptation strategy. When delivered effectively, EbA can be cost-effective and contribute to biodiversity conservation, while generating social, economic and cultural co-benefits (CBD 2009). An ecosystem-based adaptation approach is particularly relevant to the economies and communities of Solomon Islands, which are heavily reliant on local land and sea resources for maintaining national, provincial and local economies, community livelihoods and socio-cultural values. In this respect, maintaining healthy and well-functioning ecosystems will be crucial to building community resilience and reducing the vulnerability to the effects of climate change.

1.1.2 Project stages

The key stages of the PEBACC project are listed below and presented in Figure 1-1.

- (1) Ecosystem and socio-economic resilience analysis and mapping (ESRAM) study – a baseline study for adaptation planning at the national, provincial and community level.
- (2) EbA options assessment – identification and prioritisation of EbA options for Honiara and Wagina Island.
- (3) Implementation plans – development of implementation plans for demonstration sites in Honiara and Wagina Island.
- (4) EbA implementation – implementation of EbA options in Honiara and Wagina Island.

The second stage of the PEBACC project is the subject of the present report: EbA options analysis and prioritisation. Prior to this stage, an ESRAM study was undertaken in order to: (i) identify and map ecosystem types, ecosystem services, threats and trends; (ii) define the economic value of key ecosystem services; and (iii) assess the resilience of ecosystem services and communities to future climate and non-climate threats and impacts. Overall, the ESRAM study has been used as the basis for identifying ecosystem-based adaptation options for strengthening the resilience of Solomon Islands to the potential effects of climate change. It is envisioned that EbA will be incorporated and implemented in both policy and on-ground adaptation actions, providing a test case and model for other Pacific nations (or other locations within Solomon Islands).

The EbA options analysis and prioritisation will be followed by the development of EbA implementation plans for selected demonstration sites (Stage 3); and on-ground EbA implementation works (Stage 4).

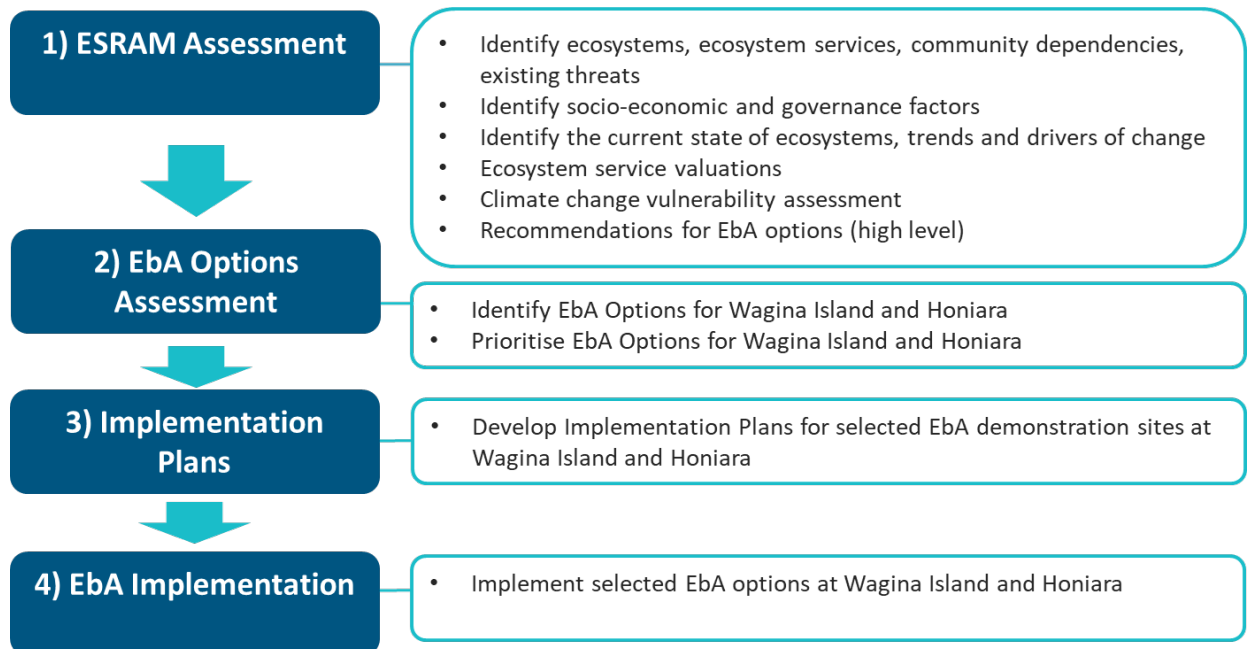


Figure 1-1 PEBACC Project process

1.2 Conclusions of the ESRAM study

The completion of the ESRAM study provides a baseline for developing and prioritising EbA options. Several community and stakeholder workshops and site visits were undertaken across Honiara to identify all ecosystem services utilised by residents, and to determine those services that have a low resilience to threats posed by future climate and non-climate events. Ecosystems and ecosystem services were mapped by workshop participants, and results were presented to community and stakeholder representatives for validation. Ecosystem services were assessed for their vulnerability to the effects of climate change and, where possible, economic valuations were undertaken to provide an insight into the relative extent and magnitude of ecosystems and ecosystem service values across different environments.

To provide context to the current EbA development phase, all ecosystem services identified during stakeholder engagement at each scale (national, Honiara and Wagina Island) are presented in the tables below. Ecosystem services most vulnerable to the threats posed by future climate and non-climate events are presented first and bolded (under their relevant provisioning ecosystem).

High-level EbA options were then established to respond to the need to build environmental resilience and provide ecosystems with the ability to adapt and, in turn, increase the likelihood of human adaptation to the adverse effects of climate change.

1.2.1 National ESRAM study findings

The climate change projections likely to have the greatest effect on ecosystem services on a national scale are an increase in sea and air temperature and ocean acidification, an increase in extreme rainfall events, and sea-level rise. Increasing habitat destruction from unsustainable logging and agriculture practices, freshwater and marine pollution, and the over-exploitation and degradation of marine resources, combined with a rapid population growth and inadequate environmental regulations and enforcement, are the key threats faced by ecosystem services on the national scale.

Table 1-1 presents the ecosystem services identified by community and stakeholder representatives on a national scale. Ecosystem services bolded and presented first have been identified as the key ecosystem services most vulnerable and in need of the provisioning ecosystems to be protected, restored and enhanced to build and strengthen resilience under future climate conditions.

Table 1-1 National ecosystem services (bolded ecosystem services are likely to be less resilient to future climate conditions)

Ecosystems	Ecosystem Services	Ecosystems	Ecosystem Services	Ecosystems	Ecosystem Services	
Rivers, streams	Food provision (e.g. fish, eels, molluscs, crustaceans, aquaculture)	Other terrestrial land	Land provision	Mangroves	Cultural values (crafts, dye)	
	Water supply (drinking and domestic)	Coral Reefs	Habitat provision / biodiversity (essential feeding, breeding, spawning, cleaning and aggregation habitat)		Recreation	
	Water supply (irrigation and industrial)		Food provision (fish, including pelagic fish, turtles, octopus, clams, beche-de-mer and trochus)	Ocean	Food provision	
	Recreation (swimming)		Coastal protection (attenuation and buffering of wave and storm energy by reefs)		Habitat provision	
	Support fisheries (local and commercial)		Income and revenue source (fish, including pelagic fish, turtles, octopus, clams, beche-de-mer, trochus, lime extraction, tourism, aquarium trade)		Climate and atmospheric regulation	
	Habitat and biodiversity		Raw materials provision (coral rock and lime)		Income and revenue generation	
	Energy generation (hydropower)		Mountains, Highlands	Cultural values (shells, ornaments and decorations)	Support transport	
	Cultural values (e.g. baptisms, source of ornamental and handicraft materials)			Regulation of marine primary productivity, nutrient and carbon cycling	Raw materials provision (building materials)	
	Waste disposal and dispersal			<i>Kastom</i> medicine	Habitat provision and biodiversity	
	Transportation, anchorage			Supports tourism industry	Water source	
Raw materials provision (e.g. gravel, sand, <i>motu</i> stones)	Recreation and leisure			Climatic regulation		
Terrestrial Forests	Raw materials (building, fuel and commercial purposes)	Coastline/ Beach		Fauna habitat (e.g. turtle nesting)	Wetlands/ Lakes/ Swamps	Provide protection from disasters
	Fauna habitat (e.g. birds, insects, wildlife) and support of biodiversity			Domestic use (bathing)		Support navigation
	Food provision (hunting grounds, nuts, fruits and vegetables)					Food provision (e.g. swamp taro taro, sago, fishing and aquaculture activities)
	Source of income/revenue (e.g. logging)					Water supply (drinking and domestic)

Ecosystems	Ecosystem Services	Ecosystems	Ecosystem Services	Ecosystems	Ecosystem Services
	Nutrient cycling and primary productivity		Raw materials provision (e.g. sand, gravel, stones)		Habitat provision and support of biodiversity (incl. value as critical habitat for migratory bird species)
	Land stability and hazard protection for communities (e.g. landslides, erosion, wind or weather break)		Coastal protection (e.g. buffer coastal communities against inundation from tsunami and storm surge)		Support aquaculture
	Soil retention and fertility		Supports transport (boat landing)		Water quality and flood flow regulation (filtration and purification of run-off from watersheds, and reducing flood flow rates)
	Air regulation and shade provision		Cultural values and handicrafts (e.g. for jewellery, ornaments, decorations, turtle nesting)		Cultural values (heritage)
	Carbon sequestration		Support recreation/leisure		Provision of raw materials (e.g. traditional building materials, reeds for weaving)
	Support provision of water	Waste disposal and dispersal	Seagrass and marine macroalgae (seaweeds)	Habitat provision (turtles, dugong)	
	<i>Kastom</i> medicine provision	Mangroves	Food provision (fish, mud crabs, molluscs, mangrove fruit)		Primary productivity
	Cultural values and handicrafts (traditional tools, ornaments, costumes, weaving, handicrafts and traditional currency)		Coastal protection, shoreline stabilisation		Income generation (seaweed farming)
	Support recreation and tourism		Fauna habitat and nursery grounds		<i>Kastom</i> medicine and food
	Raw materials and fuel provision		Seabed stabilisation		
Other terrestrial land	Commercial value (incl. agriculture)		<i>Kastom</i> medicine	Groundwater	Water supply (drinking and domestic)
	Provides identity and heritage		Carbon sequestration		Income generation (spring water)
	Support forests		Waste disposal and dispersal	Plantations and Gardens	Income generation
	Minerals source (mining industry)				Food provision

1.2.2 Honiara ESRAM study findings

Honiara is experiencing rapid rural-urban migration, predominantly in informal settlements that are highly exposed to multiple natural hazards, overcrowding and lack of basic service provisions. In both the upper and lower catchments, many households are largely subsistence-based relying heavily on ecosystem services for their water and food provisions, shelter, income-generation and overall health and well-being. The ability of these ecosystem services to continue to provide the essential services many Honiara residents depend on is decreasing due to activities such as logging, unsustainable agriculture (including on riparian land), pollution, and over-exploitation of marine resources. As Honiara's population growth rate exceeds the national growth rate, these activities will only intensify and are likely to have an increased detrimental effect on the communities and economies of Honiara. Climate change variables projected to have the greatest negative effect on ecosystem services are an increase in air and sea temperature, ocean acidification, an increase in extreme rainfall events, and sea-level rise.

Table 1-2 presents the Honiara ecosystem services identified by community and stakeholder representatives. Ecosystem services bolded and presented first have been identified as the key ecosystem services most vulnerable and in need of the provisioning ecosystems to be protected, restored and enhanced to build and strengthen resilience under future climate conditions.

Table 1-2 Honiara ecosystem services (bolded ecosystem services are likely to be less resilient to future climate conditions)

Ecosystems	Ecosystem Services	Ecosystems	Ecosystem Services	Ecosystems	Ecosystem Services		
Urban springs and groundwater	Water provision (drinking)	Coastal and Marine	Support fisheries	Terrestrial watershed	Regulating services including water quality and flow and air quality		
	Water provision (domestic)		Raw materials provision (sand, gravel, coral rock, lime, stones, timber, fuelwood)		Food provision (subsistence and commercial cultivated lands)		
Rivers, streams other water bodies	Food provision (fish, crab, ura, water cress, aquaculture)		Coastal protection (attenuation and buffering of wave and storm energy by reefs and shoreline stabilisation by mangroves at the Lungga River delta)		Urban greenspace /Landscaping	Culturally important materials and values (traditional costumes, ornaments and cultural artefacts, provision of areas for reconnecting with traditional land-based cultural practices)	
	Water supply (drinking)		Food provision			Raw materials (timber and fuelwood)	
	Water supply (domestic)		Support tourism (e.g. snorkelling, diving and sailing)			Medicinal plants	
	Water supply (irrigation and industrial)		Habitat provision and biodiversity support			Recreation and leisure (e.g. areas for socialising and reconnecting with nature)	
	Income generation (e.g. fishing, aquaculture)		Cultural artefacts and ornaments (shell money, ornaments, jewellery and decorations)			Support logging industry and agriculture	
	Environmental and event regulation (e.g. channel rain and flood waters)		Cultural identity and status			Land (e.g. built environment)	Shade provision
	Habitat provision and biodiversity		Kastom medicine provided by coral				Tourism support
	Support fisheries and aquaculture		Recreation (e.g. sporting activities, leisure)				Urban habitat and biodiversity
	Recreational uses (swimming)	Transport facilitation	Recreation and leisure				
	Raw materials provision (e.g. gravel and stones)	Waste disposal and dispersal	Terrestrial watershed	Food provision (subsistence and backyard gardens)			
	Cultural and religious values (e.g. shells, cultural identity and connection with the land, location for baptisms).	Habitat provision and biodiversity support		Provision of land for development, business and services			
	Support tourism (e.g. waterfalls)	Erosion control and land stability		Supports cultural identity			
	Waste disposal and dispersal			High value commodity			
Transport facilitation							

1.2.3 EbA recommendations

The high reliance on ecosystem services by many Solomon Island households and economies, combined with the ecosystem degradation and a rapid population growth rate, are critical issues for building the nation's resilience to future climate change effects. Based on the ecosystem services and threats identified during the ESRAM study, high level EbA options were suggested to assist in restoring and maintaining healthy and well-functioning ecosystems that will be crucial to building environmental and social resilience to the effects of climate change.

The high-level EbA options were used as a basis for presenting EbA examples during the Honiara options development workshops and, in some cases, have been expanded on by workshop participants. The high level EbA options for Honiara are presented below in Table 1.3.

