Pacific Islands Enhancing Coastal Resilience (PIECoR)

A Framework to Guide Ecosystem-based Adaptation in the Pacific Islands Region

1. Introduction

There is an urgent need for Pacific island countries and territories (PICs[1]) to strengthen their resilience to climate change impacts. In doing so it is important to focus on the opportunities and resilience provided by protecting and restoring ecosystem services that underpin national development agendas and community livelihoods. The purpose of this paper is to outline a practical programmatic framework to guide ecosystem-based approaches to climate change resilience and adaptation in the Pacific island context. It has been developed by regional partners, with the intention that it will promote a consistent, principle based and methodological approach to new and emerging investments in resilient development and adaptation. It captures and reflects key lessons and experience from decades of ecosystem management and climate change programmes in the Pacific.

The establishment of global funding instruments, such as the Green Climate Fund, provides the opportunity for PICs to develop and implement holistic responses to climate change based on the ecosystem approach. The ecosystem approach is not new, and it has been applied to varying degrees with mixed success by PICs in programmes and projects in different sectors in recent years. It is referenced in numerous national policy documents and commitments to multilateral environmental conventions; other global and regional sustainable development, climate change and disaster reduction commitments, including Forum Leaders' communiqués, the Sustainable Development Goals, Paris Agreement under the UNFCCC, Sendai Framework for Disaster Risk Reduction 2015-2030, Framework for a Pacific Oceanscape, Framework for Resilient Development in the Pacific, 2013 Laucala Declaration on Conservation in Oceania, Regional Framework for Nature Conservation and Protected Areas 2014-2020; and sectoral policies, such as the Regional Roadmap for Sustainable Pacific Fisheries, and the New Song for Coastal Fisheries - Pathways to Change.

The potential application of large scale funding through the GCF, availability of regionally based technical expertise, policy commitments of national governments to ecosystem based resilience strategies and climate change adaptation, and growing concern and interest by communities in viable approaches to protect life and livelihoods, create a nexus of opportunity to establish an effective regional coastal resilience programme.

2. Strengthening Resilience

The concept of resilience is inclusive of ecological, social and economic criteria and interactions, applied to the capacity of social-ecological systems to withstand and recover from natural disasters such as cyclones, droughts, rising sea levels, floods, earthquakes and tsunamis, as well as capacity to deal with rapid social, economic and political upheaval (Adger 2000[1]). However, in the context of climate change, it also applies to the forecast long term changes that threaten the social-ecological

[1] Includes all levels of governance: national, sub-national, community

systems[1] of Pacific islands; and changes to ecological systems and processes that will become less supportive of human needs and sustainable development over the long term.

The IPCC Fifth Assessment Report confirmed that even with meeting emission control targets critical aspects of climate change are inevitable (CDKN/ODI 2014[2]). For example, even under the most optimistic IPCC emissions scenario Frieler et al. (2013[3]) estimated that extensive degradation will occur to coral reefs globally as a result of increased sea surface temperature and that "to protect at least 50% of…coral reef…global mean temperature change would have to be limited to 1.2^{0} C…especially given the lack of evidence that corals can evolve significantly on [relatively rapid] decadal timescales and under continually escalating thermal stress". Coral reefs are also expected to be degraded by ocean acidification. These changes to coral reefs lead Bell et al. (2013[4]) to predict that "even under good management (for example, controlling runoff), coral cover is expected to decrease from the present-day maximum of 40% to 15-30% by 2035 and 10-20% by 2050, matching the rate of decline over the past 30 years. As coral cover decreases, the ability of corals to compete with macroalgae (seaweed) for space will be reduced, potentially leading to 40% seaweed cover on reefs by 2035". Coupled, and compounding these pressures are land-based pressures also related to climate change; for example droughts in atoll countries have resulted in increased nutrient levels from human sources in lagoons, leading to algal blooms, some associated with ciguatera fish poison outbreaks, and the over-growing of coral reef areas by the algae, effecting the ecological balance and reducing areas for reef fish and invertebrates.

Coral reefs and associated ecosystems are the cornerstone of coastal fisheries and the subsistence and livelihoods of most Pacific island communities, as well as forming the structural elements of coastal lagoons and providing coastal stability. In the Pacific region fish consumption, based mainly on small-scale subsistence and commercial fishing for coral reef fish, invertebrates and pelagic fish, including tuna, is often 2-4 times the global average, or even higher in remote atolls, and supplies 5090% of dietary animal protein in rural areas (Bell et al. 2013). The 2015 report card on coastal fisheries (SPC 2015[5]) notes that significant losses of coral reefs, mangroves, seagrasses and intertidal habitats, which provide shelter and food for coastal fish and shellfish, are expected to cause reductions in the productivity of coastal fisheries as a result of climate change, threatening food security and livelihoods. However, coastal ecosystems are already under threat across the region from non-climate change pressures, undermining the potential for adaptation and capacity for resilience by Pacific island social-ecological systems. Results of a survey of heads of fisheries across the region presented in the SPC report card identify a range of pressures and environmental impacts on coastal ecosystems (see Figure 1).

[1] Social-ecological systems are complex adaptive systems where social and biophysical agents interact at multiple temporal and spatial scales.

Critical natural, socioeconomic, and cultural resources whose flow and use is regulated by a combination of ecological and social systems.

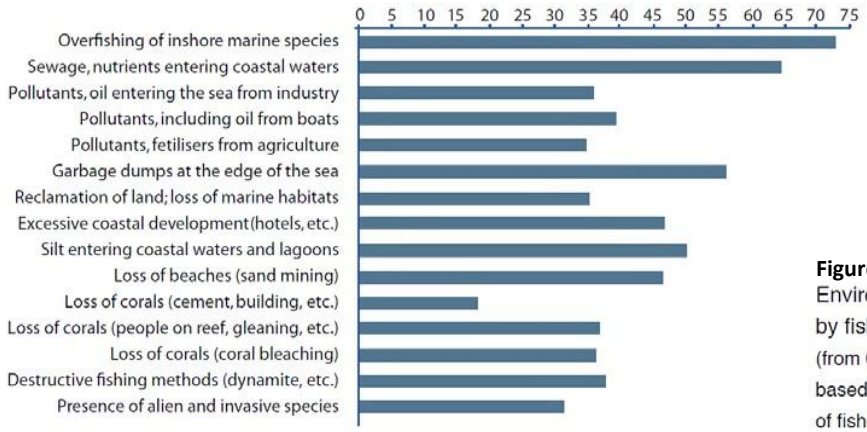


Figure 1(SPC 2015)
Environmental impacts identified by fisheries managers in PICTs (from 0% = no effect, to 100% = severe effect; based on questionnaires completed by heads of fisheries agencies)

These impacts not only have implications for fisheries but all aspects of human development and sustainability in the coastal zone. They increase the vulnerability of coastal communities (in the broadest sense) to the growing impacts of climate change and undermine their resilience to both sudden and longer term change. Overfishing, pollution of marine and freshwater resources, habitat removal, invasive species, inappropriate development, unplanned urban expansion and unsustainable population growth are some of the non-climate change issues that must be addressed by Pacific governments and supporting partners in any resilience focused programme that aims to respond to climate change.

Strong resilience and capacity for sustained/long term adaptability needs to be a primary aim for communities and the governments that must support them - increased vulnerability of social-ecological systems results in lowered resilience, and in turn reduced capacity for adaptability (Folkes 2006[6]). Conversely, reduced vulnerability and strong capacity for adaptation will place Pacific societies in the best position to deal with climate change impacts should major biophysical and social changes come to fruition over the coming century - the need for transformation to new paradigms of existence in response to, for example, higher sea levels and shrinking coastal zones, loss of coral reefs through ocean acidification and more intense weather events. Coherent and integrated action now to address climate change and non-climate change issues will maximise opportunities and time scales for viable adaptation strategies.

3. Defining 'Coastal' in the Pacific Islands Context

Vulnerability within Pacific Islands is related closely to the broad island typology of high volcanic islands, coral atolls and emergent limestone islands (Forbes et al. 2013[7]). While high islands of the Pacific vary in size and age, the largest occur in Melanesia. These have high elevation with deep soils, high biodiversity and large rivers with flood plains and are vulnerable to landslides, riverine and coastal flooding; and high elevation ecosystems that are vulnerable to air temperature increases and changing climatic and rainfall patterns. Papua New Guinea is the largest country in the Pacific Islands region and is therefore unique in terms of vulnerability as it contains a highly diverse range of landscapes and biota (Barnett and Campbell 2010[8]). Smaller high islands have steep topography and smaller rivers with less developed flood plains. These small islands are highly susceptible to cyclones and associated storm surges resulting in coastal flooding (Nunn and Mimura 1997[9]). River flooding is localised and fresh water supply is vulnerable to changing rainfall patterns.

Atolls and reef islands are characterised by low-lying topography and little or no developed soil, usually large coastal lagoons, and no fresh surface water but important, and often limited, groundwater lenses. These are highly vulnerable to flooding from storm surge and extreme high tides, and sea level rise, and are affected by changing rainfall patterns that often lead to droughts, and salt water intrusion to fresh water lenses. It has also been established that such islands are subject to natural geomorphic changes over time that reshape island coastlines (Albert et al 2016[10]; Webb and Kench 2010[11]). Raised limestone islands are the least common island type, having steep outer slopes to the ocean, relatively low elevation and no surface water or substantive surface soil. The greatest vulnerability in such islands is likely to be impacts of cyclones and fresh water shortage, with flooding rare except in some lower islands or where there are multiple levels with communities living on coastal terraces.