Table 1-3 Suggested Honiara EbA options based on ESRAM findings

High-level Ecosystem Type	Most Vulnerable Ecosystem Services to Climate and Non-climate Effects	Anthropogenic and Non-climate Stressors	Potential Climate Change-related Effects	Adaptation and Ecosystem Resilience Options	Key Stakeholders to Support EbA Option Implementation
Freshwater (groundwater, urban springs, rivers and streams)	<ul style="list-style-type: none"> Water supply (drinking, domestic, irrigation for industry and agriculture) Habitat and biodiversity Environmental and event regulation Food provision (fish, crab, ura, water cress, aquaculture) Support fisheries and aquaculture 	<ul style="list-style-type: none"> Population growth Vegetation clearing and land disturbance from logging, saw-milling, agriculture, urban development, gravel extraction Sediment run-off from inappropriate land management activities such as logging and agriculture Pollution from poor solid waste management and sanitation, chemical, pesticide and fertiliser inputs, urbanisation and extractive industries 	<ul style="list-style-type: none"> Soil erosion, sedimentation and landslip from extreme rainfall events. Exacerbated by more intense tropical cyclones Salt-water intrusion from sea-level rise 	<ul style="list-style-type: none"> Relocate communities and businesses from vulnerable riparian areas to drier, higher ground Vegetation protection and catchment and riparian revegetation programme Land-use planning restrictions on steep and unstable soils A clean water protection programme: <ul style="list-style-type: none"> increasing and sustaining water storage capacity restoration and management (including riparian and freshwater ecosystems) of water catchment areas sediment control of freshwater streams and water quality testing. City-wide environmental awareness and education programmes on: <ul style="list-style-type: none"> sustainable land management practices, including importance of riparian vegetation stormwater management systems good waste management and sanitation practices 	<ul style="list-style-type: none"> Honiara City Council Guadalcanal Provincial Government Ministry of Environment, Climate Change, Disaster Management and Meteorology Ministry of Forests and Research Ministry of Education and Human Resources Development Ministry of Women, Children and Youth Solomon Islands Water Authority Town and Country Planning Board Ministry of Infrastructure and Development Botanic Gardens and National Herbarium Solo Enviro Beautification The Nature Conservancy World Wildlife Fund SPREP

High-level Ecosystem Type	Most Vulnerable Ecosystem Services to Climate and Non-climate Effects	Anthropogenic and Non-climate Stressors	Potential Climate Change-related Effects	Adaptation and Ecosystem Resilience Options	Key Stakeholders to Support EbA Option Implementation
Coastal and Marine	<ul style="list-style-type: none"> • Commercial and subsistence fishing (source of food and income) • Habitat and biodiversity • Support tourism industry (snorkelling and diving) • Source of building materials (sand, gravel, coral rock, stones and mangrove timber) • Raw materials (fuelwood, lime, coral rock) • Hazard protection (attenuation and buffering of wave and storm energy by reefs) • Cultural artefacts and commercial ornaments (shell money, ornaments, jewellery and decorations) • Cultural identity and status • <i>Kastom</i> medicine (coral) 	<ul style="list-style-type: none"> • Population growth • Depletion of marine resources and loss of biodiversity from over-exploitation (over-fishing) • Sediment run-off from inappropriate land management activities such as logging and agriculture • Pollution from poor solid waste management and sanitation, chemical, pesticide and fertiliser inputs, urbanisation and extractive industries • Coastal development and vegetation clearing 	<ul style="list-style-type: none"> • Decline in reef ecosystem condition and coral dieback due to coral bleaching (rising temperature), ocean acidification, poor water quality (sedimentation due to extreme rainfall events) Exacerbated by more intense tropical cyclones. • Shift in marine ecosystem structure due to rise in sea temperature • Altered capacity for oceans to regulate climate from increased sea temperatures • Sediment run-off from extreme rainfall events • Coastal erosion of mangroves patches from sea-level rise, storm surge and tropical cyclones • Permanent saltwater inundation of mangrove areas 	<ul style="list-style-type: none"> • Designation of coastal and marine protection areas • Relocate communities and businesses from vulnerable coastal areas further inland or to higher ground • Sustainable fisheries management • Coastal vegetation protection and revegetation • Land-use planning restrictions on coastal fringe • Installation of fish aggregating devices (FAD) near the reefal platform west of Point Cruz • City-wide environmental awareness and education programmes on the value of coral reefs for ecosystem services and sustainable fishing • Development of a coastal and intertidal rehabilitation programme: <ul style="list-style-type: none"> - educational programme on sustainable natural resource harvesting, including the consequences of over-harvesting and concentrated vegetation clearing (with no replanting) - mangrove and coastal revegetation programme, including the creation of vegetation buffers - educational signage - assign ‘Reveg Champions’ (potentially a focus on high 	<ul style="list-style-type: none"> • Honiara City Council • Ministry of Environment, Climate Change, Disaster Management and Meteorology • Ministry of Fisheries and Marine Resources • Ministry of Education and Human Resources Development • Guadalcanal Provincial Government • Ministry of Education and Human Resources Development • Ministry of Women, Children and Youth • Solomon Islands Water Authority • Town and Country Planning Board • Ministry of Infrastructure and Development • Botanic Gardens and National Herbarium • Solo Enviro Beautification • The Nature Conservancy • World Wildlife Fund • SPREP

High-level Ecosystem Type	Most Vulnerable Ecosystem Services to Climate and Non-climate Effects	Anthropogenic and Non-climate Stressors	Potential Climate Change-related Effects	Adaptation and Ecosystem Resilience Options	Key Stakeholders to Support EbA Option Implementation
				school students) – develop an understanding of the value of coastal vegetation and mangroves, key threats and adaptation protection measures	
Terrestrial	<ul style="list-style-type: none"> • Provision of food (subsistence and commercial cultivated lands) • Habitat and biodiversity • Erosion control and land stability • Regulating services including water quality and flow and air quality • Raw materials (timber and fuelwood) • Source of income (logging, farming, market produce) • Medicinal plants and trees • Materials for traditional costumes, ornaments and cultural artefacts (e.g. leaves, seeds, timbers) • Provision of areas for reconnecting with traditional land-based cultural practices • Shade provision 	<ul style="list-style-type: none"> • Population growth • Depletion of forests and loss of biodiversity from clearing and development • Change of land use • Sediment run-off from inappropriate land management activities such as logging and agriculture • Soil degradation from chemical, pesticide and fertiliser inputs, and extractive industries • Pollution from poor solid waste management and sanitation 	<ul style="list-style-type: none"> • Soil erosion, sedimentation and landslip from extreme rainfall events Exacerbated by more intense tropical cyclones • Reduction in crop yield and soil cohesion and stability, and an increase in invasive species due to increase in temperature 	<ul style="list-style-type: none"> • Designation of protected areas • Honiara food security programme • Allocation of connected, green open space, throughout HCC area • Declaration of the Honiara Botanic Gardens as a protected area • Development of a biosecurity management programme • Vegetation protection and catchment and riparian revegetation programme • Development of a rehabilitation programme for degraded lands in a selected catchment in response to logging activities, e.g. Kongulai, Mataniko, and Lungga (as proposed for the Lunnga River Basin in the Solomon Islands National Report (ICEM 2012). • City-wide education programme on the value of terrestrial watersheds and sustainable land management practices • Land-use planning restrictions on steep and unstable soils 	<ul style="list-style-type: none"> • Honiara City Council • Guadalcanal Provincial Government • Ministry of Environment, Climate Change, Disaster Management and Meteorology • Ministry of Forests and Research • Ministry of Education and Human Resources Development • Ministry of Women, Children and Youth • Solomon Islands Water Authority • Town and Country Planning Board • Ministry of Infrastructure and Development • Botanic Gardens and National Herbarium • Solo Enviro Beautification • The Nature Conservancy • World Wildlife Fund • SPREP

2 Options analysis and prioritisation methodology

2.1 Overview of approach

The EbA options assessment provides a transparent platform for objectively incorporating decision criteria into the prioritisation process. It provides the opportunity to integrate information about intangible effects, as well as effects that are difficult to measure in monetary terms within decision-making. An options assessment enables a formal process to be undertaken to address the different needs of multiple groups of stakeholders and provides a process whereby the decision to accept or reject a course of action is made through a process of information discovery.

Figure 2-1 outlines the steps undertaken to develop and prioritise EbA options. The sections below provide further detail on each step.

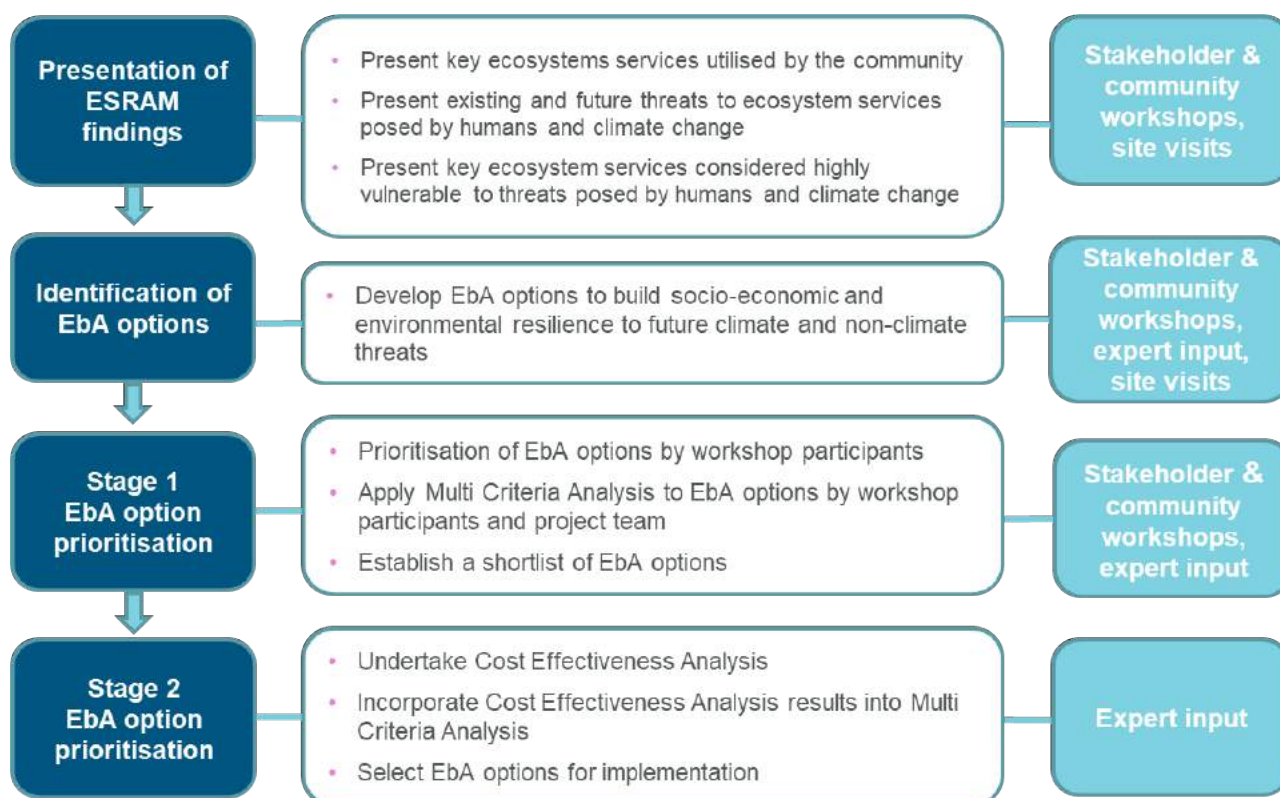


Figure 2-1 Steps undertaken during EbA options development and prioritisation

Stakeholder and community workshops were held with various representatives in Honiara City, and Barana Village to present the findings of the ESRAM studies and commence the process of EbA options identification and prioritisation. The dedicated stakeholder workshops provided the primary means for obtaining information on potential EbA options via a participatory, bottom-up approach. The overall workshop objectives are listed below.

4 Stage 1 EbA options prioritisation

4.1 Shortlisted EbA options following application of the MCA

After the application of the MCA (Table 2-2) to prioritise options, all EbA options were ranked in ascending order of their overall prioritised score (the lower the score the better performing against the MCA). EbA options with a rank of 9 or less were compiled as the EbA shortlist and are presented in Table 4-1 below in order of ranking. The purpose of establishing a shortlist of EbA

- Present the findings of the draft ESRAM study and seek validation from workshop participants, particularly the results from the interactive mapping exercise completed during the previous workshops and site visits in September 2016.
- Provide a recap on the concept of EbA and benefits of using an ecosystem-focused approach in building resilience to both climate and non-climate effects.
- Identify and prioritise potential EbA options with a focus on obtaining detailed information from workshop participants, e.g. specific location and coverage of adaptation options, the ecosystem services targeted for strengthening resilience, threats affecting the resilience of ecosystem services, key stakeholders to be involved, assistance (if needed) for planning and implementation, etc.
- Build the knowledge and capacity of workshop participants to further understand the value of protecting and enhancing ecosystem services, undertake ESRAM or similar studies, further understand the approach of EbA, and how to analyse and prioritise options that could be implemented to build the resilience of ecosystem services (as identified in an ESRAM study or the like) in the future.

The ESRAM findings on the national scale were presented and discussed during the Honiara workshop but, as per the scope of the PEBACC project, the development of EbA options are focused on the Honiara and Wagina Island scale.

2.1.1 Options assessment workshops

The National and Honiara workshops were held in Honiara on 17 March 2017 and Barana Village on 18 March 2017. The first Honiara workshop was attended by a variety of key stakeholder representatives from the national government and Honiara City Council. Also attending were key non-government stakeholders (e.g. land, planning and environmental consultants and professionals involved in the UN-Habitat project, and local communities). The full list of organisations represented is given below.

- Ministry of Environment, Climate Change, Disaster Management and Meteorology
- Ministry of Lands, Housing and Survey
- Solomon Islands National University
- Choiseul Integrated Climate Change Programme
- Ministry of Forestry and Research
- Ministry of Fisheries and Marine Resources
- Ministry of Infrastructure and Development
- Ministry of Development, Planning and Aid Coordination
- Ministry of Mines, Energy and Rural Electrification
- Guadalcanal Provincial Government (Environmental Health)
- Honiara City Council

- WorldFish
- International Waters, SPC- Ridge to Reef Project
- Solomon Island Community Resilience to Climate and Disaster Risk Project
- United Nations Development Programme /CB2
- Solomon Star Newspaper Ltd
- UN-Habitat project
- Community representatives from: Community No. 3, Barana Village, Marble Street Community, Lord Howe Community, Renlau Community, Tuvaruhu Community and Fijian Quarter Community.