Coastal marine and terrestrial ecosystems are highly interconnected by their physical and biological interdependence, with pathways and processes that generate ecosystem services and benefits moving from one habitat to another (Silvestri and Kershaw 2010[12]). Therefore the proximity and vulnerability of coastal lagoons and nearshore waters to the impacts of, for example, sediment inflow, waste and other sources of pollution from terrestrial areas requires that better planning and management must focus on the ecological and developmental interconnectivity between marine, coastal and terrestrial ecosystems (see Figure 2).

Linked to the different island types are the people and communities, most of whom live around the coastal areas or in the main urban centres. In the atoll environment, the harvesting of marine resources for subsistence and small-scale livelihoods is a way of life and essential for food security and cultural practices, as there is little other option for the collection or growing of food, with agriculture being almost non-existent. For high islands, mainly in the Melanesian countries, land is more available for growing agricultural produce, although subsistence and small-scale livelihood fishing activities are also a major activity undertaken, especially by the rural coastal communities. Therefore, the coastal zone, where most people live, is the most important area in most Pacific Island countries and territories (PICTs) and the link between terrestrial and marine environments.

Obstacles to integrated coastal planning and management and good coastal governance at national and sub-national levels of government are often related to different jurisdictions and/or management controls being applied at the marine-coastal and terrestrial interface. It is common for marine management areas not to include watersheds that provide positive (e.g., fresh water flow for mangrove ecosystems) or negative (e.g., pollutant) inputs to marine and coastal ecosystems (Ruttenberg and Granek 2011[13]). However, communities often use and manage marine and terrestrial areas in an integrated manner within the domains of their traditional tenure and access rights. This highlights the importance of developing national and sub-national integrated governance approaches, while building on community use, understanding and ownership of coastal and related ecosystems and services, and establishing more effective management regimes that can strengthen resilience to climate change impacts.

The coastal zone is regarded as the transition between land and sea, but in the Pacific islands context it is essential that the definition is applied to be inclusive of all relevant factors that maintain or impact on coastal ecosystems and the people who depend on them. This means that for most Pacific islands a holistic approach must include 'whole of island' and ridge-to-reef approaches, or the regionally coined term Integrated Island Management (Jupiter et al. 2015[14], Govan et al. 2011[15]), responsive to geographic scale, the range of issues to be addressed, and complexities of governance.