To obtain information from residents in the upper catchment areas of Honiara, a second Honiara workshop was held in Barana Village and was attended by village representatives and members, including the village chief, teachers, church leaders and youth leaders. A summary of Honiara workshop attendees is presented in Table 2-1. A reasonable representation of men and women attendees was present at both workshops.

Table 2-1 Honiara and national options development workshop attendees

Workshop	Government Representatives	Community Representatives	Organisation/ NGO/Consultant	Total
Honiara Workshop	18	8	7	33
Proportion of men	72% (13)	50% (4)	57% (4)	64%
Proportion of women	28% (5)	50% (4)	43% (3)	36%
Barana Village	1	24	-	25
Proportion of men	100% (1)	71% (17)	-	72%
Proportion of women	-	29% (7)	-	28%

In addition to the workshops, presentations were delivered to the Mataniko Working Committee to seek feedback on the findings of the ESRAM assessment and potential EbA options. Information was also sought on prior, existing and upcoming projects that the ESRAM project could complement or build upon. Subsequent to the presentations, a criterion for 'existing projects' was included in the multi-criteria analysis for the purpose of the options prioritisation stage (see Table 2-2).

The Project Team for the Honiara and Barana Village workshops consisted of the following personnel:

- Sophie Hipkin, BMT WBM
- Dr Simon Albert, University of Queensland
- Donald Kudu, UN-Habitat Consultant
- Fred Patison, SPREP.

2.2 Presentation of ESRAM findings

The ESRAM process and key findings were presented to workshop attendees. Maps identifying ecosystems and ecosystem services for the relevant scale/location were presented and distributed in hard copy to seek validation from workshop participants. A copy of the draft ESRAM study report was also made available for review during each workshop.

2.3 Identification of EbA options

At the Honiara workshops, following the presentation and discussion on the ESRAM study findings, an introduction and recap (for those attending the previous workshops in August 2016) on the concept of EbA was provided to the workshop participants to set the scene for options identification. Examples were provided, using high-level EbA options included in the draft ESRAM studies and SPREP diagrams, illustrating EbA implemented at the village level versus a village without EbA implementation and the potential consequences to ecosystems and services. Workshop participants were then separated into four (high-level) ecosystem groups (freshwater, terrestrial watershed, coastal/marine resources and urban) based on the individual's interest or field of expertise.

2.4 Stage 1 EbA option prioritisation

EbA option prioritisation was undertaken by workshop participants and the Project Team. During the Honiara workshop, each participant selected two EbA options to put forward to the prioritisation phase, based on which two they believed to provide the greatest benefits to building ecosystem and social resilience. The list was compiled for each ecosystem and groups assessed the performance of the prioritised options using the multi-criteria analysis (MCA) outlined below in Table 2-2. Each criterion was discussed with workshop groups, as well as the considerations to be deliberated on when scoring EbA options. Workshop participants were also given the opportunity to provide input into the criteria used in the MCA. Time limitations prevented the Barana Village workshop participants applying the MCA to the list of EbA options and this was therefore conducted by the Project Team (BMT WBM, UQ and SPREP).

Informal site visits were conducted by the Project Team to further investigate the options shortlisted during the workshops. Site visits on Wagina Island included the main sand/seaweed island, Beniamina Island, an aquaculture farm (currently not in operation), potential new drinking water sources and food gardens. The site visit findings will be explored further after the cost-effectiveness analysis of the shortlist of EbA options (See Section 4).

2.4.1 Application of the MCA

Following the completion of all workshops, the Project Team analysed the complete list of proposed EbA options. The first step in shortening the extensive list of options involved the assessment of each option as a 'true' EbA option. To do this, the Project Team asked the following question: *Does the option involve the protection, restoration or enhancement of an ecosystem or biodiversity to help social and ecological systems adapt to the adverse effects of climate change?* The MCA was then applied to all proposed EbA options to ensure consistency across all options. The Project Team allocated a performance score for each option in meeting the criteria and all

scores were summed to establish an initial prioritisation score. All EbA options with a prioritisation score of 9 or less were compiled to the EbA options shortlist (the lower the score the better performing against the MCA). For all analysis, the criteria were given equal weight or importance.

Table 2-2 Stage 1 multi-criteria analysis design

Criteria	Considerations	Scores			
		Very high (1)	High (2)	Medium (3)	Low (4)
Benefits of implementation	Addresses core objectives of the programme through increasing ecological and social resilience to effects of climate change Protection/enhancement of highly vulnerable ecosystem services identified in ESRAM findings. Provision of new or enhanced services (e.g. increased tourism, education, health improvements) Value-added benefits (i.e. provision of additional benefits other than adaptation)	Very high (1)	High (2)	Medium (3)	Low (4)
Cost of implementation	Implementation, ongoing management and maintenance	Low (<10K USD) (1)	Medium (10-50K USD) (2)	High (50K + USD) (3)	-
Feasibility of implementation	Tenure and landowner considerations Likely timing and logistical requirements Extent of integration with existing policy and/or programmes Stakeholder/Community supports the option	Yes (1)	Uncertain (2)	No (3)	-
Sustainability of implementation	Yields long-lasting benefits with minimal maintenance	Very high (1)	High (2)	Medium (3)	-
Existing projects /activities	Existing projects are addressing this issue/threat	Nil (1)	Few (1-2) (2)	Several (3-5) (3)	Many (6+) (4)

2.5 Stage 2 EbA options prioritisation

Following the development of the shortlist of EbA options for Honiara, a cost-effective analysis (CEA) was undertaken for each option to inform the second (and final) stage of the prioritisation of EbA options. The purpose of the CEA is to identify the ecosystems and services that will benefit from implementation of an EbA option, the costs of implementing the option, the expected extent of change (i.e. the improvements from implementing the option compared to not implementing it) and the value for money (the ratio of dollars spent on the option versus the ecosystem service benefits from the option being implemented). The CEA considers the longevity of the EbA option and the benefits created over its lifetime. This approach focusses expenditure on the most valuable assets or services in order to get the greatest net benefits (e.g. 'bang-for-buck').

Cost effectiveness analysis has been undertaken on five EbA options that were shortlisted following an initial MCA. The output of the analysis focussed on determining the relative cost-effectiveness of each option in comparison to other options, as opposed to estimating definitive cost benefit ratios. An overview of the approach that was applied is presented in Figure 2-2. Further details on each step are provided below.

Step	Key Steps
1. Identify and cost options	<ul style="list-style-type: none"> Identify options and profile up-front and ongoing costs out to 2039*
2. Identify ecosystem services positively affected by each option	<ul style="list-style-type: none"> Determine ecosystem services that will benefit following implementation of each option
3. Categorise impact as high, medium or low for each ecosystem service	<ul style="list-style-type: none"> For each option, categorise project impact (benefits) as either high, medium or low Profile project impact (benefits) for each ecosystem service out to 2039*, including to allow for impact (benefit) to ramp up over time
4. Quantify benefits of each option	<ul style="list-style-type: none"> Assume that a high, medium and low impact results in a 30%, 20% and 10% improvement under the option case relative to a 'do nothing' base case Using these assumptions and the ecosystem service values in the ESRAM report, estimate benefits out to 2039*
5. Discount costs and benefits, calculate cost effectiveness and rank options	<ul style="list-style-type: none"> Discount costs and benefits using a 7% discount rate Divide discounted benefits by discounted costs to estimate the value of benefits for every dollar invested Rank options and incorporate the results into the multi-criteria analysis

* Costs and benefits are assessed out to 2039, which assumes two years to implement each option and then 20 years for benefits to accrue.

Figure 2-2 Overarching methodology to assess cost-effectiveness of short-listed options

2.5.1 Cost-effectiveness analysis methodology

2.5.1.1 Step 1: Identify and cost options

For each shortlisted option, a profile of up-front and ongoing costs was developed. Profiling costs over time allows costs to be discounted so that the cost of all options is denominated in a constant metric (i.e. present value USD).

2.5.1.2 Step 2: Identify ecosystem services positively affected by each option

The next step was to determine which ecosystem services would be positively affected if each option was implemented. This step effectively maps each option to expected outcomes for each ecosystem service category.

2.5.1.3 Step 3: Categorise impact as high, medium or low for each ecosystem service

For each ecosystem service likely to be positively affected under each option, an assessment of whether the option is likely to deliver a high, medium or low impact was undertaken. Conceptually, this involves considering likely outcomes for each option for each ecosystem service under the project case relative to a 'do nothing' base case. In most cases, implementation of the option will avoid future environmental impacts, the costs (benefits under the project case) were categorised as being high, medium or low. The assessment of high, medium or low impact allowed for benefits to ramp up over time, where appropriate, such that a profile of high, medium or low impact over time was developed.

2.5.1.4 Step 4: Quantify benefits of each option

In this step, the benefits of each option over the appraisal period (i.e. 2017 out to 2039) were quantified in USD. To quantify benefits, the following approach was applied.

- (1) High, medium and low impact is assumed to result in a 30%, 20%, and 10% improvement in ecosystem service outcomes respectively under the option case relative to a 'do nothing' base case. The high, medium and low percentage changes were applied consistently across options to facilitate a like-for-like comparison amongst options.
- (2) For ecosystem service values denominated in dollars per hectare, the area likely to be positively affected for each ecosystem service category (e.g. forests, mangroves) was estimated using GIS mapping and existing data.
- (3) For ecosystem service values denominated in a dollar per person per annum, the number of persons likely to derive benefit was estimated, based on census data and other recent population data (UN-Habitat 2016 and Kronen *et al.* 2010¹). Historic population growth estimates were applied to future years over the appraisal period.
- (4) Benefits were estimated by multiplying the benefit factor (30%, 20% or 10%) by the area or persons affected by the ecosystem service value (in USD) for each year over the appraisal period.

2.5.1.5 Step 5: Discount costs and benefits, calculate cost-effectiveness and rank options

The final step involved the discounting of costs and benefits to present day dollars using a 7% discount rate. The value of benefits for every dollar invested was then estimated by dividing discounted benefits by discounted costs. EbA options were then ranked in order of their cost-effectiveness.

¹ UN-Habitat (2016a) Honiara Urban Resilience & Climate Action Plan. A joint strategy for the Honiara City Council and the Solomon Islands Government. Prepared for United Nations Human Settlements Programme (UN-Habitat) Cities and Climate Change Initiative (CCCI). Lead authors: Alexei Trundle and Darryn McEvoy, RMIT University Climate Change Adaptation Programme, Melbourne. Kronen (2010) Socio-economic Dimensions of Seaweed Farming in Solomon Islands. Prepared for the UN Food and Agriculture Organisation (FAO) and the Pacific Community (SPC).

2.5.2 Application of the MCA

The results of CEA were incorporated into the MCA as a final criterion to inform the overall prioritisation score for each EbA option (see final row in Table 2-3). The CEA score for each EbA option was attributed to its CEA rank.

The second stage of the MCA is presented below in Table 2-3.

Table 2-3 Stage 2 multi-criteria analysis design

Criteria	Considerations	Scores			
		Very high (1)	High (2)	Medium (3)	Low (4)
Benefits of implementation	Addresses core objectives of the programme through increasing ecological and social resilience to impacts of climate change Protection/enhancement of highly vulnerable ecosystem services identified in ESRAM findings. Provision of new or enhanced services (e.g. increased tourism, education, health improvements) Value-added benefits (i.e. provision of additional benefits other than adaptation)				
Cost of implementation	Implementation, ongoing management and maintenance	Low (<10 K USD) (1)	Medium (10-50 K USD) (2)	High (50+ K USD) (3)	-
Feasibility of implementation	Tenure and landowner considerations Likely timing and logistical requirements Extent of integration with existing policy and/or programmes Stakeholder/Community supports the option	Yes (1)	Uncertain (2)	No (3)	-
Sustainability of implementation	Yields long-lasting benefits with minimal maintenance	Very high (1)	High (2)	Medium (3)	-
Existing projects /activities	Existing projects are addressing this issue/threat	Nil (1)	Few (1-2) (2)	Several (3-5) (3)	Many (6+) (4)
Cost Effectiveness	Costs of implementing the option Expected extent of ecosystem change Value for money	Ranked 1 st (1)	Ranked 2 nd (2)	Ranked 3 rd (3)	Ranked 4 th (4)

2.6 Capacity building

As part of the options assessment process, the stakeholder and community workshops were held to encourage a two-way process of information discovery and learning. While the workshops provided the Project Team with invaluable information for the development of EbA options, the workshops provided an opportunity for stakeholders to further understand the value of undertaking the ESRAM process and how it can inform the development of climate adaptation options to enhance ecosystem and social resilience.

The options identification and prioritisation process was based on a participatory approach to gain a local perspective while building the capacity of workshop participants to identify options, based on both existing and future non-climate and climate threats, and what each EbA option sets out to achieve in terms of building ecosystem and socio-economic resilience. The application of MCA during the Honiara workshop provided workshop participants with the opportunity to apply a tool for the purpose of option prioritisation. Stakeholders were also given the opportunity to provide input into the criteria used in the MCA.

The lessons learnt at these workshops were aimed at demonstrating a formal process for decision-making that promotes transparency amongst stakeholders. As information is discovered during the planning and decision-making process, the options analysis and prioritisation can be continually revisited by stakeholders in the future and the decision-making updated.



Figure 2-3 National and Honiara workshop (17 March 2017)



Figure 2-4 Barana Village workshop (18 March 2017)

3 EbA options identification

3.1 Master list of EbA options for Honiara

This section presents the EbA options developed during the Honiara and Barana Village workshops. All options developed during the workshops have been compiled into a master list of EbA options presented in Table 3-1. The master list presents each EbA option and geographical coverage, the ecosystem services expected to benefit from implementing the option, and the proposed EbA activities nominated by workshop participants (where information was provided).

Table 3-1 Master list of EbA options for Honiara

EbA Option	Geographical area	Ecosystem and ecosystem services that may benefit from EbA implementation	Existing and future threats to ecosystem services	EbA activities proposed (where info available)
National & Honiara				
Establish a protected area over the Botanic Gardens	Botanic Gardens, Honiara	Terrestrial watershed and urban greenspace <ul style="list-style-type: none"> - Recreational, leisure and entertainment purposes - Shade provision - Water supply for washing, bathing and recreation - Habitat connectivity and biodiversity provisions - Air and noise regulation (including reduction of the head island effect) - Hazard reduction through stormwater regulation and flood control, reducing sediment load entering Rove Creek and regulating water quality - Educational platform for community education, training and awareness - Income-generation from tourism 	Vegetation clearing and habitat destruction for expanding informal settlements, agriculture activities and illegal harvesting of trees for timber and fuelwood, poor waste and sanitation practices, rapid increase in population and urbanisation, increase in extreme rainfall events	Develop a Botanic Gardens Management Plan Establish a Botanic Gardens Governance Committee Investigate avenues for establishing revenue streams that can be injected back into the operation and maintenance of the Botanic Gardens. Submit an application to declare the Botanic Gardens as a Protected Area to assist in enforcing land ownership rights and reducing environmental damage to the area. Develop 3D model of the Botanic Gardens.
Botanic Gardens replanting programme	Botanic Gardens, Honiara	Terrestrial watershed and urban greenspace <ul style="list-style-type: none"> - Recreational, leisure and entertainment purposes - Shade provision - Water supply for washing, bathing and recreation - Habitat connectivity and biodiversity provisions - Air and noise regulation (including reduction of the head island effect) - Hazard reduction through stormwater regulation and flood control, reducing sediment load entering Rove Creek and regulating water quality - Educational platform for community education, training and awareness - Income-generation from tourism 	Vegetation clearing and habitat destruction for expanding informal settlements, agriculture activities and illegal harvesting of trees for timber and fuelwood, poor waste and sanitation practices, rapid increase in population and urbanisation, increase in extreme rainfall events	Conduct the revegetation of previously cleared forested areas to restore and enhance local plant biodiversity and reduce sediment run-off Increase educational signage throughout the gardens Establish a learning centre to facilitate active involvement and engagement in Botanic Garden initiatives Investigate the installation of suitable waste disposal bins and coordinate the collection of waste with HCC.
Registration of all fish vendors in Honiara markets.	Honiara City	Marine/Coastal <ul style="list-style-type: none"> - Support of both commercial and subsistence fisheries, which provide a source of food and 	Unsustainable fishing and marine resource management, poor waste management practices,	Establish a registration system for all seafood vendors in Honiara markets. Registration to include mandatory awareness

EbA Option	Geographical area	Ecosystem and ecosystem services that may benefit from EbA implementation	Existing and future threats to ecosystem services	EbA activities proposed (where info available)
		income-generation - Provision of habitats for coastal and marine flora and fauna, and support of biodiversity generally	both in- and offshore	and education on best practice for seafood handling.
Improve waste management on ships coming to and from Point Cruz wharf, and in general with SIPA	Honiara City	Marine/Coastal - Support of both commercial and subsistence fisheries, which provide a source of food and income-generation - Support of Honiara's tourism industry by providing access for visiting cruise ships and attracting diving tourists - Provision of habitats for coastal and marine flora and fauna, and support of biodiversity generally. - Provision of recreation and leisure values as an area for sport and similar activities (e.g. swimming, sailing), as well as a bathing and washing area for coastal settlements	Poor waste management practices, both in- and offshore	Prohibit the dumping of waste at sea. Educate ships on how to dispose of waste correctly and provide waste bins on all ships. Explore options to impose fines on ships dumping waste at sea.
Beach property owner awareness on best practice for marine resource management	Honiara shoreline/coastal zone	Marine/Coastal - Support of both commercial and subsistence fisheries, which provide a source of food and income-generation - Support of Honiara's tourism industry by providing access for visiting vessels - Provision of habitats for coastal and marine flora and fauna, and support of biodiversity. - Provision of recreation and leisure values as an area for sport and similar activities (e.g. swimming, sailing), as well as a bathing and washing area for coastal settlements	Poor waste management practices and marine resource management along shoreline, sea-level rise, increase in storm surge and coastal erosion	Conduct environmental awareness and education with beach property owners, including best practice for marine resource management. Support good sanitation and waste disposal facilities for beach users.
Monitoring ballast water	Honiara City	Marine/Coastal - Support of both commercial and subsistence fisheries, which provide a source of food and income-generation - Support of Honiara's tourism industry by providing access for visiting cruise ships and directly	Poor waste management practices and marine resource management	Implement a ballast water monitoring programme in collaboration with the SIPA and Marine Division

EbA Option	Geographical area	Ecosystem and ecosystem services that may benefit from EbA implementation	Existing and future threats to ecosystem services	EbA activities proposed (where info available)
		attracting diving tourists - Provision of habitats for coastal and marine flora and fauna, and support of biodiversity. - Provision of recreation and leisure values as an area for sport and similar activities (e.g. swimming, sailing), as well as a bathing and washing area for coastal settlements		
Dredge Honiara Point Cruz Harbour seafront for plastics and sediments	Honiara shoreline/coastal zone	Marine/Coastal - Support of both commercial and subsistence fisheries, which provide a source of food and income-generation - Support of Honiara's tourism industry by providing access for visiting cruise ships and directly attracting diving tourists - Provision of habitats for coastal and marine flora and fauna, and support of biodiversity generally. - Provision of recreation and leisure values as an area for sport and similar activities (e.g. swimming, sailing), as well as a bathing and washing area for coastal settlements	Poor waste management practices and marine resource management	Dredge the Cruz Harbour seafront to remove the plastic accumulation (reported to be 3 m thick). Dredging to include Mataniko River
Mataniko River Bank rehabilitation and information centre	Mataniko River	Freshwater and terrestrial watershed - Provision of areas and opportunities for socialising, recreation and reconnecting with traditional land-based cultural practices - Shade provision - Providing habitat for terrestrial fauna and birds and sustaining biodiversity - Air and noise regulation (including reduction of the head island effect) - Hazard reduction through stormwater regulation and flood control, reducing sediment load entering Mataniko River and regulating water quality - Educational platform for community education, training and awareness	Riparian vegetation clearing for settlement expansion and agriculture activities, lack of green open space (and shade), poor waste and sanitation practices, unsustainable sand and gravel extraction practices, increase in extreme rainfall events	Explore areas to undertake river bank rehabilitation along the Mataniko River Replant riparian areas to improve water quality by reducing sediment run-off into waterways Provide appropriate waste disposal bins and coordinate collection services to reduce waste contaminating and blocking waterways. Investigate the possibility of installing a waste boom in Vara Creek upstream Conduct a clean-up campaign Establish an information centre to raise awareness and offer a one-stop-shop for information on the parkland and environmental initiatives being undertaken.

EbA Option	Geographical area	Ecosystem and ecosystem services that may benefit from EbA implementation	Existing and future threats to ecosystem services	EbA activities proposed (where info available)
		<ul style="list-style-type: none"> - Income-generation from tourism 		
Riparian buffer development ordinance	Mataniko River	<p>Freshwater and terrestrial watershed</p> <ul style="list-style-type: none"> - Regulating flood flows, water quality, carbon and nutrient cycling, land stability, erosion and sedimentation control - Supporting aquatic fauna habitat and biodiversity 	<p>Riparian vegetation clearing, lack of enforcement of environmental regulations, rapid increase in population and urbanisation, increase in extreme rainfall events</p>	<p>Enforce the riparian buffer development ordinance and undertake replanting where feasible</p>
Rehabilitation of Mataniko River	Mataniko River	<p>Freshwater and terrestrial watershed</p> <ul style="list-style-type: none"> - Provision of water supply for drinking, domestic and agricultural uses - Provision of food resources (e.g. fish, crustaceans, gastropods) - Regulating flood flows, water quality, carbon and nutrient cycling, land stability, erosion and sedimentation control - Supporting bird and aquatic fauna habitat and biodiversity - Support cultural and religious values (e.g. ornamental shells, cultural identity and connection with the land, location for baptisms) - Recreational (e.g. swimming) and leisure resources. 	<p>Riparian vegetation clearing for settlement expansion and agriculture activities, poor waste and sanitation practices, unsustainable sand and gravel extraction practices, lack of waste infrastructure resources, lack of enforcement of environmental regulations, rapid increase in population and urbanisation, increase in extreme rainfall events</p>	<p>Rehabilitate riparian sites at Tuvaruhu and near Barana village.</p> <p>Replanting to include a trial of different species of mangroves along certain areas of the river.</p> <p>Suggested people to be involved: Government (HCC, MECDM, MFR, Environment Health), communities located along the river</p>
Support HCC for waste collection	Mataniko catchment	<p>Freshwater (rivers and creeks)</p> <ul style="list-style-type: none"> - Provision of water supply for drinking, domestic and agricultural uses - Provision of food resources (e.g. fish, crustaceans, gastropods) - Regulating flood flows, water quality, carbon and nutrient cycling, land stability, erosion and sedimentation control - Supporting bird and aquatic fauna habitat and biodiversity - Support cultural and religious values (e.g. 	<p>Poor waste and sanitation practices, lack of HCC resources, lack of enforcement of environmental regulations, rapid increase in population and urbanisation, increase in extreme rainfall events</p>	<p>Provide support to HCC for waste collection for Mataniko project area. Funds could be allocated to improve disposal infrastructure and collection services.</p>

EbA Option	Geographical area	Ecosystem and ecosystem services that may benefit from EbA implementation	Existing and future threats to ecosystem services	EbA activities proposed (where info available)
		ornamental shells, cultural identity and connection with the land, location for baptisms) - Recreational (e.g. swimming) and leisure resources.		
Clean and green competition for Mataniko communities	Mataniko catchment	Freshwater (rivers and creeks) - Provision of water supply for drinking, domestic and agricultural uses - Provision of food resources (e.g. fish, crustaceans, gastropods) - Regulating flood flows, water quality, carbon and nutrient cycling, land stability, erosion and sedimentation control - Supporting bird and aquatic fauna habitat and biodiversity - Support cultural and religious values (e.g. ornamental shells, cultural identity and connection with the land, location for baptisms) - Recreational (e.g. swimming) and leisure resources.	Poor waste and sanitation practices, lack of waste infrastructure resources, lack of enforcement of environmental regulations, rapid increase in population and urbanisation, increase in extreme rainfall events	Educate and raise awareness throughout the community on good waste management practices with a clean and green competition
Environmental compliance training for government staff and stakeholders	National	All ecosystems	Lack of enforcement of environmental regulations, rapid increase in population and urbanisation	Suggested government departments that would benefit from the training include MECDM, HCC and MLHS Subject matter could include: customary law and environmental legislation and regulations; understanding violations and offences; determining the appropriate compliance action; environmental impact assessment; and licences, approvals and permits. Potential partnership with Land Advocacy Legal Support Unit (LALSU) and Solomon Islands Environmental Law Association (SIELA)
Mainstreaming EbA in the Town and Country	National	All ecosystems	Lack of enforcement of environmental regulations, lack of community	Review the act to incorporate EbA and ensure links exist between the Planning Act and Environment Act.

EbA Option	Geographical area	Ecosystem and ecosystem services that may benefit from EbA implementation	Existing and future threats to ecosystem services	EbA activities proposed (where info available)
Planning Act			awareness	
Protected area at Panatina wetland/river	Pاناتina	Urban-Freshwater <ul style="list-style-type: none"> - Provision of food resources (e.g. fish, crustaceans, gastropods) - Regulating flood flows, water quality, carbon and nutrient cycling, erosion and sedimentation control - Supporting habitat and biodiversity 	Poor waste and sanitation practices, lack of enforcement of environmental regulations, rapid increase in population and urbanisation, increase in extreme rainfall events	Development of management plan for Panatina River Rehabilitate riparian areas Conduct a clean-up campaign
Enforcement of land reclamation laws	Honiara City	Marine/Coastal (Honiara foreshore) <ul style="list-style-type: none"> - Support of both commercial and subsistence fisheries, which provide a source of food and income - Coastal protection through the attenuation and buffering of wave and storm energy by the shoreline, inshore reefs and coastal vegetation - Support of Honiara's tourism industry by providing access for visiting cruise ships and directly attracting diving tourists - Provision of habitats for coastal and marine flora and fauna, and support of biodiversity - Provision of recreation and leisure values as an area for sport and similar activities (e.g. swimming, sailing), as well as a bathing and washing area for coastal settlements. - Supports shipping and boating infrastructure and provides informal boat landing areas 	Illegal coastal developments and reclamation of foreshore, destruction of inshore reefs, restricted public access to foreshore, lack of enforcement of environmental regulations, rapid increase in population and urbanisation, sea-level rise, increase in storm surge and coastal erosion	Focus on key sites near MFMR, Marine School, IBS, NRH, Lord Howe settlement, Ranadi landfill site
Ban plastic bags	National	Marine/Coastal <ul style="list-style-type: none"> - Support of both commercial and subsistence fisheries, which provide a source of food and income-generation - Support of Honiara's tourism industry by providing access for visiting cruise ships and directly attracting diving tourists - Provision of habitats for coastal and marine flora 	Poor waste and sanitation practices, lack of enforcement of environmental regulations, rapid increase in population and urbanisation	Create and implement a legislation or ordinance at provincial level to ban the use of plastic bags. Working with HCC and UN-Women (market for change).