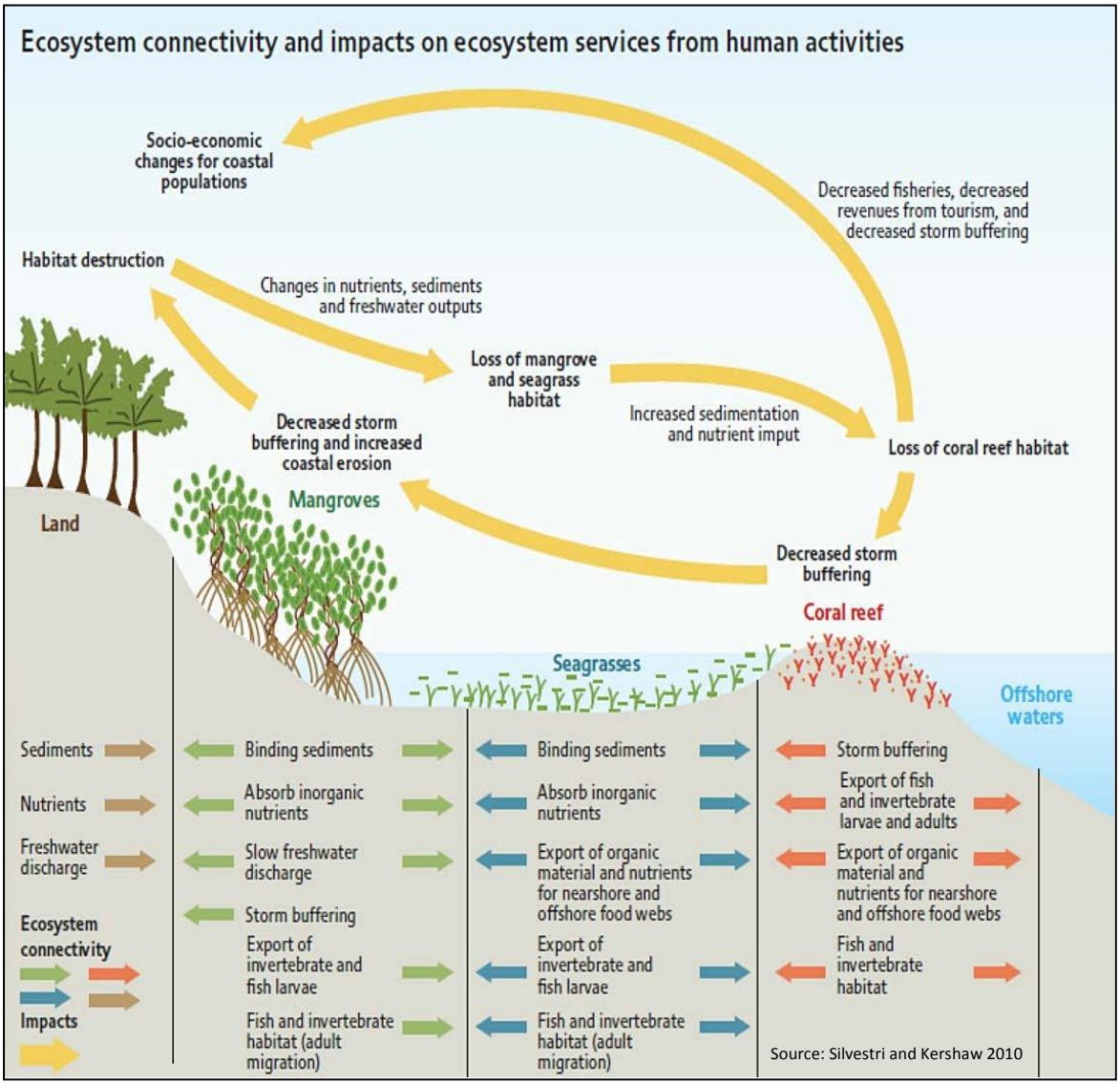


Figure 2: Ecosystem connectivity between mangroves, seagrasses and coral reefs. Potential feedbacks across ecosystems from the impacts of different human activities on ecosystem services are also shown (yellow arrows). In addition to these are the existing and predicted impacts of climate change: ocean acidification and increased sea surface temperature degrading coral reefs; changes in rainfall patterns and intensity - increased erosion and terrestrial habitat change, and decreased freshwater runoff impacting on growth of mangroves

4. The case for an ecosystem-based approach to climate change adaptation

The IPCC Working Group II Contribution to the Fifth Assessment Report includes analysis of natural and managed resources, their systems and their uses. The assessment focuses on: freshwater resources; terrestrial, inland water, coastal systems and low-lying areas; the ocean system; and food security and food production systems. The GCF (2015[16]) notes that "these resource areas capture key ecosystems and ecosystem services that will be affected by a changing climate and that should be considered for adaptation investments. It is reasonable to assume that the impact of interventions in these areas would be felt in countries that contain key ecosystems, and where economic activity and human wellbeing depend most significantly on natural resources."

Pacific island countries and territories rely on ecosystem services and natural resources to support national economies and community livelihoods (e.g., Table 1). However, a combination of non-climate change and climate change factors limit the ability of communities and governments to implement resilient approaches to climate change adaptation and effective environmental management. These factors include: deforestation and impacts on food security and water supplies; rising sea levels; heat stress; poor agricultural or land use practices; unsustainable fishing; damage to reefs and ocean acidification; removal of mangroves; natural disasters, poor waste management; increasing spread of invasive species and impacts on human health, food security and economic development; and so on (see Table 2). While most PICTs are implementing climate change adaptation programmes only a limited number explicitly address ecosystem approaches and their implementation, including the assessment of ecosystem services as a basis for long term resilience to climate change impacts. The GCF in its analysis report also notes that globally "existing ecosystem-based adaptation [EbA] is being funded [only] in a small number of cases through existing climate funds".

Table 1: Examples of Typical Community Reliance on Local Ecosystem Resources in the Solomon Islands (BMT WBM 2016[17])

Ecosystem	Ecosystem Services (in terms of examples of direct community uses)
Marine	• Marine products harvested for community consumption or trade/sale: reef and pelagic fish (e.g. coral trout, silverfish, snapper, sweetlips, surgeon fish, trevally, parrotfish, kingfish, dolphin fish, bonito, tuna, shark, barracuda, wahoo, sailfish and marlin), trochus, shark fin, eels, crayfish, clams, beche-de-mer • Octopus, crayfish, clams and limpets also harvested
Forest	• Construction materials: timber (*Gymnostoma papuana*, • *Xanthostemon melanoxylon*), ropes for house building (*Flagelaria indica*) • Decoration and kastom clothing (*Gleichenia linearis, Antiaris toxicara*), dying handicrafts (*Melastoma affine*), • Pesticides (*Selaginella rechingeri*), • Food such as pigs and other hunted fauna • Medicinal (*Gnetum gnemon*) • Firewood (*Timonius timon*). • Calophyllum trees provide wood for building canoes