EbA Option	Geographical area	Ecosystem and ecosystem services that may benefit from EbA implementation	Existing and future threats to ecosystem services	EbA activities proposed (where info available)
		<p>and fauna, and support of biodiversity</p> <ul style="list-style-type: none"> - Provision of recreation and leisure values as an area for sport and similar activities (e.g. swimming, sailing), as well as a bathing and washing area for coastal settlements 		
Introduce climate change adaptation in school syllabus	National	All ecosystems	Limited environmental awareness, training and education	Introduce climate change adaptation into the school syllabus with a focus on ecosystem-based adaptation to climate change
Barana and Queen Elizabeth National Park Management Plan	Barana/Honiara Upper catchment	<p>Terrestrial watershed</p> <ul style="list-style-type: none"> - Water supply for drinking, washing, bathing and recreation - Provision of areas and opportunities for socialising, recreation and reconnecting with traditional land-based cultural practices. - Habitat connectivity and biodiversity provisions - Regulating services such as water quality, carbon and nutrient cycling, maintaining air quality, and supporting water generation - Hazard reduction through stormwater regulation and flood control, reducing sedimentation into waterways - Educational platform for community education, training and awareness - Income-generation from tourism 	<p>Vegetation clearing (including riparian) and habitat destruction from expanding informal settlements, logging, sawmilling, and agricultural activities, poor waste and sanitation practices and lack of waste infrastructure resources, lack of enforcement of environmental regulations, lack of environmental awareness, training and education, rapid increase in population and urbanisation, increase in extreme rainfall events</p>	<p>Develop a Barana and Queen Elizabeth National Park Management Plan to provide strategic direction and priorities for the on-ground management of the upper Mataniko and Lungga catchment area water resources.</p> <p>Establish a Governance Committee to oversee the execution of the management plan and initiatives, and reports on the progress of completing each activity.</p> <p>Conduct a household and community level awareness campaign covering sanitation and waste management and vegetation clearing adjacent to water sources e.g. wells, springs and rivers</p> <p>Undertake a clean-up campaign involving the local community and Barana Primary School to promote the management plan initiatives</p> <p>Undertake replanting programme</p> <p>Coordinate the provision of water tanks to Barana Village.</p> <p>Introduce a ranger programme to enforce environmental protection and community by-laws.</p> <p>Re-establish Queen Elizabeth Park to provide an open space for recreation and environmental educational purposes (see EbA</p>

EbA Option	Geographical area	Ecosystem and ecosystem services that may benefit from EbA implementation	Existing and future threats to ecosystem services	EbA activities proposed (where info available)
				option below for proposed initiatives) Development of a 3D model of Honiara by the Barana Village.
The re-establishment of Queen Elizabeth National Park	Barana/Honiara Upper catchment	<p>Terrestrial watershed</p> <ul style="list-style-type: none"> - Provision of areas and opportunities for socialising, recreation and reconnecting with traditional land-based cultural practices. - Habitat connectivity and biodiversity provisions - Regulating services such as water quality, carbon and nutrient cycling, maintaining air quality, and supporting water generation - Hazard reduction through stormwater regulation and flood control, reducing sedimentation into waterways - Educational platform for community education, training and awareness - Income-generation from tourism 	<p>Vegetation clearing (including riparian) and habitat destruction from expanding informal settlements, logging, sawmilling and agriculture activities, lack of enforcement of environmental regulations, lack of environmental awareness, training and education, rapid increase in population, increase in extreme rainfall events</p>	<p>Potentially link to the Barana and Queen Elizabeth National Park Management Plan EbA option (see above).</p> <p>Investigate the area's current use and determine whether the National Park could be reinstated.</p> <p>Conduct a Rapid Biodiversity Assessment to provide a baseline assessment of the current condition of the park and determine whether a replanting programme is needed.</p> <p>Install educational signage throughout the park to enhance the learning experience</p> <p>The promotion of local tourism is also to be considered.</p>
Protection of Kovi/Kongulai Water Catchment	Upper catchment	<p>Terrestrial watershed</p> <ul style="list-style-type: none"> - Provision of water supply for drinking, domestic, recreation and agricultural uses - Provision of food resources (e.g. fish, crustaceans, gastropods, wild fruits and vegetables) - Support cultural and religious values - Recreational (e.g. swimming) and leisure resources. - Habitat connectivity and biodiversity provisions - Regulating services such as water quality, carbon and nutrient cycling, maintaining air quality, and supporting water generation - Hazard reduction through stormwater regulation and flood control, reducing sedimentation into waterways - Educational platform for community education, 	<p>Clearing of vegetation in proximity to water sources for logging, sawmilling and agricultural activities, lack of enforcement of environmental regulations, lack of environmental awareness, training and education, rapid increase in population, increase in extreme rainfall events</p>	<p>Development of Kovi/Kongulai Management Plan</p> <p>Replanting of grassland areas and riparian vegetation along rivers and water catchment</p> <p>Promotion of eco-tourism and the establishment of an eco-store</p> <p>Use provisions of relevant Acts to enforce management and protection of this area</p> <p>Suggested people to be involved: community - resource owners, youths, women, people with special needs, government (MECCDDM, MFR, MMERE, HCC), NGOs, SOE, Solomon Water</p>

EbA Option	Geographical area	Ecosystem and ecosystem services that may benefit from EbA implementation	Existing and future threats to ecosystem services	EbA activities proposed (where info available)
		training and awareness		
Waste management at Barana Village	Barana/Honiara Upper catchment	Terrestrial watershed <ul style="list-style-type: none"> - Provision of water supply for drinking, domestic, recreation and agricultural uses - Provision of food resources (e.g. fish, crustaceans, gastropods, wild fruits and vegetables) - Support cultural and religious values - Recreational (e.g. swimming) and leisure resources. - Habitat connectivity and biodiversity provisions - Regulating services such as water quality, carbon and nutrient cycling, maintaining air quality, and supporting water generation - Hazard reduction through stormwater regulation and flood control, reducing sedimentation into waterways - Educational platform for community education, training and awareness 	Poor waste and sanitation practices, lack of waste infrastructure resources, lack of enforcement of environmental regulations, lack of environmental awareness, training and education, rapid increase in population, increase in extreme rainfall events	Community education and awareness of sanitation and waste management Investigate the options for alternative waste management practices for disposal and collection
Sustainable agriculture at Barana Village	Barana/Honiara Upper catchment	Terrestrial watershed (plantations and gardens) <ul style="list-style-type: none"> - Provision of food resources 	Vegetation clearing for unsustainable logging, saw milling and agriculture practices, rapid increase in population, increase in extreme rainfall events, increase in temperature and susceptibility to pests and disease	Investigate sustainable agriculture options with the aim of reducing run-off and increasing soil fertility at Barana Village
Control and management of giant African snails and beetles at Barana Village	Barana/Honiara Upper catchment	Terrestrial watershed <ul style="list-style-type: none"> - Provision of food resources - Habitat connectivity and biodiversity provisions 	Reduced food security and biodiversity, lack of resources for pest eradication and management, rapid increase in population, changing climate (increase	Source further information on the eradication of snails and beetles Apply for assistance from aid donors to help in eradicating pests

EbA Option	Geographical area	Ecosystem and ecosystem services that may benefit from EbA implementation	Existing and future threats to ecosystem services	EbA activities proposed (where info available)
			in extreme rainfall events and temperature may increase/decrease the snail population)	
Edible plant species of Barana Village	Barana/Honiara upper catchment	Terrestrial watershed (plantations and gardens) - Provision of food resources	Vegetation clearing for unsustainable logging, saw-milling and agriculture practices, rapid increase in population, changing climate (increase in extreme rainfall events and temperature may increase/decrease the snail population)	Technical research team to study Barana village's edible plants for future commercial agricultural opportunities Species include: kolobal, uvi kabe, sino, uvivatu and taumana
Landscaping/tree planting in Chinatown or other targeted sites within the CBD	Honiara CBD	Urban greenspace - Shade provision - Aesthetic values - Urban habitat connectivity and biodiversity corridor - Air quality and noise regulation (including reduction of the head island effect) - Hazard reduction through stormwater regulation and flood control	Vegetation clearing, increase in hardstand areas, disregard for CBD, poor waste management practices, rapid increase in population and urbanisation, increase in extreme rainfall events, increase in temperature	Beautification and planting of China Town where currently no plants exist Collaboration with business owners Provide waste collection bins Conduct a clean-up campaign Interpretive signage
Development of an EbA learning centre	Honiara City	All	Environmental awareness, training and education	Establish a learning centre focussed around environmental awareness and EbA. The centre could be used as the key venue for environmental awareness training
Cleanest community, shipping company and beach competition	Honiara shoreline/coastal zone	Marine/Coastal - Support of both commercial and subsistence fisheries, which provide a source of food and income generation - Support of Honiara's tourism industry by providing access for visiting vessels - Provision of habitats for coastal and marine flora	Poor waste management practices and marine resource management along shoreline, rapid increase in population and urbanisation	Create a competition for cleanest community, cleanest shipping company at point Cruz wharf and best beach in Honiara (Tenaru to Bonege)

EbA Option	Geographical area	Ecosystem and ecosystem services that may benefit from EbA implementation	Existing and future threats to ecosystem services	EbA activities proposed (where info available)
		<p>and fauna, and support of biodiversity.</p> <p>Provision of recreation and leisure values as an area for sport and similar activities (e.g. swimming, sailing), as well as a bathing and washing area for coastal settlements</p>		
Sewerage and industrial waste treatment	Honiara shoreline/coastal zone	<p>Marine/Coastal and freshwater</p> <ul style="list-style-type: none"> - Support of both commercial and subsistence fisheries, which provide a source of food and income generation - Provision of water supply for drinking, domestic and agricultural uses - Provision of habitats for coastal marine and freshwater flora and fauna, and support of biodiversity. - Provision of recreation and leisure values as an area for sport and similar activities (e.g. swimming, sailing), as well as a bathing and washing area for coastal and river mouth settlements - Support of Honiara's tourism industry by providing access for visiting cruise ships and attracting diving tourists - Regulating water quality, carbon and nutrient cycling 	<p>Poor waste management practices and marine resource management, increase in population and urbanisation, increase in extreme rainfall events, increase in temperature</p>	<p>Assessment of current status and needs for wastewater management</p> <p>Treatment of wastewater and sewerage at pipe outlets and industrial waste e.g. Ranadi and other sites</p>

Stakeholder and community workshops were held with various representatives in Honiara City, and Barana Village to present the findings of the ESRAM studies and commence the process of EbA options identification and prioritisation. The dedicated stakeholder workshops provided the primary means for obtaining information on potential EbA options via a participatory, bottom-up approach. The overall workshop objectives are listed below.

4 Stage 1 EbA options prioritisation

4.1 Shortlisted EbA options following application of the MCA

After the application of the MCA (Table 2-2) to prioritise options, all EbA options were ranked in ascending order of their overall prioritised score (the lower the score the better performing against the MCA). EbA options with a rank of 9 or less were compiled as the EbA shortlist and are presented in Table 4-1 below in order of ranking. The purpose of establishing a shortlist of EbA options is to identify and objectively prioritise key options to be further assessed for their cost-effectiveness.

The EbA shortlist table outlines a brief description of each option, the key ecosystem services each option aims to target in building ecosystem and social resilience, and the performance score against each MCA criteria. Ecosystems services bolded correspond to the services likely to be less resilient to future climate and non-climate threats as identified in the ESRAM findings.

Shortlisted options for Honiara include the development of management plans, replanting and landscaping programmes, environmental regulation training for government staff, community environmental education and awareness programmes, establishment of parklands, protected areas and information centres, and establishing support networks.

Table 4-1 Honiara shortlisted EbA options (Stage 1 EbA options prioritisation using MCA)

EbA Option	Description	Targeted Ecosystems and Ecosystem Services	Benefit VH-1, H-2, M-3, L-4	Cost L-1, M-2, H-3	Feasibility Y-1, U-2, N-3	Sustainability VH-1, H-2, M-3, L-4	Other projects Nil-1, Few-2, Sev-3, Many-4	Prioritisation Score
Honiara								
Support botanic gardens to be a formal protected area and formulate a management plan	<p>The development of a management plan is proposed to strategically manage the area with the ultimate goal of declaring the Botanic Gardens as a forest reserve under the forestry act and <i>Protected Areas Act 2010</i> to secure its future. A number of improvements to the services such as sustainable finance, education and information platforms will also be supported.</p> <p>A targeted enrichment replanting programme of previously cleared forested areas within the Botanic Garden's boundaries will be undertaken. A learning centre will be established for environmental educational, awareness and training.</p> <p>Note: this is a combination of two EbA options: establish a protected area over the Botanic Gardens and a Botanic Gardens replanting programme. The 'cost' criteria will be updated to a 3 (high) in the next prioritisation stage to represent the cost of combining the two EbA options.</p>	<p>Terrestrial watershed and urban greenspace</p> <ul style="list-style-type: none"> - Provision of areas and opportunities for socialising, recreation and reconnecting with traditional land-based cultural practices - Provision of shaded areas - Habitat connectivity and biodiversity provisions - Water supply for domestic (washing, bathing) and recreation purposes - Tourism generation - Educational platform for community education, training and awareness - Sustainable livelihood - Hazard reduction through stormwater regulation and flood control, reducing sediment load entering Rove Creek and regulating water quality 	2	2	1	1	1	7
Barana and Queen Elizabeth Park management plan	<p>Establishment of the Barana and Queen Elizabeth Park to improve the upper Mataniko and Lungga catchment area's provision of fresh water supply and other ecosystem services. Mapping and establishing the site's boundary for the site will also be conducted.</p> <p>A management plan will be formulated to reduce the rate of deforestation and change the current mind set and behaviour of landowners towards informal logging and saw-milling activities. The management plan will also have a long-term aim to re-establish the Queen Elizabeth National Park.</p>	<p>Terrestrial watershed</p> <ul style="list-style-type: none"> - Water supply for domestic (washing, bathing) and recreation purposes - Educational platform for community education, training and awareness - Hazard reduction through stormwater regulation and flood control, reducing sedimentation into waterways - Habitat connectivity and biodiversity 	2	2	1	2	1	8

EbA Option	Description	Targeted Ecosystems and Ecosystem Services	Benefit VH-1, H-2, M-3, L-4	Cost L-1, M-2, H-3	Feasibility Y-1, U-2, N-3	Sustainability VH-1, H-2, M-3, L-4	Other projects Nil-1, Few-2, Sev-3, Many-4	Prioritisation Score
	Note: this is a combination of two EbA options - Barana and Queen Elizabeth National Park management plan and the re-establishment of Queen Elizabeth National Park. The 'cost' criteria will be updated to a 3 (high) in the next prioritisation stage to represent the cost of combining the two EbA options.	provisions						
Beautifying and creating green space for the Honiara CBD	Beautifying a targeted area of the Honiara CBD through landscaping and tree planting. Beautifying activities will include improved waste management of the selected area and the installation of interpretive signs.	Urban greenspace - Shade provision - Aesthetic values	2	2	1	3	1	9
Environmental compliance training for government staff and stakeholders	Facilitate environmental compliance training to relevant government staff on the enforcement of HCC by-laws, Guadalcanal provincial ordinances and national environmental regulations. The training is aimed at providing staff with the appropriate level of knowledge and tools required to undertake regulatory inspections and investigations. As staff become increasingly aware of their powers of authority, environmental regulations are more likely to be enforced and the extent of environmental damage reduced. Key stakeholders and community groups will also be included as target groups for capacity development and encouraging the mainstreaming of EbA in adapting to the impacts of climate change.	All	2	2	1	2	2	9
Mataniko River bank rehabilitation and information centre	Explore areas to undertake river bank rehabilitation along the Mataniko River to improve water quality by reducing sediment run-off. Promote information sharing of for environmental education and awareness purposes. The area will include an information centre that aims to promote EbA practices to build the resilience of local ecosystems against existing threats and lead by example. Proposed environmental initiatives include: revegetating the	Freshwater and terrestrial watershed - Fresh water filtration - Erosion and sedimentation control - Hazard reduction through stormwater regulation and flood control, reducing sediment and regulating water quality - Water supply for domestic (washing,	2	3	1	2	1	9

EbA Option	Description	Targeted Ecosystems and Ecosystem Services	Benefit VH-1, H-2, M-3, L-4	Cost L-1, M-2, H-3	Feasibility Y-1, U-2, N-3	Sustainability VH-1, H-2, M-3, L-4	Other projects Nil-1, Few-2, Sev-3, Many-4	Prioritisation Score
	riparian zone to meet the 15 m riparian buffer ordinance, provision of waste bins and collection services, and planting of shade trees around the information centre to reduce the heat island effect.	bathing) and recreation purposes - Educational platform for community education, training and awareness						

5 Cost-effectiveness analysis

Following the establishment of the shortlist of EbA options for Honiara, a cost-effective analysis (CEA) was undertaken for each option. The results of the CEA are presented below in Table 5-1.