Ecosystem	Ecosystem Services (in terms of examples of direct community uses)
Gardens and plantations (i.e. modified terrestrial habitat in the form of domestic crops and commercial agriculture)	• Products harvested for community consumption or trade/sale: coconut, *Colocasia* and *Cyrtosperma* taros, manioc, banana, breadfruit and papaya, tobacco, sweet potato, yam, sago, pumpkin, watermelon, sugar cane, fruit trees (e.g. *Burckella obovata*, Malay apple), Tahitian chestnut, canarium almond, turmeric, cocoa, cordyline, areca nut other fruits and *Piper betle*. • Plantations such as coconut, palm oil, cocoa
Other terrestrial	• Pandanus and coconut (leaves for sleeping mats, edible fruit and medicinal) • Coconut crab
Water supplies	• From rainwater, freshwater springs, streams, and groundwater - recognised as a critical need for drinking water in particular, but also for washing, bathing, cooking etc.

Table 2: Summary of key existing Threats to Broad Ecosystems Categories in Solomon Islands (BMT WBM 2016)

Ecosystem Category	Major Existing Threats
Marine	• Sedimentation of nearshore lagoons and reefs from logging • Community fishing (overharvesting, human population growth), commercial fishing (overharvesting) • Poaching • General resource and habitat degradation • Declining biodiversity
Terrestrial	• Logging / timber extraction • Industrial agriculture (especially forestry and oil palm plantations) • Urban development and urbanisation • Deforestation • Natural disasters (e.g. cyclones, earthquakes) • Fauna overharvesting • Introduced/invasive species, including those used in reforestation • Mining • Habitat degradation • Wildlife trade • Population growth
Gardens and plantations (i.e. modified terrestrial habitat in the form of domestic crops and commercial agriculture)	• Pest species • Population growth • Reduction in soil fertility and integrity
Aquatic and water supplies	• Logging (e.g. sedimentation) • Overharvesting of aquatic fauna • Poor agricultural practices • Mining • Introduced pest species (e.g. Tilapia)

However, awareness in the Pacific islands region of the validity and relevance of the EbA approach is increasing, largely as a result of its promotion and implementation by SPREP and other organisations. Some PICs have explicitly included ecosystem approaches in national climate change policies, for example, the 2012 Solomon Islands national climate change policy states: "healthy and functioning ecosystems are crucial for the achievement of adaptation and mitigation objectives'' (MECCDM 2012)[18] by taking into account the ecosystem services on which people depend for their livelihoods and social and economic security, EbA integrates sustainable use of biodiversity and ecosystem services in a comprehensive adaptation strategy (CBD 2009[19]), which is highly relevant to Pacific island responses to climate change. However, to be effective it is vital that there is a coherent national response to climate change that integrates social, economic and ecological approaches across all sectors and at all levels of society (Hill et al. 2013[20]). The GCF (2015) notes:

> "Ecosystem-based adaptation…offers flexible and cost-effective measures to address risks at multiple scales that can also deliver co-benefits for mitigation, livelihood protection and poverty alleviation. Ecosystem services have been shown to reduce exposure to natural hazards and build adaptive capacity, which also contributes to resilient outcomes."

In 2010 the World Bank (2010[21]) reported that the cost for developing countries to adapt to climate change between 2010 and 2050, based on adapting to an approximately 2^{o}C warmer world by 2050, is estimated at $70 billion-$100 billion a year at 2005 prices. Loss of functioning ecosystems and their services, which provide cost-effective defences against climate change and support adaptation and resilience action, will result in much higher human and financial cost.

Parallel to the EbA approach, in the marine sector is the community-based ecosystem approach to fisheries management (CEAFM), being implemented by the SPC and many other NGOs, including the LMMA network. The Apia Policy (Anon 2008[22]) was developed by the Head of Fisheries of the PICTs, and highlighted the need for a holistic approach given the up-stream activities that were affecting the marine environment (refer Figure 1). This was taken further and expanded by SPC, FAO and The Nature Conservancy (TNC) in 2010 with the development of CEAFM guidelines (SPC 2010[23]) and a supporting booklet. The aim of this was to provide guidance and principles to community practitioners to improve both the lagoon environment and management of coastal resources.

The CEAFM, which has many other terminologies, has been accepted by many PICTs in the recent past, and it some cases it allows coastal communities to go back to traditional community-based approaches with closed seasons or areas for specific species or fisheries. In 2011 the SPC and LMMA produced a series of 29 information sheets (Anon 2011[24]), 3 brochures, a guide book and several posters, to better disseminate information to as many communities as possible, and moved away from specific pilot sites, that in many cases become dependent on donor funding, so sustainability is a key to future work in this area.