Cost-effectiveness is reported in USD (2017) and provides an indication of the potential monetary benefit for each option per dollar invested.

Table 5-1 Honiara Cost Effectiveness Analysis results

Honiara EbA Option	Cost (USD)	Cost-effectiveness (USD) (per \$ invested)	Honiara EbA option rank
Environmental compliance training for government staff and stakeholders	60,000	19,206.90	1
Barana and Queen Elizabeth Park management plan	100,000	10.60	2
Mataniko River Bank rehabilitation and information centre	55,000	7.40	3
Support Botanic Gardens to be a formal protected area and formulate a management plan	72,000	6.60	4
Beautifying and creating green space for the Honiara CBD	75,000	0.20	5

The CEA results for Honiara illustrate that all options except the *Beautifying and creating green space for the Honiara CBD* option is estimated to deliver benefits that exceed implementation costs. Options that are more holistic, i.e. the Honiara *Environmental compliance training for government staff and stakeholders*, are assumed to benefit a broader suite of ecosystem services than the more discrete options, such as *Beautifying and creating green space for the Honiara CBD*. The latter option affects fewer ecosystems given it is located further downstream of the other options, and therefore has limited positive effect in the upper reaches of the catchment.

Based on the CEA results alone, and with a project budget of USD 155,000 for each location, the CEA results suggest that implementing two of the top four ranked options for would result in the best value for money within or close to the available budget.

As part of the CEA process, the approximate costs of implementing each EbA option was investigated by the Project Team. The initial scoring under the 'cost' criterion during the Stage 1 option prioritisation had allocated several options as being 'medium' (USD 10,000–50,000) (see Section 4.1). However, further cost investigations indicate that all shortlisted options are estimated to cost more than USD 50,000 and therefore should be scored as 'high' (>USD 50,000). The cost criterion performance scores have been updated for the shortlisted options in the Stage 2 option prioritisation to reflect these findings (see Section 6).

The CEA ranking for each option will inform the final step in the EbA options prioritisation. Each option's rank represents the performance score attributed to the CEA criterion in the multi-criteria analysis (see Section 6).

6 Stage 2 EbA options prioritisation

The cost-effective analysis (CEA) provides the expected value for money (the ratio of dollars spent on the option versus the ecosystem service benefits from the option being implemented) for the implementation of each EbA option, i.e. 'bang-for-buck'. The CEA considers the longevity of the EbA option and the benefits delivered over its project life.

Results from the CEA were incorporated into the existing MCA as performed as part of the Stage 1 EbA options prioritisation (see Section 4.1) and represents the final step in the options prioritisation process. Table 6-1 presents the results of the final MCA for Honiara.

The final MCA results largely reflect the results of the CEA in terms of ranking EbA options for Honiara. Honiara's top three EbA options are tied in with their MCA results and present a strong selection of options for the implementation phase.

Table 6-1 Stage 2 EbA options prioritisation using MCA and CEA

EbA Option	Benefit VH-1, H-2, M-3, L-4	Cost * L-1, M-2, H-3	Feasibility Y-1, U-2, N-3	Sustainability VH-1, H-2, M-3, L-4	Other projects Nil-1, Few-2, Sev-3, Many-4	Cost-effectiveness Analysis Rank 1, 2, 3, 4, 5	Prioritisation Score
Honiara							
Barana and Queen Elizabeth Park management plan	2	3	1	2	1	2	11
Support Botanic Gardens to be a formal protected area and formulate a management plan	2	3	1	1	1	3	11
Environmental compliance training for government staff and stakeholders	2	3	1	2	2	1	11
Mataniko Parklands, river bank rehabilitation and information centre	2	3	1	2	1	4	13
Beautifying and creating green space for the Honiara CBD	2	3	1	3	1	5	15

* The performance scores attributed to the cost criterion have been updated to reflect further information sourced on the cost associated with implementing each EbA option.

Project concept notes for the above shortlisted EbA options were developed and are described in Appendix A.

7 EbA options for implementation by PEBACC

Informed by the results of the MCA, the EbA options to be implemented in Honiara are listed below.

- Barana and Queen Elizabeth Park management plan
- Support Botanic Gardens to be a formal protected area and formulate a management plan
- Mataniko Parklands river bank rehabilitation and information centre.

Despite being a top option in the CEA and MCA, the Honiara *Environmental compliance training for government staff and stakeholders* option was not selected for implementation. A focus towards on-ground works in Honiara is thought to be more beneficial at the time of developing the implementation plans. By demonstrating the successful outcomes of EbA activities and the contribution to building ecosystem and social resilience to future climate and non-climate threats, the outcome of the Implementation Plans aim to engage and capture a growing audience and increase the participation and involvement of communities and key stakeholders.

The above EbA options selected for implementation will have detailed implementation plans developed and will consider project elements, such as (but not limited to): preferred site selection; aims and outcomes; justification of implementation; major tasks, roles and responsibilities; implementation schedule; constraints to implementation; permit and/or approval requirements; ecological and social indicators that could be used to monitor and evaluate the effect of the EbA activities proposed; and indicative cost estimates.

Appendix A Concept notes for shortlisted EbA options

A.1 *Barana and Queen Elizabeth Park Management Plan*

A.1.1 Background Information

Terrestrial watersheds (e.g. forests) surrounding greater Honiara's major waterways are a keystone ecosystem underpinning many of the local and downstream ecosystem services on which Honiara's residents are largely dependent. Intact watersheds of the major Lungga, Mataniko and Kovi/Kongulai Rivers, in particular, contribute to ecosystem services derived from much of Honiara's terrestrial, aquatic and marine ecosystems (e.g. provision of raw materials and income generation from forests, provision of water and food in rivers, provision of food and incomes from the nearshore marine environment).

Barana is located to the south of Mount Austen, approximately 4 km south of the Honiara CBD, and on the edge of forested lands that stretch across the Mataniko and Lungga catchments. It is located outside of the HCC boundaries and is governed by the Guadalcanal Provincial Government. An estimated 800 people reside in Barana, which consists of a primary school, three villages and isolated settlements.

Barana is also located in the vicinity of the old Queen Elizabeth National Park, which was originally established by the High Commissioner Sir Robert Stanley (q.v.) in honour of the coronation of Queen Elizabeth II in 1953. During the park's establishment, the area covered 6,070 ha and the hunting of fauna was prohibited. Local residents did not agree with the High Commissioner's governmental land allocation and cleared large areas of rainforest on Mount Austin. By 1973, the area that was once declared as National Park was reduced to 800 ha (Moore 2013) and is reportedly largely degraded

A.1.2 Proposed EbA option

Description

Establishment of the Barana and Queen Elizabeth Park to improve the upper Mataniko and Lungga catchment area's provision of fresh water supply and other ecosystem services. Mapping and establishing the site's boundary for the site will also be conducted.

A management plan will be formulated to reduce the rate of deforestation and promote a change in the current mind set and behaviour of landowners away from informal logging and sawmilling activities. It will do this by identifying current and future land use preferences via land use mapping, and endorsing more environmentally sustainable enterprises as alternative means of income generation. The management plan will also have a long term aim to re-establish the Queen Elizabeth National Park.

Project aims and outcomes

- Sustainable land management of the upper Mataniko and Lungga catchment areas with an aim of changing the mind set of landowners away from a dependence on logging and sawmilling activities and unsustainable agriculture practices, towards more environmentally sustainable land use and alternative income generation initiatives.

- Mapping of the Mataniko and Lungga catchment to inform management measures to be taken by the communities.
- Restoration and protection of woody vegetation in areas previously cleared to reduce erosion and sedimentation of waterways, increase purification functionality, increasing habitat provisions, and reducing impacts to receiving coastal ecosystems.
- Support the improvement of access to freshwater supply for Barana Village residents and increase the freshwater quality of Mataniko and Lungga catchments for downstream residents.
- Improved provision of food supply to Barana Village residents.
- Establish an environmental education and awareness park and information centre for raising awareness for the Barana and nearby communities.
- Promote eco-tourism activities for second world war sites and ecosystem services.

Output indicators

- Area to be replanted
- Rate of vegetation clearing vs regrowth/replanting
- Area to be replanted
- Water quality conditions
- Litter/waste coverage
- Number of food trees planted
- Number of attendees in educational programmes
- Establishment of Queen Elizabeth Park
- Number of eco-tourist visitors

Site specifications

Upper catchment of Mataniko and Lungga Rivers, south of the HCC boundary. The information centre will be located at the former forest research and nursery site at the entrance to Barana village. The historic location of the original Queen Elizabeth National Park is indicated in Figure A-1, noting that its historic boundaries extended northwards to encompass the (now developed/cleared) areas around Mount Austen. Exact boundaries for the original Queen Elizabeth National Park were unavailable at time of writing.

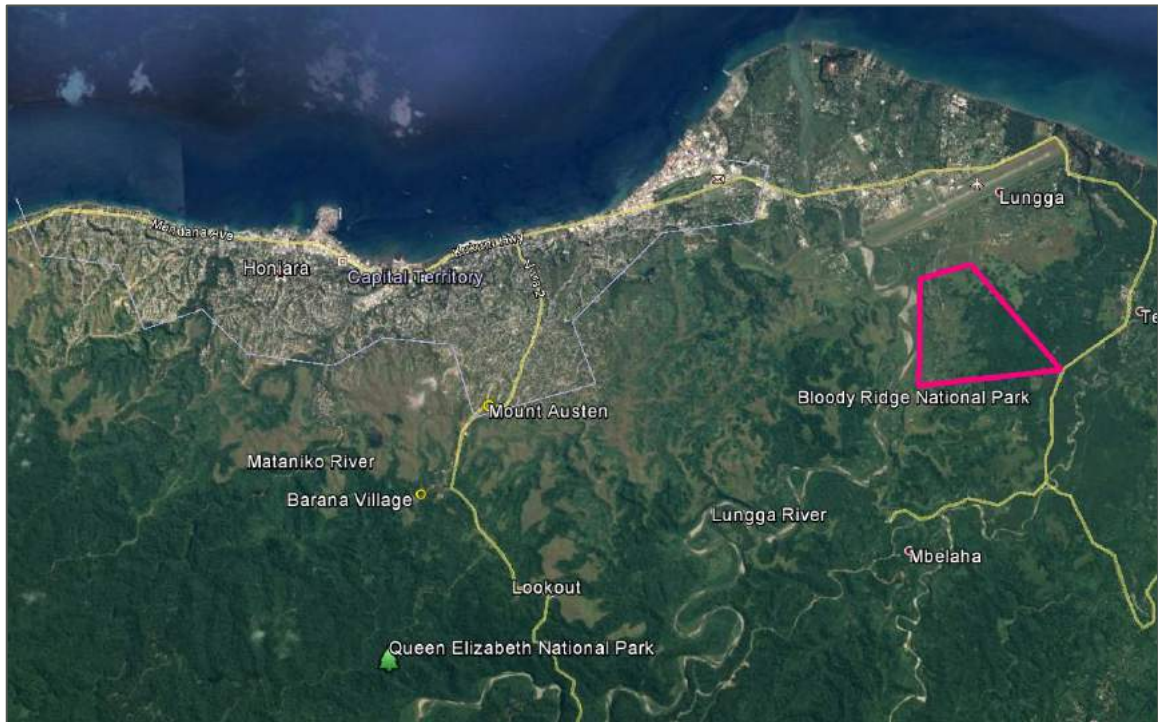


Figure A-1 Indication of historical location of original Queen Elizabeth National Park, Barana Village and proposed Bloody Ridge National Park

Proposed activities

- 1) Conduct detailed land use mapping (current and future preferred land uses) through landowner engagement to guide the development of the management plan.
- 2) Develop a Barana and Queen Elizabeth Park Management Plan to provide strategic direction and priorities for the on-ground management of the upper Mataniko and Lungga catchment area water resources
- 3) Establish a Governance Committee to oversee the execution of the management plan and initiatives, and report on the progress of completing each activity.
- 4) Conduct a household and community level awareness campaign covering sanitation and waste management and vegetation clearing adjacent to water sources e.g. wells, springs and rivers.
- 5) Undertake a clean-up campaign involving the local community and Barana Primary School.
- 6) Undertake a replanting programme, preferably using native species, for restoration, income generation and sustainability purposes.
- 8) Coordinate the provision of water tanks to Barana Village.
- 9) Introduce a Park Ranger programme to enforce environmental protection and community by-laws.
- 10) Re-establish the Queen Elizabeth Park initially as a community conservation area, to provide an open space for recreation, conservation and environmental educational purposes.

Potential stakeholder involvement

- SPREP/PEBACC
- Guadalcanal Provincial Government
- Ministry of Environment, Climate Change, Disaster Management and Meteorology (MECDM)
- Ministry of Forests and Research
- Honiara City Council
- Ministry of Culture and Tourism
- Honiara Botanical Gardens
- Solo Enviro Beautification
- Local communities (households, communities, schools, churches)
- Solomon Water

Potential constraints to implementation

- Disagreement within the Governance Committee on executing the management plan and its initiatives
- Resistance from landowners towards environmental awareness and a transition to alternative income streams that avoid vegetation clearing
- Resistance by existing residents on re-establishing park boundaries
- Infestation of invasive species (e.g. Giant African Snail and Rhinoceros Beetle infestation)
- Disagreement by stakeholders on the design of the park.

Timing

The implementation of the proposed EbA option is expected to require the full two-year time allocation

Costs

Estimated costs for the implementation of the EbA option is:

Activities	Cost (SBD)	Cost (USD)
Barana and Queen Elizabeth Park Management Plan	154,400	20,000
Detailed land use mapping	77,200	10,000
Establish a Governance Committee	38,600	5,000
Household and community level environmental awareness campaign	38,600	5,000
Clean-up campaign	38,600	5,000
Replanting programme and enrichment planting	115,800	15,000
Supply water tanks to Barana Village and training	154,400	20,000
Field mapping and ranger training	77,200	10,000
Establish a new Queen Elizabeth Park	231,600	30,000
Total	926,400	120,000

A.2 Support Botanical Gardens to be a Formal Protected Area and formulate a Management Plan

A.2.1 Background Information

Established in 1965 by tropical botanist, Professor Tim Whitmore, the Honiara Botanical Gardens is Honiara City's largest greenspace covering an estimated 19 ha. Located approximately 2 km from the city centre in Rove, the gardens showcase a range of local and exotic plant species, including the largest assortment of Solomon Island orchids, collected from all nine Solomon Island provinces. The Botanical Gardens is also home to the National Herbarium providing a resource centre for conservation, biodiversity, education, research and development. Whilst managed as an asset of the Ministry of Forestry and Research, the gardens are not afforded formal protection as a forest reserve under the *Forest and Timber Utilisation Act 1969* or *Protected Areas Act 2010*.

Prior to its establishment as a botanical garden, the government had encouraged its use as a camp area for workers originating from outside Honiara (i.e. similar to temporary staff housing). This practice continues, such that the gardens support informal settlers which, in turn, cause land clearing and informal development to encroach on the gardens.

As one of the city's last remaining significantly shaded areas, many consider the Botanical Gardens a green haven for both nature and the people of Honiara (Figure A-2). At an ecosystem services level, the area is a focal point for recreation, washing, bathing, shade provision, aesthetic values, tourism, and biodiversity. The area provides a sanctuary for native fauna, including a vast array of reptiles, birds and insects. Running through the middle of the gardens, Rove Creek is highly utilised by locals, who use the creek's water supply for services including recreation, washing and bathing activities. Environmental degradation to the Botanical Gardens is occurring due to the competition for other land uses, particularly the encroachment of informal settlements along Rove Creek. Vegetation is cleared to make room for expanding settlements, who also harvest plants for fuelwood and building materials. Informal clearing is also taking place for permanent residential housing at the southern extent of the gardens in the upper catchment.

The Botanical Gardens have historical importance with links to World War II with both the Japanese and American forces using the area as a base. The gardens were also the site for capital punishment during the 1940s and 1950s with public hangings conducted adjacent to the current nursery. During the 1980s, the garden's extensive plant collection began to deteriorate. In 1988, New Zealand volunteers and the now Director of Herbarium, Myknee Qusa Sirikolo, rehabilitated the collections and restored the gardens over several years (Bennett 2000). More recently, limited resources for the garden's daily maintenance have seen some sections neglected and the rate of informal clearing and harvesting reportedly increasing. Various rehabilitation projects have provided restoration works throughout the gardens and enhanced the recreational facilities, including walking tracks, picnic areas and the installation of essential signage at the main entrance of the gardens.



Figure A-2 Honiara Botanical Garden near the main entrance

Today, the Ministry of Forestry and Research oversees the Herbarium's research activities and the general maintenance of the Botanical Gardens.

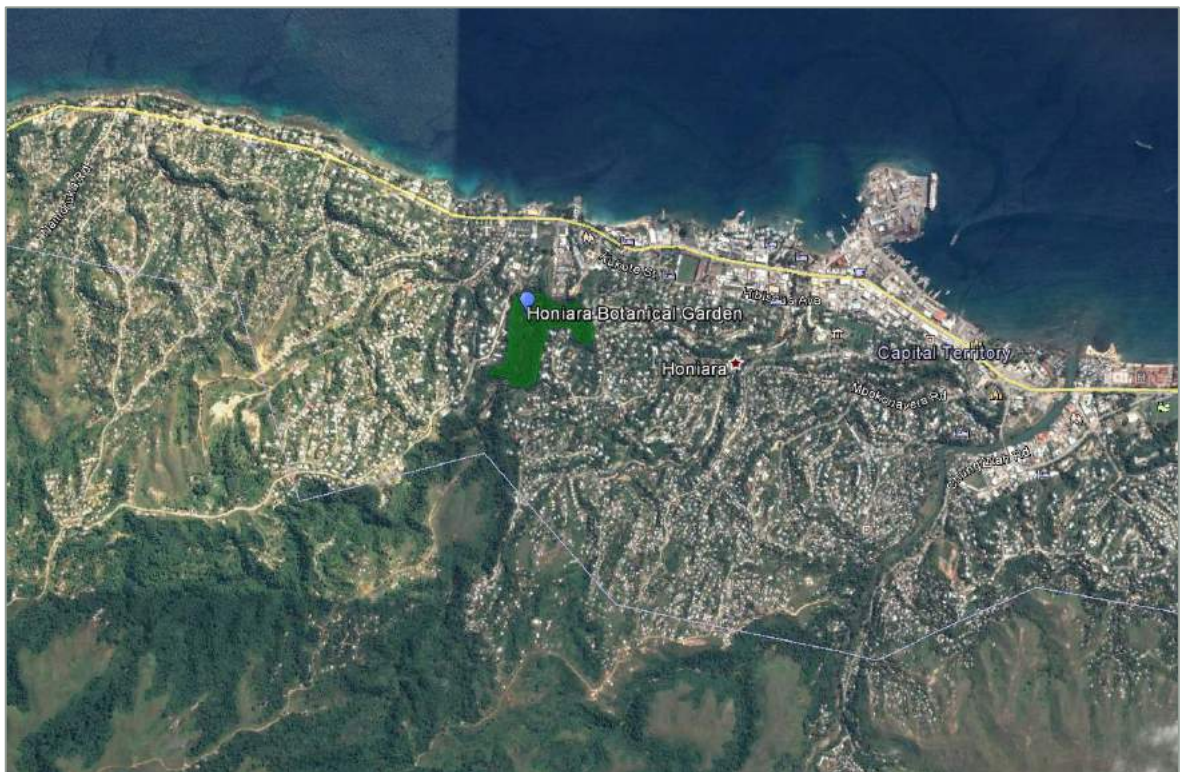


Figure A-3 Location of Honiara Botanical Garden

A.2.2 Proposed EbA option

Description

The development of a management plan is proposed to strategically manage the area with the ultimate goal of declaring the Botanical Gardens as a forest reserve under the *Forest and Timber Utilisation Act 1969* and *Protected Areas Act 2010* to secure its future. A number of improvements to the services such as sustainable finance, education and information platforms will also be supported.

A targeted enrichment replanting programme of previously cleared forested areas within the Botanical Garden's boundaries will be undertaken. The establishment of a learning centre will be supported for environmental educational, awareness and training.

Project aims and outcomes

- Sustainable land management of gardens aiming to reduce illegal clearing, harvesting and encroachment resulting in the loss of habitat, erosion and sedimentation of Rove Creek and reduced water quality, and improved waste management practices.
- Restoration and protection of woody vegetation in areas previously cleared to reduce erosion and sedimentation of Rove Creek, increase purification functionality, and provide a robust network of greenspace for wildlife and the residents of Honiara
- Improve the freshwater quality of Rove Creek for the continued provision of safe domestic water supply to the communities residing downstream, outside the Botanical Garden (i.e. Rove community)
- Reduce the invasion of exotic weed species
- Strengthen the ability for the gardens to provide a meeting place for cultural and environmental education activities, and a sense of place through an opportunity to connect with nature
- Enhance the Botanical Garden's tourism and recreation opportunities
- Declaring the Botanical Gardens as a forest reserve under the *Forest Act 1999* and *Protected Areas Act 2010*.

Output indicators

- Area to be replanted
- Area illegally cleared or harvested
- Water quality levels
- Litter/waste coverage
- Declaring the Botanical Gardens as a forest reserve under the *Forest Act 1999* and *Protected Areas Act 2010*.
- Number of weed species and/or extent
- Number of responsible visitors to the gardens
- Number of attendees and feedback on educational programmes
- Botanical gardens formally declared a protected area

Proposed activities

- 1) Develop a Botanical Gardens Management
- 2) Establish a Botanical Gardens Governance Committee
- 3) Investigate avenues for establishing revenue streams that can be injected back into the operation and maintenance of the Botanical Gardens.
- 4) Submit an application to declare the Botanical Gardens as a Protected.
- 5) Train existing employees to enforce the garden's rules and regulations.
- 6) Conduct a Rapid Biodiversity Assessment to provide a baseline assessment of the current condition of the gardens and identify the list of species to be replanted.
- 7) Increase nursery capacity and species list for replanting activities (if needed)
- 8) Conduct the revegetation of previously cleared forested areas.
- 9) Increase educational signage throughout the gardens to enhance the learning experience (with a focus on ecosystem services).
- 10) Establish a Learning Centre and increase educational signage throughout the gardens
- 11) Investigate the installation of suitable waste disposal bins and coordinate waste collection.
- 12) Develop a 3D model of the Botanical Gardens

Potential stakeholder involvement

- SPREP/PEBACC
- Ministry of Forests (MoFR)
- National Herbarium
- Ministry of Environment, Climate Change, Disaster Management and Meteorology (MECDM)
- Honiara City Council (HCC)
- Solo Enviro Beautification and other local NGOs
- Local communities
- Ministry of Culture and Tourism

Potential constraints to implementation

- Disagreement within the Botanical Gardens Governance Committee on executing the management plan and its initiatives.
- Resistance from local residents regarding government policies for preventing further expansion of informal settlements into Botanical Gardens.
- Existing tensions between Botanic Gardens, MoFR and Solo Enviro Beautification, and potentially Honiara City Council.
- Potential rejection of application to declare the Botanical Gardens a Protected Area

Timing

The implementation of the proposed EbA option is expected to require the full two-year time allocation.

Costs

Estimated costs for the implementation of the EbA option is:

Activities	Cost (SBD)	Cost (USD)
Developing the management plan (incl. revenue raising plan)	77,200	10,000
Establishment of governance committee	38,600	5,000
Preparation of Protected Area application	154,400	20,000
Train and engage rangers to protect and maintain gardens (Ministry of Forestry provision of training to their staff in-kind)	<i>In kind</i>	<i>In kind</i>
Rapid Biodiversity Assessment	38,600	5,000
Nursery expansion	38,600	5,000
Replanting programme	92,640	12,000
Educational signage	38,600	5,000
Investigate and implement a waste disposal and collection system	38,600	5,000
Establishment of learning centre	115,800	15,000
Development of a 3D model	77,200	10,000
Total	710,240	92,000

A.3 Environmental compliance training for government staff and stakeholders

A.3.1 Background Information

Over the last decade, environmental protection regulations at both national and provincial levels have been strengthened to protect and support the sustainable management of ecosystems throughout Solomon Islands. However, consistent compliance and effective enforcement of these regulations by government agencies is lacking, resulting in large-scale environmental degradation of natural resources and services. Consultations with government staff during the national and Honiara EbA options development workshop (March 2017) suggested that the poor enforcement of environmental regulations is largely due to the lack of government agency resources and a lack of training received by government regulators on the statutory power of the national and provincial environmental regulations.

Threats / Issues

A lack of enforcement (and compliance) of environmental regulations will ultimately result in an increased rate of environmental degradation from unplanned development, pollution and contamination, resource extraction and habitat modification. Poor enforcement conveys a negative message to existing and potential offenders that violations are not taken seriously and penalties will not transpire.

A.3.2 Proposed EbA option

Description

Facilitate environmental compliance training to relevant government staff on the enforcement of HCC by-laws, Guadalcanal provincial ordinances and national environmental regulations. The training is aimed at providing staff with the appropriate level of knowledge and tools required to undertake regulatory inspections and investigations. Importantly, this training will involve cross-institutional understanding, whereby staff can gain knowledge in the relevant rules and enforcement options in other ministries and levels of government. As staff become increasingly aware of their powers of authority, environmental regulations are more likely to be enforced and the extent of environmental damage reduced.

Key stakeholders and community groups will also be included as target groups for capacity development and encouraging the mainstreaming of EbA in adapting to the impacts of climate change.

Project aims and outcomes

- All relevant government staff are better equipped to enforce environmental regulations.
- Relevant community stakeholders are better informed to increase knowledge-sharing to the wider community.
- The rates of illegal vegetation clearing, including riparian vegetation, land reclamation of coastal foreshore areas, general littering and the dumping of waste (into waterways and on land) will be reduced.

Output indicators

- Number of training attendees
- Number of fines or prosecutions in violating environmental regulations and ordinances
- Litter/waste coverage
- Area of vegetation cleared
- Area of land reclamation

Proposed activities

- Upfront training to be delivered through an intensive multi-day workshop that will involve presentations on the subject matters listed below, group break-out sessions, role plays, scenario demonstrations by the facilitator, and question and answer sessions. It should be highly interactive, with reference material developed to support each session. A second workshop should be conducted 3-4 months after the initial workshop as a means of checking in with participants to encourage the sharing of experiences and lessons learned.
- Subject matters should include: customary law and environmental legislation and regulations; understanding violations and offences; determining the appropriate compliance action; environmental impact assessment; and licences, approvals and permits.
- Training resources are to include: a synthesis of all relevant environmental regulations; investigation; examples of investigation techniques; using regulatory tools; how to develop standard operating procedures; and how to ensure the sufficient level of evidence is gathered for preparing reports/briefs of evidence.
- All government staff in an environmental compliance and enforcement role should be encouraged to attend the training. Suggested government departments that would benefit from the training include: Ministry of Environment, Climate Change, Disaster Management and Meteorology; Honiara City Council; Ministry of Fisheries and Marine Resources; Guadalcanal Provincial Government; and Ministry of Lands, Housing and Survey.
- Potential partnership with Landowner Advocacy and Legal Support Unit (LALSU) and Solomon Islands Environmental Law Association (SIELA). Investigate the potential secondment of a lawyer into the relevant agency if further on-the-job training is required.
- Key stakeholders and community groups to undertake capacity development sessions to develop further knowledge of customary law and environmental legislation and regulations for knowledge transfer to the wider community.

Stakeholder Involvement

- Government agencies
- Community stakeholders
- Partnership with LALSU and SIELA
- SPREP

Potential constraints to implementation

- Lack of support from upper management or political representatives
- Lack of human resources preventing government staff attending and/or completing the training sessions

Timing

The implementation of the proposed EbA option is expected to require 12 months.