5. Key Elements of the Coastal Resilience Framework

The aim of the framework is to help Pacific island governments and communities to strategically and practically address the critical challenges posed by climate change to the social and ecological systems that are the foundations for resilience and adaptation. It will facilitate a paradigm shift by Pacific island governments to move from current disjunct and reactionary approaches to dealing with climate change and other anthropogenic stressors, which tend to focus on sectors, development agendas and thematic responses separately, to integrated holistic approaches within

comprehensive analytical frameworks and scenario planning appropriate to the dimensions of predicted climate change impacts and the scale of countries or islands. As the basis for this approach it is essential that EbA is developed and implemented as part of an integrated programme of work, which will also support implementation of NAPAs and JNAPs that have already been developed.

For example, with regard to coastal fisheries it is essential to consolidate CEAFM and the supporting science behind this (resources and supporting habitats including fish, invertebrates, mangroves and seagrasses) as an underlying process to ensure governments and communities manage coastal resources collaboratively at national and sub-national level and to integrate climate change adaptation. As EbA generates new information, CEAFM and other approaches can be modified and adapted based on the new information, so it will be an iterative process of change that will allow communities and practitioners to evolve and use more resilient approaches to address both climate change and non-climate change issues. In addition, the information collected provides a baseline in the event of a natural disaster, so that better assessments can be done on damage and loss, especially the environmental impact or cost, and allow recovery to be measured over time.

This framework is shown schematically in Figure 3 and comprises, in summary, the following key components for action:

i. Assess and Map Current Critical Ecosystem Services and Socio-economic Relationships, Governance Functions and Relationships

- Define appropriate geographic, ecological, social and governance scales and boundaries relevant to the programme/project.
- Identify and assess the health of, and pressures on, key marine, coastal and terrestrial ecosystems and resources that are essential for maintaining essential ecosystem services that support livelihoods and food security for communities (e.g., coral reefs, coastal fish and invertebrate populations and their supporting habitats, freshwater resources, mangroves, seagrasses) and other development (e.g., tourism) in the coastal zone.
- Assess extent and severity of current and predicted climate change and non-climate change pressures on ecosystem services.
- Implement ecosystem and socio-economic resilience analysis and mapping (ESRAM) at scales that are inclusive of all relevant ecosystem, socio-economic and governance linkages to integrate climate change and non-climate change issues into ecosystem services and socio-economic vulnerability and opportunity assessments (ESVOAs - next section).
- Strengthen existing efforts in CEAFM to ensure national systems of co-management with full engagement of stakeholders at all levels, from the start, including the establishment and/or strengthening of consultative or advisory group that includes representatives from all stakeholders. This would include climate change adaptation activities that support food security and small-scale livelihoods. As early new information becomes available from the above activities, changes can be made to adapt and incorporate the new information.
- Consolidate national CEAFM priorities in line with the regional policy (New Song) which will ensure, amongst other things, that communities are fully engaged and aware of what is happening in their area and the possible consequences based on the actions they take or choose not to take, and that this adaptive management is supported by national and sub-national management systems.

ii. Assess Ecological and Socio-economic Vulnerabilities and Opportunities

This analytical phase synthesizes the outcomes of the preceding assessment process and ESRAM implementation to produce the ESVOA, which identifies and articulates the vulnerabilities of social (including governance) and ecological systems to climate and non-climate change pressures and impacts, and to disasters. It is also important that opportunities are identified to protect and restore critical ecosystems and their services, and opportunities to retain and build on the strengths of social systems and effective governance structures. Building on strengths and opportunities is a critical element for resilience and adaptation.

iii. Evaluate Future Resilience Scenarios

It is important that Pacific island countries move from reactive responses to climate and non-climate change impacts to proactive forward planning. The purpose of scenario building is to engage communities, planners and policy makers in a process that defines as much as possible predicted futures in a changing climate, peoples' aspirations and concerns, and development of policies and actions that can strengthen the resilience of societies and ecosystems. Walker et al. (2002[25]) observe that "scenarios create a framework to discover pathways and actions that connect the kinds of worlds people prefer (or seek to avoid) with the kinds of drivers to which they will have to adapt as they strive to attain their visions". A recent example of this is a climate change and Pacific island food systems (Bell et al. 2016[26]) publication, where four scenarios were reviewed covering connectedness to markets and governance of natural resources (both good, both bad, and one good and bad) through sketches to depict the perceived outcome of the different scenarios in 2030.

This strategic planning phase takes the outcomes of the previous two steps to develop and review potential scenarios based on key drivers, including: extent and intensity of projected climate change impacts (e.g., sea level rise and loss of usable coastal land, ocean acidification, droughts and diminution or loss of coral reefs and/or marine resources); predicted frequency of severe weather events and other natural disasters; trends and long term outcomes of non-climate change impacts (e.g., pollution, deforestation, unsustainable fishing); societal trends (e.g., changes in national, subnational or traditional resource management and governance); population growth; urbanisation (e.g., 50 percent of Pacific island populations are already urban); food security and water resource demands; and preferred outcomes of adaptation responses. Time frames for future scenarios need to be determined in terms of predicted climate change impacts and their implications, the scale and trajectory of linked non-climate change issues if either addressed or not, social and development issues, trends and priorities. Looking ahead 10-30-50 years may be appropriate time frames in terms of climate projections in order to set in place and commence implementation of strategies and policies that move Pacific island societies to a more resilient and adaptive future. It will also depend on the social and biophysical parameters of each country/island in the context of climate change projections, and for many it will need to include options that go beyond adaptation to transformation strategies, such as the atoll countries faced with the existential issue of sea level rise or high islands with populations living on narrow coastal strips.

Adaptation priorities from the results of scenarios can then be considered in the current day-to-day activities underway so these can be refined to account for the projected changes. Again, this would be an iterative process and adaptive management at national, sub-national and community levels including plans, policies and legislation. It will also allow better integration of the different sectors for a more holistic approach with community at the centre of the change, as the custodians of

resources and the environment within the area of their jurisdiction through EbA or CEAFM approaches. This would also include all climate change adaptation activities.

iv. Design and Implement Resilience and Adaptation Responses

The outcomes of the preceding three phases will be the drivers for designing, redesigning, adapting and implementing resilience and adaptation focused responses. At national, sub-national and community governance levels this could include formulation of plans, policies and legislation, and relevant enforcement mechanisms to address issues such as: landscape scale responses to protecting and restoring ecosystem services, including protection and restoration of mangroves, seagrasses, forests and water catchments, coral reefs and marine ecosystems; unplanned expansion of urban settlements; pollution prevention and control; control of invasive species; fire prevention strategies; adjustment of fisheries policies to support better balanced ecological relationships and trophic structures and to promote food security; integrated sectoral responses to adaptation and development - including development decision making through a resilience and adaptation 'lens' to protect ecosystem services and communities. Engagement at the highest political and decision making levels will be critical to ensure buy-in by political and institutional leaders.

At community levels, resilience and adaptation responses could include: support from national and sub-national governments for national/sub-national polices; education and awareness programmes on climate change risk - understanding threats, options and responses and increased decision-making power; better settlement planning; improved community-based management of ecosystems and resources and benefit sharing; fishing regulations to protect habitat and promote a more balanced species take at different trophic levels; hazard and vulnerability mapping and ESRAM/ESVOA processes at local scales.

In addition, more specific climate change adaptation activities can be developed or those in practice refined or modified as needed, and can include both land management practices and other terrestrial focused activities, as well as reducing or redirecting fishing and other pressures on reef fish and invertebrate species and their supporting habitats through the CEAFM and/or co-management approach. Some climate change adaptation activities for the marine sector can include the use of FADs and small-scale aquaculture activities, as well as non-extractive activities such as eco-tourism and tag and release sports fishing.

Two feedback loops are considered essential for successful implementation of the programme and its projects that are designed for implementation at national and sub-national levels:

i. Regular validation of implementation activities to ensure that they meet preferred scenario goals, and that new information or insights resulting from implementation can inform modification of scenario assumptions if required.

ii. Periodic monitoring and evaluation of the process and its implementation to verify outputs and outcomes against the ESRAM assessments and ESVOA framework to ensure relevance and/or adapt strategies and assumptions that underpin scenarios, based on new knowledge derived from implementation and/or information (e.g., climate change and ecological science).

6. Framework Implementation

Implementation of the framework will require dealing with different geographic and governance scales to ensure that all stakeholders and social, environmental and economic development