Costs

Estimated costs for the implementation of the EbA option

Tasks	Cost (SBD)	Cost (USD)
Training programme design	276,500	35,000
Workshop 1 (training)	79,000	10,000
Training programme reference materials	15,800	2,000
On the job training delivery (e.g. secondment by LALSU and SIELA representative)	79,000	10,000
Workshop 2 (check in session)	23,700	3,000
Total	474,000	60,000

A.4 Mataniko River Rehabilitation and Information Centre

A.4.1 Background Information

Being a major river system in Honiara, the Mataniko River contributes significantly to river-derived ecosystem services in Honiara. Most notably, the river plays a key role in the provision of aquatic foods and water for domestic uses, and livelihoods (e.g. fishing, gravel) for the people of Honiara.

In 2014 the Mataniko River was severely affected by floods, with heavy rainfall and flash flooding causing extensive damage to infrastructure and homes. The event caused human fatalities, as well as large scale damage to residential and commercial properties. Since the 2014 flood event, residents have not returned to the worst affected areas, and neighbouring residents report that land owners do not plan on resettling at these areas in the future.

In addition to disturbances associated with severe weather events, the Mataniko River and its tributaries (e.g. Vara Creek) are in poor condition and heavily modified. Typical of most waterways in Honiara, the downstream reaches of both the Mataniko River and Vara Creek receive direct pollution inputs from excessive disposal and accumulation of solid wastes, contaminants from sanitation uses, industrial discharges, agricultural runoff, and watershed runoff (e.g. sediment inputs) (see Figure A-4).



Figure A-4 Mataniko River and Vara Creek confluence and adjacent land

Sites along the Mataniko River (e.g. at confluence with Vara Creek) have been used as waste dumping grounds by informal settlements. The extensive volume of waste being dumped into waterways was arguably a contributing factor to the severity of the 2014 floods (Trundle and McEvoy 2016). While a high level of rainfall was received over several days, the accumulation of solid waste is reported to have blocked drainage channels preventing the natural flow of water down the Mataniko River and its tributaries. The blockage of drainage channels combined with the extensive watershed run-off caused by the deforestation of the upper catchment, suggests the impacts from the heavy rainfall was intensified by these human induced factors.

Flood affected, or otherwise degraded, areas along the Mataniko River that are no longer used for residential (or similar) purposes provide an opportunity for EbA. Specifically, river restoration works and associated community awareness campaigns will bring about positive change and build climate change resilience into the river and the ecosystem services that it provides for communities in Honiara.

A.4.2 Proposed EbA option

Description

This project will implement river rehabilitation/restoration works on the Mataniko River and/or its tributaries, as well as develop information sharing opportunities for improving environmental awareness within the community (e.g. on issues such as waste management, waterway health, improving flood resilience). The site will promote good environmental management practices through leading by example, with environmental initiatives targeting existing threats to ecosystems and ecosystem services. Depending on the location(s) selected for restoration works and information sharing, there is an opportunity to present this option as a transformational project for one of the key hotspots of poor waste management in Honiara. An information centre will be established to provide a one stop shop for information on environmental initiatives being undertaken in the local area.

Project aims and outcomes

- Sustainable land management of the Mataniko through changing the mind set of local residents from seeing the river as a waste repository to valuing and protecting the river as a local natural asset.
- Restoration and protection of woody riparian vegetation in areas previously cleared to reduce erosion and sedimentation of waterways, increase purification functionality, increasing habitat provisions, and reducing impacts to receiving coastal ecosystems.
- Improved waste management practices, particularly in and adjacent to waterways.
- Environmental education and training platform for the Honiara City Council community.

Output indicators

- Area to be replanted
- Area informally cleared
- Water quality conditions
- Litter/waste coverage
- Number of attendees in educational programmes

Site specifications

Downstream reaches of Mataniko River located within HCC (Figure A-5), focusing particularly on river reaches most notably affected by the 2014 flood and/or excessive human disturbance (e.g. household waste disposal hotspots). Exact site location(s) for on-ground works to be determined as part of the implementation process.

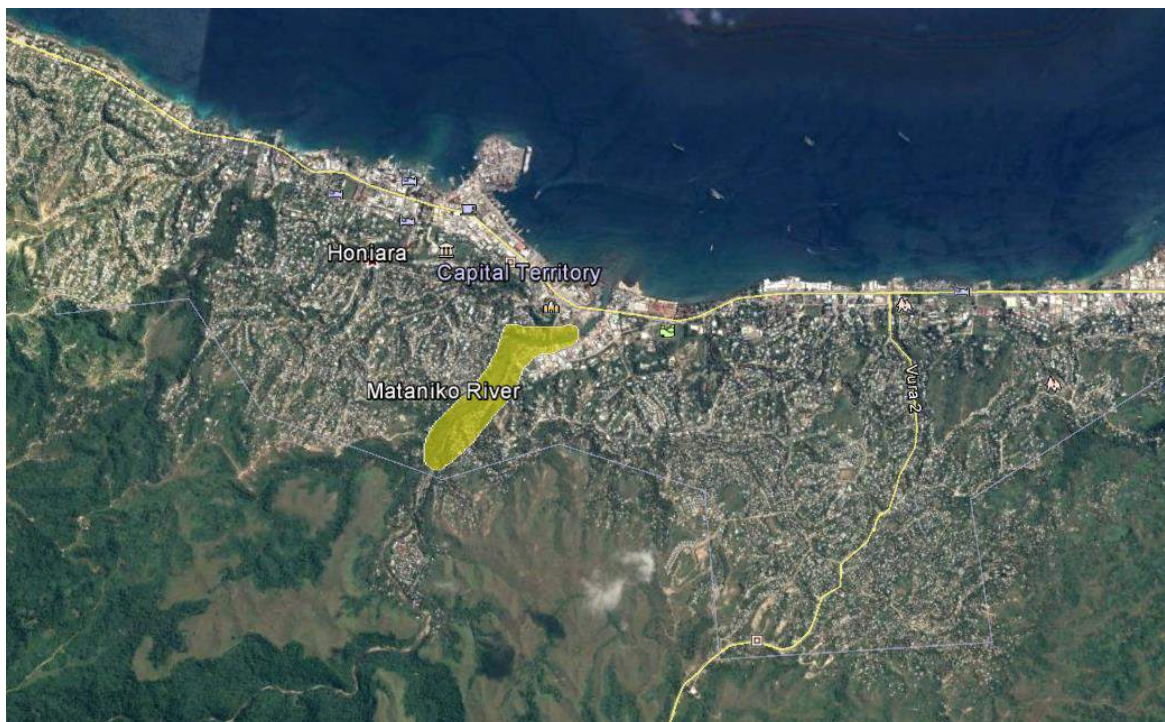


Figure A-5 Indicative Focal Area on Lower Mataniko River

Proposed activities

- 1) Investigate potential site options for river restoration and/or rehabilitation works (e.g. replanting riparian vegetation, waste clean-up campaigns), and for locating the information centre.
- 2) Establish an information centre to raise environmental awareness and provide information on the parkland and environmental initiatives being undertaken in the area.
- 3) Support initiatives to replant riparian areas to improve water quality by reducing sediment run-off into waterways; planting shade trees to reduce the heat island affect from modified landscapes; and providing appropriate waste disposal bins and coordinating collection services to reduce waste contaminating and blocking waterways.
- 4) Install a waste boom upstream in Vara Creek to catch solid waste before it enters the Mataniko River.
- 5) Conduct a clean-up campaign involving the local community and HCC.
- 6) Host an official unveiling/opening of the area to celebrate environmental awareness and promote community stewardship.

Potential stakeholder involvement

- SPREP/PEBACC
- HCC
- Ministry of Environment, Climate Change, Disaster Management and Meteorology (MECDM)
- Ministry of Health
- Chinese Association
- Botanical Garden and National Herbarium
- Solo Enviro Beautification
- Local business owners
- Local community
- Ministry of Culture and Tourism.

Potential constraints to implementation

- Disagreement by stakeholders on the location and design of works.
- Engineering and/or design limitations e.g. flood prone area.
- Disengagement of stakeholders, including communities.

Timing

The implementation of the proposed EbA option is expected to require the full two-year time allocation.

Costs

Estimated costs for the implementation of the EbA option is:

Activities	Cost (SBD)	Costs (USD)
Investigate and finalise restoration sites/options	154,400	20,000
Information Centre and Education signage	115,800	15,000
Plantings	77,200	10,000
Clean-up campaign	115,800	15,000
Opening event	38,600	5,000
Total	501,800	65,000

A.5 Beautifying and creating green space for the Honiara CBD

A.5.1 Background Information

True to its definition, the central business district (CBD) of Honiara is the bustling centre of business activities. Since its establishment, the centre's green space and shade provisions have dramatically declined and are now heavily dominated by a man-made landscape, consisting of concrete, asphalt and rocks (see Figure A-6). Waste management also presents challenges throughout the CBD area, with many business owners reportedly frustrated at the waste collection service. Many CBD areas are considered by the local community to be hot, polluted and uninviting.



Figure A-6 Chinatown streetscape (photos taken on a Sunday when streets were at their quietest)

Threats /Issues

The Honiara CBD is at risk of increased pollution and further disregard by the local community and business owners. Any area perceived as unappealing with poor custodianship is likely to lead to neglect and misuse. Poor waste management practices increase the threat of pollution to waterways and ultimately human health.

The lack of vegetation in an area that is highly-utilised by both pedestrians and vehicles poses many threats to ecosystem and human health. An expansive hardstand area will increase stormwater run-off and flooding, and cause more pollution of the surrounding waterways. The lack of shade provisions, particularly in Honiara's hot climate, pose a threat to human health and is likely to be contributing to increased temperatures in the city centre (see heat island affect below), while a lack of trees also prevents the absorption of pollutants from increasing traffic volumes, the burning of waste, and dust emissions during times of prolonged dry periods.

A lack of open and green space presents several threats to ecosystem and human health. As the rate of urban development increases in Honiara, the conversion of natural landscapes to hardscape developments also increases. By replacing vegetated areas with asphalt or concrete, the surrounding area is likely to experience the phenomenon known as the 'heat island effect'². Consequently, the surrounding area may experience an increase in night-time temperatures, or high night-time temperatures remain high as the heat island effect limits night-time cooling (Department of Health 2008). The lack of vegetation – and therefore the lack of evapotranspiration, shade and the cooling effect provided by trees – is also a key contributor to the heat island effect. The heat island effect causes heat-related stress amongst pregnant women, children, people with cardiovascular and respiratory diseases, and the elderly (Doick and Hutchings 2013).

The predicted increases in temperature and number of hot days, coupled with the increase in population growth in urban areas, will further exacerbate the heat island effect.

A.5.2 Proposed EbA option

Description

Beautifying a targeted area of the Honiara CBD through landscaping will reduce the heat island effect, provide habitat connectivity, absorb pollution and reduce the rate of stormwater run-off. Beautifying activities will also include improved waste management and the installation of interpretive signs. During the Honiara EbA options workshop, the area given prioritisation for beautification by stakeholders was Chinatown (Figure A-6). All activities proposed below could also be undertaken in other targeted areas throughout Honiara (e.g. Mataniko River).

Project aims and outcomes

- Provides shade and reduces the local temperature for pedestrians and business owners.
- Transforms the area to be aesthetically pleasing and brings a sense of pride and ownership to the CBD.
- Reduces run-off into local waterways.

² The heat island effect phenomenon is caused from the modification of materials, a change in where heat is stored, the amount of heat stored, and the rate and extent of energy release. After sunset, the energy stored within building materials is released as longwave radiation which then radiates into neighbouring buildings and is absorbed, to be then re-emitted into the atmosphere.

Output indicators

- Area to be replanted
- Litter/waste coverage
- Number of visitors to the area

Proposed activities and implementation considerations

- The proposed works will require a professional designer to ensure that the design meets the needs of various stakeholders while being functional and aesthetically pleasing for business owners and the community. Plantings will provide shade to regulate the heat island effect, particularly as an increase in temperature is projected for Honiara, while areas with a soft substrate will reduce stormwater run-off and the associated impacts of localised flooding. Plantings will also increase the absorption of local pollutants.
- The following steps are envisioned for the design of the landscaping works.
 - Develop the overall design brief for the targeted site
 - Once the location of the project is selected, engage with stakeholders to identify the key features to be included in the site design, and any perceived constraints to the potential works. Engaging with stakeholders during the early stages of planning will allow the designer to further understand the values, needs and intended use of the area. Involvement during the design process will provide stakeholders with a sense of ownership of the area and they are more likely to support the project and maintain the area.
 - Information collected during stakeholder engagement is to be utilised by the landscape architect/designer to develop the design brief. Typical elements captured in a design brief include the design style, plant species and landscape materials.
 - Develop the concept design
 - Utilising the design brief, the landscape designer will then develop the concept design, taking into consideration the current streetscape, architecture, geography and typical utilisation of the area. The concept design is the draft stage of the design and documentation process and will provide spatial definition, hard and soft landscape sections, planting themes, and landscape specification (e.g. landscape materials). The waste management system for the site and the location of interpretive signs should also be incorporated into the concept design.
 - Undertake a second stage of stakeholder engagement to capture the final input of the designs. This may involve a smaller, more select group than the first stage of engagement.
 - Develop the final plan
 - A final comprehensive plan will be developed for the site and includes detailed design and documentation.
- Prior to the construction of the landscape works, a clean-up campaign involving local business owners, local community, workshop attendees and HCC should be conducted. This will promote

the upcoming landscaping works and demonstrate a sense of pride for the area to the broader community.

- Host an official unveiling/opening of the area
 - The opening event should aim to showcase the efforts of all stakeholders. Similar to the clean-up campaign, demonstrating a sense of pride for the area will increase the long-term support and up-keep by the local community.
 - A well-functioning waste management system for the area is critical for this event.

Potential stakeholder involvement

- HCC
- SPREP
- Solo Enviro Beautification or other EbA option implementing body
- Local business owners
- Local community

Potential constraints to implementation

- Disagreement by stakeholders on the selected area for the works
- Disagreement by stakeholders on the landscape design
- Engineering/structural limitations to the works, e.g. whether the demolition of concrete for gardens can take place and therefore the garden design is limited to pots.

Timing

The implementation of the proposed EbA option is expected to require 12 to 18 months.

Costs

Estimated costs for the implementation of the EbA option is:

Tasks	Cost (SBD)	Cost (USD)
Landscape designer	<i>In kind</i>	<i>In kind</i>
Stakeholder engagement (e.g. workshops)	118,500	15,000
Waste management system	39,500	5,000
Clean-up campaign	39,500	5,000
Construction works	158,000	20,000
Signage	79,000	10,000
Plants	118,500	15,000
Opening event	39,500	5,000
Total	592,500	75,000



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