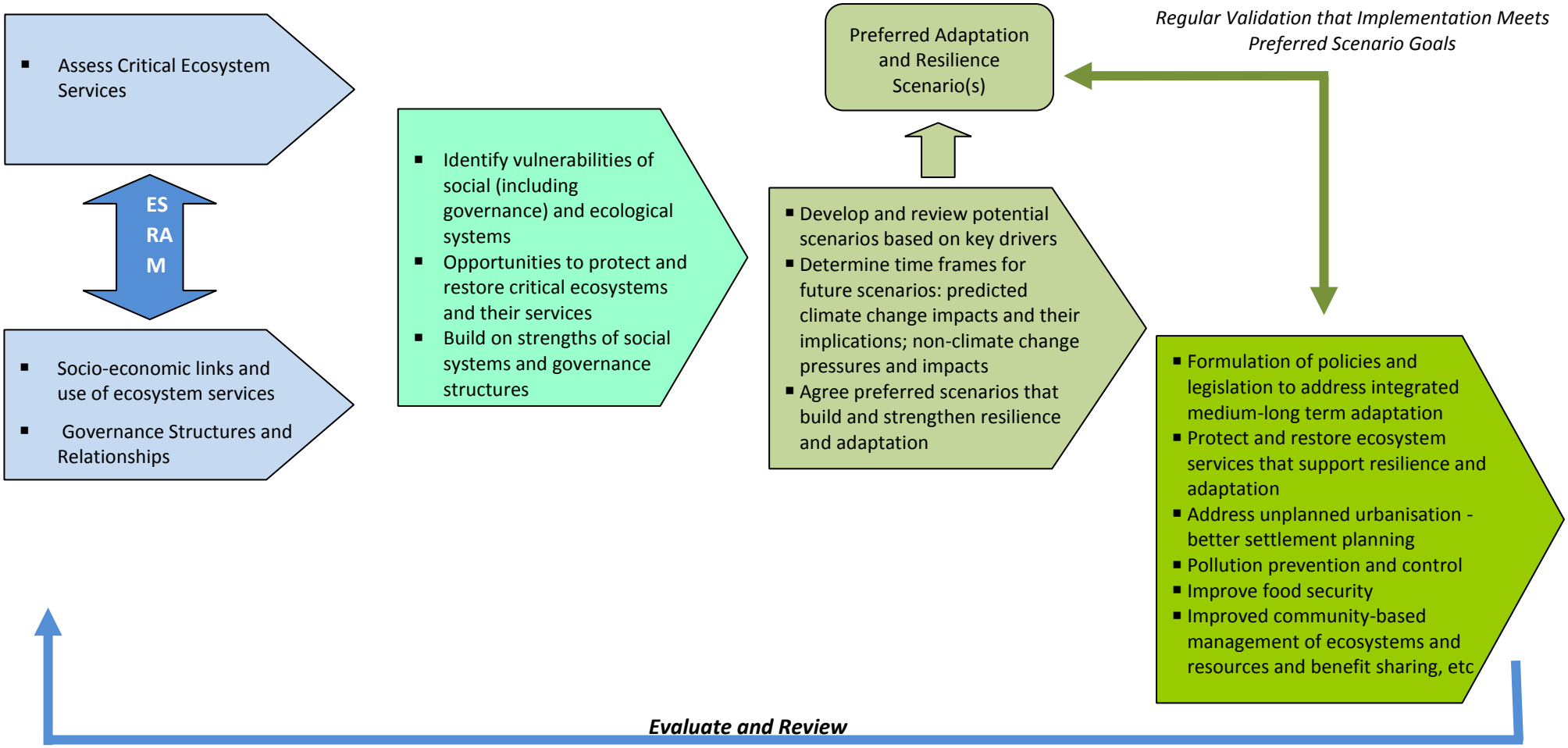
parameters are addressed. It will also require a long term perspective moving through logical stages of assessment, planning and implementation integrated across multiple sectors. Implementation will include or support the following principles and commitments:

- Establishment of a steering and coordination committee comprising the Implementing Entities and partners, and relevant country representation
- Participatory engagement with stakeholders, including national, sub-national and community levels and the formation or enhancement of consultative or advisory group that includes representatives from all stakeholders to bridge gaps and create a holistic approach to the project.
- Capacity building and institutional strengthening
- Good governance and accountability
- Human rights based approach
- Gender equity
- Community rights
- Long-term sustainability
- Integration with other relevant programmes and projects to maximise impacts, build synergies and minimise duplication
- Monitoring and evaluation of impacts over the long term (i.e. after the conclusion of a given project under the program)
- Attainment of SDGs
- Attainment of CBD Aichi Targets
- Attainment of result areas in other relevant regional policies and frameworks, including the Framework for a Pacific Oceanscape, Framework for Resilient Development in the Pacific, Regional Framework for Nature Conservation and Protected Areas, and the New Song for Coastal Fisheries - Pathways to Change

As soon as successful approaches and methodologies have been finalised, the aim will be to upscale and rollout successful activities and approaches to other similar locations, both within country and in other countries in the region. It is important to upscale as soon as new technologies or ideas are proven to ensure maximum coverage around the region. This will cover all aspects of the work and activities undertaken by the project.

Figure 3: Implementation Process

1. ***Assess and Map Current Critical Ecosystem Services and Socio-economic Relationships, Governance Functions and Relationships - ESRAM***
2. ***Assess Ecological and Socio-economic Vulnerabilities and Opportunities - ESVOA***
3. ***Evaluate Future Resilience Scenarios***
4. ***Design and Implement Resilience and Adaptation Responses***



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